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Thesis

Large Scale Land Acquisition

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The Thesis is organized in four parts (papers):

1. *Investments in Agriculture Land: Drivers, Dimension and Geography.*
2. *What are the pull factors of land demand in Africa?*
3. *A meta analytic assessment of the effects of Land Inequality on Growth.*
4. *Conversion Forest Land to Crop Land: Environmental Impact!*

Abstract

Natural resources are likely to become, over the 21st century, the focus of an intensified competition among different uses, competition triggered by the rapidly increasing demand for water, energy, food and minerals related to population growth and urbanisation, and by changing lifestyles and diets. The availability of any kind of resource has a strict dependence on land. This dependence is very high for agriculture and water, and very significant for energy and minerals. Land ownership and use adds layers of complexity in the nexus relating water, energy and food, which are the key pillars of human well-being and societal development globally. In global this context, it seems to be important to increase understanding of the converging global dynamics that have spurred a global rush for agricultural land in Africa, Latin America and parts of South-east Asia, which has intensified after the food price crises in 2007-2008, after many years of little investments in the agricultural sector. This trend is generally referred to as land grabbing and is characterised by purchases or long-term leases (which typically run for 50 to 99 years) of farming land by either private or public investors.

In the first part of the thesis, I have reviewed the literature, explaining the drivers and the trends of Large-Scale Land Acquisitions (LSLAs). It is easy to see that the majority of such investments are targeting Africa continent. This because at the first sight the continent presents the most available land in the world ready to be cultivated. “Available”, “degraded” and “underutilized”, have became epithets in common usage among proponents of large-scale land acquisitions, rendering landscapes as commodities ready for the taking. Foreign and local investments offer crucial opportunities to recipients in terms of access to capital, technology and innovation, foreign market access and infrastructure development. However there are development risk associated with insecure property rights and land concentration. Hence, concern for the recent capital flows is linked to the likelihood that it may shift the path of agricultural development away from smallholder strategies, with the possible negative implications extensively discussed in the development and agricultural economics literature.

In the following part, using a beta regression, I have investigated the determinants of land acquisitions for large-scale agriculture. Results confirm the central role of agro-ecological potential as a pull factor, and also that such investments in Africa are targeting forested areas. During the 1980 – 2000 period, more than half of the new agricultural land across the tropics came at the expense of intact forests, and another 28% came from non intact forests, raising concerns about environmental services and biodiversity globally. Intensive farming, which continues to increase, has resulted in loss of natural habitats and species living in them. Forest and mixed-use woodlands are often targeted by government for agriculture expansion in order to avoid the displacement of crop land.

In the third part of my thesis, I have analysed the link between inequality access to land and growth, given that the large size of foreign and domestic capital flows in conjunction with state landlordism in Africa may result in a development path that is geared towards large farms and land concentration. The average size of a farm in Africa is 2.2 ha, namely a very small size if compared to investments in land that are at least 200 ha large. In order to analyse the above link I have used a meta regression technique to review the land inequality literature. A large literature on inequality and growth has firmly established a strong role of land inequality as determinant of income inequality, and the negative impact of land inequality on long term growth; long term analysis also clearly shows that inequality in asset ownership once established is very difficult to reverse. The policy implications are that smallholder or outgrower strategies should be encouraged also in a context of large-scale deals, the degree of legal protection of land rights is crucial, elements of land related corporate social responsibility could usefully integrate public regulation in the domain of protection of user's rights.

In the last part, I have done a preliminary assessment of loss of carbon following the conversation of land use from forest to crop land. Converting a forest to crop-land, for example, for biofuels production can result in much more global warming pollution than the amount that can be reduced by the biofuels grown on that land. Thus, I have assumed that 30 per cent of such investments are happening on forest land, unfortunately the inaccuracy of localization data do not allow an assessment more precise.

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Investments in Agriculture Land: Drivers, Dimension and Geography.

1.1 Introduction.

The second half of the first decade of this century has witnessed an increased attraction for lands for agricultural use, especially in developing countries caused by the impression of vast available land, cheap labour and land, favourable climate for agricultural production, and availability of water resources to be used to irrigate at relatively low costs (De Schutter, 2009). Large-scale land acquisitions (LSLAs) in developing and, to a lesser extent, in former transition countries, represents a new and growing issue at global level. It has been reported and emphasized by several papers and press articles, documenting a large number of deals (Friis et al., 2010; Grain, 2008; Cotula et al. 2009; FAO, 2009; GTZ, 2009). This flood of investments, the majority of which has been done for agriculture use, has been critically labelled as "*land grabbing*", this because the deals involve crucial assets, such as land and water, usually in a context of complex and often insecure property rights (Cuffaro et al., 2013). However, discussion about the phenomenon reflect different positions. Some authors have highlighted the negative impact of these investments on natural resources, livelihood and sovereignty (Davis et al, 2014; Rulli et al., 2013; Deininger, 2011; De Schutter, 2011). Others see these investments as a path for economic and social development that may come from capital inflows in the target economies (World Bank, 2011; German Federal Ministry for Economic Cooperation and Development (BMZ), 2009).

International investors come from all over the world: Europe, Asia, Middle East and North Africa and North and South America but also Sub Saharan Africa had started investing in land for different purposes: agriculture, tourist resorts, biofuels cultivation and so on. Indeed, starting from 2007, the demand for land rose at an unprecedented pace and at the same time a range of new peculiar aspects appeared (Deininger et al., 2011). Water demand, also, for the agriculture sector is supposed to increase by at least 20% by 2050, even in the presence of productivity improvements through technological development (De Fraiture et al., 2007). In order to meet the production of food and animal feed an additional 47 million ha of land will be needed by 2030, and also 42-48 million ha will be needed for large-scale afforestation and 18-44 million ha for producing biofuels feedstock (ERD, 2012). However the amount of land to put under cultivation is unequal located, with large tracts of land in Sub-Saharan Africa and Latin America and, to a lesser extent, East Asia (FAO, 2011).

1.2 General Picture of the phenomenon.

During the 2011 Tirana Conference the International Land Coalition defined land grabbing as land acquisitions that are in violation of human rights, without prior consent of the pre-existing land users, and with no consideration of the social and environmental impacts. In many cases, land grabbing is not the result of a transparent and democratic decision process (International Land Coalition, 2011; Rulli, 2012). The legitimacy of foreign land deals is one of the most controversial issues debated by the scientific community worldwide (IFAD, 2011). It has been discussed that, in countries characterised by weak land governance and high corruption, politicians often allow concessions to investors in return of bribes and allow eviction from land of local farmers, often without adequate compensation (Vermeulen et al., 2010). Many American and European companies have set up arrangements in food - deficit countries, such as Ethiopia, Mozambique and Tanzania, and switched land-use from growing crops for food to biofuels (FAO, 2009). Furthermore it has been calculated that the share of biofuels production is almost three times larger than the share of food production (Anseeuw et al., 2012b).

Farmland acquisition is not certainly a new phenomenon, however some facets of the current trend are new, including its range and the complex set of drivers, namely a combination of food, energy, climate and financial crises (Quagliarotti, 2013). In fact, looking back through centuries of human history, it is possible to find similar events in the North, South, East and West, including pre-colonial confiscated land associated with territorial wars, European possessions in the North, and dispossession of native people in North America. “*In many regions of the global South, land was first grabbed by pre-colonial rulers in chronic territorial wars with each other, then by colonial governments and increasingly by foreign or domestic corporations*” (White et al., 2012). But the history of land grabbing reveals much more than just the fact that the phenomenon is not new. There is a general consensus that a number of aspects distinguish the most recent flood of land grabbing from the past.

First, the trend is happening at a relatively fast pace, caused by changing dynamics in the global food regime, in energy security responses, in environmental protection in the context of climate change, and in the international flow of finance capital searching for safe investments after the failure of sub-prime mortgage markets in the North.

Second, the trend is large-scale acquisitions of land. Examples are 50,000 hectares acquired in Kenya by UK company Jatropha Africa in 2011 for jatropha production; 250,000 hectares acquired in Ethiopia by MIDROC Group of Saudi Arabia in 2008 for jatropha and oil palm production; and 50,000 hectares acquired in Senegal by the Italian company Nuove Iniziative Industriali srl in 2010.

Third, the trend is also long-term leases, purchase or other economic arrangements. The basic land transactions typically vary from 30 to 50 or even 99 years at a time, often with the option to be renewed too.

Fourth, the trend has become global in scope and allocation. The phenomenon it is happening everywhere, throughout South and Central America, throughout South and South-east Asia, and in many parts of the global North, even in the former Soviet Eurasia, but Africa is certainly a hotspot.

To sum up, distinctive elements are:

- the high incidence of Large Scale Land Acquisitions (LSLAs),

- the major role played by both public and private foreign investors mainly targeting arable land and forests in the developing world, and
- the increasing pressure on land as a resource, which follows the multiplication of competing uses for land (Anseeuw et al., 2012a; Cotula, et al, 2009; Cuffaro et al., 2013).

This combination of factors pushed civil society groups and transnational networks to alert the world about the global land grab under-going and its possible negative impacts on communities and fragile ecosystems (Fairhead et al., 2012). In the most of the cases, these large land deals are not properly acquisitions. The land, usually, has been leased to be exploited by domestic or international actors. This because arable land tend to be a scarce resource in several rich and emerging countries, e.g. Gulf Countries, while it seems to be available in most developing countries, especially in Sub Saharan Africa, where it is still underutilized by the local populations or enterprises (FAO, 2011). Deininger & Byerlee (2011, p. XIV) provide a good picture of the LSLAs phenomenology: "*The demand for land has been enormous. Compared to an average annual expansion of global agricultural land of less than 4 million hectares before 2008, approximately 56 million hectares of large-scale farmland deals were announced even before the end of 2009. More than 70 percent of such demand has been in Africa; countries such as Ethiopia, Mozambique, and Sudan have transferred millions of hectares to investors in recent years*."

It is important stressing that the overall size of LSLAs is not precisely known, and the existing estimates vary according to the selected sources and the criteria on which each list is being built, i.e. time frame, geographic coverage and information collection method (Table 1).

Similarly, the trend of the amount of land demanded over time is not clear. It seems that after the fast growth experienced from 2008 in the last years the demand for LSLAs has slowed down, according to Land Matrix data (Figure 1).

The Land Matrix is an Online Public Database on Land Deals. It is a global and independent land monitoring initiative that promotes transparency and accountability in decisions over land and investment[1]. The Beta version of Land Matrix, that has been launched in April 2012 and upgraded in June 2014, provides the best source of data to account for land acquisitions worldwide.

Table 1. Estimated inventories of areas involved in large - scale land investments. ***Source HLPE , 2011***

Amount of land (ha)	Coverage	Time period	Source	Method
2.5 million	Ethiopia, Ghana, Madagascar, Mali and Sudan	2004-2009	Cotula *et al.* 2009	Systematic inventories based on in-country research
51-63 million	27 countries in Africa	Until April 2010	Friis & Reenberg 2010	Systematic inventory of media reports
Approximately 1.5 million	Mali, Laos, Cambodia	Until 2009	Görgen *et al.* 2009	Systematic inventories based on in-country research
>3.5 million	Kazakhstan, Ukraine. Russia	2006-2011	Visser & Spoor 2011	Media and web based
46.6 million	81 countries	2004-2009?	Deiniger *et al.*, 2011	Systematic inventory of media reports
4.3 million	Brazil	until 2008	Wilkinson at al 2010	-
545,000	Mali	By end 2010	Baxtor, 2011	Field visits, govt documents
3.6 million	Ethiopia	2008-11	Horne, 2011	Field visits, govt documents
15-20 million	"poor countries"	2006-09	IFPRI 2009	-
> 80 million	Global	Since 2000	International Land Coalition	Systematic inventory of verified media reports
Approximately 15-20 million ha	Global	Since 2000	v. Braun and Meinzen-Dick (2009)	Estimate based on media reports
Not identified	Global	2007-2008	GRAIN 2008	Media and web based

The land transactions, included in the Land Matrix database, are those which:

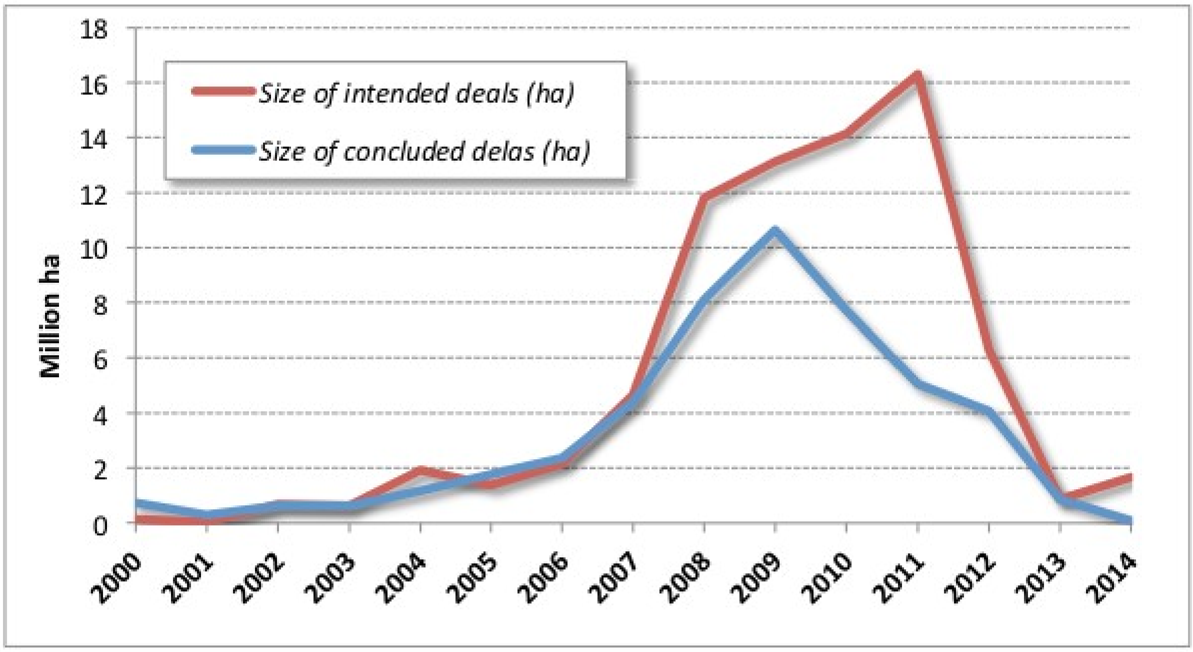
- entail a transfer of rights to use, control or own land through sale, lease or concession;
- imply a conversion from land used by small-holders, or for important environmental functions, to large-scale commercial use;
- are 200 ha or larger;
- and were not concluded before the year 2000.

The Land Matrix database records cases of intended and concluded land deals involving foreign and domestic investors, at any level of implementation (under negotiation, start-up phase, in operation,

1 The Land Matrix Global Observatory is coordinated by the following organisations: International Land Coalition (ILC), Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Centre for Development and Environment (CDE), German Institute of Global and Area Studies (GIGA) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

failed), obtained by a variety of cross-referenced sources ranging from research papers, personal information, field-based research projects, government records, company websites and media reports. The reported deals refer to six main sectors: food, fuel, timber, carbon sequestration, mineral extraction and tourism. However, a lack of transparency in the involved countries seem to suggest that the scale of the land acquisitions could be underestimated (Anseeuw et al., 2012b). Databases on land transactions are generally affected by both over- and under- estimates (Pearce, 2013). In any case, it has been shown that many of the reported land transactions have never materialised or are not in operation (Verhoeven et al., 2012).

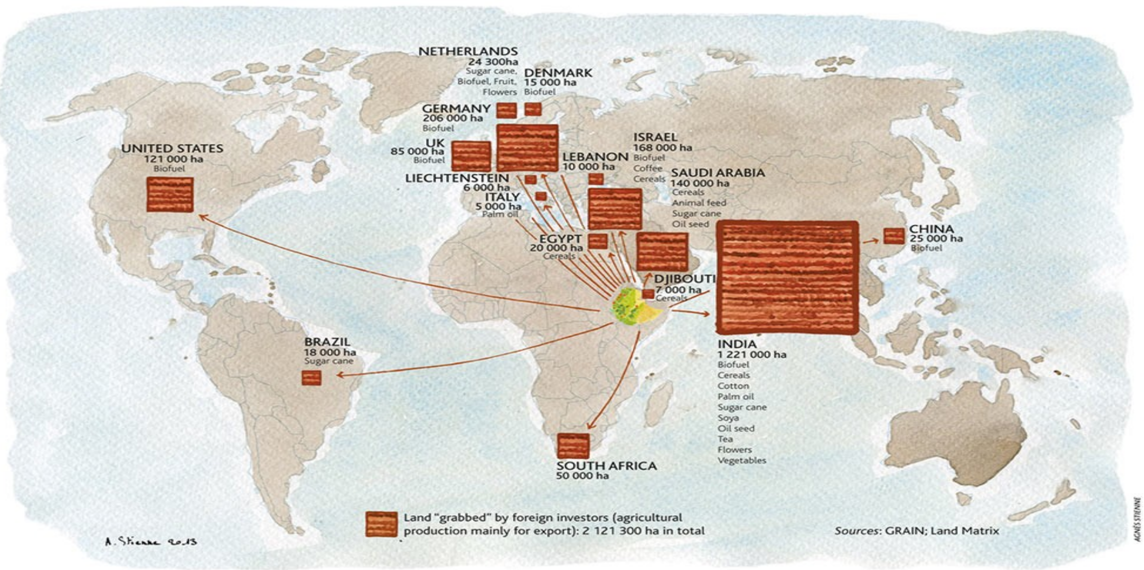
Figure 1 - Total size of intended and concluded LSLAs over time. ***Source, De Maria, 2015.***



The recent decline may simply reflects the delays of the data collection method based on media report, there is a time gap between the information about a new deal and the media publication. Nevertheless, even if the hypothesis that LSLAs were just a bubble that will not repeat in the future, the amount of land that has been traded and the following change in the land uses are so extensive that the effects are likely to be deep and long lasting, therefore further research on the topic are needed.

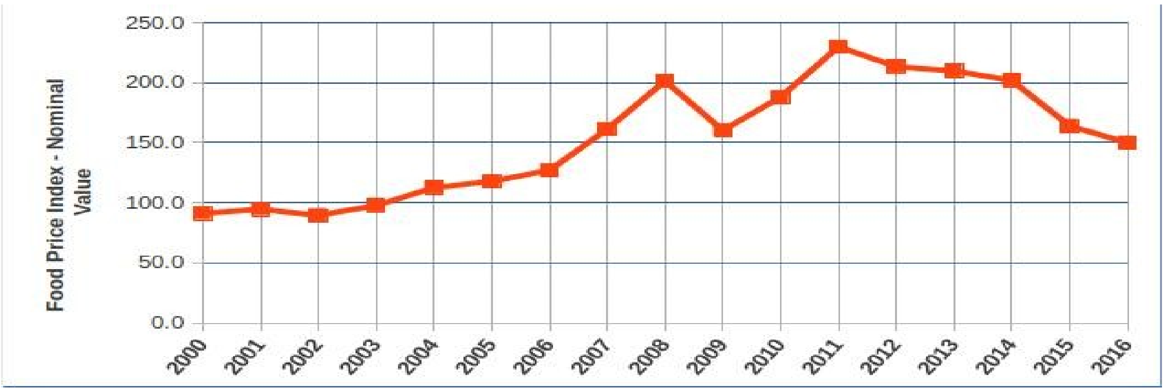
There is no doubt that Africa is the main target of LSLAs and the increasing demand for its land has generated heated debates about if the net effect is positive or negative for the continent and its people. Although foreign investment is desirable in order to encourage agriculture productive sector, Africa does not need policies that transfer land to investors manly motivated by the urge to export food crops to feed their own populations (Imagine 1) while, Africans wallow in hunger, or to supply biofuels markets across the globe, and meantime small farmers are dispossessed of their main asset and livelihoods.

Imagine 1. Land Investments in Ethiopia. Source: GRAIN, Land Matrix.



In fact, natural resources investments emerged between 2004 and 2005, intensified after 2007 – 2008, when the global food price rose and the economic slowdown revived the interest in investing in agricultural land, peaking in 2009 and slowing down in 2010 (GRAIN, 2008; Anseeuw et al., 2012a). During 2007-2008, the downward trend of food prices of the previous 25 years came to an end (Figure 2), in combination with high and volatile oil and fertilizer prices (FAO, 2009).

Figure 2 – FAO Food Price Index. Source: Author's elaboration.



The raise of food crop demand, both in the EU and in the US, caused by the reduction of food crop stocks (Mitchell, 2008), by the switch of land-use due to the expansion of cultivated land under biofuels feedstock, which reduced, in turn, the production of other crops, and by speculative activities (Mittal, 2009; UNDESA, 2013), affected harshly food prices (about 70% of the increase in maize prices and 40% increase in soy-bean prices). The domestic price of these food commodities increased by 48% in real terms in developing countries (Dawe et al., 2009). Rising food prices, of course, impacted most severely the world's low-income and food-deficit countries (Maros et al., 2008), not only by putting at risk the main source of livelihood of local populations (especially in the case of cash - crop farmers), but also by reducing their purchasing power (Benson et al., 2008; Minot, 2012). Food represents, in fact, about 60 - 80% of consumer spending in the less developed world, compared with only 10 - 20% in rich countries (UNCTAD, 2008).

1.3 Background. Natural Resources.

1.3.1 Land.

The world's agricultural production has grown between 2.5 and 3 times in the last 50 years, while the cultivated area has grown only by 12 percent. Actually agriculture uses 11 percent of the world's land surface for crop production, and uses about 70 percent of all water withdrawn from aquifers, streams and lakes, a figure that approaches 90 percent in countries such as India and China, which rely on extensive irrigation (FAO, 2011; Fisher et al., 2002). Because of growing population and energy demand, it is necessary to bring more land under cultivation, and the land suitable for cropping is present in those countries where population need to raise production. Large-scale land acquisitions are happening in parts of Africa, Asia and Latin America, where land and water resources appear to be abundant and available. However, contrary to perceptions there is very little empty land as most suitable land is already used or claimed, often by local people. In fact, there is a risk that the rural poor could be evicted or lose access to land, water and other related resources. Many countries do not have sufficient mechanisms to protect local rights and take account of local interests, livelihoods and welfare (Cotula et al., 2009).

1.3.2 Land use and suitability.

The global area of cultivated land has grown approximately by a net 160 Mha since 1961. This increase includes a larger area of land newly brought into cultivation, while over the same period previously cultivated lands have gone out of production. All of the net increase in cultivated area, over the last 50 years, is attributable to a net increase in irrigated cropping. Irrigated area more than doubled over the period, and the number of hectares needed to feed one person has reduced from 0.45 to 0.22 ha per person (FAO, 2010). However, a decline of about 129 Mha in forested area between 1990 and 2015 suggests that the expansion in the cultivated area and the replacement of degraded arable land with new cultivated land have been partly achieved through conversion of previously forested areas (FAO, 2015).

Globally, about 0.23 ha of land is cultivated per head of the world’s population. High-income countries cultivate more than twice the area per capita (0.37 ha) than low-income (0.17 ha) countries, while middle-income countries cultivate 0.23 ha per capita.

1.3.3 Forest *(more details in the last part of the thesis)***.**

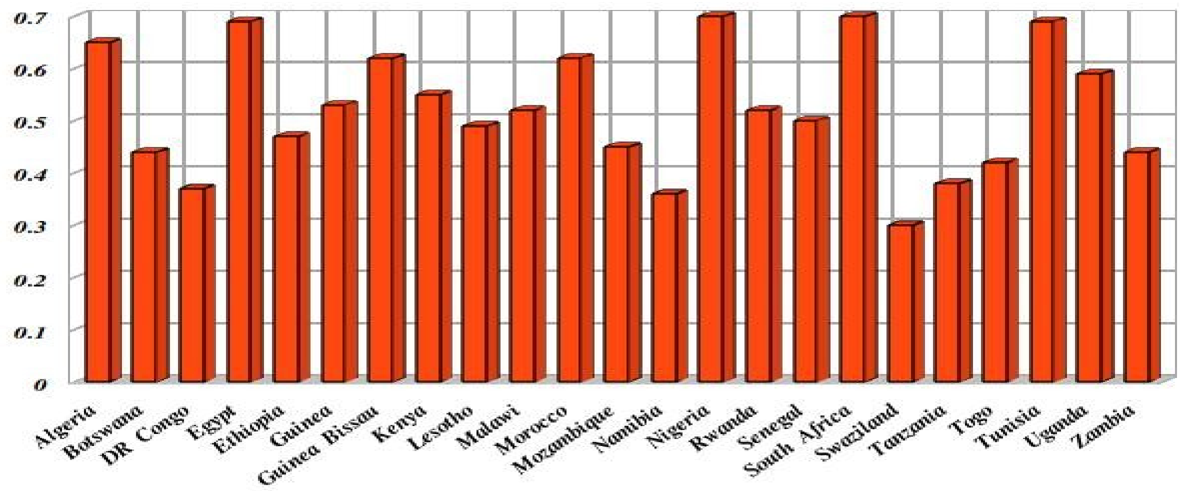
In 2015, forests covered approximately 3999 million of ha. Deforestation, arising mainly from the switch of tropical forests to agricultural land, has recently shown signs of decreasing, but still continues at an alarming rate. However, during the last decade, the net reduction in forest areas has been limited by large-scale planted of trees. Net losses of forested land were concentrated in South America, sub-Saharan Africa, South-east Asia and Oceania, while the US, India, China, Russia and several European countries showed net gains in forested land. Forests play a vital environmental role in the production of timber, wood, fuel, and other products; conservation of biodiversity and wild life habits; mitigation of global change; and control of flood risks. Africa lost some 53 million ha of forest, mainly from expansion of crop cultivation (Fisher et al., 2002).

1.3.4 The access to land and the small farmers.

In the rural world, the poorest have no land or have the lowest access to land and water, and low access to land and water is a precondition for poverty. The concentrations of rural poverty can be linked to marginal lands, commonly, poor farmers are locked in a poverty trap of small, remote plots with no secure tenure, poor-quality soils and high vulnerability to land degradation and climatic uncertainty. At the same time, technologies and farming systems are typically low-management, low-input systems that often contribute to resource degradation. However, improved farming systems can modify the relationship between land and water resources and poverty: the likelihood of being poor is much lower when improved farming systems are employed (Hussain et al., 2004). Thus, improving land and water tenure arrangements and management practices in these areas is likely to have a direct positive impact on food insecurity and poverty (Lipton, 2009).

In African countries most smallholder farms are gradually shrinking. The average farm sizes has shrunk by 30–40% since the 1970s (Headey et al., 2014). Land inequality is also very high, particularly in Kenya (with a Gini coefficient of 0.55) and Nigeria (with a Gini of 0.70), with evidence of rising Gini Land coefficients over time (Jayne et al., 2014, Figure 3). Between 1994 and 2006, the proportion of Kenya's farms smaller than one hectare rose from 45 to 74%. (Jayne et al., 2014). Due to a myriad of forces and factors (such as land concentration, population pressure or lack of access to land) most small farms have been getting smaller over time. Average farm sizes have shrunk in Asia and Africa (Figure 4). In India, the average farm size roughly halved from 1971 to 2006, doubling the number of farms measuring less than two hectares. In China, the average area of land cultivated per household fell by 25% between 1985 and 2000, after which it slowly started to increase due to land concentration and industrialisation. In industrialised countries, where the industrialisation of agriculture is rampant, average farm size is increasing, but not the size of small farms.

Figure 3. Gini Index for Land Distribution* . Author's elaboration



Notes: Figures on agricultural land obtained from FAOSTAT , accessed 2014, * 0 = equity and 1 = inequity

Small farms have less than a quarter of the world's agricultural land (Figure 5) – or less than a fifth if one excludes China and India from the calculation, such farms are getting smaller all the time. However, small farmers still produce most of the food. The UN Environment Programme, the International Fund for Agricultural Development, FAO and the UN Special Rapporteur on the Right to Food all estimate that small farmers produce up to 80% of the food in the non-industrialised countries (IFAD, 2013).

Figure 4. Patterns and trends in farm sizes in some African countries. ***Sources: Jayne et al., 2014***

Country Land constrained Africa[a]	Year	Average farm size	Country Land abundant Africa[a]	Year	Average farm size
Ethiopia	1977	1.4	Botswana	2004	1.9
	1990	0.8	Burkina Faso	1993	3.9
	2002	1.0	Cameroon	1972	1.6
	2012	1.0	Cote d'Ivoire	1974	5.0
Kenya	1974	4.1		2001	3.9
	1980	2.5	Ghana	1970	3.2
	1997	2.4		1999	2.8
	2004	2.5		2006	3.2
	2010	2.1	Madagascar	1961	1.0
Malawi	1969	1.5		1980	1.3
	1981	1.2		2005	0.9
	1990	0.7	Mali	1960	4.4
	2009	1.4		1980	3.3
Nigeria	1994	2.5		2005	4.1
	2010	1.4	Senegal	1998	4.3
Rwanda	1980	1.2	Tanzania	1970	1.3
	2006	0.7		1996	1.0
Uganda	1963	3.3		2003	2.4
	1991	2.2	Zambia	1970	3.1
	1996	1.6		2001	3.6
	2006	0.9		2008	3.7
Average (latest year)		1.2	Average (latest year)		3.0

[a] Defined as countries with population per square km of agricultural land greater than (less than) 100 people.

Figure 5. Global Distribution of Agricultural land. ***Source: GRAIN, 2014***

GLOBAL DISTRIBUTION OF AGRICULTURAL LAND

	Agricultural land (thousands of ha)	Number of farms (thousands)	Number of small farms (thousands)	small farms as % of all farms	Agricultural land in the hands of small farmers (thousands of ha)	% of agricultural land in the hands of small farmers	Average size of small farms (ha)
Asia-Pacific	1,990,228	447,614	420,348	**93.9%**	689,737	**34.7%**	**1.6**
China	*521,775*	*200,555*	*200,160*	*99.8%*	*370,000*	**70.9%**	*1.8*
India	*179,759*	*138,348*	*127,605*	*92.2%*	*71,152*	**39.6%**	*0.6*
Africa	1,242,624	94,591	84,757	**89.6%**	182,766	**14.7%**	**2.2**
Latin America & Caribbean	894,314	22,333	17,894	**80.1%**	172,686	**19.3%**	**9.7**
North America	478,436	2,410	1,850	**76.8%**	125,102	**26.1%**	**67.6**
Europe	474,552	42,013	37,182	**88.5%**	82,337	**17.4%**	**2.2**
TOTAL	**5,080,154**	**608,962**	**562,031**	**92.3%**	**1,252,628**	**24.7%**	**2.2**

In the third part of the thesis, the link between inequality in distribution of land and growth will be examined.

1.3.5 Land tenure.

Land tenure institutions have been modelled on local socio-economic conditions (FAO, 2002). The principal form of traditional tenure was communal, especially in Africa, with well-negotiated rules and norms for individual access. The resulting tenure usually provided security and incentives for farmers to invest in land and water development. Modern systems of legislation have then tended to impose property rights systems on these traditional institutions. As a result, modern laws have rarely defined or protected communal rights. In some situations, this has conducted to progressive dispossession and inequity in land distribution. When population densities were low and farming systems at subsistence level, the tensions implicit in this legal asymmetry were largely hidden. Nowadays, demographic growth have put pressures on both resources and traditional institutions. At the same time, rapid technological and economic changes have taken place but have not been accompanied by adaptation of social institutions.

1.3.6 Small-scale versus large-scale farms.

The debate about the large scale land acquisitions has renewed the issue on which is the best solution for agricultural growth: small-scale farm versus large-scale farm. The success of the Green Revolution, especially in Asia where almost 90 percent of wheat fields were planted with modern procedures and rice yielding had increased from 12 to 67 percent, has stressed the efficiency of small-scale farms. This success of Asian countries compared to the unequal agrarian structure of Latin America countries enforced small-scale model. The Green Revolution, meaning the adoption of high-yielding varieties, was largely made possible by investments in fertilizer and irrigation. The massive use of fertilizers changed agricultural practices forever. Irrigation - thanks to which water can be stored and sent to dry areas, putting more land into agricultural production - also increased production. The Green Revolution exponentially increased the amount of food production worldwide and sharply reduced the incidence of famine, especially in Asia. What needs to be done in order to achieve higher yields and, thus, agricultural growth in Sub-Saharan Africa? Consensus about the need for a Green Revolution in Africa is universal but the characteristics of the African continent urge for a different solution. In comparison with Asia, Africa is heterogeneous in terms of agro - ecological conditions, farming systems, and types of crops planted. The FAO considers that there are 14 main farming systems in Sub-Saharan Africa (Staatz and Dembele, 2007). They depend rather weakly on rice or wheat, which have been the drivers of the Asian Green Revolution. Moreover, most agriculture in Africa is rain-fed (de Janvry and Sadoulet, 2009), whereas the Green Revolution in Asia was partly driven by intensive irrigation. In fact, only 4 percent of crop area in Africa is irrigated, versus 34 percent in Asia. Another factor that makes the Sub-Saharan African context different is the underdevelopment of infrastructure, which slow down market access and leads to high transportation costs. As a consequence, several geographically separate revolutions will have to take place across Sub-Saharan Africa (Staatz et al., 2007) to obtain the same results as in Asia.

Growth in smallholder agriculture has been shown to have higher impact on poverty reduction respect to growth in other sectors (Loayza et al., 2010). However, the success of Brazil's large-scale farms have pushed to consider the large-scale mechanized farming as the path to improve the agriculture sector. But, this formula had no success in Sub Saharan Africa to improve productivity (Collier et al., 2009). Moreover, the experience of large-scale farming, during the course of history, has been largely negative (Deininger et al., 2011). A monopoly on land has often been associated to policy distortions, for example to drive down wages (Binswanger et al., 1995).

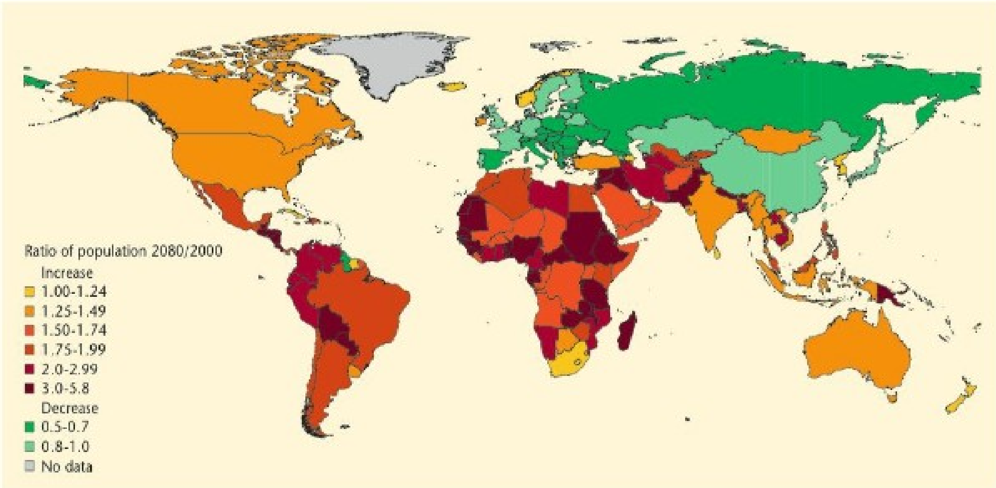
1.4 Land Rush: Drivers.

Between 1961 and 2007, the area of cultivated land has expanded around 3.5 million hectares per year (FAOSTAT), this increase was unevenly distributed between industrialised and no industrialised countries, most of expansion happened in Sub Saharan Africa, Latin America and East Asia.

Here some factors pushed this expansion (World Bank, 2011):

1. Growth of population (Figure 6) and income and consequence surge of demand for food, feed and other raw materials. The need to secure food supplies in the long term, especially for land and water scarce countries, this is the case, for example, of the arid and semi-arid countries as countries in the Middle East (Jagerskog et al., 2012).

Figure 6. Global population growth and decline by country (2000 – 2080). **Source: WWAP (2009)**



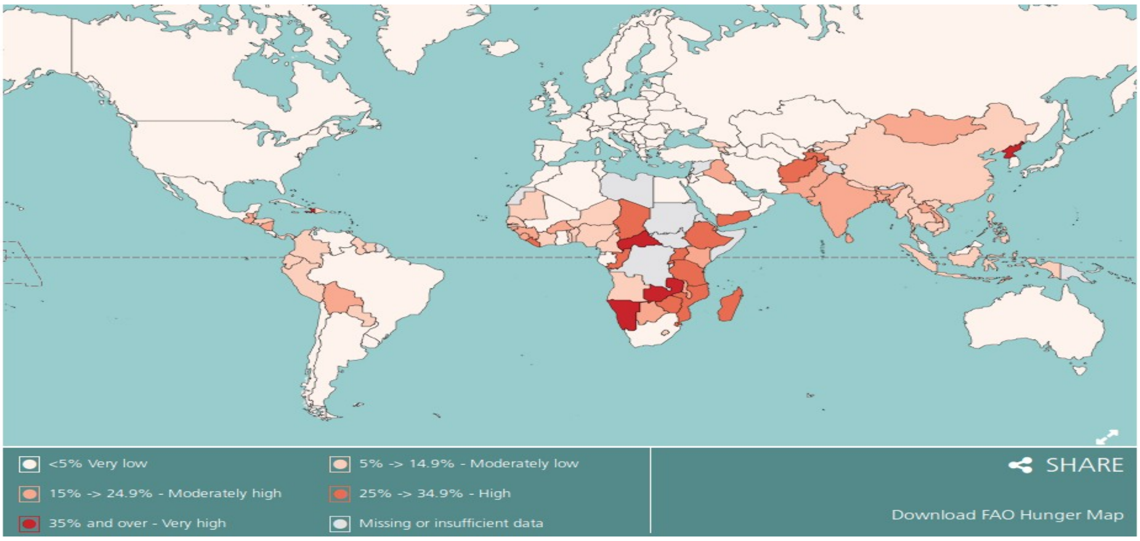
2. Current studies indicate that world population will growth from 6.9 billion people today to 9.1 billion in 2050 (De Castro, 2012; Bruinsma 2009). In developing countries, the increase will reach up to 100% by 2050, relative to 2009 levels (FAO, 2011). In these areas, population growth will be very intense and often combined with malnutrition (Figure 7). As consequence by 2050, food production is supposed to increase by about 70 percent globally and nearly 100 percent in developing countries (FAO, 2011). The pressures on land and water resources are also likely to be exacerbated by the increasing demands for high - value

animal protein, which are positively correlated to the level of income of a country. About 26% of the world's land area is used for grazing livestock and 21% of arable land is used for producing cereals for feeding animals (Steinfeld et al. 1997). According to the World Health Organisation (2013), annual meat production will increase from 218 million tonnes in 1997 - 1999 to 376 million tonnes by 2030; annual meat consumption is projected to increase from 36.4 kg per capita per year in 1997 - 1999 to 45.3 kg per capita per year in 2030.

3. Demand for Biofuels will grow, as reaction to public policies, especially in Europe and the USA (EU Directive, 2009; EISA, 2007). In 2008, biofuels crop production covered about 2.3% or about 36 Mha of global crop-land, as compared to 26.6 Mha or 1.7% of global crop land in 2007, and 13.8 Mha or about 0.9% of global crop-land in 2004. With growing demand for biofuels, the extension of crop-land for biofuels production is continuing, in particular in tropical countries where natural conditions favour high yields (UNEP, 2009). According some studies, biofuels production is the main purpose of the investments targeting Sub-Saharan Africa (Giovannetti et al., 2013; Anseeuw et al., 2012a). Demand for biofuels feedstock is a major factor for world agriculture land conversion for biofuels, by 2030 some 44–53 million hectares of cultivated land could be used for bio - energy feed-stock production (Fischer et al., 2009). Biofuels mandates also drive expansion of sugar cane for ethanol. Brazil processes half its cane into ethanol, and the cane area is expected to double by 2017 (BNDES, 2008).
4. Land in some regions may be cheaper and productivity higher than in traditional regions, where the productivity already reached its maximum level. A higher potential for yield improvements is commonly seen for developing countries, and often especially for Africa.
5. Finally, another driver for an increased competition for land and water resources is climate change, which is expected to modify precipitation patterns, evapotranspiration and

temperature, while increasing the number and severity of extreme events (Bates et al., 2008; UNFCCC, 2007). Climate change will have profound impacts on agricultural production in several ways. While higher temperatures will maybe allow crop cultivation to expand into areas that have traditionally been too cold for crop cultivation, it is likely to reduce yields in hotter climates. However impacts need to be considered on a country-by-country basis, aggregate impacts could be significant. One study estimates that climate change will reduce irrigated wheat yields in developing countries by a 34 percent by 2050 (Nelson, 2009).

Figure 7. Map of world malnutrition. **Source: FAOSTAT, 2015.**



Summarizing population growth, rising income, and urbanization will continue to drive demand growth for some food, especially vegetable oils and livestock. To cope with an increase in world population, agriculture production need to raise by 70 percent (Bruinsma, 2009).

From 1990 to 2007, growth of harvested areas for different crops was concentrated in a few commodities: soy-bean, rapeseed, sunflower and oil palm accounted for more than half of total growth. Demand for this oil crops raised as consequence of higher consumption of cooking oil in developing countries, as Asia, higher use of soy bean as feed, and demand for biofuels in European Union (World Bank, 2011). In 2008, the total area under biofuels crops was estimated at 36 million of ha, with 8.3 million ha in European Union (mainly rapeseed), 7.5 million ha in the United States (mainly maize), and 6.4 million ha in Latin America and the Caribbean (mainly sugar cane) (UNEP, 2009).

From Table 2, it is possible to observe that US oilseeds amount of land is up by 7.7% mainly due to the influence of EU policies on the global oilseeds market. This increase is accompanied by the increased acreage devoted to oilseeds in other regions, where the percentage increases range from 6 – 12% in Latin America, and 14% in Africa, to nearly 20% in Canada and 48% in the EU. Sugar-cane area rises by nearly 23% in Brazil, but declines elsewhere, and at the same time acreage dedicated to other grains and crops rises in some regions and declines elsewhere (Hertel et al., 2010).

Table 2. Change in Crop Harvested Area by Region, due to EU and US Biofuel Mandates. Source: Hertel, 2010.

	% Change in Crops – 2006-2015				
Region:	Coarse Grains	Oilseeds	Sugar-cane	Other Grains	Other Agri
U.S.A.	6.2*	7.7*	-4.2*	-7.4*	-1.8*
Canada	-0.6	19.4*	-3.0*	-2.5*	-1.5*
EU-27	-9.0*	47.8*	-6.6*	-15.0*	-5.4*
Brazil	-10.5*	6.4*	22.9*	-18.0*	-10.6*
Japan	5.2*	7.6*	-0.5	0.6	-0.1
China-Hong Kong	0.8	6.7*	-0.5	-0.2	-0.4
India	-0.6	0.9	-0.6	0.3	-0.2
Latin American Energy Exporters	0.4	12.2*	-1.9*	0.2	-0.6
Rest of Latin America & Caribbean	-0.1	12.3*	-1.5*	-0.7	-0.3
EE & FSU Energy Exp	0.3	18.8*	-0.5	0.0	-0.3
Rest of Europe	0.8	11.2*	0.1	1.8	0.5
Middle Eastern North Africa energy exporters	2.1*	9.0*	-0.4	2.4*	-0.3
Sub Saharan Energy exporters	-1.0*	14.1*	-0.1	2.2*	1.1
Rest of North Africa & SSA	0.1	15.7*	-0.2	1.3	1.3*
South Asian Energy exporters	-0.7	2.6*	-0.8*	-0.5	0.0
Rest of High Income Asia	2.3*	6.0*	-0.2	-0.2	0.0
Rest of Southeast & South Asia	-0.4	2.7*	-0.7*	-0.1	-0.1
Oceania countries	1.4	19.3*	-0.4	-1.3*	0.4

Note: * indicates that mean values are larger than twice the standard deviations from zero, reflecting significant variation in results subjected to the given range of parameter values.

The biofuels policies have a much greater effect than just on the US or just on the EU agricultural policies, in fact crop cover rising sharply in Latin America, Africa and Oceania as a result of the these policies. These increases in crop cover come at the expense of pasture lands as well as forests. Global irrigated area could expand by 23 million ha by 2030 (Bruinsma, 2009).

In sum, a conservative estimate is that 6 million ha/year of additional land will be brought into production through 2030, implying a total land expansion of 120 million ha.

Other projections, instead, foresees a total increment up to 240 million ha over the same period. The fact that land use is in decline in developed and transition economies implies that more area expansion will shift to developing countries.

Table 3. Land with Potential for Rainfed Crop Production (Million Ha).

Land use, potential availability, and yield gap across regions.

Region	Area cultivated	Potentially cultivable area	Yield gap
Africa	208,218	200,787	0.821
Australia & Oceania	49,943	31,250	0.309
East Asia & Pacific	238,536	14,058	0.433
East & Central Europe	251,812	52,387	0.667
Latin America & Caribb.	161,780	123,248	0.653
Middle East/N Africa	65,869	2756	0.604
North America	224,787	17,440	0.356
Western Europe	84,050	2202	0.169
South Asia	206,496	164	0.621
Total	1,491,491	444,292	

Source: FAOSTAT and figures by Deininger and Byerlee (2011).

As land that may be used for expansion is not equally distributed, some two-thirds of land expansion in developing countries is likely to be in Latin America and the Caribbean and in Sub-Saharan Africa (Table 3).

1.5 Who is making international deals?

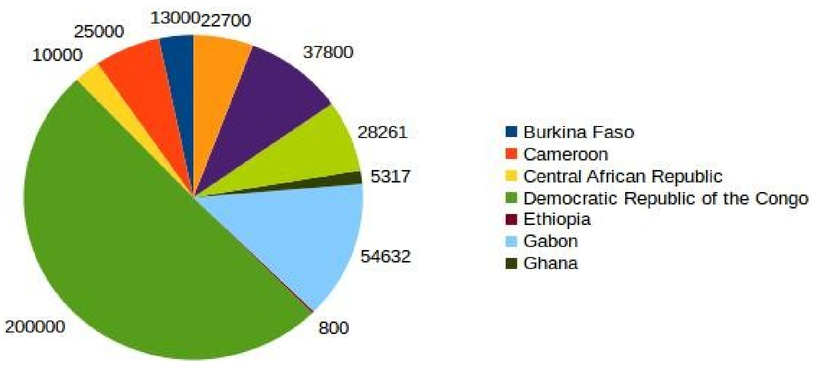
The Land Matrix contains data on 1,105 concluded deals that correspond to nearly 40 millions ha, and on 136 countries of which 110 are investor countries, 83 are destination countries, and 57 are both target and investor (De Maria, 2015). According to Anseeuw et al. (2012a) *investor countries are more heterogeneous then target countries* and can be organized in three main groups (Table 4):

I. Emerging countries (i.e. China, Argentina, Brazil and South Africa). These countries are characterized by a huge availability of capital and by a fast growing and highly competitive agro-food sector. Both public and private subjects are involved.

II. Gulf countries (Saudi Arabia, United Arab Emirate and Qatar), whose domestic availability of land suitable for agricultural activities is typically scarce. Both public and private subjects are involved.

III. OECD countries (USA and EU member states). These countries often take advantage of historical relations with targeted countries, especially with former colonies (Figure 8). Private investors and agribusiness firms are the main subject involved in land FDI.

Figure 8. French Investments in Africa (million ha). Source: Land Matrix 2015.
Author's elaboration



Reported land agreements involve four different types of investors – namely,

- private companies,
- state - owned companies,
- investment funds and

- public - private partnerships.

Table 4. The Top 10 Investors for concluded deals. Country names marked with * have been shortened to improve legibility. Source: Land Matrix, 2015.

Top 10 Countries

Investor countries	Target countries
Usa*	6,284,544
Malaysia	3,896,996
Singapore	2,937,987
Arab Emirates*	2,301,727
Uk*	2,246,715
Brazil	2,151,448
India	2,069,483
Canada	1,988,832
China	1,803,331
Netherlands	1,697,124

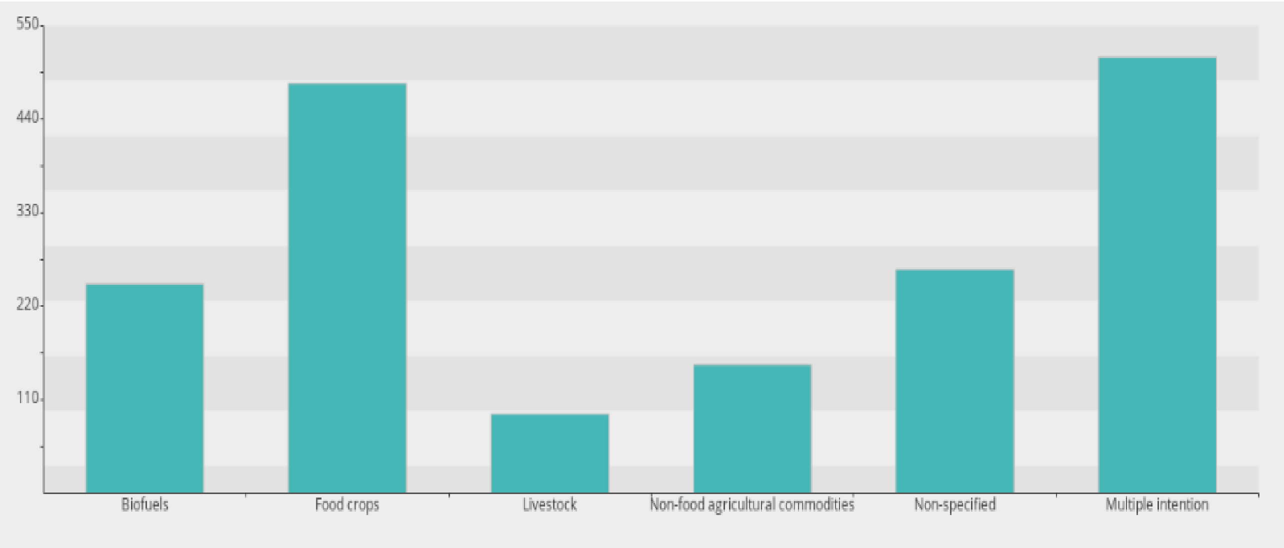
Agribusiness accounts for the largest share of investors in land acquisitions but governments and sovereign wealth funds are also involved in providing finance and other support to private investors or in some cases directly. Several countries fully depending on food imports, such as the Gulf countries, have substantially increased their investments and in these countries the number of private-public partnerships (with government mainly providing guarantees or tax discounts) has also been increasing in the last few years (Anseeuw et al., 2012a). More generally, as suggested, amongst others, by Sassen (2013), the financializing of commodities has brought new potentials for profit-making to the primary sectors, from food to minerals and metals, thus stimulating speculative investments in land.

European countries have emerged as both investors and target countries. It has been reported that the EU is using about one third of its own arable area outside its own territory as a result of virtual land 'imports' , which totalled almost 35 million hectares in 2007/2008 (Von Witzke et al., 2010). In general, most of the deals are agriculture-oriented, but forestry activities and multi-purpose projects also assume an important role (Figure 9).

Large scale land acquisitions exist since colonial times, being driven by a long request for land and other strategic resources. Food production is not the only reason behind land deals. Land is also being bought with the aim to produce biofuels, forestry products and minerals, expanding the range of old and new actors in the global fight for resources (Weis 2010; White et al., 2010).

Thus a better way to start to understand land grabbing is through the lens of political economy. It is important to talk about control of land, and look at who is benefiting. From this perspective, land grabbing becomes essentially a control grabbing (Franco et al., 2013). It refers to the acquisition of power to control land and other associated resources like water, minerals or forests, in order to control the benefits of its use.

Figure 9. Deals divided by intention of investment. Source Land Matrix, 2015.



Note: Data include both domestic and foreign deals. Information on 1,748 deals.

The scope is "*to fix or consolidate forms of access to land-based wealth*" (McCarthy et al., 2012). It is emerging the necessity of including land grabbing within broader analysis of contemporary global capitalist development (Harvey, 2003), as it is occurring in a fast way during the convergence of multiple crisis: food, energy, climate change and finance capital (White et al.; 2012; Borras et al.;

2012; Quagliarotti, 2013). Land grabbing needs to be seen in the context of the power of national and transnational resources. The global land grab is therefore a manifestation of an ongoing and accelerating change in the meaning and use of the land and its associated resources (like water) from small scale, labour - intensive uses like peasant farming for household consumption and local markets, toward large-scale, capital-intensive, resource-depleting uses such as industrial mono-cultures, raw material extraction, and large-scale hydro-power generation – integrated into a growing infrastructure that link peripheral extractive frontiers to metropolitan areas and foreign markets (White et al.; 2012).

Land deals occur at multiple levels, within and between regions. For example, the South African commercial farmers‘ association (AgriSA) is reported to have acquired 200,000 ha in the Republic of Congo, and to be involved in further negotiations with 22 African governments (Hall, 2011). Large - scale land investments involve a complex global system of interests. Investments may be direct or indirect, international and domestic, productive and speculative, as well as corporate, public and farmer investments. Direct players include companies seeking land to grow food, feed and biofuels (Gillon, 2010, Franco et al., 2010; McMichael et al., 2010), instead indirect players, such as pension fund managers, real estate groups, and finance capital, may seek land as an additional asset in a investment portfolio. Since the financial crisis of 2007 - 08, caused in large part by speculation in a range of financial instruments, there has been concern that international investment in land has become just another element in the portfolios of financial institutions. Evidence suggests that many land deals are not functioning, with only 20% of investments becoming operational (Deininger et al., 2011). Speculation might be one of the reasons for that. It is, however, difficult to say how much international investment in land can be classified as speculative or not. In any case, some deals that were announced have been delayed or abandoned (Smaller and Mann, 2009).

Governments often require that investors demonstrate a business plan, and evidence of developing intent in order to have the land granted, otherwise the government is able to take the land back. However, there is often little capacity by host governments to monitor conformity to the agreed business plan. At the same time, several governments (such as Tanzania, Ethiopia, Mozambique, Cambodia) have made proactive efforts to identify available land that can be allocated to investors. In fact, most governments have set up investment promotion agencies to provide the doorway for those seeking to acquire land. In the case of Cambodia, for example, the government has established Economic Land Concessions for investors, in all totalling close to 2 million hectares between 1998-2010. Many of these concessions are for plantations of eucalyptus, sugar cane, palm oil and rubber, the majority held by domestic investors often linked to foreign capital. In some countries, domestic investors may be even more significant than foreign ones. There is an increasing concern regarding domestic land acquisitions, for instance O'Brien (2011) documents the problems of land acquisitions by Kenyan elites and the lack of political will to solve them. These domestic elites have direct and indirect linkages to foreign capital, as in the case of Kampong Speu and Pursat large land deals in Cambodia (with Thai and Chinese capital, respectively), and the San Miguel Corporation land deal in the Philippines (with Malaysian capital). Equally, where there are legal constraints on land acquisition by foreigners, domestic players may be sought as partners in order to overcome these constraints. Such domestic land acquisitions, together with foreign investments on land, are deepening an historical problem related to land distribution. The Gini Land Coefficient of countries like Brazil, 0.86 (Sauer et al., 2011), and Ecuador, 0.80 (Valle, 2010), among so many others, clearly shows such historical process of land concentration, that conducted to displacement. Additional dispossession and displacement can be caused by large - scale land investments, that will worsen already problematic land distribution conditions in many countries, and are likely to provoke further conflict and violence.

1.6 Where international deals are happening?

Data reveals a tendency in investment concentration in low-income countries, with a high incidence of hunger and weak land institutions (FAO, 2012).

According to World Bank Report (2011), globally the non-cultivated area suitable for rain-fed cultivation of at least one of the crops between wheat, sugar cane, oil palm, maize and soy bean amounts to about 445 million ha (Fischer et al., 2010). The largest total area available for rain-fed cultivation is in Africa, followed by Latin America. The concentration of currently uncultivated but potentially suitable land for rain-fed cultivation illustrates that availability of such land in the rest of the world (namely, Eastern Europe, East and South Asia, Middle East and North Africa, and all other countries together) is less than what is available in Latin America and the Caribbean alone. Even within regions, land not currently cultivated but potentially suitable for rain-fed cultivation is concentrated in a few countries.

Using the 25 persons/km^2 cut-off, the seven countries with the largest amount of land available (Sudan, Brazil, Australia, the Russian Federation, Argentina, Mozambique, and Democratic Republic of Congo, in that order) account approximately for 200 million ha. The 32 countries, with more than 3 million ha of land each, account for more than 90 percent of available land. Of these, 16 are in Sub-Saharan Africa (SSA), 8 in Latin America and the Caribbean, 3 in Eastern Europe and Central Asia, and 5 in the rest of the world. Many of the countries with ample land available have only limited amounts of land under cultivation.

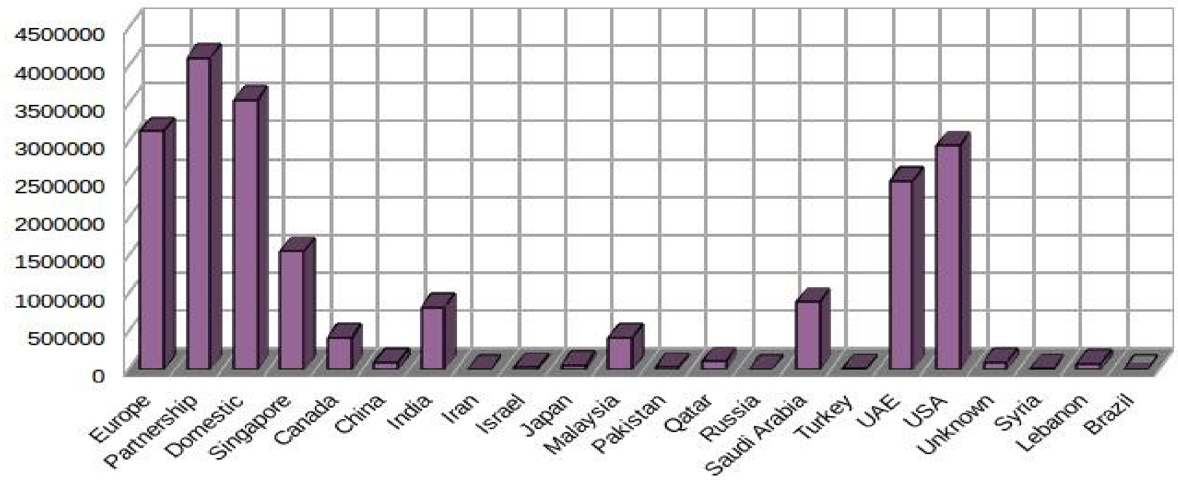
Thus, the set of destination countries appears homogeneous, at least in terms of GDP per capita and land endowment. Indeed, most of the reported deals occurred in Sub-Saharan Africa (SSA), namely in low-income and land-abundant countries (Deininger, 2011; Schoneveld, 2011; Anseeuw et al., 2012b; Cotula, 2012; Antonelli et al., 2015). However, Latin America, South-Eastern Asia and to a lesser extent Eastern Europe are also attracting both international and domestic investors (Visser et al., 2010; Kenney-Lazar, 2012; Visser et al., 2012; Baka, 2013; Borras et al., 2013). In sum, SSA is the main target area of large land investments and represent more than forty-five per cent of the total number of deals (Map 1). The focus of my analysis is, therefore, about land acquisitions in Africa, Foreign and Domestic Investments in these areas are likely to have important consequences in terms of food security and agricultural policies (Aabø et al., 2012). Other areas as South America and South and South East Asian countries -as India, Cambodia and Laos - record together more than fifty per cent of the total number of deals worldwide while Eastern Europe- mainly Ukraine and Russian Federation- and Oceania represent marginal areas in this global phenomenon (Land Matrix, accessed February 2015). Table 5 shows how the phenomenon of large land acquisitions can be considered a key issue for large part of the Developing World.

Table 5. Top 10 Target Countries, Land Matrix, 2015.
Country names marked with * have been shortened to improve legibility.

Indonesia	*5,824,398 ha*
Sudan	*4,858,100 ha*
South Sudan	*4,4362,573 ha*
Philippines	*4,315,650 ha*
*Papua New**	*3,723,375 ha*
Madagascar	*3,318,058 ha*
Mozambique	*3,155,259 ha*
*DRC**	*2,894,221 ha*
Congo	*2,218,000 ha*
Brazil	*1,980,190 ha*

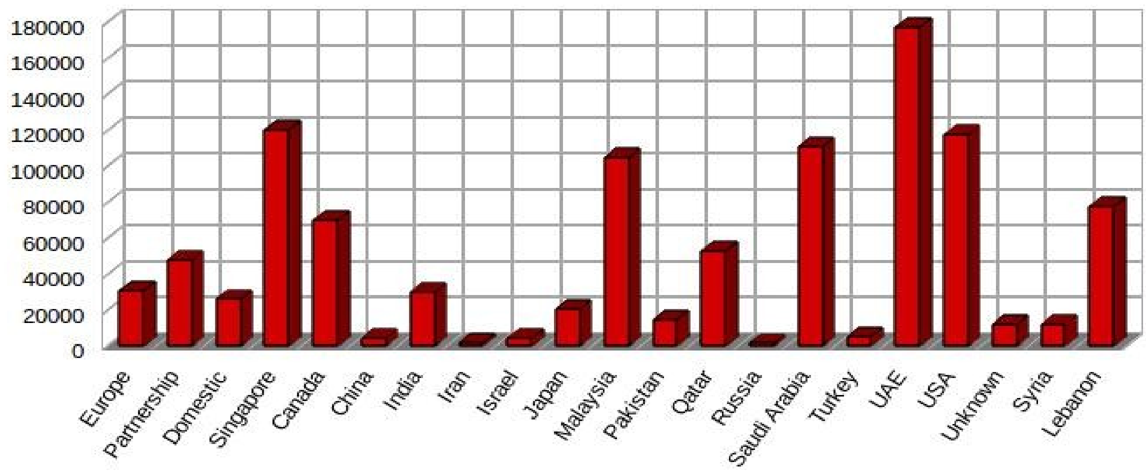
Figures 10 a and b show investors by target country in Africa and the average size of contracts by investor country. Acquisitions, especially foreign investments from some countries, often appear as bulk land acquisitions. Only a small minority of the total area acquired has a local operator, this findings highlights the critical role of international capital in driving large-scale farmland investments, and the traditional investors from industrialized countries are still the dominant farmland investors. Food crops feature predominantly in the investments by Saudi Arabia, oil palm has an important role for investors from Singapore and Malaysia. Food crops and wood and fibre account respectively for 25 and 56 per cent of the land acquired by USA, the latter as a result of very few large investments in forestry. Similarly carbon sequestration ranks very high for investments by Singapore as a result of a single investment and tourism is 83 per cent of area acquired by UAE investors as a result of a single investment (Schoneveld, 2014). In sum, investments in Africa are influenced by EU policy for biofuels, the essential commercial orientation of Asian investors (e.g., oil palm), the state led model of FDI flows from Gulf countries, which leads to very large size investments, the emerging role of South Africa as a dynamic agricultural investors in the continent.

Figure 10a. Investors in Africa[2]. Author's elaboration based on 466 contract (million ha) listed in Land Matrix database (accessed February 2015).



2 Partnership is related to deals made by several investor partners from several countries.

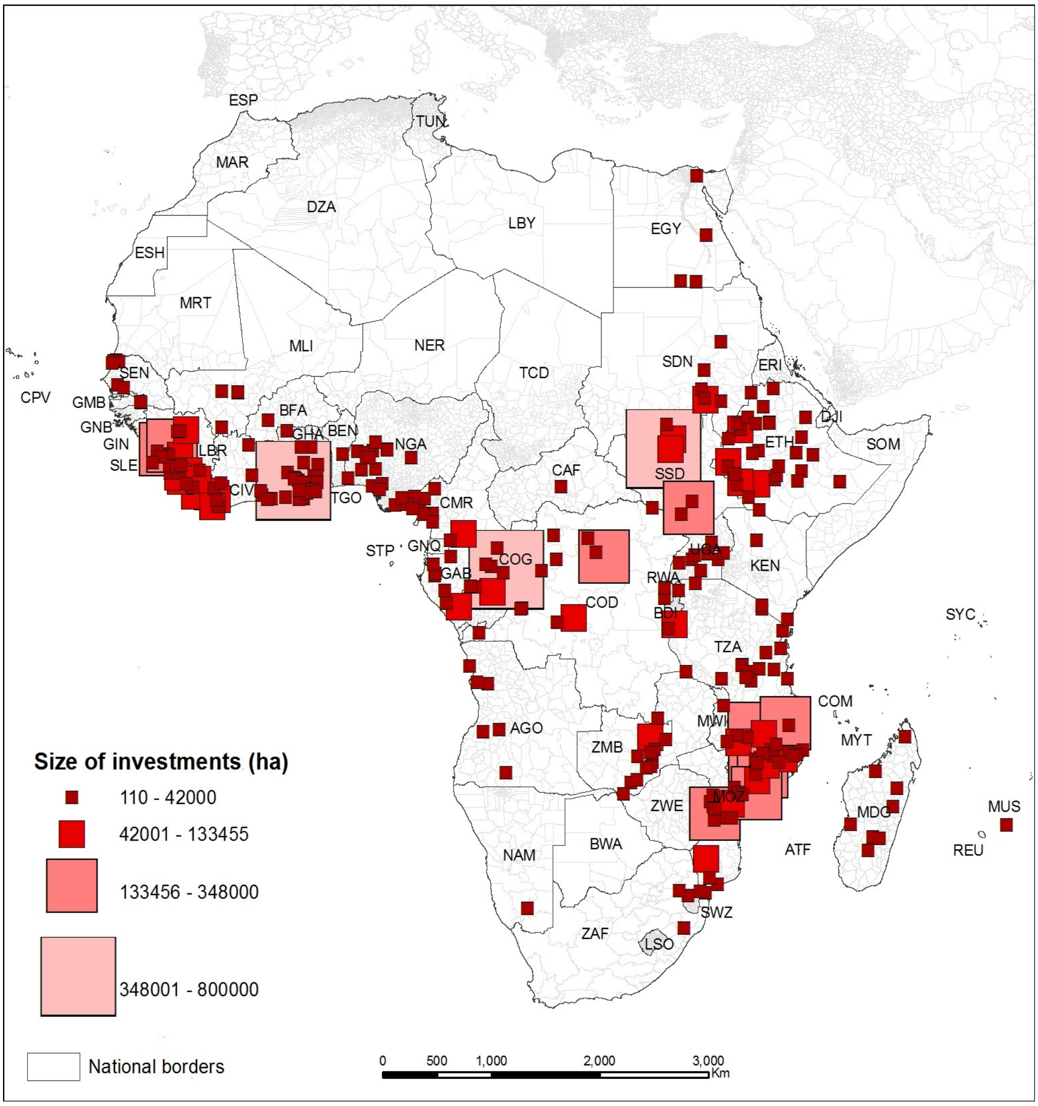
Figure 10b. Average Deal Size for Investors in Africa. Author's elaboration based on 466 contract (million ha) listed in Land Matrix database (accessed February 2015).



The investors' choices are partly influenced by the behaviour of hosting countries, which attempt to attract investments through a series of pro-active policies from the leasing for free of natural resources to the opening of local or regional markets in order to make their land profitability more convenient for international and domestic investors. This is, for instance, the case of Ethiopia, where, even if the control of the land property remains under the central and political authorities despite the continuous pressure of international organizations to privatize, local authorities start to lease large portions of land to international investors becoming, in this way, one of the favourite target of the land acquisition process worldwide (Rahmato, 2014). The Ethiopian case, even if with many differences, can easily be translated to other African countries and developing countries.

Another important issue to be considered especially for the rural areas is the increasing prices for agricultural products and their consequences in the number of poor people in several countries causing the re-emergence of the phenomenon of hunger (Figure 7) and wide poverty in certain regions. Compared to other areas, SSA is the poorest sub-continent. Moreover, many African countries faced two important social phenomena: demographic transaction and urbanization. Large part of the sub-continent recorded a rising population, in fact they show typical data of transaction in population growth- reducing fertility and mortality rates (UNICEF, 2014).

Map 1. Large Scale Land Acquisitions in Africa. Author's elaboration.



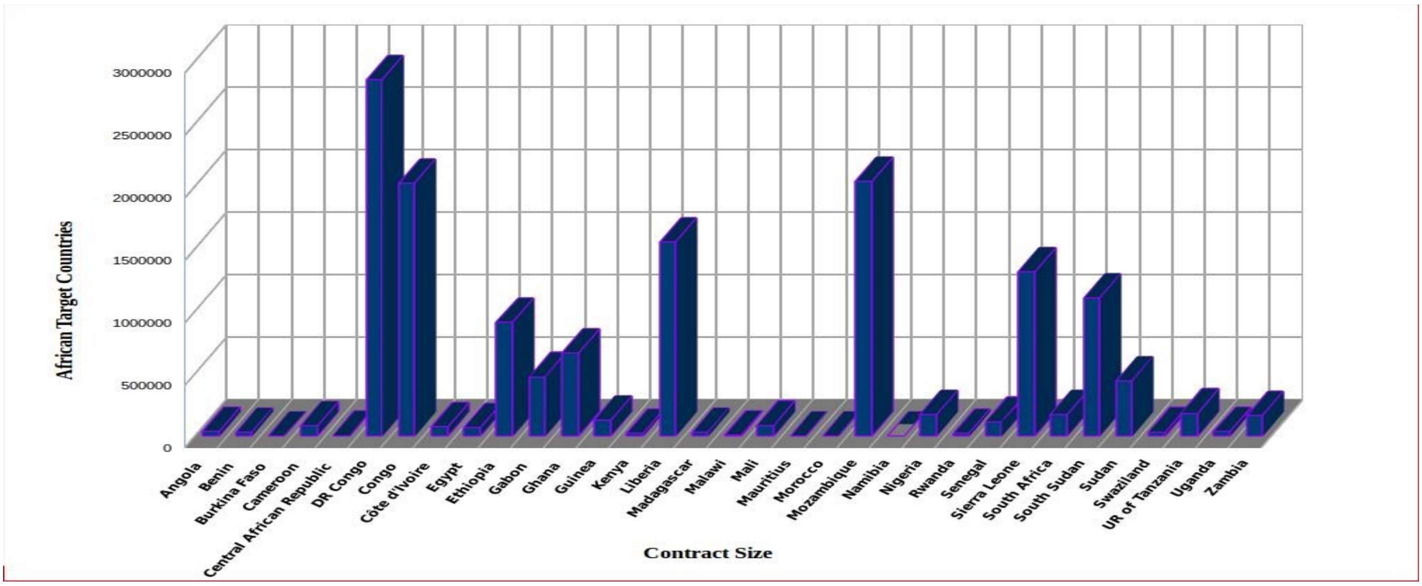
African countries faced a slight increase in inequality, despite some important indicators improved in some areas as the education, health and social policies. Some of the millennium development goals (MDGs) -have been reached while some other important as poverty indices is not completely achieved in several countries and at continental level. According to the international datasets, African countries increased their GDP till the explosion of the international crisis in 2007-2008.

The bulk of African countries are still characterized by large part of the population under the poverty line, in fact these countries remain under the category of least developed countries in the international classifications.

Economic and social conditions in the African target countries are different in terms of general profile compared to other target countries. Sub Saharan African countries are the poorest while Asians and Latin American countries interested in this process are growing, even if relevant exceptions exist.

Cotula et al. (2009) report that the maximum size of approved project in the period 2004-2009 in terms of largest land allocation happened in seven African countries: Ethiopia, Congo, DR Congo, Liberia, Mozambique, Sierra Leone, South Sudan (Figure 11).

Figure 11. Contract Size for Each African Target Country (million ha). Author's elaboration based on Land Matrix (accessed February 2015).



South America is considered an attractive target for investors because of its productive climate and soils, but the value of land has started rising, and the number of deals is less than half those of Africa. In targeted countries, in general, there are many buyers, but each specific area/country seems to be a dedicated target for an investor (e.g. India tends to invest in land in Ethiopia; Saudi Arabia and the Gulf countries in Muslim countries, in particular in Sudan and South Sudan (Figure 12 a and b). Land deals occurred within and between regions, with a strong tendency to intra regional flows in Asia and South America (FAO, 2012) and South-South deals becoming common. China for instance, is a key investor in South Asia and South America (Cotula et al., 2012) and a large one in some countries in SSA. Case studies of projects in 7 countries suggest that widespread concern about large-scale farming being associated with potentially large risks is justified. Key risks include:

- weak land governance and an associated failure to recognize and protect local communities' land rights (Alden-Wily, 2010),
- lack of capacity to process and manage large-scale investments, including inclusive and participatory consultations that result in clear and enforceable agreements (Deininger et al., 2011),
- investor proposals that were non-viable technically, or inconsistent with local visions and national plans for development, in some cases leading investors to usurp local lands and resources, as consequence there will be possible conflict with negative distributional and gender effects (Tamrat, 2010; World Bank, 2010).

Figure 12a. India Land Investments in Africa. Number of Deals. Author's elaboration

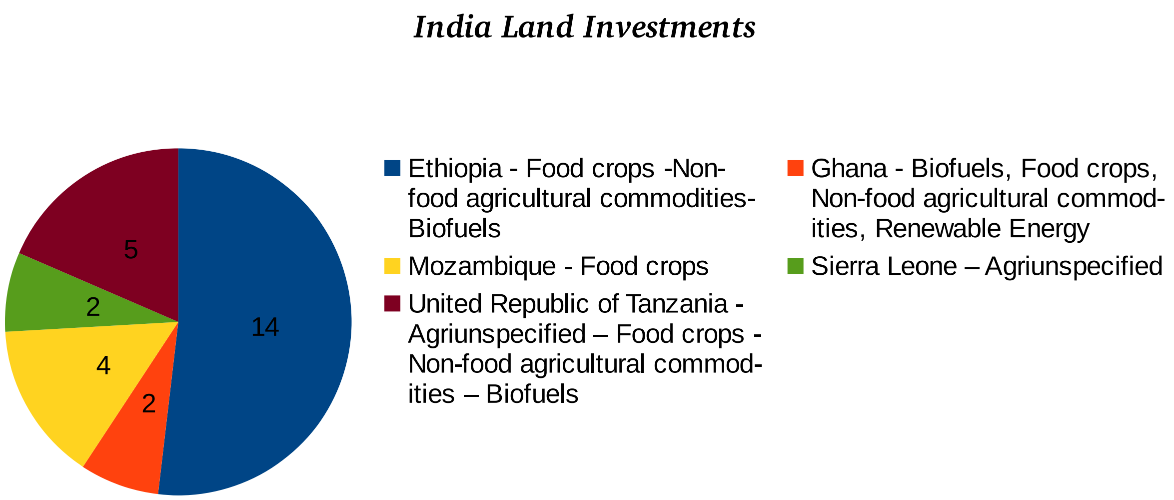
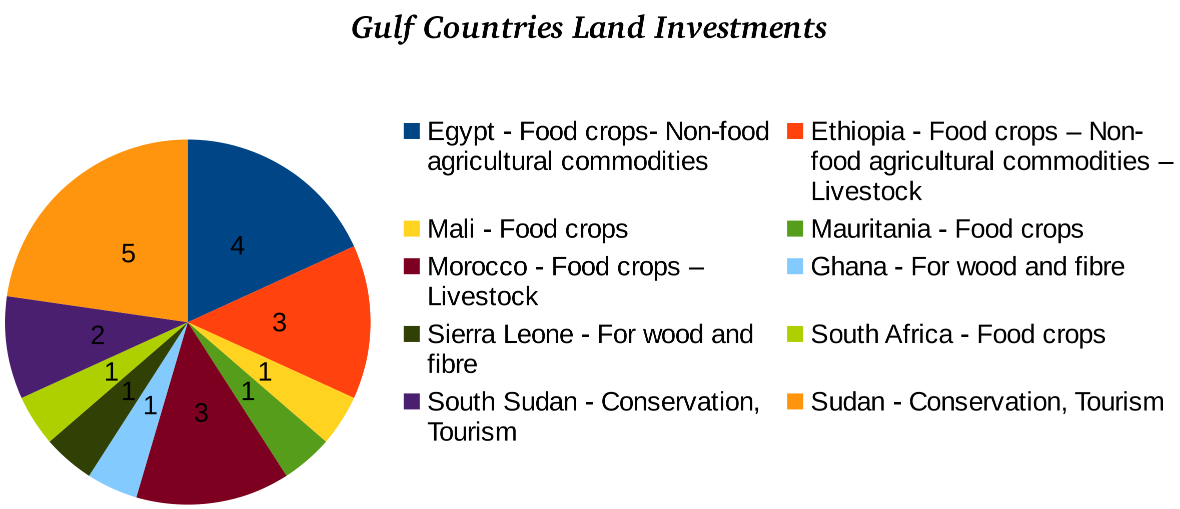


Figure 12b. Gulf Countries Land Investments in Africa. Number of Deals. Author's elaboration



At the same time, by comparing over time, case studies document that well-executed investments can provide benefits. These occur through four main channels:

- social infrastructure, often supported by community development funds using land compensation,
- employment and jobs,
- access to markets and technology for local producers,
- local or national revenue.

However, even if overall effects are positive, distributional issues may arise and will need to be addressed upfront to inform negotiation and contract design. For example, skilled people could gain from jobs creation through an investment while vulnerable groups or women lost access to livelihood without being compensated (Deininger et al., 2011). In any case, it is quite difficult to perform a good assessment, because reliable data and transparent information about the scope and status of land acquisitions remain elusive.

1.7 Conclusion.

Juergen Voegele, director of the Agricultural and Rural Development Department of the World Bank argues this saying: "*When done right, larger-scale farming can provide opportunities for poor countries with large agricultural sectors and ample endowments of land. To make the most of these opportunities, however, countries will need to better secure local land rights and improve land governance. Adopting an open and proactive approach to dealing with investors is also needed to ensure that investment contributes to broader development objectives*" (World Bank, 2011). Developing countries have generally welcomed foreign or local investments in agriculture as a path to macro-economic development through employment generation, increased exports and economic and technological spillovers to rural areas (Honing, 2012; Schoneveld, 2011). The assumption is that the ongoing rural crisis of persistent chronic poverty and wide-spread hunger is at base a crisis of lack of investment. Therefore the current upswing of big-investor interest in land is portrayed as a must-seize opportunity. Moreover, many supporters have said that the investment will need to be large-scale and corporate controlled in order to be capable of achieving higher international competitive abilities in the increasingly integrated value chains of global agricultural production (White et. al., 2012). While attracting investment is an important priority for land-abundant countries, caution is warranted to prevent speculative investments or arrangements in which local land rights are lost or landholders are excluded from the benefits of the investment. Large scale land acquisitions during commodities boom were detrimental to social and economic development, as evidenced in Central America during the coffee boom of the late 19^{th} century when privatization of previously customary conducted to rapid land concentration. In countries such as Guatemala and El Salvador, the coffee boom led to the expropriation of land on a massive scale, followed by decades of conflict and civil war that undermined economic, human, and social development. By contrast, in Costa Rica and Colombia, increasing coffee prices fostered the emergence of vibrant smallholder coffee economies. Although the four countries started in very similar conditions, the latter now enjoy a per capita income double that of the former, rank much higher on the human development index, and have been democracies for more than 50 years rather than little more than a decade (Songwe et al., 2009). The reality of world food provision and agricultural investment, however is that the bulk of investment in agriculture is undertaken by farmers themselves, with smallholder farmers producing most of the food consumed locally in many developing regions (Committee on World Food Security, 2011). In Zimbabwe for example, small-scale farmers are using their own savings to invest in farm buildings, farm equipment, cattle and transport. In Latin America, the agro - ecology movement is sharing the benefits of this low-external input agriculture through a farmer-to-farmer process of knowledge exchange and innovation. In the EU and US, food re-localisation strategies connect producers, retailers, and consumers in the exchange of healthy, nutritious, locally sourced food, outside the reach of transnational supermarket chains. These are just a few examples of positive investment alternatives to the large-scale, capital intensive, corporate controlled agricultural model, which presents itself as the only solution to world hunger and rural poverty.

The agriculture sector continues to play a crucial role for development, especially in low-income countries where the sector is large both in terms of aggregate income and total labour force (Dethier et al., 2012). Strategic plans for poverty reduction have been prepared since 1998 by at the least 15 African governments with support from World Bank. However, most of them provide only scant attention to the role of land access and land distribution in rural poverty (Jayne et al., 2003). Growth alone is not sufficient for poverty reduction; the distribution of assets makes a difference. The egalitarian land distribution patterns have tended to generate higher rates of economic growth than highly concentrated ones (Mellor, 1976; Quan et al., 1985; Deininger et al., 1998). The basic reason for this is that broad-based agricultural growth tends to generate second-round expenditures in support of local non - tradable goods and services in rural areas and towns. These multiplier effects tend to be much weaker when the source of agricultural growth is concentrated in relatively few hands. Therefore this concentration of investments in low-income countries, with a high levels of hunger and weak land institutions (FAO, 2012), could lead to the risk of weak governance of investments and consequent negative environmental and socio – economic effects. Water and land have thus become global resources, contented at global level (Antonelli et al., 2015).

References.

- Benson T., Minot N., Pender J., Robles M., and von Braun J. (2008), Global Food Crises: Monitoring and Assessing Impact to Inform Policy Responses, International Food Policy Research Institute (IFPRI), Washington, DC. Available online at: www.ifpri.org/publication/global-food-crises-0
- Dawe D., Morales-Opazo M., (2009). How much did developing country domestic staple food prices increase during the world food crisis? How much have they declined? ESA Working Paper No. 09-09. FAO, Working Paper 2009.
- Dethier, J.-J., Effenberger, A., Agriculture and development: A brief review of the literature. Econ. Syst. (2012), doi: 10.1016/j.ecosys.2011.09.003
- Maros I. and Martin W. (2008), "Implications of Higher Global Food Prices for Poverty in Low-Income Countries", Policy Research Working Paper, Report No. WPS 4594, The World Bank, Washington, DC.
- Aabø E., Kring T., (2012) "The Political Economy of Large-Scale Agricultural Land Acquisitions: Implications for Food Security and Livelihoods/Employment Creation in Rural Mozambique", UNDP, WP 2012-004, Maputo, Mozambique.
- Alden-Wily L., (2010). Whose land are you giving away, Mr. President?. Washington DC: Paper presented at the Annual Bank Conference on Land Policy and Administration, April 26 and 27, 2010.
- Anseeuw, W., Alden Wily L., Cotula L., and Taylor M., (2012a): Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project. ILC, Rome: Italy.
- Anseeuw, W., Boche, M., Breu, T., Giger, M., Lay, J., Messerli, P., & K., Nolte (2012b): Transnational Land Deals for Agriculture in the Global South. Analytical Report based on

the Land Matrix Database. CDE/CIRAD/GIGA, Bern/Montpellier/Hamburg.

- Antonelli M., Siciliano G., Turvani M. E., Rulli C. M., (2015). Global investments in agricultural land and the role of the EU: Drivers, scope and potential impacts. Land Use Policy. Elsevier Ltd.
- Baka, J. (2013): The political construction of wasteland: governmentality, land acquisition and social inequality in South India. Development and Change, 44(2), pp. 409-428.
- Bates B.C., Kundzewicz Z.W., Wu S., and Palutikof J.P. [eds] (2008), “Climate Change and Water”, Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva.
- Binswanger, H. P., Deininger, K., & Feder, G., (1995). Power, distortions, revolt and reform in agricultural land relations. Handbook of Development Economics, 3B, 2659–2772.
- BNDES - Banco Nacional de Desevolvimento Economico e Social, (2008). Sugarcane-based Bioethanol Energy for Sustainable Development. Rio de Janeiro: BNDES.
- Borras M. Saturnino Jr, Kay Cristobal, Gomez Sergio, Wilkinson John (2012), Land Grabbing and global Capitalist accumulation: key features in Latin America. Canadian Journal of Development Studies, 33:4, 402-416.
- Borras, S., Kay, C., Gómez, S., & Wilkinson, J., (2013): Land grabbing and global capitalist accumulation: key features in Latin America. Canadian Journal of Development Studies/Revue canadienne d'études du développement, 33(4), pp. 402-416.
- Bruinsma J. (2009), The Resource Outlook to 2050: By How Much do Land, Water and Crop Yields Need to Increase by 2050? Prepared for the FAO Expert Meeting on “How to Feed the World in 2050”, 24 – 26 June 2009, Rome.
- Bruinsma, J., (2009). “The Resource Outlook to 2050: By How Much Do Land, Water Use

and Crop Yields Need to Increase by 2050?" Paper presented at the Expert Meeting on How to Feed the World in 2050, Food and Agriculture Organization of the United Nations, Rome.

- Collier, P., & Dercon, S., (2009). African agriculture in 50 years:Smallholders in a rapidly changing world. Paper Presented at the Expert Meeting on How to Feed the World in 2050. Rome: Food and Agriculture Organization of the United Nations.
- Committee on World Food Security, (2011). How to Increase Food Security and Smallholder-Sensitive Investment in Agriculture. 37th Session of the Committee on World Food Security, Rome, FAO.
- Cotula L., Polack E., (2012), The Global Land Rush: What the Evidence Reveals About Scale and Geography, IIED, April.
- Cotula, L., (2012): The international political economy of the global land rush: A critical appraisal of trends, scale, geography and drivers. Journal of Peasant Studies, 39 (3-4), pp. 649-680.
- Cotula, L., Vermeulen, S., Leonard, R. & J. Keeley (2009): Land grab or development opportunity? Agricultural investment and international land deals in Africa. IIED/FAO/IFAD, London/Rome.
- Cuffaro, N., Giovannetti, G., & Monni, S. (2013): Foreign acquisitions of land in developing countries. Risks, opportunities and new actors. QA Rivista dell'Associazione Rossi-Doria, 2 (2013), pp. 9-36.
- Davis K. F., D'Odorico P., Rulli M. C., (2014). Land Grabbing: a preliminary quantification of economic impacts on rural livelyhoods. Popul. Environ. 36, 180-192.
- De Castro Paolo, (2012). Corsa alla terra. Cibo e agricoltura nell'era della nuova scarsità. Saggine editore.

- De Fraiture, C., Wichelns, D., Rockstrom, J., Kemp-Benedict, E., Eriyagama, N., Gordon, L.J., Hanjra, M.A., Hoogeveen, J., Huber-Lee, A., Karlberg, L., (2007). Looking ahead to 2050: scenarios of alternative investment approaches. In: Molden, D. (Ed.), Water for Food, Water for Life. A Comprehensive Assessment of Water Management in Agriculture. International Water Management Institute (IMWI) and Earthscan, London, pp. 91–145.
- de Janvry, A., Sadoulet, E., 2009. Agriculture for development: lessons from the World Development Report 2008. QA Rivista dell'Associazione Rossi-Doria 1, 9–24.
- De Maria M., (2015). Trading the Untradeable: a Gravity Model for Large-Scale Land Acquisitions. Paper prepared for presentation at the "2015 World Bank Conference On Land And Poverty" the World Bank - Washington DC, March 23-27, 2015.
- De Schutter O. (2009), Large - scale land acquisitions and leases: A set core of principles and measures to address the human rights challenge. Available online at: http://www.oecd.org/site/swacmali2010/44031283.pdd
- De Schutter, O., (2011). The green rush: the global race for farmland and the rights of land users. Harv. Int. Law J. 52 (2), 504–559.
- Deininger, K. (2011): Challenges posed by the new wave of farmland investment. The Journal of Peasant Studies, 38(2), pp. 217-247.
- Deininger, K. W., & Byerlee, D., (2011): Rising global interest in farmland: can it yield sustainable and equitable benefits?. World Bank Publications: Washington, DC.
- Deininger, K., Byerlee, D., Lindsay, J., Norton, A., Selod, H., Stickler, M., (2011). Rising Global Interest in Farmland. Can it Yield Sustainable and Equitable Benefits? Washington, DC: World Bank.
- Deininger, K., Squire, L., (1998). New ways of looking at old issues: inequality and growth.

Journal of Development Economics 57, 259 – 287.

- EISA, 2007. Energy independence and security act of 2007, public law, 110-140.
- ERD (Report on Development 2011/2012), (2012). Confronting scarcity: managing water, energy and land for inclusive and sustainable growth. Overseas development institute (ODI), European Centre for Development Policy Management (ECDPM), German Development Institute/Deutsches Institut für Entwicklungspolitik (GDI/DIE). Available at: http://www.erd-report.eu/erd/report 2011/
- EU Directive, 2009. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources.
- Fairhead J., Leach M. and Scoones I., (2012) "Green Grabbing: a new appropriation of nature?" Journal of Peasant Studies 39(2).
- Fischer G., Shah M., (2010). Farmaland Investments and Food Security: Statistical Annex. Report Prepared under a World Bank and International Institute for Applied System Analysis contract, Laxenburg, Austria.
- Fischer G., Sylvia Prieler, Harrij van Velthuizen, Goran Berndes, Andre Faaij, Marc Londo, Marc de Wit, (2009). Biofuel production potentials in Europe: Sustainable use of cultivated land and pastures, Part II: Land use scenarios. Biomass and Bioenergy xxx (2009) 1–15.
- Fisher G., van Velthuizen H., Shah M., Nachtergaele F., (2002). Global Agro-ecological Assessment for Agriculture in the 21st Century: Methodology and Results. IIASA, Laxenburg, Austria, FAO, Rome, Italy.
- Food Agriculture Organization, (2015). Global Forest Resources Assessment 2015. How are the world's forests changing? Rome.
- Food and Agriculture Organisation of the United Nations - FAO, (2011). The state of the

world's land and water resources for food and agriculture. Managing system at risk, Summary Report, Rome, Italy. (http://www.fao.org/nr/solaw/solaw-home/en/) (accessed 2015).

- Food and Agriculture Organisation of the United Nations [FAO] (2009), Country responses to the food security crisis: Nature and preliminary implications of the policies pursued, Initiative on soaring food prices, Rome, Italy.
- Food And Agriculture Organization Of The United Nations -FAO (2009), "Assessing the Nature, Extent and Impacts of FDI on West Africa Agriculture: The Case of Ghana and Senegal", Consultant Report, Mimeo.
- Food And Agriculture Organization Of The United Nations -FAO, Rome, (2010). The State of Food Insecurity in the World. Addressing food insecurity in protracted crises. Rome, Italy.
- Food And Agriculture Organization Of The United Nations -FAO, Rome, (2012).The State of Food Insecurity in the World Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. Rome, Italy.
- Food And Agriculture Organization Of The United Nations Rome, (2002). Land Tenure and Rural Development, Rome, Italy.
- Franco J., Saturnino Borras Jr., Alberto Alonso-Fradejas, Nick Buxton, Roman Herre, Sylvia Kay, Timothé Feodoroff, (2013), The Global Land Grab, Transnational Institute.
- Franco, J., Levidow, L., Fig, D., Goldfarb, L. Hönicke, M., Mendonça, M.L., (2010). Assumptions in the European Union biofuels policy: frictions with experiences in Germany, Brazil and Mozambique. Journal of Peasant Studies, 37(4): 661–698.
- Friis, Cecilie and Reenberg, Anette (2010). Land grab in Africa: Emerging land system drivers in a teleconnected world. GLP Report No. 1. GLP-IPO, Copenhagen.

- German Federal Ministry for Economic Cooperation and Development (BMZ), 2009. Development Policy Stance on the Topic of Land Grabbing—the Purchase and Leasing of Large Areas of Land in Developing Countries. Discourse 015. BMZ, Bonn/Berlin.
- Gillon, S. (2010). Fields of dreams: negotiating an ethanol agenda in the Midwest United States. Journal of Peasant Studies, 37(4): 723–748.
- Giovannetti G., Ticci E., (2013). Foreign Investment in Sub-Saharan Africa: the land energy-nexus. Foreign Acquisitions of Land in Developing Countries, Risk, Opportunities and New Actors, 2. Rivista Associazione Rossi Doria, pp. 57-88.
- GRAIN (2008): Seized! The 2008 land grab for food and financial security. GRAIN Briefing. Girona: Spain.
- GRAIN (2014). Hungry for land: small farmers feed the world with less than a quarter of all farmald at: https://www.grain.org/article/entries/4929-hungry-for-land-small-farmers-feed-the-world-wi th-less-than-a-quarter-of-all-farmland#sdfootnote37sym
- GTZ (2009), Foreign Direct Investment (FDI) in Land in Developing Countries, Deutsche Gesellschaft fur Technische Zusammenarbeit, Eschborn, December 2009.
- Hall, R., (2011). The Next Great Trek? South African commercial farmers move north, http://www.iss.nl/Menupages/Research-Networks/The-Land-Deal-Politics-Initiative-DPI/April-2011-IDS-Sussex2/LDPI-Conference-Papers/The-next-Great-Trek-South-African-commercial-farmers-move-nort.
- Harvey D. (2003), The new Imperialism. Oxford: Oxford University Press.
- Headey, D., Jayne, T.S., (2014). Adaptation to land constraints: Is Africa different? Food Policy 48. http://dx.doi.org/10.1016/j.foodpol.2014.05.005
- Hertel T. W., Tyner W. E., Birur D. K. (2010). The Global Impact of Biofuel Mandates.

Energy Journal 31: 75-100.

- HLPE (2011): Land tenure and international investments in agriculture. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2011.
- Honing L. (2012), "State Land Transfers and Local Authorities in Zambia", Second International Conference on Global Land Grabbing, Cornell University, 17-19 October.
- Hussain I., Hanjra A. M., (2004). Irrigation And Poverty Alleviation: Review Of The Empirical Evidence.
- International Fund for Agricultural Development [IFAD] (2011), Responding to 'land grabbig' and promoting responsible investment in agriculture. IFAD Occasional Paper 2.
- International Fund for Agricultural Development, IFAD (2013). Smallholders, food security, and the environment at: http://www.unep.org/pdf/SmallholderReport_WEB.pdf
- International Land Coalition (2011) , Global Assembly 2011, Tirana Albania, May 24-27, 2011 (ILC 2011).
- Jagerskog A., Cascao A., Harsmar M., Kim K., (2012). Land acquisitions: how will they impact transboundary waters? Stockholm International Water Institute.
- Jayne, T. S., T. Yamano, M. T. Weber, D. Tschirley, R. Benfica, A. Chapoto and B. Zulu, (2003). 'Smallholder Income and Land Distribution in Africa: Implications for Poverty Reduction Strategies', Food Policy 28 (3): 253 - 275.
- Jayne, T.S., Chapoto, Antony, Sitko, Nicholas, Nkonde, Chewe, Muyanga, Milu, Chamberlin, Jordan, (2014). Is the Scramble for Land in Africa Foreclosing a Smallholder Agricultural Expansion Strategy? J. Int. Affairs. Spring Issue, pp. 35–53.
- Kenney-Lazar, M., (2012): Plantation rubber, land grabbing and social-property

transformation in southern Laos. Journal of Peasant Studies, 39(3-4), pp. 1017-1037.

- Lipton M., (2009). Land reform in developing countries: property rights and property wrongs. New York, Routledge.
- Loayza N. V., Raddatz C., (2010). The composition of growth matters for poverty alleviation. Jounarl of Development Economics 93(1), 137–151.
- McCarthy J.F., J.A.C. Vel and S. Afiff, (2012). “Trajectories of land acquisition and enclosure: development schemes, virtual land grabs, and green acquisitions in Indonesia’s Outer Islands” Journal of Peasant Studies 39(2), p. 523.
- McMichael, P., Scoones, I. (guest editors), (2010). The politics of biofuels, land and agrarian change. Journal of Peasant Studies, 37(4), Special Issue.
- Mellor, J., (1976). The New Economics of Growth: A Strategy for India and the Developing World. Cornell University Press, Ithaca.
- Minot N., (2012). “Food Price Volatility in Africa. Has It Really Increased?”, IFRI Discussion Paper 01239, December. Available online at: www.ifri.org
- Mitchell D., (2008) “A note on rising food prices”, World Bank Development Economics Group 4682. Available online at: wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2008/07/28/000020439_20080728103002/Rendered/PDF/WP4682.pdf
- Mittal A. (2009), “The 2008 Food Price Crisis: Rethinking Food Security Policies”, G-24 Discussion Paper Series, United Nations Conference on Trade and Development, 56, June.
- Nachtergaele F., J. Bruinsma, J. Valbo-Jorgensen, and D. Bartley, (2011). Anticipated trends in the use of global land and water resources. SOLAW Background Thematic Report – TR01. FAO.

- Nelson G. C. and others, (2009). Climate Change: Impact on Agriculture and Costs of Adaptation. Food Policy Report, International Food Policy Research Institute, Washington, DC.
- O'Brien, E. (2011). Irregular and illegal land acquisition by Kenya's elites: Trends, processes, and impacts of Kenya's land-grabbing phenomenon. The International Land Coalition.
- Pearce, F., (2013). Splash and grab: the global scramble for water. New scientist. 2906. http://www.newscientist.com/article/mg21729066.400-splash-and-grab-the-global-scramble-for-water.html#.Uq4uYqXGNjQ
- Quagliarotti Desirée A.L., (2013). Land grabbing: hydro-political effects in the Nile river basin. QA Rivista dell'Associazione Rossi-Doria, Issue 2: 87-108.
- Quan, N., Koo, A.Y.C., (1985). Concentration of land holdings: an empirical exploration of Kuznets' conjecture. Journal of Development Economics 18, 101–117.
- Rahmato D., (2014). The perils of development from above: land deals in Ethiopia. African Identities, Volume 12, Issue 1, 2014, pages 26-44. Francis & Taylor.
- Rulli M.C., D'Odorico P., (2013). The water footprint of land grabbing. Geoghys. Res. Lett. 40, 6130-6135.
- Rulli Maria Cristina, Saviori Antonio, D'Odorico Paolo (2012), B.L. Turner, Ariziona State University, Tempe, AZ.
- Sassen S. (2013), "Land Grabs Today: Feeding the Disassembling of National Territory", Globalizations, 10, 1, pp. 25-46.
- Sauer, S. Leite, S.P. (2011). Agrarian structure, foreign land ownership, and land value in Brazil. The International Conference on Global Land Grabbing, University of Sussex, UK,

April 6-8, 2011. Available at: http://www.future-agricultures.org/index.php?option=com_docman&task=cat_view&gid=1552&Itemid=971&limitstart=10

- Schoneveld, G. C. (2011): The anatomy of large-scale farmland acquisitions in sub-Saharan Africa. CIFOR Working Paper, (85).
- Schoneveld, G. C. (2014). The Geography and Sectoral Patterns of Large-Scale Farmland Investments in Sub-Saharan Africa. Food Policy 48: 34-50.
- Smaller, C., Mann, H. (2009). A Thirst for Distant Lands: Foreign Investment in Agricultural Land and Water. Winnipeg, Canada: International Institute for Sustainable Development (IISD) – Foreign Investment for Sustainable Development Program.
- Songwe Vera, Deininger Klaus (2009), Foreign Investment in Agricultural Production: Opportunities and Challenges, Agriculture & Rural Development Notes and Administration, Agriculture Rural Development and World Bank.
- Staatz, J.M., Dembele, N.N., (2007). Agriculture for development in Sub-Saharan Africa. In: Background Paper for the World Development Report 2008, World Bank, Washington, DC.
- Steinfeld H., de Haan C., and Blackburn H. (1997), Livestock – environment interactions. Finding a balance, Report of Study by the Commission of the European Communities, the World Bank and the governments of Denmark, France, Germany, The Netherlands, United Kingdom and The United States of America.
- Tamrat I., (2010). Governance of large scale agricultural investment in Africa: The case of Ethiopia. Washington DC: Paper presented at the Annual Bank Conference on Land Policy and Administration, April 26 and 27, 2010.
- The Land Matrix Global Observatory (2012): Land Matrix. International Land Coalition (ILC), Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Centre for Development and Environment (CDE), German

Institute for Global and Area Studies (GIGA) and Deutsche Gesellschaftfür InternationaleZusammenarbeit (GIZ). Available at: http://www.landmatrix.org

- UNEP - United Nations Environment Programme, (2009). Towards Sustainable Production and Use of Resources assessing Biofuels. Paris.
- UNICEF Annual Report, (2014). Reimagine the future Innovation for every child. United Nations Children’s Fund (UNICEF), November 2014.
- United Nations Conference on Trade and Development [UNCTAD] (2008), The Least Developed Countries Report 2008. Growth, Poverty and the Terms of Development Partnership, United Nations publication, New York and Geneva. Available online at: http://unctad.org/en/docs/ldc2008_en.pdf
- United Nations Department of Economic and Social Affairs [UNDESA] (2013), World Population Prospects: The 2012 Revision, Highlights and Advance Tables, United Nations, New York
- United Nations Framework Convention on Climate Change [UNFCCC] (2007), Climate change:impacts, vulnerability and adaptation in developing countries, United Nations. Available online at http://unfccc.int/resource/docs/publications/impacts.pdf
- Valle, L. M., (2010). El proceso de concentración de tierras en el Ecuador. Paper prepared for the workshop on the dynamics of land markets in Latin America. Santiago, Chile, 2010.
- Verhoeven, H., Woertz, E., (2012). Mirage in the desert: the myth of Africa’s land grab. CNN News, 9 July 2012.
- Vermeulen S., and Cotula L. (2010), "Over the heads of local people: consultation, consent, and recompense in large - scale land deals for biofuels projects in Africa", The Journal of Peasant Studies, 37(4), pp. 899 - 916.

- Visser, O., & Spoor, M., (2010): Land grabbing in Eastern Europe: global food security and land governance in post-Soviet Eurasia. In The 118th Seminar of the EAAE, Rural Development: Governance, Policy Design and Delivery, Ljubljana, Slovenia.
- Visser, O., Mamonova, N., & Spoor, M., (2012): Oligarchs, megafarms and land reserves: understanding land grabbing in Russia. Journal of Peasant Studies, 39(3-4), pp. 899-931.
- Von Witzke H., and Noleppa S. (2010), “EU agricultural production and trade: can more efficiency prevent increasing land - grabbing outside of Europe?”, Internal Report, Humboldt University of Berlin, Germany.
- Weis, T. (2010). The Accelerating Biophysical Contradictions of Industrial Capitalist Agriculture. Journal of Agrarian Change, 10(3): 315 – 341.
- White B., Saturnino M. Borras Jr, Ruth Hall, Ian Scoones, Wendy Wolford (2012), “The New Enclosures: Critical Perspectives on the Corporate Land Deals”. Journal of Peasant Studies 39 (3-4): 619-648.
- White, B., Dasgupta, A. (2010). Agrofuels capitalism: a view from political economy. Journal of Peasant Studies, 37(4): 593 – 607.
- WHO [World Health Organisation) (2013), "Global and regional food consumption patterns and trends", Nutrition Health Topics. Available online at: http://www.who.int/entity/nutrition/topics/en/
- World Bank, (2010). Lao PDR: Investment and access to land and natural resources: Challenges in promoting sustainable development. Washington DC: World Bank.
- World Bank, (2011). Rising Global Interest in Farmland. Can it yield sustainable and equitable benefits? Agriculture and Rural Development.
- WWAP [World Water Assessment Programme] (2009), United Nations World Water

Development Report 3: Water in a Changing World, Paris/London, UNESCO Publishing/ Earthscan. Available online at: http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/

What are the pull factors of land demand in Africa?

"Outsoucing's third wave –
Rich food importers are acquiring vast tracts of poor countries' farmland.
Is this beneficial foreign investment or neocolonialism?"
The Economist, 2009

2.1 Introduction.

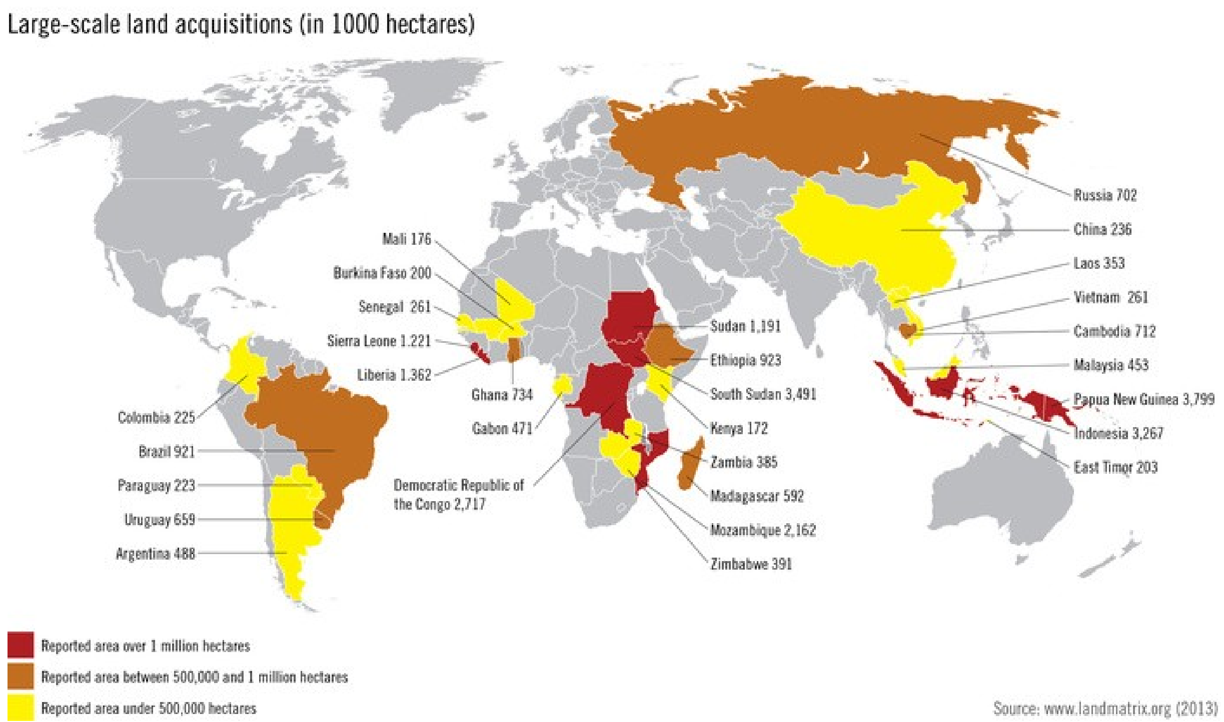
The phenomenon of large scale land acquisitions (LSLA) in developing countries was firstly delivered to universal attention by NGO GRAIN, that published a report titled *Seized! The 2008 land grab for food and financial security,* and, afterwards, during 2009 Andrew Rice wrote a long article in The New York Times Magazine, that gave more visibility to the phenomenon.

During the 2008 financial crisis, there has been a rise of interest in foreign investment in agricultural land, and the literature suggests that much of this interest was driven by fears of political instability, due to the dependence on food imports (Woertz, 2013). Furthermore, investment banks, hurt by the crisis in the banking and real estate sector, and in seek of new sources of investment, have also contributed to the surge of this kind of investments.

Smaller and Mann (2009) have distinguished Foreign Agricultural acquisitions from traditional Foreign Direct Investments in land. The former ones are neither market driven nor mainly seeking comparative-advantage for production. Rather the actual land acquisition is about securing exclusive usage rights of farmland and associated water resources. The cultivated crops types do not represent private demand for traditional crops, but rather, the national needs of the involved investor country. Some experts consider foreign agricultural investments as a way to provide new sustenance opportunities in developing countries and a means to ensure food security for a growing world population. Others, instead, have raised concerns about the potential social and environmental impacts, such as loss of land for rural people and deterioration of soil and water resources. In fact, this issue has incited an intense debate at national and international level, in which strong stands are taken about the future impacts of this form of investment on the environment, land rights, food security, local and international conflicts.

Pearce (2012), in his book, highlights the irony of potentially large food exports from countries that may depend on food aid (Figure 1). *"[...] food and financial crises have, in tandem, triggered a new global land grab. On the one hand, "food insecure" governments that rely on imports to feed their people are snatching up vast areas of farmland abroad, for their own offshore food production. On the other hand, food corporations and private investors, hungry for profits in the midst of the deepening financial crisis, see investment in foreign farmland as an important new source of revenue. As a result, fertile agricultural land is becoming increasingly privatised and concentrated. If left unchecked, this global land grab could spell the end of small scale farming,* *and rural livelihoods, in numerous places around the world"* (GRAIN, 2008). One government report identify land grabbing as one of the most pronounced manifestations of corruption and moral decadence in modern society (Government of Kenya, 2004).

Figure 1. Large Scale Land Acquisitions. The imagine depicts a snapshot of the situation at the end of 2013, showing both concluded and intended deals for which information was available. Source: Land Matrix.



There is a broad consensus that the tide of recent investments in land could affect food security, agricultural production patterns, and global stability in the long-term (Arezki et al., 2013). The global land grab is, therefore, a son of the ongoing change in the meaning and use of the land and its associated resources (like water) from small scale, labour intensive uses like peasant farming for the local markets, toward large scale, capital intensive, resource depleting uses such as industrial mono-cultures, raw material extraction, integrated into a growing infrastructure that link extractive frontiers to metropolitan areas and foreign markets (White et al., 2012).

Such analysis is relevant for two important development issue: first one regarding the most appropriate structure of agricultural production, small versus large farm, second one regarding high inequality in distribution of land, that has negatively affected human and economic development. A good example of the relationship between farm size, poverty, and employment can be found in the contrast Brazil and China from 1991 to 2001. During that period, China increased by two times its cereal yields based on a smallholder sector, raised almost 400 million out of poverty. During the same period, Brazil achieved somewhat lower rates of growth based on mechanized large scale farming, but the number of rural poor actually increased (Songwe et al., 2009). Family farms have been proved to be economically much more efficient than plantations operated by wage labour. Considering the second issue, we can examine what happened in Central America during coffee boom in the late 19th century. In Guatemala and El Salvador, the coffee boom led to expropriation of land and privatization of customary lands, causing conflict and civil war that undermined human and economic development. Instead in Costa Rica and Colombia, the coffee boom encouraging smallholder coffee economies. At nowadays (World Bank Indicators, 2014) the latter has an income per capita more than double in respect to the former, and have been democracies for more than 50 years rather than little more than a decade (Nugent et al., 2002). In cross section studies considering less developed countries, inequality in land distribution has an impact on growth negative and more pronounced (Neves et al., 2012). Using initial distribution of land as a measure of inequality, Deiniger and Squire (1998) find a negative, significant effect of inequality on growth, even when regional dummies are used. Using panel data instead of cross-section data, Deininger and Olinto (2000) also find that initial land distribution, but not initial income distribution, has a significant growth reducing impact.

Large farms have used their locally dominant position to monopolize markets (Binswanger et al., 1995), subvert the provision of public goods such as education (Nugent and Robinson, 2010), and restrict political participation (Baland et al., 2008). Growth alone is not sufficient for poverty reduction; the distribution of assets makes a difference. Johston and Kilby (1975); Mellor (1976), and Quan and Koo (1985) have demonstrated that democratic land distribution patterns tend to generate higher rate of economic growth than highly concentrated ones. The reason for this is that broad-based agricultural growth tends to generate expenditures in support of local non tradable goods and service in rural areas and towns (Jayne et al., 2003).

I intend to contribute to debate by examining and studying the determinants of actual trans-national and national land demand and actual land transfers. I run unilateral regression and I make a cluster analysis for land demand (expressed by the number of project) and for land transfers (expressed by an index of investment).

This paper focuses on the renewed interest in purchasing or leasing land, for agricultural production; it does not focus on other forms of foreign investment in agriculture. For the purpose of this study I will focus on how political environment and agro -ecological potential attract foreign investment in agriculture in Africa. I choose to analyse only African Continent, because it is the main target all over the world. Arezki et al. (2013) have analysed three different dataset (GRAIN, A&C, Land Matrix), and all data sources coincide in suggesting that there has been an unequal focus on Africa. It is very likely that the area covered by foreign LSLAs in Sub Saharan Africa alone goes into the two digit millions of hectares. The scale of foreign LSLA is indeed alarming, especially if one considers that 57.3 percent of the labour force in Sub Saharan Africa consists of small holder agricultural producers (Dercon and Gollin, 2014), that are dependent on the same land resources as their main source of nutriment (the African rural population is about 60% of the entire population, Geohive, 2010). In the rural areas, poverty and deprivation are most severe, and manifest itself in the lack of the basic human needs such as access to food and income (Diao et al., 2007). Also, in Africa, the seller is the government rather that a private part for almost 90 percent of the known cases (Alden-Wiley, 2010), this is because most of the farmers cultivate the land on the basis of customary rights, rather than official rights. This makes the rural population even more vulnerable. In several African countries, land is nationalised or otherwise mainly controlled by the state. For instance, land is nationalised in Ethiopia (under Proclamation No. 31 of 1975 and the 1995 Constitution), Mozambique (at independence in 1975, and more recently under the 1990 Constitution and the Land Act 1997) and Tanzania (after independence and more recently under the Land Act 1999 and the Village Land Act 1999). In these cases, purchases are banned, although some African countries have introduced private ownership where this was previously ruled out (e.g. Burkina Faso in the 1990s), or enabled transfers of "underdeveloped" state lands even if land property title remains to the state (e.g. in Tanzania, under article 6 of the Land (Amendment) Act 2004). The World Bank estimates that, across Africa, only between 2 and 10% of the land is held under formal land tenure (Deininger, 2003). Thus, in Cameroon, only about 3% of the land has been formally registered and is held under private ownership (Egbe, 2001), mainly by urban elites such as politicians, government employees and businessmen (Firmin-Sellers and Sellers, 1999). For example in Sudan, although private land ownership is formally recognised, about 95% of all the land is state owned. The limited spread of private ownership is partly due to the long and complicated procedures required to acquire it, particularly land registration (Cotula et al., 2009). In addition, where "customary" tenure systems are functioning and perceived as legitimate, local resource users may feel that they have sufficient tenure security under these systems. The implication is that, even where private ownership is formally recognised, most of the land is controlled by the state. The problem, especially in Africa, is thus that the local farmers cultivate land on customary rights, and have no or little recognition under national law. This circumstance is historically rooted in the colonial experience, when colonisers treated conquered lands as empty and brought them under state ownership, and in decades of post-independence single-party regimes or military dictatorships did not undertake land reform (Alden Wily, 2010). This policy was undertaken in order to increase agricultural productivity especially in rural areas under the ideological hat of nationalization in all the economic sectors. As a result, the government has legal authority to sign off transactions. However, governments and investors could still consult local people, but in many publicly reported deals, in Africa, local people are not properly considered (World Bank, 2010) and are therefore vulnerable to dispossession.

The remaining part of this study is divided as follow: literature review on foreign direct investment; data and methodology, based on statistical functions, followed by the results and interpretation section; then the conclusion.

2.2 Literature Review on Foreign Direct Investment.

Literature on foreign direct investments (FDIs) suggest that the range and distribution of capital flows to target countries are determined by pull and push factors (Calvo et al., 1996), in addition to country-specific variables. Cross-section analysis supports the decisive role of institutional factors to explain the magnitude and nature of capital flows toward developing and emerging countries (Alfaro et al., 2008). Moreover, panel analysis have been used to show, not only that time invariant factors such as institutional patterns affect foreign capital flows, but also that foreign investors tend to compensate policy reforms by increasing bank lending once institutional reforms have been implemented (Papaioannou, 2009). These analysis suggest that institutional variables, rather than human capital or income, are crucial factors underlying this relationship. Some studies highlight the importance, in order to attract FDIs, of a sound legal framework and a stable political environment (Giovannetti et al., 2013), others highlight the importance of a good institutions (Naudè and Krugell, 2007). Democracy in a country provides secure property rights and a fair competitive environment durable for an efficient market; also others argue that democracy suppresses monopoly in order to undermine Multinational Corporations' illicit profits (Okafor et al., 2011). Olsen (1993) affirms that democracies supply the optimal environment for investors due to respect for individual rights. Anyway, this is sometimes not possible for Africa, where some specific investments, for instance those in land or in "dirty industries", are made in countries with weak governance to keep away from strict rules and laws (Giovannetti et a., 2013). Stable democratic governance boosts a country's ability in order to attract FDI (Li et al., 2003), democracy promotes competitiveness and open markets, which benefits the all population, but in Sub-Saharan Africa there is a complete different path. In fact the share of FDIs in total capital flows is higher in countries with weak governance, because investors will demand ways of investing that supply them with greater control (Hausmann et al., 2007). Jensen (2003) suggests that the need to attract FDIs pushes governments to provide a climate more hospitable to foreign corporations, altering patterns of domestic policy, even challenging the sovereignty of the nation and the capacity for democratic governance. In fact Resnick (2001) finds that the transition to democracy has a negative impact on FDIs, and O'Donnell (1978) asserts that FDI favours autocracy for reasons such as its capacity to suppress labour demands, repress riots, and offer tax incentives. Many countries that are democratizing, also, happen to be developing economic pursuing foreign capital, in this case the developing country faces a trade-off between competing for limited FDI and democratization. Okafor et al. (2011) analysed a set of 48-Sub Saharan African countries, their results suggest that the more efficient, accountable, and transparent a country's democracy is the less FDI inflow it receives. The findings is in line with that one of Resnick (2001), transition to more efficient democracy has a negative effect on FDI inflow in developing countries. Li & Resnick (2003) describe three elements that slows FDIs. First, democratic constraints over elected politicians tend to weaken the oligopolistic or monopolistic position of Multinational Companies. Second, these constraints prevent the governments from offering fiscal incentives to foreign investors. Third, broad access to elected officials offer protection for local business people.

Sub-Sahara Africa has the title as the poorest region in the world. It is suffering from the effects of economic mismanagement, inter-ethnic conflict, and corruption at local, state, and federal level. Exploitation of country's wealth and natural resources by local and not local agents is very common in Africa. Despite its huge natural resources (the region produce, among others, 30% of the world's gold, 88% of the world's platinum and so on), in Sub-Saharan Africa there are most of less developed countries in the world.

2.3 Data and Methodology.

2.3.1 Data.

In the following, I will estimate the determinants of large-scale land deals in Africa (I will consider not just Sub-Saharan Africa but also North Africa and also, I will consider national and international deals).

Dependent variable.

I use two dependent variables: firstly the Count of Deals, secondly an Index of Investment, namely the ratio of the actual size of projects (concluded, documented by direct sources of information and reported in the Land Matrix dataset) and the suitable land (given by the sum of cultivated, grass and wood and forest land). These variables are elaborated from the last version of the Land Matrix Globally Observatory (accessed March 2015). Land Matrix Globally Observatory is an open database recording rural land deals reported since 2000 which entail a transfer of rights to use, control or ownership of land or larger through sale, lease or concession (Anseeuw et al., 2012, 2013). The Land Matrix Dataset has been object of criticism on incompleteness and political sensitivity in monitoring and measuring large scale land transactions (Arezki et al. 2013; Cotula 2012; Oya 2013; Edelman 2013). Rulli et al. (2013), referring to the imprecision of the land grabbing data, state that data are inaccurate and incomplete because of the rapid pace of the phenomenon, its lack of transparency, and the absence of a standard criterion to classify and report these acquisitions. However the last version of the Land Matrix provides detailed information on a range of dimensions: type of sources, status of negotiations (intended, concluded, failed), intention of investments and cultivated crops for agricultural land deals, investor and target countries. The database has gone through an error-checking process of triangulation and covers almost 40 million ha corresponded to more that 1000 transnational deals concluded between 2000 and today. Unlike most other sources that do not consider any deal less than 1000 ha, this covers deals of 200 ha and above. I select only land deals with concluded contracts and documented by direct sources of information, namely from companies, contracts or official government records, while I exclude intended and failed negotiations and deals reported only by media, research documents and personal communications (Table 1). Existing data confirm that international land investments disproportionally target SSA countries and are very large.

Table 1. Foreign Direct Land Investments in African Countries and Land Tenure Insecurity (I only consider Deals concluded and documented by direct source). Source: Land Matrix and Institutional Profile Database.

Target Country	Nr. of Investment	Size of Deal (Ha)	Purpose of Land Deal	Land Tenure Insecurity
Angola	6	37500	Agriculture – Biofuels	3.25
Benin	1	32000	Biofuels	2.75
Burkina Faso	2	2644	Agriculture – Biofuels	3
Cameroon	5	82991	Agriculture	3
Central African Republic	1	5317	Agriculture	2
D.R. Congo	12	2850993	Agriculture - Forestry	3.75
Congo	5	2022000	Agriculture – Biofuels - Forestry	2.5
Cote d'Ivoire	6	73101	Agriculture	3
Egypt	6	66839	Agriculture	3
Ethiopia	68	910756	Agriculture – Biofuels – Forestry	3.5
Gabon	4	473800	Agriculture - Tourism	2.25
Ghana	20	664131	Biofuels – Agriculture – Forestry	3
Guinea	3	129215	Agriculture	3
Kenya	2	22187	Agriculture – Renewable Energy	3
Liberia	17	1553527	Agriculture – Forestry - Biofuels	3
Madagascar	6	32216	Forestry – Agriculture – Biofuels	1.67
Malawi	3	7154	Agriculture	N.A.

Mali	5	86845	Agriculture – Renewable Energy - Biofuels	3
Mauritius	1	500	Agriculture	1.67
Morocco	1	520	Agriculture	2.75
Mozambique	52	2039303	Agriculture – Biofuels – Forestry – Renewable Energy - Tourism	2.67
Namibia	1	220	Agriculture	2
Nigeria	19	174252	Agriculture – Biofuels – Renewable Energy	2.67
Rwanda	3	21130	Forestry – Biofuels – Agriculture -	4
Senegal	7	117050	Biofuels – Agriculture – Forestry - Renewable Energy	2.67
Sierra Leone	18	1272152	Biofuels – Renewable Energy – Forestry – Agriculture	3
South Africa	5	174446	Forestry – Agriculture	1.67
South Sudan	6	1105893	Agriculture – Forestry	1.67
Sudan	9	443298	Agriculture	2.33
Swaziland	2	32970	Forestry	N.A.
United Republic of Tanzania	17	182832	Agriculture – Forestry - Biofuels	2.33
Uganda	7	37548	Agriculture – Forestry	2.67
Zambia	15	162447	Agriculture - Biofuels	2
Total	**336**	**14817777**		

Note: Land Tenure Insecurity, Source French Development Agency (AFD) and the Directorate General of the Treasury. Share of the population with no formally recognised land tenure rights. The Rank 0 to 4, 0= Very low land tenure insecurity, 4= Very high land tenure insecurity.

Before 2008 there were few deals (total deals of 2 million ha), after the volume increased to 6 million ha in 2008 and 30 million in 2009, followed by a reduction to 9 and 10 million thereafter. This boom is more pronounced for biofuel, and moreover, government had not acted as buyers at all in the period before 2008 (Arezki et al., 2013).

Covariates.

The attractiveness of a country for farmland investment depend on the availability of land with high agro-ecological potential, that is not used for intensive crop production and institutional factors. In order to make these data useful for my regression and cluster analysis, I have analysed some variables trough model regression to explore the links between **land supply, governance, investor protection and property rights** (table 2). This kind of approach, allow me to compute a measure of land supply. I take in account Cultivated Land (Irrigated and Rain-Fed Cultivated Land), Forest Land, Grassland and Woodland, I exclude Barren and Sparsely Vegetated Land and of course Built-up Land. The rationale is that the suitable land includes cultivated and not cultivated land (like forested), but not barren land because it should be less productive and therefore less attractive for foreign investors. The diffuse perception that Africa has underutilized lands, suitable for cultivation has made the continent a target destination. A number of Sub-Saharan African countries are land abundant (Mozambique, Congo and the DRC for example) and furthermore lands are often cultivated by local farmers on the basis of customary rights. There are many reasons to invest in land in Africa, because the continent has land, water and large unexploited agricultural potential (Deininger, 2011).

Table 2. Covariates, Definitions and Sources.

Table 2.a Indicators of Politics and Governance - Percentile rank among all countries (ranges from 0 (lowest) to 100 (highest) rank).

VARIABLES	DEFINITION	SOURCE
Regulatory Quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	The Worldwide Governance Indicators (WGI) project. The WGI are produced by: 6. Natural Resource Governance Institute (NRGI) and Brookings Institution 7. World Bank Development Research Group 8. World Bank Institute
Political Stability and Absence of Violence	Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.	Same source as before

Rule of Law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	Same source as before
Control of Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	Same source as before

Table 2.b Indicator of Investor protection

VARIABLES	DEFINITION	SOURCE
Protecting Investors – For weak investor protection, a low value characterizes a country in which governance is poor.	Provides information on the firm-specific regulatory environment. The index consists of a weighted average of indices measuring the transparency of transactions, the liability of company directors and shareholders. The variable is defined as the country's percentile in the ordered distribution of ranks regarding investor protection. For weak investor protection, a high value corresponds to a situation in which investors' rights are weakly protected.	The *Doing Business* project provides objective measures of business regulations and their enforcement across 189 economies and selected cities at the sub national and regional level. World Bank Group.

Table 2.c Indicators of Land Governance

VARIABLES	DEFINITION	SOURCE
Diversity of the land tenure system	Diversity of the land tenure system across the country in practice (communal ownership, usage rights, customary rights, religious rights, "modern" rights etc.). The Rank from 0 to 4, 0 = No Diversity, 4= High Diversity	This new edition of the IPD is the result of a collaboration between the French Development Agency (AFD) and the Directorate General of the Treasury (DG Trésor). The perception data needed to build the indicators were gathered through a survey completed by country/regional Economic Services (Services Économiques) of the Ministry for the Economy and Finance (MEF) and the country AFD's offices. The Centre for Prospective Studies and International Information (CEPII) and

		the University of Maastricht (Maastricht Graduate School of Governance – MGSoG) are our partners in this project.
Share of rural land under the traditional rights system	Share of rural land under the traditional rights system (use, grazing, transhumance, exploitation etc.). The Rank 0 to 4, 0= No Land Under Traditional System, 4= Very Large	Same source as before.
Land tenure insecurity	Share of the population with no formally recognised land tenure rights. The Rank 0 to 4, 0= Very low land tenure insecurity, 4= Very high land tenure insecurity	Same source as before.

Table 2.d Land Price

VARIABLES	DEFINITION	SOURCE
Land Price	Value of Land	World Bank - 1999

Table 2.e Indicators of land suitability, land availability and yield gap

VARIABLES	DEFINITION	SOURCE
Nutrient availability: 1. No or slight Constraints 2. Moderate Constraints	The Nutrient availability dataset refers to soil fertility, particularly important for low input farming.	GAEZ- Global Agro - Ecological Zones, FAO and IIASA
Workability: 1. No or slight Constraints 2. Moderate Constraints	The Workability dataset refers to the soil workability constraints that comprise conditions that may cause physical hindrance to cultivation, or cause limitations to cultivation imposed by soil texture/ clay mineralogy and soil bulk-density.	Same source as before
Cultivated Land	The Cultivated Land dataset represents the estimated share of cultivated land which includes both rain-fed and irrigated land.	Same source as before
Forest Land	The Forest Land Dataset represents	Same source as before

	the estimated share of forest land.	
Grassland and Woodland	The Grassland and Woodland Dataset represents the estimated share of grassland and woodland.	Same source as before

Note: Land cover maps were combined to produce a quantification of the main land use/land cover shares based on a 5 arc-minute grid-cell in the spatial raster.

2.3.2 Methodology.

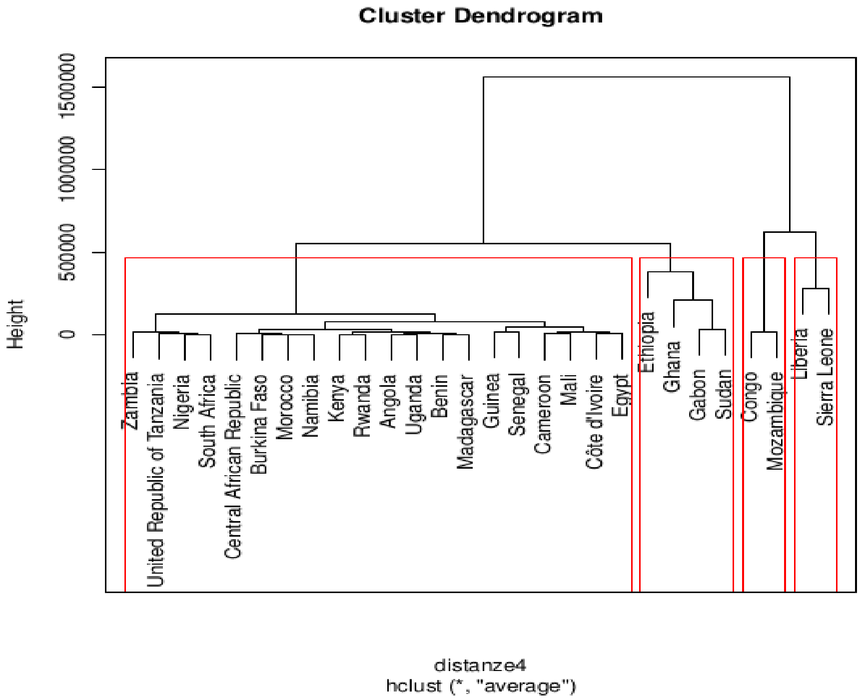
Cluster Analysis.

Cluster Analysis (CA) is an exploratory data analysis implemented for classifying a large amount of data (e.g. people, things, events) into meaningful clusters, which maximizes the similarity within each cluster while maximizing the dissimilarity between groups.

For my cluster analysis I use an aggregative hierarchical algorithm that considers the data matrix X of dimension n x p (n= unit, p= quantitative variable) and starts grouping into subgroups based on their similarity. In particular, the algorithm asks to choice a similarity measure of distance between units, and I have considered the Euclidean distance, and the choice of a similarity measure between clusters, and here I have considered possible pairs of units, one belonging to a cluster, the other to another one.

Dendrograms. Number of country observed, 28.

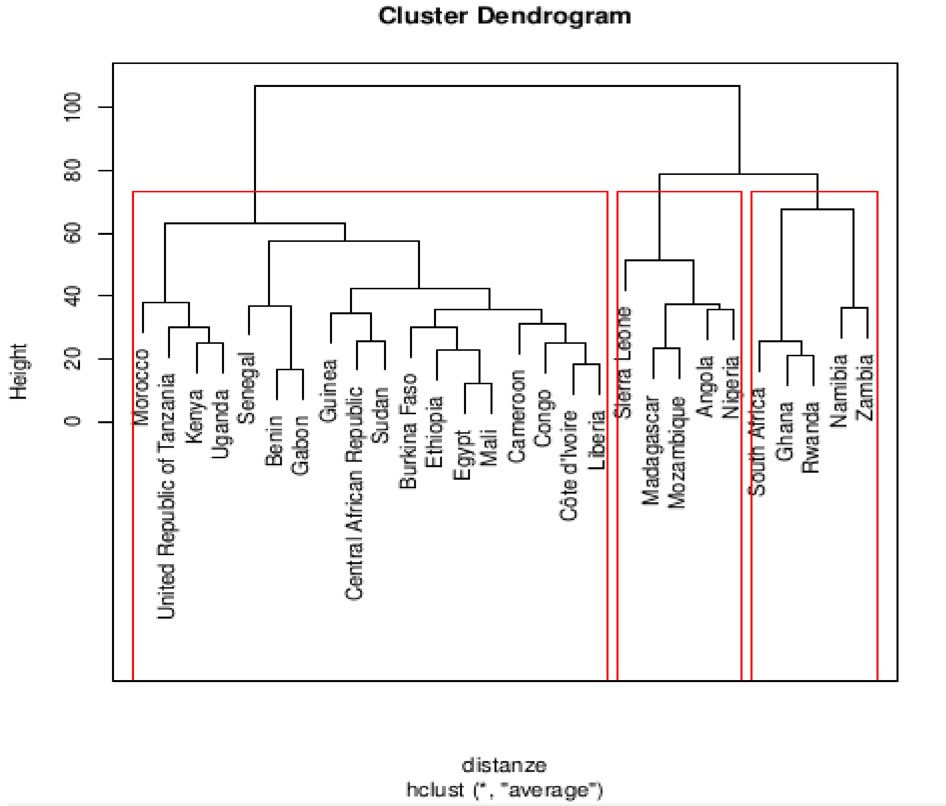
First Dendrogram. Dependent Variable: Size of Deals, Number of Deals, Index of Investment.



Averages of Clusters for the First Dendrogram.

	Average 1st Cluster	Average 2nd Cluster	Average 3rd Cluster	Average 4th Cluster
Size of Deals	72065	622996,2	2030652	1412840
Number of Deals	5,95	25,5	28,5	17,5
Index of Investment	0,002993253	0,01579418	0,04311513	0,174099

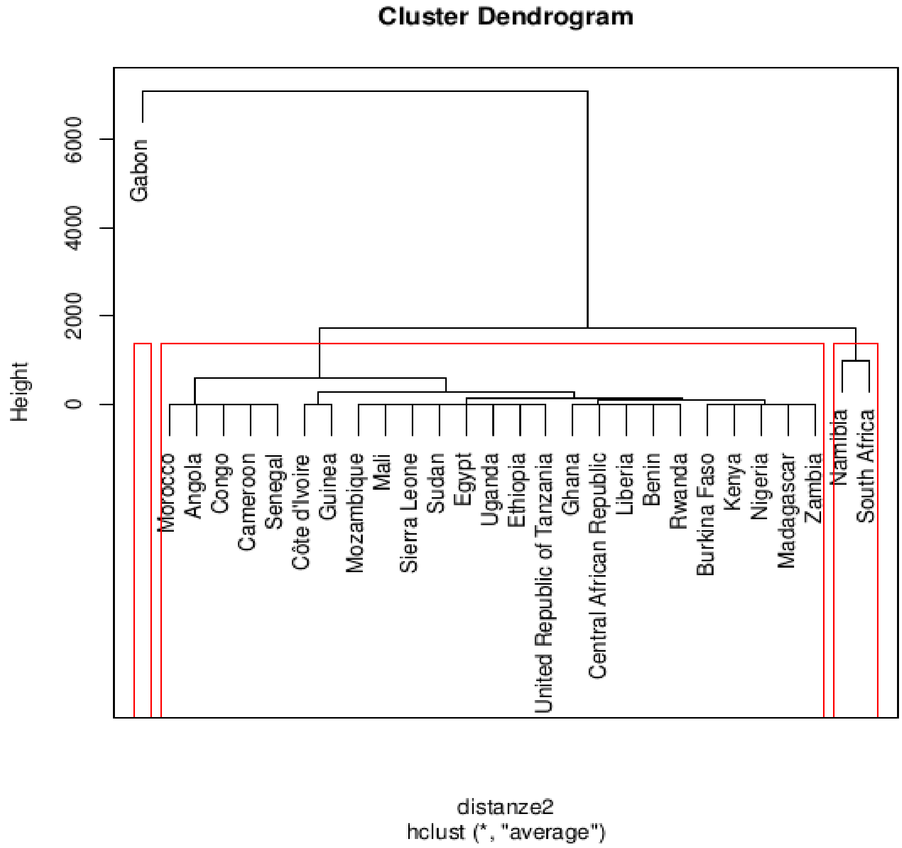
Second Dendrogram. Indicators of Politics and Governance.



Averages of Clusters for the Second Dendrogram.

	1st Cluster	2nd Cluster	3rd Cluster
Political Stability and Absence of Violence Terrorism	28.152	23.98667	54.596
Regulatory Quality	26.220	28.73500	52.248
Rule of Law	16.778	27.09222	54.124
Control of Corruption	18.086	24.21667	58.470
Protecting Investor	58.000	142.77778	45.200

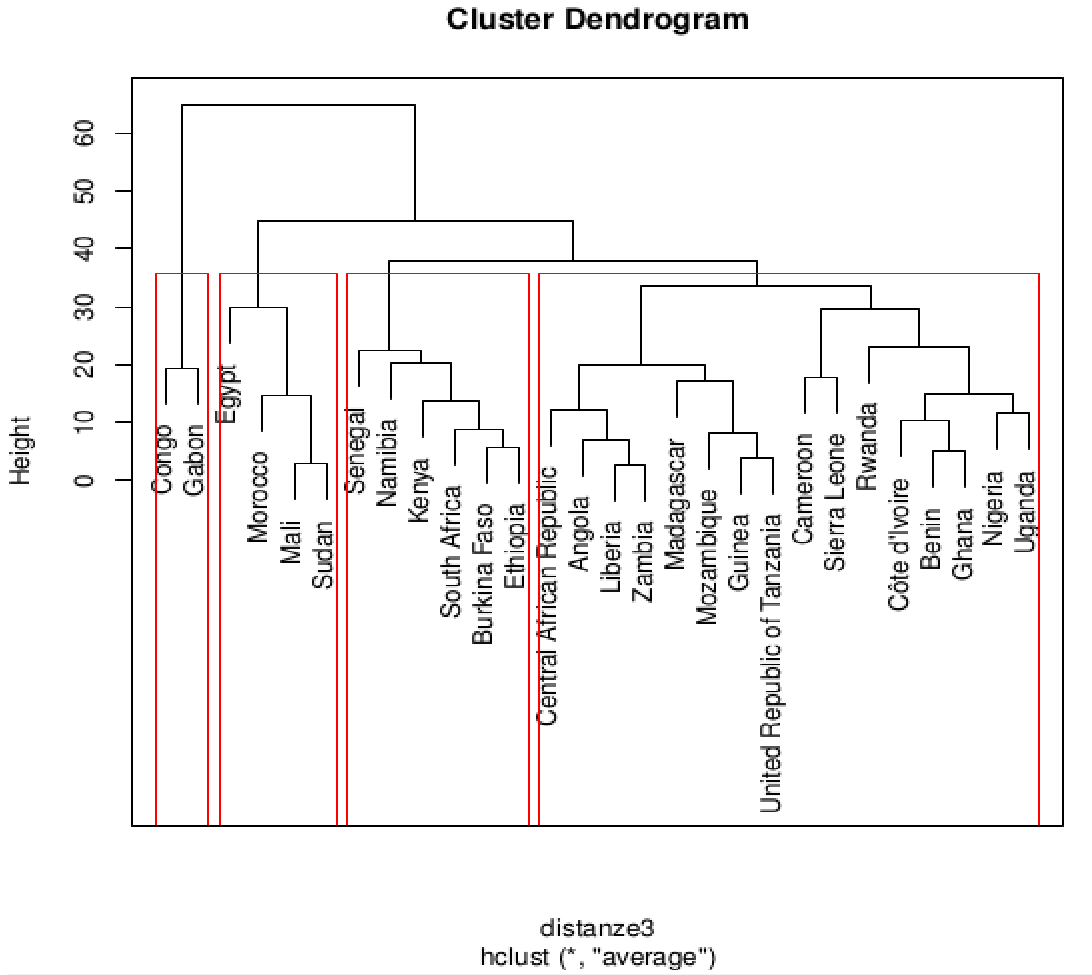
Third Dendrogram. Indicators of Land Governance.



Averages of Clusters for the Third Dendrogram.

	1st Cluster	2nd Cluster	3rd Cluster
Diversity of land tenure system	2.48	3.00	2.50
Share of rural land under the traditional rights system	2.84	3.00	2.00
Land tenure insecurity	2.67	2.25	2.25
Land Price Avarage	278.34	7500.50	2000.50

Fourth Dendrogram. Indicators of land suitability, land availability and yield gap.



Averages of Clusters for the Fourth Dendrogram.

	1st Cluster	2nd Cluster	3rd Cluster	4th Cluster
Cultivated Land	18.8209510	13.7341994	1.843431921	9.5925838
Grassland Woodland	45.4504979	65.9572198	21.505896407	21.0293910
Forest Land	30.7148970	6.6854358	75.000050514	2.4013722
Nutrient Moderate constraints	0.3699331	0.3152592	0.302715477	0.2727006
Nutrient No or slight constraints	0.2670483	0.4411664	0.001464656	0.4920926
Workability Moderate	0.2232008	0.2403042	0.063922487	0.2420985

constraints				
Workability No or slight constraints	0.6357683	0.4401396	0.921642782	0.3740001
Yield Gap	0.8247438	0.6166013	0.525405306	0.3038063

Results for each dendrogram.

In the first dendrogram, it is possible to observe that the third and forth cluster have the size of deals larger compared to the other clusters. The third cluster is formed by Congo and Mozambique with, in average, 28.5 deals and 2.030.652 ha of size of deals; the fourth cluster is formed by Liberia and Sierra Leone, with, in average, 17.5 deals and 1.412.840 ha of size of deals.

The second dendrogram, representing indicators of politics and governance, presents three clusters. Sierra Leone and Mozambique are part of first cluster, instead Congo and Liberia are part of second cluster. Both clusters are characterised by rank of indicators of politics and governance very low.

The third dendrogram presents three clusters, all countries (Congo, Mozambique, Sierra Leone and Liberia) are part of the first cluster. It has, in average, the price of land lower, 278.34 US dollars, and indicator of land tenure insecurity, always in average, 2.67 points (the rank varies from 0 to 4, 0= very low land tenure insecurity, 4= very high land tenure insecurity).

The fourth dendrogram represents the indicators of land availability and suitability and presents fourth clusters. Three countries are part of the first cluster and Congo is part of the third cluster. In the third cluster, in average, forest land is about 75% of suitability land, in the first cluster, in average, forest land is about 30% of suitability land. Interesting to note that the first and third clusters have the share of forest land larger compared to the other two clusters.

Regressions.

I run two different regression. Firstly a Poisson, and after a Beta Regression.

Poisson Regression.

I am interested in explaining the impact of a set of predictor variables on the large scale land deals, and since my dependent variable is a count, namely the number of deals (Figure 2), I use a Poisson Regression (Zeileis et al., 2008).

When the response variable is a count, there are some constraints. Counts are all positive, and for some events the Poisson distribution (rather than the Normal) is more appropriate, considering that the Poisson mean > 0.

The basic count data regression models can be represented using the GLM -Generalized Linear Model- framework, (Nelder and Wedderburn, 1972). GLMs describe the dependence of a scalar variable yi (i= 1,...,n) on a vector of regressors xi. The conditional distribution of yi | xi is a linear exponential family with probability density function:

$$f(y; \lambda, \varphi) = \exp((y * \lambda - b(\lambda)) / \varphi) + c(y, \varphi) \qquad (1)$$

where λ is a parameter that depends on the regressors via a linear predictor and φ is a dispersion parameter that is often known. The function b (.) and c (.) are known and determine which member of the family is used, e.g., the normal, binomial or Poisson distribution. Conditional mean and variance of yi are given by $E[yi \mid xi] = \mu i = b'(\lambda i)$.

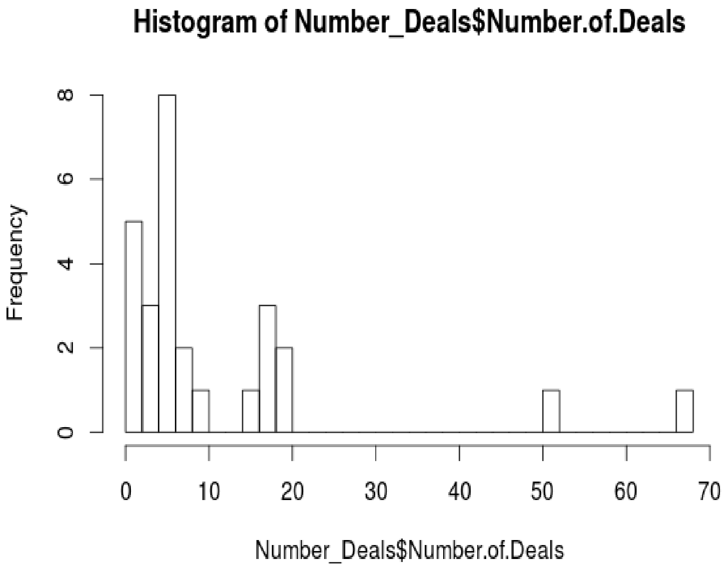
The simplest distribution used for modeling count data is the Poisson distribution with probability density function: $f(y, \mu) = (\exp(-\mu) * \mu^y) / y!$

which is of type (1) and thus Poisson regression is a special case of the GLM family. The canonical link is $g(\mu) = \log(\mu)$ resulting in a log-linear relationship between mean and linear predictor. The variance in the Poisson model is identical to the mean, thus the dispersion is fixed at $\varphi = 1$ and the variance function is $V(\mu) = \mu$.

So the logarithm[3] of the response variable is linked to a linear function of explanatory variables such that $\log_e(Y) = \beta 0+\beta 1X1+\beta 2X2$....etc. and so $Y = (e^{\beta 0})\ (e^{\beta 1X1})\ (e^{\beta 2X2})$... etc. In other words, the typical Poisson regression model expresses the log outcome rate as a linear function of a set of predictors.

Figure 2. Histogram of Explanatory Variable.

The Histogram of Number of Deals show that the dependent variable does not have a normal distribution.



3. When the response variable had a Normal distribution, its mean could be linked to a set of explanatory variables using a linear function like $Y=\beta 0+\beta 1X1+\beta 2X2.....+\beta k\ Xk$. In the case of binary regression the fact that probability lies between 0-1 imposes a constraint. The normality assumption of multiple linear regression is lost, and so also is the assumption of constant variance. Without these assumptions the F and t tests have no basis. The solution is to use the logistic transformation of the probability p or logit p, such that $\log_e (p/1-p)=\beta 0+\beta 1X1+\beta 2X2......\beta n\ Xn$. The β coefficients could now be interpreted as increasing or decreasing the log odds of an event, and exp β (the odds multiplier) could be used as the odds ratio for a unit increase or decrease in the explanatory variable. In survival analysis it used the natural logarithm of the hazard ratio, that is $\log_e h(t)/h0\ (t) = \beta 0+\beta 1X1 + ...+ \beta n\ Xn$.

Table 3. Results from Unilateral Poisson Regression of the Number of Projects

The dependent variable is the number of projects concluded, documented by direct sources of information and reported in the Land Matrix dataset.
I assume that the dependent variable do has any number of zeros.
A constant is included throughout but not reported.
Source: Author's analysis based on data as explained in the text.

Coefficients	Estimate	Std. Error	Z value	Pr (> |z|)
Political Stability and Absence of Violence	-0.024121	0.006837	-3.528	0.000418 ***
Regulatory Quality	-0.061313	0.009669	-6.341	2.28e-10 ***
Rule of Law	0.037802	0.008463	4.467	7.94e-06 ***
Diversity of the land tenure system	0.233501	0.057566	-4.056	4.99e-05 ***
Forest Land	0.032320	0.006944	4.655	3.25e-06 ***
Nutrient availability (Moderate Constraints)	4.022035	0.615724	6.532	6.48e-11 ***
Nutrient availability (No or slight Constraints)	3.852699	0.509188	7.566	3.84e-14 ***
Protecting Investors	-0.013269	0.001771	-7.493	6.73e-14 ***
Pseudo R2[4]	McFadden 0.4988783 r2ML[5] 0.9997819 r2CU[6] 0.9997819			

4. Poisson regression does not have an equivalent to the R-squared found in OLS regression; however, many have tried to derive an equivalent measure. There are a variety of pseudo-R-square statistics.
5. Maximum likelihood pseudo r-squared
6. Cragg and Uhler's pseudo r-squared

Number of Countries Considered - Observations	27[7]

Note: Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Deviance Residuals:

Min	1Q	Median	3Q	Max
-3.5881	-2.0215	-0.1877	0.9624	5.0052

Null deviance: 367.19 on 28 degrees of freedom
Residual deviance: 135.65 on 20 degrees of freedom
AIC: 261.441
Number of Fisher Scoring iterations: 5

Results.

The results of the Poisson regression, with the count of large-scale land acquisition projects in the country of destination as the dependent variable, are reported in Table 3. All coefficients are highly significant.

1. The coefficients of two Politics and Governance Indicators (Political Stability and Regulatory Quality) are negative and significant, this finding supports the idea that weak governance has been associated with higher investor interest.

2. The results also suggest that availability of uncultivated land (forested) and the agro-pontential (represented by Nutrient availability) are an important driver of land demand.

Beta Regression.

Ferrari and Cribari-Neto (2004) proposed a regression model for continuous variates that assume values in the unit interval ($0 < y < 1$), e.g. rates, proportions, or inequality indices (e.g. Gini), it is based on the assumption that the dependent variable is beta distributed and that its mean is related

7. Some countries of the Table 1 are not considered due to missing data.

to a set of regressors through a link function. The regression parameters are interpretable in terms of the mean y (the variable of interest) and the model is heteroskedastic. The motivation for beta regression model lies in the flexibility delivered by the assumed beta law. The beta distribution is very flexible for modelling proportions since its density can have quite different shapes depending on the values of the two parameters that index the distribution. “Beta distributions are very versatile and a variety of uncertainties can be usefully modelled by them. This flexibility encourages its empirical use in a wide range of applications” (Johnson, Kotz and Balakrishnan, 1995, p. 235).

The beta density is given by:

$\pi (y; p; q) = (\Gamma (p + q) / \Gamma (p) \Gamma (q)) * yp-1$, $0 < y < 1$ (1)

where $p > 0$ and $q > 0$, and $\Gamma(.)$ is the gamma function. The mean and variance of y are, respectively:

$E (y) = p / p + q$; (2)

$var (y) = pq/(p + q)^2 * (p+q+1)$ (3).

Let y1,…, yn be independent random variables, where each yt, t = 1, …, n, follows the density with mean μt and unknown precision φ. The beta regression model is obtained by assuming that the mean of yt can be written as $g(\mu i) = xi^T \beta = \eta i$, where $\beta = (\beta i , …. , \beta k)^T$ is a k x 1 vector of unknown regression parameters ($k < n$), $xi = (xi 1, …,xi k)^T$ is the vector of k regressors and ηi is a linear predictor. Here, g(.) : (0,1) is a link function. There are two motivation to use a link function, first both sides of the regression equation assume values in the real line when a link function is applied to μi; second there is an added flexibility since it is possible choose the function that yields that best fit. Furthermore, the model shares some properties (such as linear predictor, link function, dispersion parameter) with generalized linear models, but it is not a special case of this framework (Cribari - Neto et al., 2010).

The modelling and inferential procedures, that I use, are similar to those for generalized linear models (McCullagh and Nelder, 1989), except that the distribution of the response is not a member of the exponential family.

Table 4. Results from Unilateral Beta Regression of the Total Actual Contract Size for Country.

The dependent variable is the index of investment (as explained in the previous part of the paper). A constant is included throughout but not reported.
I use a logit link function and parameter estimation is performed by maximum likelihood (ML). Source: Author's analysis based on data as explained in the text.

Coefficients	Estimate	Std. Error	Z value	Pr (> |z|)
Regulatory Quality	-1.909e-01	2.966e-02	-6.438	1.21e-10 ***
Rule of Law	1.899e-01	2.711e-02	7.005	2.47e-12 ***
Diversity of the land tenure system	7.640e-01	1.767e-01	4.323	1.54e-05 ***
Share of rural land under the traditional rights system	1.049e+00	2.368e-01	4.432	9.35e-06 ***
Land tenure insecurity	-7.135e-01	3.450e-01	-2.068	0.038642 *
Cultivated Land	-1.273e-01	1.958e-02	-6.504	7.83e-11 ***
Grassland and Woodland	-4.238e-02	1.096e-02	-3.865	0.000111 ***
Forest Land	2.455e-02	1.049e-02	2.341	0.019248 *
Nutrient availability (Moderate Constraints)	3.047e+00	1.059e+00	2.878	0.004000 **
Workability	5.829e+00	1.878e+00	3.104	0.001906 **

(Moderate Constraints)				
Price Land	-5.909e-04	9.851e-05	-5.998	2.00e-09 ***
Protecting Investors	-9.999e-03	3.027e-03	-3.303	0.000956 ***
Yield Gap	4.973e+00	1.099e+00	4.525	6.03e-06 ***
Number of Countries Considered - Observations	27[8]			

Note: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
AIC: -204.3744

Standardized weighted residuals 2:

```
    Min      1Q  Median      3Q     Max
-3.4684 -0.4983  0.1231  0.8396  2.4561
```

Phi coefficients (precision model with identity link):

```
      Estimate Std. Error z value Pr(>|z|)
(phi)   266.59      82.55    3.23  0.00124 **
---
```

Type of estimator: ML (maximum likelihood)
Log-likelihood: 117.2 on 15 Df
Pseudo R-squared: 0.7164
Number of iterations: 94 (BFGS) + 19 (Fisher scoring)

At this point, I have decided to run the Beta Regression on the Single Contract, in order to have more observations.

Table 5. Results from Unilateral Beta Regression of the Single Actual Contract Size.

The dependent variable is an index of investment (as explained in the previous Beta Regression, the difference is that now I am analysing the single contract size).
A constant is included throughout but not reported.
I use a logit link function and parameter estimation is performed by maximum likelihood (ML).
Source: Author's analysis based on data as explained in the text.

Coefficients	Estimate	Std. Error	Z value	Pr (> |z|)
Control of Corruption	1.306e-02	4.773e-03	2.736	0.00623 **

8. Some countries of the Table 1 are not considered due to missing data.

Diversity of the land tenure system	1.616e-01	6.128e-02	2.637	0.00837 **
Share of rural land under the traditional rights system	5.502e-01	1.147e-01	4.797	1.61e-06 ***
Grassland and Woodland	-1.533e-02	4.473e-03	-3.427	0.00061 ***
Forest Land	2.288e-02	3.987e-03	5.738	9.60e-09 ***
Nutrient availability (Moderate Constraints)	2.433e+00	4.904e-01	4.961	7.02e-07 ***
Workability (Moderate Constraints)	1.574e+00	6.534e-01	2.409	0.01600 *
Price Land	-1.609e-04	7.094e-05	-2.269	0.02329 *
Protecting Investors	7.106e-03	1.216e-03	5.842	5.16e-09 ***
Observations	312			
Number of Countries Considered	27			

Note: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
Standardized weighted residuals 2:
    Min      1Q  Median      3Q     Max 
-3.1916 -0.3216  0.0244  0.3353  2.6251 

Phi coefficients (precision model with identity link):
      Estimate Std. Error z value Pr(>|z|)    
(phi)   229.04      26.19   8.745   <2e-16 ***
---
Type of estimator: ML (maximum likelihood)
Log-likelihood:  1967 on 11 Df
Pseudo R-squared: 0.4259
Number of iterations: 93 (BFGS) + 4 (Fisher scoring)
```

Results.

It is possible to use the usual interpretation of odds and log odds belonged to family logit regression, in order to read the outcomes of beta regression. With the exception that in a beta regression, there is not a ratio of probability, but a ratio of the value of size of land deal investments in relation to the availability of land, therefore this ratio can be read as the relative risk of land investments.

The results of a Beta regression reported in Table 4 and 5 suggest that:

1. Suitable land are a key driver. I highlight that in both the regression, (Poisson and Beta) Forest Land is an attractive factor, instead Cultivated and Grass/Wood Land have a negative impact on LSLA.

2. The yield gap (the difference between the performance that is technically achievable and the effective yield observed) is a driver. I am not in line with the previous literature (see Arezki et al., 2014). Probably the yield gap can read as the attractiveness to invest in land that do not bear an intensive cultivation, so the yield can be improved.

3. Quality of Land Governance and Land and Order are highly significant, suggesting that land demand is higher where protection for such rights and security of property is weak, e.g. Land tenure insecurity is significant and negative, this means that LSLA bloom where there are insecurity land rights.

4. As in previous regression, another important attractive factor is the agro-potential of land (Nutrient and Workability Availability).

5. Forest area are an important attraction. Risk of land investments raises in relation to available forest areas to exploit.

As the Land Matrix Globally Observatory received much criticism, in the Appendix I run another Beta Regression on a small sample. I checked on the Investor's website to see if they confirm the acquisition and the size of the acquisition. I found confirmation for 85 observations. The results of the smallest sample ratify that ones of the biggest sample.

2.4 Conclusion.

Concerns about food security and research for alternative source of energy have raised interest up in agricultural land. It could be desirable for countries subject to such interest to encourage pioneer investors, but keep out speculators (Collier and Vanable, 2011). Unfortunately little is known about the impact on local smallholders and their livelihoods. One major reason behind the lack of evidence is simply that the foreign large-scale projects is very recent, and the deals are, in many cases, not yet operational (Sipangule et al., 2015). The scale of foreign LSLA is, in any case, alarming, especially if one considers labour force in Sub Saharan Africa consists of smallholder agricultural producers that are dependent on the same land resources as their main source of livelihood. This is why analysing the potential implications of foreign LSLA on smallholder agricultural production is an important exercise understanding whether foreign LSLAs will have beneficial or not on local livelihoods. There are good reasons to believe that foreign LSLAs may be harmful for local populations and for smallholders in particular; yet, there may also be positive local effects. Foreign LSLAs may facilitate needed development in rural areas through the provision of capital and through the creation of income opportunities and infrastructures (von Braun and Meinzen-Dick, 2009), other potential benefits associated with foreign LSLAs include technological spill-overs (von Braun and Meinzen-Dick, 2009). However, opponents of foreign LSLA argue that these benefits may be marginal as target countries usually do not have the capacity to address these investments in a way that leads to rural development and poverty reduction (De Schutter, 2011). They point out that a number of foreign LSLAs have already had undesirable consequences such as displacement and increased water constraints that have threatened food security levels in regions that were already prone to food shortages (von Braun and Meinzen-Dick, 2009; Cotula et al., 2008).

My econometric results allow me to identify the drivers of foreign land acquisition: the potential availability of uncultivated land, namely forest land, and the association of weak land governance. This notion is in line with literature that states of countries that attract large amounts of investors but are unable to address them into beneficial impacts for the local population. Economic globalization also increases the influence of large agribusiness enterprises and international financial flows on local land use decisions, in some cases weakening national policies intended to promote a public good. Furthermore, my results show a strong attractiveness towards forest areas. During the 1980 – 2000 period, more than half of the new agricultural land across the tropics came at the expense of intact forests, and another 28% came from non intact forests, raising concerns about environmental services and biodiversity globally (Lambin et al., 2011). Converting a forest to crop-land for biofuel production can result in much more global warming pollution than the amount that can be reduced by the biofuels grown on that land. Intensive farming, which continues to increase, has resulted in loss of natural habitats and species living in them (Haruna et. al., 2014). Forest and mixed-use woodlands are often targeted by government for agriculture expansion in order to avoid the displacement of crop land. However, the identification of such areas is more often driven by perceptions than evidence, and discriminatory views of customary land uses. “Available”, “degraded” and “underutilized”, have became epithets in common usage among proponents of large-scale land acquisitions, rendering landscapes as commodities ready for the taking.

In summary, due to the possible neglect of use rights land may appear more “abundant” than it actually is in economic terms and states, with a strong control over the land, may be excessively inclined to attracting capital through ‘‘bonanza’’ discount purchases to the first buyer. Since FDI flows are large compared to the economic size of target countries, foreign capital flows in conjunction with state landlordism in Africa may result in a development path that is “excessively” geared towards large farms and land concentration.

References

- Alden-Wily L., (2010). Whose Land are you giving away, Mr President? Paper presented at the Annual Bank Conference on Land and Policy Administration, Washington, DC, April 26-27.
- Alfaro L., Kalehm-Ozcan S., Volosovych V., (2008). Why Doesn't Capital Flow from Rich to Poor Countries? An Empirical Investigation. Review of Economics and Statistics 90 (2): 347-68.
- Anseeuw W., Wily A. L., Cotula L., Tyalor M., (2012). Land Rights and the Rush for Land. Findings of the Global Commercial Pressure on Land Research Project. Rome, Italy: International Land Coalition.
- Anseeuw, W. Lay J., Messerli, P. Giger M. and M. Taylor (2013), "Creating a public tool to assess and promote transparency in global land deals: the experience of the Land Matrix", The Journal of Peasant Studies, 40(3), pp. 521-530.
- Arezki R., Deininger K., and Selod H. (2014), What Drives the Global "Land Rush"? OxCarre Research Paper 120. Oxford Centre for the Analysis of Resources Rich Economies.
- Arezki, R., Deininger, K. and H. Selod (2013), "What drives the global "land rush"?," World Bank Econonomic Review (2013) doi: 10.1093/wber/lht034 First published online: October 21, 2013.
- Baland J. M., Robinson (2008). Land and Power: Theory and Evidence from Chile. American Economic Review 98 (5): 1737-65.
- Binswager H.P., Deininger K., Feder G., (1995). Power, Distortions, Revolt and Reform in Agricultural Land Relations. Handbook of Development Economics 3B 2659-772.
- Calvo G.A., Leonardo Leiderman, and Carmen M. Reinhart, (1996). Inflows of Capital to

Developing Countries in the 1990s. Journal of Economic Perspectives 10 (2): 123-39.

- Chamberlin J., (2008). It's a Small World After All. Defining Smallholder Agriculture in Ghana. IFPRI Discussion Paper 00823.
- Collier P., Venables A.J., (2011). Land Deals in Africa: Pioneers and Speculators. Discussion Paper 8644. Centre for Economic Policy Research, London.
- Cotula L. (2012), "The international political economy of the global land rush: A critical appraisal of trends, scale, geography and drivers", Journal of Peasant Studies, 39(3): 1-32.
- Cotula L., Dyer N., Vermeulen S., (2008). Fuelling Exclusion? The Biofuels Boom and Poor People's Access to Land, IIED, London.
- Cotula, L., Vermeulen, S., Leonard, R. and Keeley, J., (2009), Land Grab Or Development Opportunity? Agricultural Investment And International Land Deals In Africa, Iied/Fao/Ifad, London/Rome. ISBN: 978-1-84369-741-1
- Cribari-Neto F., Zeiles A., (2010). Beta Regression in R. Journal of Statistical Software. April, Volume 24, Issue 2.
- Cuffaro Nadia, Giovannetti Giorgia, Monni Salvatore (2013), Foreign Acquisitions of Land in Developing Countries. Risks, Opportunities and New Actors, Rivista dell' Associazione Rossi – Doria.
- De Schutter, O. (2011). How Not to Think of Land-Grabbing: Three Critiques of Large-Scale Investments in Farmland. The Journal of Peasant Studies 38(2): 249-279.
- Deininger K., (2011). Challenges Posed by the New Wave of Farmland Investments. The Journal of Peasant Studies, 38: 217-247.
- Deininger K., Olinto P. (2000), Asset Distribution, Inequality, and Growth, The World Bank, Policy Research Working Paper, 2375, June 2000.

- Deininger K., Squire L. (1998), New ways of looking at old issue: Inequality and Growth, Journal of Development Economics, 57: 259-287.
- Deininger, K., (2003), Land Policies for Growth and Poverty Reduction, Washington DC, World Bank.
- Dercon, S. and Gollin D., (2014). Agriculture in African Development: Theories and Strategies. Annual Review of Resource Economics 6: 471- 492.
- Diao X., Hazell P., Resnick D., and Thurlo J., (2007). The Role of Agriculture in Development Implications for Sub-Saharan Africa. IFPRI, Research Report, 153.
- Edelman M., (2013). Messy hectares: questions about the epistomology of land grabbing data. Journal of Peasant Studies, 40(3): 485-501.
- Egbe, S.E., (2001), "The Concept of Community Forestry under Cameroonian Law", 45 Journal of African Law 25-50.
- Ferrari S.L.P., Cribari-Neto F., (2004). Beta Regression for modelling rates and proportions. Journal of Applied Statistics, 31(7), 799-815.
- Firmin-Sellers, K., and Sellers, P., (1999), "Expected Failures and Unexpected Successes of Land Titling in Africa", 27(7) World Development 1115-1128.
- Franco J., Saturnino Borras Jr., Alberto Alonso - Fradejas, Nick Buxton, Roman Herre, Sylvia Kay, Timothé Feodorof (2013), The Global Land Grab , Transnational Institute.
- GAEZ- Global Agro - Ecological Zones, FAO and IIASA available at: http://www.fao.org/nr/gaez/en/
- Geohive (2010), Available at http://www.geohive.com/earth/pop_urban.aspx
- Giovannetti G., Ticci E., (2013). Foreign Direct Investment in Sub-Saharan Africa: The Land-Energy Nexus. ivista dell' Associazione Rossi – Doria.

- Government of Kenya (2004). Report of the Commission of inquiry into the illegal/irregular Allocation of public land. Nairobi Government Printer, p. 192.
- GRAIN (2008), "SEIZED! The 2008 Land Grab for Food and Financial Security", GRAIN Briefing, Barcelona, available on line: http://www.grain.org/article/entries/93-seized-the-2008-landgrab-for-food-and-financial-security
- Haruna S., Home P., Nyadawa M., (2014). Land Use Change Detection Across River Nanyuki Catchment Using Envi And CLASlite Programs. Proceedings of 2014 International Conference on Sustainable Research and Innovation, Volume 5, 7th-9th May.
- Harvey D. (2003), The new Imperialism . Oxford : Oxford University Press .
- Hausmann R., Sturzenegger F., Sibert A., Tille C., (2007). The Missing Dark Matter in the Wealth of Nations and its implications for Global Imbalances. Economic Policy (51): 69-518.
- International Land Coalition (2011), Global assembly 2011, Tirana, Albania, May 24–27, 2011. (ILC 2011). Available at http://www.landcoalition.org/about-us/aom2011/tirana-declaration
- Istitutional Profile Database available – Cepii available at: http://www.cepii.fr/institutions/EN/ipd.asp
- Jayne T.S., Takashi Y., Weber T. M., Tschirley D., Benfica R., Chapoto A., Zulu B. (2003). Smallholder income and land distribution in Africa: implications for poverty reduction strategies. Elsevier Science Ltd. Food Policy 28: 253-275.
- Jensen N.M. (2003). Democratic governance and multinational corporations: political regimes and inflows of foreign direct investments, International Organization, 57: 587-616.
- Johnson, N.L., Kotz, S. and Balakrishnan, N. (1995).Continuous Univariate Distributions,

vol. 2, 2nd ed. New York: Wiley.

- Johnston B. F., Kilby P., (1975). Agriculture and Structural trasformation: Economic Strategies in Late-Developing Countries. Oxford University Press, New York.
- Lambin E.F., Meyfroidt P., (2011). Global land use change, economic globalization, and the looming land scarcity. This contribution is part of the special series of Inaugural Articles by members of the National Academy of Sciences elected in 2009. PNAS.
- Land Matrix (2012), The Land Matrix Database. (Land Matrix 2012). Available at http://landportal.info/landmatrix
- Li Q., Resnick A., (2003). Reversal of Fortunes: Democratic Institutions and Foreign Direct Investment Inflows to Developing Countries. International Organization, 57: 175-211.
- McCarthy J. F., Vel J. A. C. and Aff S., (2012) “Trajectories of land acquisition and enclosure: development schemes, virtual land grabs, and green acquisitions in Indonesia’s Outer Islands” Journal of Peasant Studies 39(2), p . 523.
- McCullagh, P. and Nelder, J.A. (1989). Generalized Linear Models, 2nd ed. London: Chapman and Hall.
- Mellor J. (1976). The New Economics of Growth: A Strategy for India and Developing World. Cornell University Press, Ithaca.
- Naudé W.A., Krugell W.F., (2007). Investing Geography and Institutions as Determinants of Foreign Direct Investment in Africa using Panel Data. Applied Economics, 39, 10-12, pp. 1223-34.
- Nelder JA, Wedderburn RWM (1972). Generalized Linear Models. Journal of the Royal Statistical Society A, 135, 370–384.
- Neves P., Silva S., Afonso O., (2012), A meta-analytic assessment of the effects of inequality

on growth. CEF.UP Working Paper 2012-04

- Nugent J. B., Robinson J.A. (2002), Are Endowments Fate? CEPR Working Paper 3206. Center for Economic Policy Research, London.
- Nugent J. B., Robinson J.A. (2010), Are Endowments Fate? Revista de Historia Economica 28 (1): 45-82.
- O'Donnell G. (1978). Reflections on the patterns of change in the bureaucratic authoritarian state, Latin American Research Review, 13 (1): 3-38.
- Okafor E. C., Nacasius U. U., Elkassabgi A. Y., Winifred U. A., (2011). International Research Journal of Finance and Economics. ISSN 1450-2887 Issue 63.
- Olsen M. (1993). Dictatorship, democracy, and development. American Political Science Review, 87 (3): 567-576.
- Oya, C. (2013), “Methodological reflections on land databases and the land grab literature ‘rush’. Global Land Grabbing II Forum. Journal of Peasant Studies; 40(3): 503-520.
- Papaioannou E., (2009). What Drives International Financial Flows? Politics, Institutions, and Other Determinants. Journal of Development Economics 88 (269): 281.
- Pearce F. (2012), The Landgrabbers: The New Fight Over Who Owns The Earth. Londo: Transworld Publishers.
- Quan N., Koo A.Y. C., (1985). Concentration of land holdings: an empirical exploration of Kuznet' conjecture. Journal of Development Economic 18, 101-117.
- Resnick A.L. (2001). Investors, turbulence, and transition: Democratic transition and foreign direct investment in nineteen developing countrie. International Interactions: Empirical and Theoretical Research in International Relations, 27(4): 381-398.
- Rice A., (2009). Is there such a thing as agro-imperialism? The New York Times Magazine,

16 November. Available at: http://www.nytimes.com/2009/11/22/magazine/22land-t.html?pagewanted=all&_r=0

- Rulli M.C., Saviori A., D'Odorico P. (2013). Global land and water grabbing. Proceedings of the National Academy of Sciences, 110(3): 892-897.
- Rulli Maria Cristina , Saviori Antonio , D' Odorico Paolo (2013), B . L . Turner, Global land and water grabbing, Arizona State University , Tempe , AZ.
- Sipangule K., Lay J., (2015). The Impact of Foreign Large-Scale Land Acquisitions on Smallholder Productivity: Evidence from Zambia. AGRODEP Working Paper 0011.
- Smaller C. and Mann H. (2009), A Thirst for Distant Lands: Foreign Investment in Agricultural Land and Water. International Institute for Sustainable Development, Winnipeg.
- Songwe V., Deininger K. (2009), Foreign Investment in Agricultural Production: Opportunities and Challenges. Agriculture & Rural Development NOTES. Land Policy and Administration. ARD, The World Bank
- The Doing Business available at: http://www.doingbusiness.org/
- The Economist (2009), Buying Farmland Abroad: Outsoucing's third wave – Rich food importers are acquiring vast tracts of poor countries' farmland. Is this beneficial foreign investment or neocolonialism?". The Economist, available at http://www.economist.com/node/13692889
- von Braun, J., and R. S. Meinzen-Dick. (2009). Land Grabbing by Foreign Investors in Developing Countries: Risks and Opportunities. International Food Policy Research Institute, Policy Brief. Washington, DC: IFPRI.
- White B., Saturnino M. Borras Jr, Ruth Hall, Ian Scoones, Wendy Wolford (2012), "The New Enclosures: Critical Perspectives on the Corporate Land Deals". Journal of Peasant

Studies 39 (3-4): 619-648.

- Woertz,(2013). Oil for Food: The Global Food Crises and The Middle East. Oxford: Oxford University Press.
- World Bank Indicators (2014) available at: http://data.worldbank.org/indicator
- World Bank, (2010), Rising Global Interest in Farmland: Can it Yield Sustainable and Equitable Benefits?, Washington DC, World Bank, http://siteresources.worldbank.org/INTARD/.../ESW_Sept7_final_final.pdf.
- Zeileis A., Kleiber C., Jackman S., (2008). Regression Models for Count Data in R. Journal of Statistical Software, Vol. 27, Issue 8, Jul 2008.

Appendix 1. Results from Unilateral Beta Regression of the Single Actual Contract Size – Smallest Sample as explained in the text.

The dependent variable is an index of investment for a small sample.
A constant is included throughout but not reported.
I use a logit link function and parameter estimation is performed by maximum likelihood (ML).
Source: Author's analysis based on data as explained in the text.

Coefficients	Estimate	Std. Error	Z value	Pr (> |z|)
Share of rural land under the traditional rights system	5.536e-01	1.817e-01	3.046	0.00232 **
Grassland and Woodland	-2.509e-02	6.124e-03	-4.096	4.20e-05 ***
Forest Land	1.669e-02	6.172e-03	2.704	0.00684 **
Nutrient availability (Moderate Constraints)	1.745e+00	8.466e-01	2.061	0.03932 *
Workability (Moderate Constraints)	2.248e+00	1.190e+00	1.888	0.05896 .
Price Land	-1.641e-04	8.581e-05	-1.912	0.05584 .
Protecting Investors	8.478e-03	2.166e-03	3.915	9.04e-05 ***
Observations	85			
Number of Countries Considered	19			

Note: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Phi coefficients (precision model with identity link):
Estimate Std. Error z value Pr(>|z|)
(phi) 331.78 68.48 4.845 1.27e-06 ***

Standardized weighted residuals 2:

Min	1Q	Median	3Q	Max
-3.4313	-0.3989	-0.0386	0.4414	2.1459

Type of estimator: ML (maximum likelihood)
Log-likelihood: 528.5 on 9 Df
Pseudo R-squared: 0.4193

A meta analytic assessment of the effects of Land Inequality on Growth.

Only through replication of the results of others can scientists unify
the disparate findings of various researches in a discipline into a defensible,
consistent, coherent body of knowledge
(Dewald et al., 1986, p. 600).

3.1 Introduction.

In the last decade matters of inequality have attracted renewed interest in the development literature for the reason that inequality is economically costly (Deininger et al., 2000; Timmer, 2002), therefore economists' interest in equality and wealth distribution raises because inequality and economic growth are mutually related (Ray, 1998). Economic inequality has been described as the "fundamental disparity that permits one individual certain material choices, while denying another individual those very same choices" (Ray, 1998).

In 1955, Kuznets affirmed that inequality rises in early phases of development and then falls as a consequence of economic and institutional developments that enhance equality. The result is the famous inverted U-shaped relationship between inequality and per capita income. After the pivotal work of Kuznets, a growing empirical literature has paid attention to this subject. Nowadays the theoretical literature is less secure on the shape of the above described relationship. Most authors hold that inequality have a negative effect on economic growth, Alesina and Rodrik (1994), Persson and Tabellini (1994), Deininger and Squire (1998) state that inequality slows down economic growth. Most of these studies are based on cross-country growth regressions and recently this cross-country evidence has been challenged. Using different econometric techniques, e.g. a panel data over 10 years intervals, Barro (2000) finds no evidence of a consequence of income inequality on growth. Most studies that explore the relationship between inequality and growth use measures of income inequality rather than of asset distribution as an explanatory variable. Wealth distribution as a cause rather than a consequence of economic growth has only recently, in the late 1980s, entered the research the agenda of institutions such as the World Bank, deviating from the tradition of Simon Kuznets. This new literature has encouraged policy makers and international institutions to pay greater attention to the distributional implications of macro economic policies in order to avoid increases in inequality and situations where high level of inequality can hurt the growth (Deininger et al., 2000). Most of the studies that use cross-country regressions find that reductions in countries' growth are caused by an unequal distribution of asset, such as land distribution, and not by income inequality, when a variable for initial land inequality is included, it is negatively associated to growth (Persson et al., 1994; Alesina et., 1994; Birdsall et al., 1997; Deininger et al., 1998; Kefer et al., 2002). Alesina and Rodrik (1994) focused on a measure of land ownership (Gini index) and, controlling for initial levels of income, human capital and land distribution, found a statistically significant negative relationship between inequality in land distribution and economic growth. The essential implication for their model is that the more unequal is the distribution of resources in society, the lower is the rate of economic growth. Squire through a set of studies suggests that income inequality is less important than the distribution of land, because land inequality is a constraint to poverty reduction, the poor' s lack of access to the assets that generate adequate income (Birdsall et al., 1997). Anyway the cross-country estimates have received several critiques, due to the omitted variables in the regression model, such as technology, climate, institutions and any other variable specific to a particular country. To address this methodological concerns, Deininger and Olinto (2000), Li and Squire and Zou (2000) and Mo (2003) use panel data econometric methods, fixed-effect estimators in order to account for country specific characteristic. They found that initial inequality in land distribution has a significant reducing impact on growth, even using panel data techniques. This suggests that inequality in the distribution of assets and income affect growth through different channels and has a more stable relationship. Likely the relationship between inequality and growth is better interpreted by assets distribution rather than by income. According to Neves and Silva (2010) inequality in wealth (proxied by land or human capital) seems to have a stronger negative impact on growth than inequality in income distribution. For policy purposes, it makes a huge difference if inequality of income or inequality of assets is the underlying factor of registered differences in economic growth. For example, in presence of borrowing limitations the initial distribution of assets matters for the accumulation of human capital (Galor et al., 1993). In situations in which the distribution of wealth is highly unequal, and people cannot borrow because of market imperfections, fewer individuals can invest in education, and this results in a lower growth rate. In fact there is a wide consensus on feedback to growth from equality of access to education and initial land distribution (Birdsall et al, 1995; Birdsall et al., 1997a). Therefore, initial distribution of assets may be a vital variable for individuals' ability to start up companies and overcome the unequal income distribution (Bardham et al., 1998). Birdsall and Londono's econometric work (1997b) shows that any region-specific effect of income inequality disappears once asset inequality has taken in account (this result is in relation to Latin America and the Caribbean). In general their findings show that an une1qual distribution of assets, especially human capital and land, affects overall growth. A better distribution of assets increases the income of the poor, increases aggregate growth and reduces poverty – instead better income distribution, without asset redistribution, will not speed income growth up.

The aim of this study is to investigate if the initial distribution of land effects economic development, and I use, for this purpose, a meta analytic assessment.

3.2 Land Inequality and Growth: brief literature review.

A large literature on inequality and growth has firmly established a strong role of land inequality as a determinant of income inequality, and the negative impact of inequality on long term growth. For a simple taxonomy of this literature one could distinguish three types of contributions:

(i) Mainly empirically oriented, econometric analysis; (ii) Political economy models; (iii) Mainly historical approaches.

3.2.1 Empirically oriented analysis.

Many early empirically oriented contributions have analysed the relationship between inequality, especially asset/land inequality, and growth in relation to World Bank research and policies on poverty reduction[9] (Birdsall and Londoño, 1997; Deininger and Squire, 1998; World Bank, 2006). In particular Deininger and Squire (1998) developed a data set on the distribution of land as a proxy for the distribution of assets and focused on an empirical analysis of the relationship between initial inequality and subsequent growth. Results show that initial income inequality is not a robust determinant of future growth, whilst initial inequality of assets, as proxied by the distribution of land, has a significant effect on subsequent growth. The negative relationship between asset inequality and growth emerges if investments in human or physical capital have to be financed through credit, information is costly and imperfect, and agents obtain credit only if they own assets that can be used as collateral. A more unequal distribution of assets would then imply that, for any given level of per capita income, a greater number of people are credit-constrained.

The Deininger and Squire database is also used by Birdsall and Londoño (1997b) for econometric analysis of growth as a function of capital accumulation, initial conditions in terms of income level, education level, inequality in income, land and education. They find that the rate of capital accumulation has a strong impact and income inequality is negatively associated with long term growth. However, once the variables measuring initial asset inequality (land and human capital) are entered, income inequality itself is no longer statistically significant, suggesting that the effect of income inequality on growth reflects differences in access of different groups to productive assets.

9 The many complementarities between equity – defined as equal opportunities for individuals - and prosperity were at the core of the 2006 World Development Report, which extensively argues that the complementarities arise from many market failures in developing countries, notably in the markets for credit, insurance, land, and human capital.

Moreover the authors estimate that these negative effects are much larger on income growth of the poorest, leading to the conclusion that a better distribution of assets would reduce poverty directly and indirectly through the general growth rate effect.

Similarly in Deininger and Olinto (2000) initial asset inequality, as measured by the land distribution, has a significant growth-reducing impact. The also point out that the consequences of policies of deregulation and privatization of state assets can, if not implemented carefully, lead to large increases in the inequality of asset distribution and long term negative consequences. For example, sales of assets without an adequate regulatory framework, experienced in many Eastern European countries, lead to huge jumps in inequality in a relatively short period of time; such high levels of inequality are very difficult and costly to reverse.

The consideration is of indirect but strong relevance in relation to contemporary land issues in Africa, given the institutional conditions in which the land markets operate, with the state generally playing a crucial role as ultimate holder of the right to alienate land.

3.2.2 Political economy models.

A part of the models focuses on how an economy's initial configuration of resources shapes the political struggle for income and wealth distribution which, in turn affects long-run growth. This generally works through a political economy mechanism with a pivotal voter who decides on the value of some redistributive policy instrument, which determines the rate of growth of the economy (e.g. Alesina and Rodrik, 1994; Persson and Tabellini, 1994). In Alesina and Rodrik (1994) spending on public services is financed through a tax on capital income (physical capital, human capital, and all proprietary technology, i.e. the tax is on all resources that are accumulated), whilst the unskilled labour force is not subject to taxation. Growth is driven by the expansion of the capital stock, in turn determined by individual saving decisions. The tax on capital induces a lower rate of capital accumulation. An individual whose income derives entirely from capital prefers the tax rate that maximizes the economy's growth rate. Anyone else would prefer a higher tax, with a correspondingly lower growth rate. The lower an individual's share of capital income (relative to his labour income), the higher is his ideal tax. Under majority voting, the political equilibrium yields a tax rate that is the ideal tax rate of the median voter, the latter identified by his relative factor endowment. The more equitable is distribution in the economy, the better endowed is the median voter with capital. Hence the greater is the inequality of wealth and income, the higher the rate of taxation, and the lower growth.

Other authors in this strand of literature have argued that redistribution through the tax system may yield opposite results if progressive redistribution helps beneficiaries to overcome the effects of some capital market imperfection or liquidity constraint which prevented them from investing in profitable projects or in human capital (Borguignon and Verdier, 2000; Galor and Zeira, 1993; Perotti, 1993; Banerjeeand Newmann, 1991; Benabou, 1996; Piketty, 1997).

As for the role of land, although land is only one component of wealth, Alesina and Rodrik (1994) use the Gini coefficient of land ownership as a proxy for wealth distribution, pointing out that inequality in land ownership is likely to be highly correlated with inequality in the distribution of accumulating assets. The model implies that countries that reduced the inequality in land ownership through a land reform in the aftermath of World War II should have had higher growth, a motive often mentioned in the literature on economic development as part of the explanation for comparative better growth performance of Asian countries, such as Japan, South Korea, or Taiwan, versus Latin American countries.

Galor and Zeira (1993) develop a model where individuals are assumed to be identical with regard to their potential skills and preferences and differ only with respect to their inherited wealth. With credit market imperfections (there are enforcement and supervision costs on individual borrowers, hence the borrowing interest rate is higher than the lending rate) the inheritance of each individual determines whether she invests in human capital or not. The long run dynamics of the economy depend also on initial wealth: there are rich dynasties and poor dynasties, the initial distribution of wealth determines how big these two groups of dynasties are, and therefore what is the long-run equilibrium in the economy.

Borguignon and Verdier (2000) derive strong implications of inequality not only for growth but also for politics in a political economy model based on the assumption that political participation is solely determined by the educational level, or more generally by the socio - economic status of citizens and also that human capital accumulation is the sole engine of growth. Fixed costs of education and liquidity constraints deny poor persons both education (in the absence of transfers from the upper income) and political action. Implications include that initial income inequality negatively affects both the likelihood for a country to be a democracy and its average rate of growth and reduces the speed of full democratization for countries which are experiencing a democratic transition.

3.2.3 Econometric analysis of colonialism.

Many studies have analysed the relationship between inequality and growth in the long term historical perspective of the relationship between colonial institutions and patterns of growth.

Acemoglu, Johnson and Robinson (2001) develop a model based on the hypothesis that different colonization strategies were influenced by the feasibility of colonial settlements: at one extreme, European powers set up "extractive states”, at the other many Europeans migrated and settled in a number of colonies, and tried to replicate European institutions, with strong emphasis on private property and checks against government power, as in the case of the United States, Australia, and New Zealand. Where the colonial powers set up authoritarian and absolutists states with the purpose of solidifying their control and facilitating the extraction of resources, extractive institutions mostly persisted economic performance is a function of institutions and institutions in turn are a function of the mortality rates expected by the first European settlers in the colonies (mortality rates are an instrumental variable influencing institutions).

Frankema (2005) concentrates on the cross-country variation in land inequality at the end of the colonial age and on the impact of initial land inequality on current income inequality in a study focused on Latin America, where the heavy colonial heritage of land inequality is a major pillar of persistent high levels of income inequality. Land inequality is explained as a function of the feasibility of cash or food crops; population density; a dummy for Iberian colony and one for other European colonization; settler conditions (mortality rates) and the presence of Catholic Church[10]. Current income inequality is explained as a function of land inequality, the level of economic development, and measures of the quality of institutions. Results show that land inequality at independence generally had a strong impact on subsequent income inequality directly (because of the share of rural inequality in total inequality) and indirectly because of path dependent effects of land inequality on the distribution of non-land assets and that the nature of the political system and the quality of institutions have also a strong role.

In the case of the colonial history of Sub-Saharan Africa unfavourable conditions for colonial settlers resulted in less land appropriation and land concentration than in other regions and high income inequality was more the result of the colonialists rent seeking activities in tax collection trade and exploitation of natural resources.

3.3 Econometric approach.

Traditional approaches of literature review, typically, use qualitative methods to analyse previous empirical results. Meta analysis, instead, is a quantitative literature review method which has been broadly used as an alternative approach to the narrative one. It is a statistical method to analyse a collection of studies regarding the same subject. Glass (1976) coined the term meta analysis as “the

10 A natural environment suitable to cash-crop production is associated with high levels of income inequality in the long run, since cash crops such as sugar, tobacco, coffee, cocoa, rubber, and bananas can be efficiently produced on large estates exploiting coerced indigenous or slave labor, whilst a specialization in scale-neutral food crops has a moderating effect on land inequality. High settler mortality rates reduce rates of colonial settlement and are negatively related to land inequality.

analysis of the analyses", and since then several meta analysis has been performed in the medical and social sciences. However, in the last two decades, that technique has been used in other fields of research, including economics (Stanley 1998, 2004; Görg et al. 2001; Rose et al. 2004). In comparison with traditional qualitative literature reviews, meta-analysis has the advantage of summarizing studies' findings in a systematic way, with the purpose of avoiding wrong interpretations or wrong review conclusions (Shadish, 1982). Moreover, quantitative methodology is more useful than qualitative reviews in stressing heterogeneity in wide fields of the literature (Light et al., 1984).

Land inequality can be quantifies in different ways. I have chosen to use one of the most known measures, the Gini Index. It measures degree of inequality of land distribution among households, from zero (prefect equality), to 1 (perfect inequality). I prefer use the Gini Index in order to have the highest degree of comparability between different estimates of the impact of inequality in land asset on growth.

The usual procedure for estimating the impact of land inequality on growth is to assume a simple linear relationship between the two variables. The growth rate of per capita income is regressed on a series of covariates used to capture the differences in growth rates among countries and a measure of land inequality.

3.3.1 The data.

In the first phase of the meta analyses I conducted a systematic search of the literature on the impact of land inequality on growth, via electronic sources. I searched in Google and Economic Literature Index for any references on "inequality land and growth" and "distribution land and growth" in the title or in the abstract of articles published and unpublished. My search led me a large number of papers, but, in order to have comparability of the population under investigation, I restricted my sample to studies that use the Gini Land Index as a measure of the inequality of land distribution.

This lefts me with 13 studies, since I excluded studies that use simultaneous equation, always to keep comparability. I then, defined the variable to meta - analyse as the estimate of the average annual growth rate with regard to the Gini Land coefficient. This is my central measure of the *effect size*, as it quantify the orientation and the seize of the correlation between land inequality and growth. Most quantitative studies estimate a regression of the following form:

$$g = \beta_0 + \Sigma_{m=1...M}\beta_m X_m + \alpha LandInequality + e; \quad (1)$$

with m = 1,….M, where: g is the average annual growth rate; Land Inequality is the measure of land inequality using Gini Index, X_m is a vector of other variables that influence growth; and e is the disturbance term. Parameter α is the effect size and its estimate is collected from each empirical study.

A frequent problem in conducting a meta-analysis occurs when more than one estimate of the effect size is given in a single study. Stanley (2005) and Rose and Stanley (2005) propose different methods, for example to use the average estimate, the median estimate, or the estimate preferred by the author. I opted to pick up all estimates by each study. This criteria left me a total of 111 estimates of coefficient associated with the Gini Index (Table 1).

Table 1 - List of the studies included in the meta sample and estimates of the effect size reported in the primary studies.

Study	Type of Publication	Data	Nr. of Estimates	Ranges		Average Effect Size
				Min	Max	
Alesina and Rodrik (1994)	Journal	Cross-Country	8	-0.052	-0.081	-0.061
Balisican	Journal	Cross-	2	0.001	0.001	0.001

and Nobuhiko (2003)		Country				
Caselli (2005)	Working Paper	Cross-Country	12	-0.006	0.076	-0.874
Deininger and Olinto (2000)	Working Paper	Panel Data	12	-0.0111	0.0095	-0.0373
Deininger and Squire (1998)	Journal	Cross-Country	20	-0.053	0.011	-0.03515
Fort and Ruben (2006)	Contributed Paper	Panel Data	7	-0.0569	0.103	-0.3969
Keefer and Knack (2002)	Journal	Cross-Country	2	-0.039	-0.026	-0.0325
Li and Zou (1998)	Journal	Cross-Country	4	-0.034	-0.03	-0.03125
Li, Squire and Zou (2000)	Journal	Panel Data	6	-0.08	0.002	-0.166
Li, Xu and Zou (2000)	Journal	Cross-Country	14	-0.034	0.032	-0.0025
Mo (2003)	Journal	Panel Data	10	-0.0544	-0.0020	-0.0343
Nunn (2007)	MPRA Paper	Cross-Country	4	-0.46	0.45	-0.0125
Weede (1997)	Journal	Cross-Country	10	-0.046	-0.028	-0.0384
Total[11]			111			-0.13236

The above table 1 illustrates the composition of my meta sample and reports in brackets the year of

11 This is the sum for the fourth column and the average value for the last column. The average is calculated over the entire sample of 111 observations.

publication, if the paper has been published or not, the number of observations and range, and the average value of the estimates.

It is easily observable from the above list that the average value of the estimates, in the my meta sample, is always negative with the exception of one study; , 8% of of the total estimates shows a positive value and the remainder 92% shows a negative value.

3.3.2 Meta-analysis of the effects of land inequality on growth.

I use meta analytical techniques to characterize my sample and investigate in detail the results of the effects of land inequality on growth. Several steps will be implemented. First, I start by pooling all effects reported by the primary studies, and after I test for the presence of heterogeneity in the effect sizes and for possible publication bias.

3.3.3 Pooled Fixed and Random effects estimates of the effect size.

One possibility of a meta-analysis is to estimate the combined effect. If all studies in the analysis were equally precise I could simply compute the mean of the effect sizes. However, if some studies were more precise than others I want to assign more weight to the studies that carried more information. Rather than compute a simple mean of the effect sizes I compute a weighted mean. Therefore, a first question is what the combined estimate of all studies is that adequately represents the true underlying effect between land inequality and growth; what combined estimate of the effect size do I get if I pool (combine) the information of the effect size from all studies? To answer that question, I choose two widely used estimators in meta-analysis: the *fixed effect estimator* and the *random effect estimator*. Both of them are weighted averages of the effect size estimates reported by the studies, but they differ in their underlying assumptions.

Under the *fixed effect* model I can assume that there is one true effect size which is shared by all the included studies. It follows that the combined effect is my estimate of the common effect size. The fixed effect estimator assumes that there is no heterogeneity among study results and that different magnitude of the estimates is due to sampling variation. Statistically, this is equivalent to the hypothesis that all effect sizes are equal, for example $\alpha_1 = \alpha_2 = \alpha_3 = \ldots = \alpha_n = \alpha$, where α is the true effect size, or population effect size (Hedges et al., 1985). The observed effects will be distributed around α, and will have a variance σ^2 that depends primarily on the sample size for each study. T_i is the effect size and is determined by the common effect α plus the within-study error ε_i. More generally, for any observed effect T_i,

$$T_i = \alpha + \varepsilon_{i..} \qquad (2)$$

Since meta analysis' aim is to assign more weight to the studies that carry more information, I assign weights based on the inverse of the variance rather than sample size. The inverse variance is practically proportional to sample size, but is a more precise measure, and serves to minimize the variance of the combined effect. In this way the fixed effect estimator of α can be seen as a weighted average of each estimate of the effect size, α_j, with a weight inversely proportional to the Since meta analysis' aim is to assign more weight to the studies that carry more information, I assign weights based on the inverse of the variance rather than sample size. The inverse variance is practically proportional to sample size, but is a more precise measure, and serves to minimize the variance of the combined effect. In this way the fixed effect estimator of α can be seen as a weighted average of each estimate of the effect size, α_j, with a weight inversely proportional to the precision of the estimates, $w_j = 1/v_j$, where v_j is the estimated variance of the effect size. I follow de Dominicis et al. (2008) 's calculation. They show that the weights that minimize the variance of the effect sizes are inversely proportional to the square of the standard errors reported in the primary studies. The method is known as the inverse variance.

In the fixed effect model there is only one level of sampling, since all studies are sampled from a population with effect size α. Therefore, there is only one source of sampling error, ε, within studies. The weighted mean or the pooled estimate is then computed as follows:

$$T. = \Sigma_{i=1,\ldots k}\, w_i\, T_i \;/\; \Sigma_{i=1,\ldots k}\, w_i \qquad (3)$$

where i= 1, …., k are independent observations of the effect size T_i and w_i is a weight assigned to the i_{th} study.

The *random effect* estimator assumes heterogeneity among studies results. There is not a single true effect across studies; each study has its own "true" effect size, randomly picked from a larger population with a fixed mean and variance. Rather than assume that there is one true effect, we allow that there is a distribution of true effect sizes. The combined effect, therefore, can not represent the one common effect, but instead represents the mean of the population of true effects. The variance associated with each effect size has two component, one regarding to sample level, as in the fixed effect model (within – variance) and the other one regarding to the random effect variance (between – variance). The matter will be to take account for both sources of imprecision. T_i is determined by the true effect θ_i plus the within-study error ε_i. More generally, for any observed effect T_i,

$$T_i = \theta_i + \varepsilon_i \qquad (4)$$

Both sources of variation are assumed to be normally distributed, with mean zero and variance v_i and t^2. As the fixed effect estimator, the random effect estimator is also an inverse – variance weighted estimator of α_i, but the weight are $w_i = 1/ v_i + t^{2,}$ where v_i represents the estimate of the within study variance and t^2 the estimates of the between study variance. For further calculation's details I refer to Borenstein et al., 2007.

I have calculated the pooled estimates of the effect size in my sample. The fixed effect shows a value of *-0.002* instead the random effect shows a value of *-0.013*. Thus, a preliminary findings of my meta analysis is that land inequality seems to influence growth negatively, there is a trade – off between land inequality and economic growth. In both cases, the null hypothesis of a coefficient different from zero is significant at the 1% level.

3.3.4 Testing for heterogeneity of effect size.

Now I want to test the hypothesis of heterogeneity by performing the so-called Q-test. A Q – test on the pooled estimates is being performed to check for the presence of heterogeneity among estimates. It is formally a test of the null hypothesis of homogeneity ($H_0 : \alpha_1 = \alpha_2 = \alpha_3 ... = \alpha_N$) versus the alternative that at least one of the effect sizes differ from the rest. If all N studies have the same population effect size (H_0 is true), the Q - test has an asymptotic chi-squared distribution with k -1 degrees of freedom (Hedges, 1982). Thus, if the resulted value of Q exceeds the upper critical value of the chi – square distribution, the null hypothesis of homogeneity of the underlying population effect size is rejected. The Q-statistic has the following form:

$$Q = \Sigma_{i=1,...k} w_i T_i^2 - (\Sigma_{i=1,...k} w_i T_i)^2 / \Sigma_{i=1,...k} w_i , \qquad (5)$$

with all notations as before, and as before for further calculation details, I refer to Borenstein et al., 2007. In my meta-sample, the Q-test is 1042, which is larger than 135.4802, the 95% critical value of the chi-squared distribution with 110 degree of freedom. Thus, the hypothesis of heterogeneity is accepted and the null hypothesis of homogeneity is rejected with a p-value < 0.001.

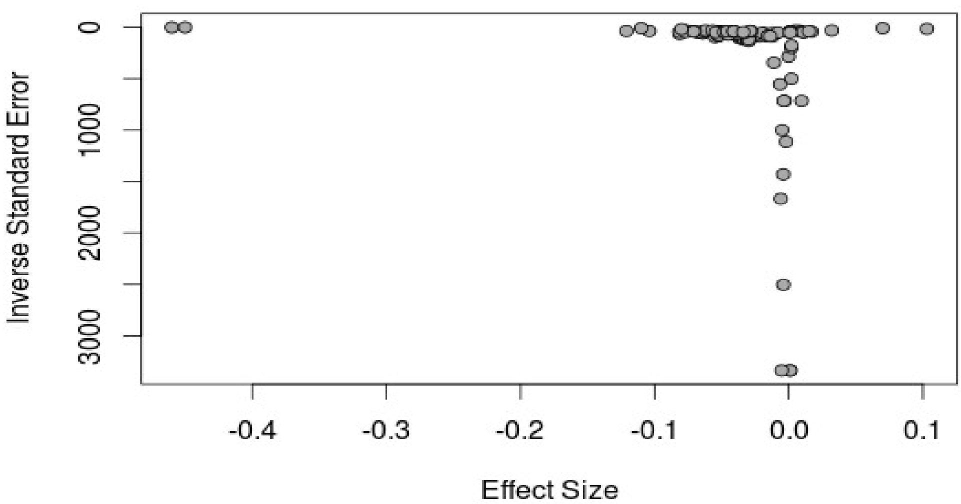
3.4 Testing for the presence of publication bias.

In this session I will take in consideration only two kind of biases, namely in the publication of the results and in the magnitude of the results. The rationality is that according to me those are the main sources of biases, in particular testing the second bias will be useful for the second part of the meta analysis, the meta-regression.

3.4.1 Bias in the publication of the results

One of the major advantage of the meta analysis is testing for the presence of publication bias. Publication bias refers to a distortion in the process of reporting results (Sutton et al., 2000). There are several form a publication bias, first authors and journal editors may interested in publishing results in a certain direction, second, it can be published only statistically significant findings, leaving apart non-significant findings or studies. These are the most common forms of publication bias, which have been widely recognized. A popular plot for detecting the presence of publication bias is the *funnel plot* (Egger et al., 1997). It is a scatter diagram that compares the estimates of the effect size (in my analysis the estimated coefficient of the impact of land inequality on growth) from each study in the horizontal axis against its precision in the vertical axis, measured by the inverse of the estimate of the standard error. This plot should show a funnel shape centred around the true overall mean. The logic behind the funnel plot is that in the absence of publication bias and regardless of the magnitude of the true effect, estimates will vary randomly and symmetrically around it. After all, estimates provided by studies with larger samples will be closer to the true effect size, while those provided by small sample studies will be spread out the true effect size. Publication bias may lead to asymmetrical funnel plots.

Figure 1. Funnel Plot



The funnel graph in Figure 1 plots on the vertical axis the estimated coefficients in the collected literature and on the horizontal axis the associated inverse of the standard errors. The result seems to be clear, there is a concentration around zero value and the most of the effect sizes are negative. A funnel plot is a simple scatter plot of the effect estimates from individual studies against some measure of each study' s size or precision. It is most common to plot the effect estimates on the horizontal scale, and thus the precision of study size on the vertical axis. This is the opposite of conventional graphical displays for scatter plots, in which the outcome is plotted on the vertical axis and the covariate is plotted on the horizontal axis. The name 'funnel plot' stem from the fact that precision of the estimated effect increases as the size of the study increases. Effect estimates from small studies will therefore scatter more widely at the bottom of the graph, with the spread narrowing among larger studies. In the absence of bias the plot should approximately resemble a symmetrical (inverted) funnel. However, visual inspection are subjective and somehow ambiguous (Stanley et al., 2008). Egger et al., (1997) proposed a test for detecting asymmetry of the funnel plot, the Funnel Asymmetry Test (FAT). It runs a regression between the effect size and its estimated standard error. The test determines if the intercept deviates significantly from zero in a regression of the effect estimates against their precision. In this case the dependent variable is an estimated regression coefficient drawn from each study, thus the equation has a problem of heteroschedacity. In order to deal with this problem, I divide the regression by its standard error (For further calculation's details I refer to Neves et al., 2012). The regression is estimated by OLS, correcting for heteroschedacity and auto-correlation, using the Newey-West procedure (Newey et al.,1987). The estimated intercept of my meta sample is *-1.869*, with an associated p-value < 0.001. Therefore, there is asymmetry.

3.4.2 Bias in the magnitude of the results

Publication bias, which is sometimes referred to as the "file-drawer problem", arises when publishers have a preference for publishing only results statistically significant (Stanley, 2005).

However, this bias often occurs because authors themselves not submit statistically insignificant results on the expectation that they will have a lower probability of publication.

In this case, the problem is that such bias leads to empirical results seem larger than they are. Therefore, in presence of publication bias towards statistically significance, one should expect a positive relationship between the magnitude of a study' s estimate of the effect size and its standard error. This provides the basis for testing this form of bias. The test result of my sample rejects the null hypothesis, this means that there is evidence of the existence of publication bias towards statistical significance (For further calculation's details I refer to Neves et al., 2012). Thus the reported results of the effect of inequality on growth are likely to be overstated. Then, it is necessary to correct the estimates of the effect size collected in the primary studies. Following Stanley (2005) procedure, I first estimate the magnitude of each observation's bias and second I shrink each reported effect size towards zero. In the next section I will run a meta-regression on these new estimates.

4. Meta-Regression.

Meta regression is a tool to model heterogeneity in the findings of a body of studies. It is a regression where the dependent variable is a summary statistic, usually a regression parameter, picked out from primary studies, while the independent variables should include characteristics of the method, design and data of the empirical studies, in order to explain variation in study to study. The independent variables should include: dummy variables which reflect if independent variables were omitted or included in the primary study, variables that account for types of regression and sources and so forth (Stanley et al., 1989).

After correcting for heteroschedasticity and autocorrelation, I can estimate the meta-regression by an OLS. I correct the heteroschedasticity dividing all the variables by the standard error and the autocorrelation using the Newey – West procedure (Newey et al., 1987). Table 2 presents the estimation results.

Table 2. Results of the meta-regression.

The dependent variable is the effect size drawn in the primary study and weighted by a measure of precision (in my case the standard error).

Moderator Variable	***Estimate***	***Std. Error***	***t value***	***Pr(>|t|)***
Dynamic of the land inequality index: Initial Year	*-4.3142e-02*	*9.4469e-03*	*-4.5668*	*1.414e-05 ****
Dataset FAO	*-1.3638e-02*	*5.5785e-03*	*-2.4447*	*0.016249 **
Other definition of Inequality Included	*2.4548e-02*	*7.5887e-03*	*3.2349*	*0.001650 ***
Panel (Structure of the Data)	*-2.0785e-02*	*8.4547e-03*	*-2.4583*	*0.015677 **
Estimation Method	*-3.1323e-02*	*1.4031e-02*	*-2.2325*	*0.027816 **
Regional Dummies included	*-1.8036e-02*	*6.3055e-03*	*-2.8604*	*0.005151 ***
Sample of Countries - LDCs	*-2.0500e-01*	*7.7616e-02*	*-2.6412*	*0.009587 ***
Journal	*2.6173e-02*	*1.2624e-02*	*2.0732*	*0.040724 **

A constant is included throughout but not reported.
Notes: Coefficients are estimated by OLS. Standards Errors are heteroschedasticity-autocorrelation consistent. Moderator variables are are divided by Se.

*Signif. Codes: '***','**', '*', referring respectively to the 1% (high significance), 5% (medium significance), 10% (low significance) level.*

Residual standard error: 1.837 on 100 degrees of freedom

Multiple R-squared: 0.5589, Adjusted R-squared: 0.5148
F-statistic: 12.67 on 10 and 100 DF, p-value: 5.514e-14

I have hypothesize that heterogeneity in empirical results is partly attributable to differences in estimate method, data quality, and the geographical coverage (Stanley et al., 1989) of the primary studies.

As first stage, I have investigate if the dynamic of land inequality index, used by authors, leads to different results. I have defined a dummy labelled *Dynamic of the land inequality index: Initial Year* which has a value equal to one when in the primary study land distribution is measured at the beginning of the investigation period otherwise the dummy assumes value equal to zero. The coefficient is negative and statistically significant, this confirms that when inequality in land distribution is measured at the begging of a period strengthens the negative impact of inequality on growth. This results confirms a general theoretical orientation in the development literature that emphasizes the role of widespread "opportunities" in a society in fostering growth. For example Deiniger and Olinto (2000) find that initial asset inequality, as measured by the land distribution, has a significant growth-reducing impact. Possession of land could be a major determinant of individuals' productive capacity and their ability to invest, especially in agrarian economies where land is a major asset.

At a later stage, I have controlled for the use of different database for land inequality in the primary study: i..e the FAO World Census of Agriculture or the Taylor Hudson dataset. In this case the coefficient is negative for the variable dataset FAO. Gini index, an aggregate numerical measure, is used to measure the extent to which distribution of land among individuals or households within an economy deviates from a perfectly equal distribution. Taylor and Hudson (1972) presents a dataset consisting a Gini coefficients of land distribution of 54 different countries in some year close to 1960. Instead FAO census was initiated in 1924 by the International Institute of Agriculture (IIA) in

Rome, the predecessor of the FAO. The census has been carried out each decade since the 1930s, with the exception of the 1940s.

Other definition of inequality is a dummy variable equal to one when the primary study includes more than one definition of inequality in the regression, and zero otherwise, in my case I have include income inequality measured by Gini income index. If it is true that land inequality is not fully capturing the impact of an unequal distribution of resources on growth, I expect the impact of land inequality on growth to be weaker when the study includes another explanatory variable that controls for the effect of other determinants of inequality, in fact the meta regression show that the associated coefficient is positive and significant.

I have also defined a dummy labelled *Panel* which has a value equal to one when the primary study estimate is based on the use of panel data. The coefficient is negative and statistically significant. Panel data contain observations of multiple phenomena obtained over multiple time periods for the same countries or individuals. The negative coefficient confirms that studies based on panel data find a negative relationship between land inequality and growth. The panel data studies examine the inequality-growth relationship in the long period, instead the cross-section studies do the same in the short-medium period, thus the transmission channels between inequality and growth are likely to operate in different way in the two cases.

I have defined a dummy labelled *Estimation Method* which has value equal to one if the primary study is based on OLS regression. Even in this case the coefficient is negative but statistically not significant.

I have included, also, the *Regional* dummy variable which is equal to one if the primary study incorporates regional dummies in the model regression, and is equal to zero otherwise it. The meta regression shows that the coefficient associated to Regional has a negative estimate and is statistically different from zero, this means that the inclusion of regional dummies strengthens the impact of inequality on growth, namely country and region specificities play a crucial role in explaining the heterogeneity found in the reported effect size. This is confirmed through the dummy *Sample of Countries – LDCs,* it assumes value equal to one when the primary study includes LDCs. The coefficient is negative and statistically significant, supporting the hypothesis that especially for less developed economies land inequality hampers subsequent growth. Indeed Barro (2000) and Galor and Moav (2004) argue that the relationship between inequality and growth is different in rich and poor economies.

Finally, I checked if systematic reporting trends are present in this sample, either according to the type of publication. I define a dummy variable labelled *Journal* which takes one if the estimate is from a paper published in a journal. The resulting coefficient is statistically significant. Thus I checked that the majority of the published studies has used a cross-country data, maybe this result can be explained by the structure of the data.

5. Conclusions.

I have conducted a quantitative analysis of the empirical literature on the effects of inequality in land distribution using tools taken from meta-analysis. Such analysis allows drawing conclusions more objectively in a research field marked by divergences in the results and in the methodologies employed. The direction and the magnitude of the correlation between land inequality and economic growth is relevant when it comes to policy making and policy evaluation. In the empirical literature, the majority of cross-sectional studies has found a negative correlation between the two variables. However the negative effect does not disappears when the models are estimated using panel data datasets. There is a tendency in the literature to study the relationship between inequality and growth for samples pooling countries with very different economic, social and institutional characteristics. The analysis of the growth and land inequality on a regional basis may be much more informative that the analysis based on worldwide cross-country datasets. A problem when looking at countries with disparate features is that the same model might not be relevant for all countries. There are fundamental differences among countries, for example in the degree of democracy, human rights, type of economy and so on, which does not make it reasonable to expect that one model holds for all countries.

References.

- Acemoglu D., Johnson S., Robinson J. A., (2001). The colonial origins of comparative development: an empirical investigation. American Economic Review, 91: 1369-1401.
- Alesina A., Perrotti R., (1996). Income Distribution, Political Instability, and Investment, European Economic Review, 81 (5): 1170-89.
- Alesina A., Rodrik D., (1994). Distributive Politics and Economic Growth, Quarterly Journal of Economics, 109 (2): 465-90.
- Banerjee A., Newmann A., (1991). Risk – bearing and the theory of income distribution. Review of Economic Studies 58: 211-236.
- Bardham P., Bowles S., Gintis H., (1998). Wealth inequality, wealth constraints and economic performance. University of Massachuttes, Amherst.
- Barro R.J., (2000). Inequality and Growth in a Panel of Countries, Journal of Economic Growth, 5: 5-32.
- Bateman I.J., Jone A.P., (2003). Contrasting Conventional with multi-level modelling approaches to Meta-analysis: Expectation Consistency in U.K. Woodland Recreation Values, Land Economics, 79 (2): 235-58.
- Benabou R., (1996). Inequality and growth. CEPR Discussion Paper N. 1450.
- Birdsall, N., Londono, J. L., (1997a). 'Asset inequality matters: An assessment of the World Bank's approach to poverty reduction'. The American Economic Review, May 1997, Vol. 87, No. 2, pp 32-37.
- Birdsall, N., Londono, J. L., (1997b). Asset inequality does matter: lessons from Latin America. OCE Working Paper. Inter America Development Bank.
- Birdsall, N., Ross, D. and Sabot, R., (1995). 'Inequality and Growth Reconsidered: Lessons from East Asia'. World Bank Economic Review', Vol. 9, No. 3, pp 477-508.
- Borenstein M., Hedges L., Rothstein H., (2007). Meta-Analysis, Fixed effect vs. random effects. www.Meta-Analysis.com, 2007 Borenstein, Hedges, Rothstein.
- Bourguignon F., Verdier T., (2000). Oligarchy, Democracy, Inequality and Growth. Journal

of Development Economics, 62,2, 285-313.

- Byamugisha, F. (1999). The effects of land registration on financial development and economic growth: a theoretical and conceptual framework. World Bank Policy Research working paper 2240.
- de Dominicis L., Florax R. J. G. M., de Groot Henri L. F., 2008. "A Meta-Analysis On The Relationship Between Income Inequality And Economic Growth," Scottish Journal of Political Economy, Scottish Economic Society, vol. 55(5), pages 654-682, November.
- de Janvry, A., Sadoulet, E., (2009). Agriculture for development: lessons from the World Development Report 2008. QA Rivista dell'Associazione Rossi-Doria 1, 9–24.
- Deininger K., Olinto P., (2000). Asset Distribution, Inequality, and Growth. Policy Research Working Paper N. 2375. World Bank.
- Deininger K., Squire L., (1998). New ways of looking at old issues: inequality and growth. Journal of Development Economics 57, 259-287.
- Deininger, K., E. Zegarra, et al. (2003). "Determinants and Impacts of Rural Land Market Activity: Evidence from Nicaragua." World Development 31(8): 1385-1404.
- Dethier J.J., Effenberger A., (2011). Agriculture and development: A brief review of the literatutre. Economic Systems. Elsevier.
- Dewald, W. G., Thursby, J. G. and Anderson, R. G. (1986). Replication in empirical economics. American Economic Review 76: 587–603.
- Egger M., Smith G., Scheider M., Minder C., (1997). Bias in meta-analysis detected by a simple, graphical test. British Medical Journal 316, pp. 629 – 634.
- Fort R., Ruben R., (2006). Land Inequality and Economic Growth: A dynamic panel data approach. Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006.
- Frankema, E.H.P. (2005) : The colonial origins of inequality: exploring the causes and consequences of land distribution, Discussion papers // Ibero America Institute for Economic Research, No. 119.

- Galor O., Moav O., (2004). From physical to human capital accumulation: inequality and the process of development. Review of economic study, 71, pp. 1001-26.
- Galor O., Zeira J., (1993). Income Distribution and Macroeconomics, Review of Economics Studies, 60 (1): 35-52.
- Glass, G. (1976). Primary, Secondary, and Meta-Analysis of Research. The Educational Researcher 10, pp. 3-8.
- Gorg H., Strobl E., (2001). Multinational Companies and Productivity Spillovers: a Meta-Analysis, Economic Journal, 111: 723 – 39.
- Hedges L., (1982). Fitting categorical models to effect sizes from a series of experiments. Journal of Educational Statistics 7, pp. 119 – 137.
- Hedges L., Olkin I., (1985). Statistical Method for Meta-analysis. New York: Academic Press.
- Hedges L., Vevea J.L., (1998). Fixed and Random Effect Models in Meta-analysis. American Psychological Association Inc. Psychological Methods 1998, Vol. 3, N. 4, 486-504.
- Jayne T.S., Yamano T., Weber M. T., Tschirley D., Benfica R., Chapoto A., Zulu B., (2003). Smallholder income and land distribution in Africa: implications for poverty reduction strategies. 2003 Elsevier Science Ltd. Food Policy 28 (2003), 253-257.
- Keefer, P. and S. Knack (2002). "Polarization, Politics and Property Rights: Links between Inequality and Growth." Public Choice. March 111(1-2): 127-54.
- Kuznets S., (1955). Economic Growth and Income Inequality, American Economic Review, 45: 1-28.
- Light R., Pillemer D., (1984). Summing up – the science of reviewing research. Cambridge: Harvard University Press.
- Maddala, G. S. (1977). Econometrics. New York: McGraw Hill.
- Mellor J., (1976). The New Economics of growth: a strategy for India and the Developing World. Cornell University Press, Ithaca.

- Nahuis R., de Groot H.L.F., (2003). Rising skill Premia: You ain't seen nothing yet?, CPB Discussion Paper, n. 20, The Hague.
- Neves P., Silva S., (2010). Inequality and Growth: Uncovering the main conclusions from the empirics. FEP Working Paper n. 381.
- Neves P., Silva S., Afonso O., (2012). A Meta – Analytic Assessment of the Effects of Inequality on Growth. CEF.UP Working Paper 2012-04.
- Newey, W. K; West, K. D., (1987). "A Simple, Positive Semi-definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix". Econometrica 55 (3): 703–708.
- Perotti R., (1993). Political equilibrium, income distribution, and growth. Review of Economic Studies 60 (4): 755-776.
- Persson T., Tabellini G., (1994). Is Inequality Harmful for Growth? American Economic Review, 84 (3): 600-21.
- Piketty T., (1997). The dynamics of wealth distribution and the interest rate with credit rationing. Review of Economic Studies 64: 173-189.
- Quan N., Koo A.Y.C., (1985). Concentration of land holdings: and empirical exploration of Kuznets' conjecture. Journal of Development Economics 18, 101-117.
- Ray, D. (1998). Development Economics, Princeton University Press.
- Rodrik D., (2000). Institutions For High-Quality Growth: What They Are And How To Acquire Them. Working Paper 7540. National Bureau Of Economic Research: http://www.nber.org/papers/w7540
- Rose A. K., Stanley T.D., (2005). A Meta-Analysis of the Effect of Common Currencies on International Trade, Journal of Economic Surveys, 19 (3): 347-65.
- Shadish W., (1982). A review and critique of controlled studies of the effectiveness of preventive child health care. Health Policy Quarterly 2, pp. 24-52.
- Staatz, J.M., Dembele, N.N., (2007). Agriculture for development in Sub-Saharan Africa. In: Background Paper for the World Development Report 2008, World Bank, Washington, DC.
- Stanely T.D., (2005). Beyond publication bias. Journal of Economic Surveys 19: 309-345.

- Stanley T., Doucouliagos C., Jarrell S., (2008). Meta – regression analyses as the socio – economics of economics research. Journal of Behavioral and Experimental Economics (formerly The Journal of Socio-Economics), Elsevier, vol. 37(1), pages 276-292, February.
- Stanley T.D. (1998). New wine in Old Battles: A meta-analyisis of Ricardian equivalence, Southern Economic Journal 64: 713-27.
- Stanley T.D. (2004). Does unemployment Hysteresis Falsify the Natural Rate Hypothesis? A Meta-Regression Analysis, Journal of Economic Survey, 18 (4): 589-337.
- Stanley T.D., Jarrell S. B., (1989). Meta-Regression Analysis: A quantitative Method of Literature Surveys. Journal of Economic Surveys vol. 19, n. 3.
- Sutton A., Duval S., Tweedie R., Abrams K., Jones D., (2000). Empirical Assessment of effect of publication bias on meta – analyses. British Medical Journal 320, pp. 1574 – 1577.
- Taylor, Charles & Michael C. Hudson, 1972. World Handbook of Political and Social Indicators. New Haven, CT: Yale University Press.
- Timmer C.P., (2002). Agriculture and economic development. In: Handbook of Agricultural Economics, vol. 2A, pp. 1487-1546.
- Winer, B. J. (1971). Statistical Principles of Experimental Design , 2nd edn. New York: McGraw Hill.
- World Bank, (2006). World Development Report. Equity and Development, World Bank.

Appendix 1. List of case studies included in meta sample.

- Alesina A., Rodrik D., (1994). Distributive Politics and Economic Growth, Quarterly Journal of Economics, 109 (2): 465-90.
- Balisican A. M., Fuwa N., (2003). Growth, Inequality and Politics Revisited: A Developing-country Case. Economics Letter.
- Caselli M., (2005). Does High Inequality in Developing Countries Lead to Slow Economic Growth? Undergraduate Economic Rewiev. Volume 2, Issue 1, University of Sussex.
- Deininger K., Olinto P., (2000). Asset Distribution, Inequality, and Growth. Policy Research Working Paper N. 2375. World Bank.
- Deininger K., Squire L., (1998). New ways of looking at old issues: inequality and growth. Journal of Development Economics 57, 259-287.
- Fort R., Ruben R., (2006). Land Inequality and Economic Growth: A dynamic panel data approach. Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006.
- Keefer, P. and S. Knack (2002). "Polarization, Politics and Property Rights: Links between Inequality and Growth." Public Choice. March 111(1-2): 127-54.
- Li H., Squire L., Zou H., (1998). Explaining international and intertemporal variations in income inequality. The Economic Journal, 108. Royal Economic Society.
- Li H., Xu C. L., Zou H., (2000). Corruption, Income Distribution, and Growth. Economics and Politics, volume 12, N. 2, pp. 155-181.
- Li H., Zou H., (1998). Income Inequality is not harmful for growth: Theory and Evidence. Review of Development Economics. Volume 2, Issue 3, pp. 318 – 334.
- Mo P. H., (2003). Land Distribution inequality and Economic growth: Transmission channels and effects. Pacific Economic Review, 8: 2 (2003).
- Nunn N., (2007). Slavery, Inequality, and Economic Development in the Americas: an examination of the Engerman – Sokoloff Hypothesis. MPRA_paper_4080, University of British Columbia.

- Weede E., (1997). Income inequality, democracy and growth reconsidered. European Journal of Political Economy. Vol. 13 (1997), 751 – 764.

Conversion Forest Land to Crop Land: Environmental Impact!

Sustainable development is
the type of development that meets the needs of the present generation,
without affecting the ability of future generations to meet their needs.
WCED (1987).

Fundamental changes in how we think about forests are needed.
And they are needed in the next few years. Not 15 years. Not 20 years.
Otherwise, we will continue to lose forests at a rate
of eight football fields every 10 seconds.
Kerry Cesareo.[12]

4.1 Introduction.

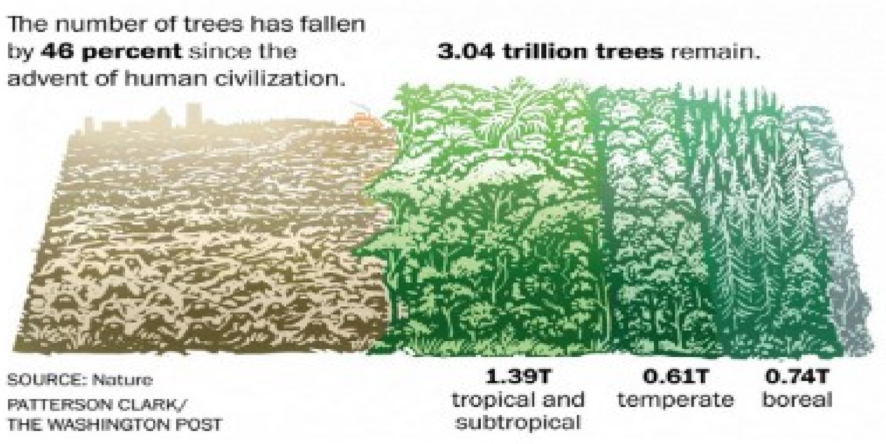
The increment of agricultural and industrial needs, population growth and consumer demand are the main propulsive forces behind forest's loss. As human populations continue to increase it is likely that the switch of more forest land to agriculture, particularly in the tropics (unless agricultural productivity expands considerably on existing agricultural lands), will continue (Figure 1). According to the FAO database in 1990 the forest land was broad 4128 million of ha, by 2015 this area has diminished to 3999 million of ha. However, tracking deforestation or forest conversion is quite complicated, forest losses and gains happen regularly.

The loss of some 129 million ha of forest from 1990 to 2015, representing an annual rate of -0.13 percent, namely a total area about the dimension of South Africa (FAO, 2015), namely average per capita forest area declined from 0.8 ha to 0.6 ha per person in the last 25 years. The biggest forest loss happened in the tropics, especially in South America and Africa. Africa as a continent has received world wide attention in relation to climate change, and is often portrayed as a helpless

12 Senior director of forests at the World Wildlife Fund, at: https://www.washingtonpost.com/news/energy-environment/wp/2015/09/08/the-world-lost-a-south-africa-sized-area-of-forest-since-1990-says-the-u-n/ It's important to note that the study' s estimates critically rely on the definition of "tree" — the study calls it a woody plant that, at breast height, has a stem that is at least 10 centimetres in diameter.

victim.

Figure 1. The world's tree: 15 billion trees are cut down yearly, a loss more than two trees for every person (Mooney Chris, 2015).



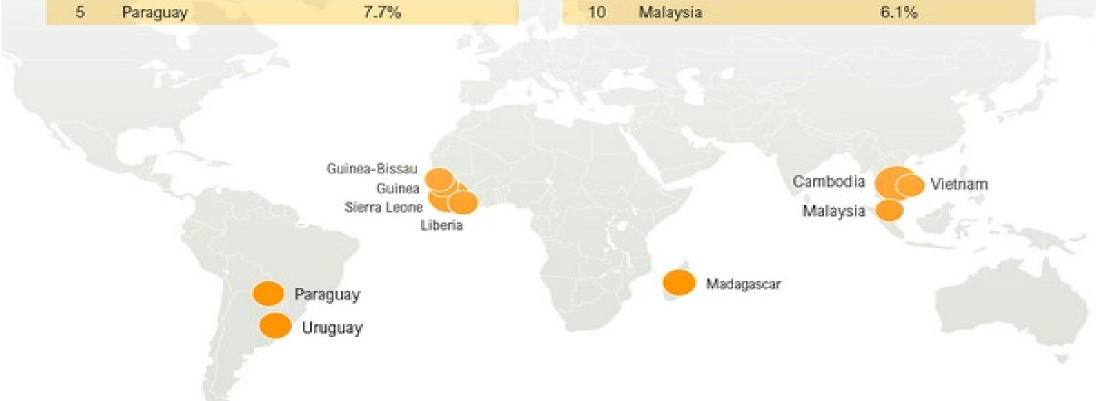
Tropical countries, only in 2014, lost nearly 10 million hectares of tree cover, therefore tree cover loss in the tropics is speeding up (Figure 2, Source: World Resources Institute, Global Forest Watch). Out of the 10 countries with the fastest acceleration of tree cover loss, almost half can be found in West Africa. The countries of the Congo Basin, including the Democratic Republic of Congo, Republic of Congo, Cameroon, Central African Republic and Gabon have seen tree cover loss accelerate quickly because of palm oil expansion, timber extraction and small-scale agriculture (New York Times, August 1, 2015). Forest ecosystem plays a crucial role in providing, at local level, food, water, wood products, medicines and so on, at the regional level, it is important in the providing of ecosystem services such as water regulation, soil stability, flood alleviation, at the global level, it makes an important contribution to biodiversity and climate regulation. Forests, indeed, are the most important storehouse of terrestrial biological biodiversity, lodging up to 90 per cent of known terrestrial species, and also they play as sinks and sources of carbon, thus tracking forest losses and gains, through land-use change, helps scientists and decision-makers to measure the forests' ability to reduce net greenhouse gas (GHG) emissions. In fact forests hold 80% of the total soil C (carbon) in terrestrial ecosystems, and they assimilate 67% of the total CO_2 taken off from the atmosphere by all terrestrial ecosystems (Landsberg et al., 1997); it is estimated that the forests store 283 Gigatonnes (Gt) of carbon in their biomass alone, and the carbon stored in forest biomass, deadwood and soil together is approximately 50 per cent more than the carbon in the atmosphere (UNEP, 2006), thus their destruction or degradation, for example by burning it, should account for 12–15 per cent of all carbon gas emissions into the atmosphere (van der Werf et al., 2009). Indeed, rainforests cover only 7 per cent of the land on earth, but they include approximately half of all the trees on earth and they generate about 40 per cent of the world's oxygen. Prior to the industrialized era, the atmospheric concentration of CO_2 had been relatively stable between 260 and 280 parts per million (ppm) for 10 millions of years. Since 1750, the concentration of CO_2 in the atmosphere has increased from around 280 ppm to nearly 380 ppm in 2005 (IPCC, 2007). The increase in atmospheric CO_2 concentration stems from human activities: deforestation is the second largest cause of carbon dioxide in the atmosphere, after fossil fuel combustion, but also cement production and other changes in land use and management such as biomass burning, crop production and conversion of grasslands to crop lands. Anyway the rate of forest area loss is declining and the indicators for sustainable forest management account positive progress in forest management (Mongabay, 2010). At the same time unsustainable forest practices (e.g. illegal cut) and forest conversion clearly persist, despite increased efforts.

Mitigating the potential impacts of climate change is one of the main environmental policy concerns of the 21st Century. Global interest in climate change has acquired considerable attention in the international development arena since the first World Climate Conference in 1979. At later time in Toronto in 1988, it was adopted the United Nations Framework Convention on Climate Change

(UNFCCC), whose driving aim is to stabilize greenhouse gas (GHG) concentrations in the atmosphere, it was an important purpose of action in order to fight climate change (Article 2, UNFCCC). The UNFCCC was expanded through the Kyoto Protocol, which was adopted in 1997. With respect to mitigation, Article 2 of the UNFCCC declares that the ultimate goal of the Convention is ‘*to achieve [. . .] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous [. . .] interference with the climate system*’. Maintaining global mean temperature change to less than 2°C has been widely accepted as the most important climate protection aim (e.g. EC, 2007; UNDP, 2007), and in order to achieve it, it is necessary stabilizing GHG concentrations, or limiting global carbon emissions. Consequently, global emissions must decline by 50 – 80% from 2000 to 2050 (IPCC, 2007), this because global GHG emissions have increased by 70%, namely by 1.58% per annum on average between 1970 and 2004 (Le-Yin Zhang, 2011). Such reductions will be impossible without drastic changes to the present model of development.

Figure 2. Countries with Fastest Acceleration of Tree Cover Loss 2001 – 2014.

RANK	COUNTRY	INCREASE IN ANNUAL FOREST LOSS RATE PER YEAR	RANK	COUNTRY	INCREASE IN ANNUAL FOREST LOSS RATE PER YEAR
1	Cambodia	14.4%	6	Liberia	6.9%
2	Sierra Leone	12.6%	7	Guinea	6.5%
3	Madagascar	8.3%	8	Guinea-Bissau	6.4%
4	Uruguay*	8.1%	9	Vietnam	6.1%
5	Paraguay	7.7%	10	Malaysia	6.1%



Acceleration represents the slope of the regression line of rate of loss (ha yr-1) versus time (yr) from 2001 to 2014. All p values < .05

* Uruguay has a high proportion of tree plantations. Its inclusion in this table may indicate trees removed in harvest cycles, rather than clearing of natural forests.

Source: World Resources Institute at: http://blog.globalforestwatch.org/2015/09/2014-tree-cover-loss-2/

4.2 Why Forests are important?

The entire global population relies on forests for their carbon sequestration services. Forests ensure protection and conservation of natural resources, including soil and water, and other environmental services. Forests slow water dispersion and favour infiltration of rainwater, which revitalises soil and recharges underground water storage. This is crucial in catering clean water for drinking, agriculture and other uses. Furthermore forests can protect soils from wind and water erosion, avalanches and landslides, and moreover provide biodiversity and ecological processes, behind that they have cultural, religious and recreational values that are essential to many forest users. Knowing whether and how forests are altered helps governments to identify priority needs for restoration. The demand for wood have stepped up since 1990, and it has passed from 2.75 billion m^3 per year in 1990 to 3.0 billion m^3 per year in 2011, the annual value of internationally traded forest products is between $150 billion and $200 billion (UNEP, 2011).

Land cover change (LCC) has considerable effects on the earth's climate, hydrology, water resources, soils (Mahmood et al., 2013; Pereira et al., 2010). LCC has been taken into consideration in any assessment of climate processes, and involves land surface exchanges such as the following: forest to agriculture, reforestation of agricultural areas, rural to suburban, grassland to irrigated agriculture, and suburban to built-up land. If the amount of actively growing plant biomass changes, this modifies the transpiration of water vapour into the atmosphere and as consequences the amount of carbon that is stored. Studies of tropical deforestation suggest a contraction in surface evapotranspiration, usually leading to a net reduction in rainfall over the deforested land. For example, in a modelling experiment over eastern Amazonia, Sampaio et al. (2007) found up to 25% reductions in annual average rainfall. Deforestation impacts the global climate both by freeing the carbon stored in the living plants and soils, and by modifying the physical properties of the planetary surface. Indeed deforestation has a warming influence by adding CO_2 to the atmosphere, eliminating the possible increased carbon stored in trees as a result of future CO_2 fertilization, and decreasing evapotranspiration, particularly in the tropics (Snyder et al., 2004). Evapotranspiration changes atmospheric water vapour that, in turn, triggers local and global temperature changes (Bala et al., 2006; Boucher et al., 2004; Werth et al., 2004).

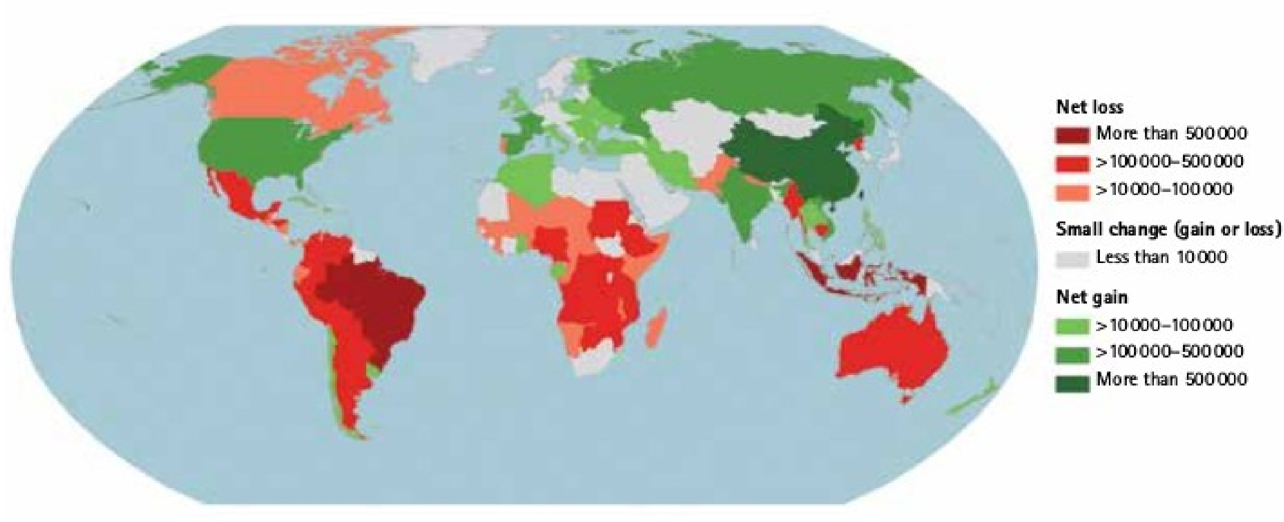
4.2.1 A brief description of the forest ecosystem c cycle.

The forest carbon (C) cycle is characterized by a biological (forest ecosystem) and industrial (forest products) cycle. I will only describe the biological one.

The biomass and carbon stocks in forests are important signals of forests' productive capacities, energy potential, and capacity to sequester carbon. The role of forests as terrestrial sinks and sources of carbon dioxide has received world wide attention since the adoption of the 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). The highest storages of carbon are found in forests of South America and Western and Central Africa, storing about 120 tonnes of carbon per hectare in the living biomass alone. The global average is close to 75 tonnes per hectare. Over the past 25 years the carbon stocks in forest biomass decreased by 697 million tonnes per year (FAO, 2015) or about 2.5 Gt of carbon dioxide (CO_2). The reduction is mainly driven by carbon stock changes as a result of switching forest lands to agriculture and degradation of forest area. Africa, South and Southeast Asia and South America account for most of the losses. Carbon stocks increased, instead, in East Asia, Europe, North America, and Western and Central Asia. Caribbean, instead, reported only a minor increase (Figure 3), countries in South and Central America and Asia have worked to slow the rate of loss. Brazil alone reported that the annual loss of carbon in above- and below-ground biomass was reduced from 193 million tonnes of carbon per year in the 1990s to about 63 million tonnes per year for 2010–2015 period.

The most important changes to the forest C cycle are due to society's grown demand for fibre and fuel and conversion of forests to cropland and pasture (FAO, 2000). Deforestation to cultivate crops and grazing was the dominant land use change in temperate regions in the past and is now the key land use change in tropical regions (Watson et al., 2000). Other disturbances, such as wildfire and insect outbreaks, are natural processes in forest ecosystems, but there is increased evidence that the frequency and severity of these disturbances are growing as an indirect result of human activities (Kurz et al., 1999). Land use and human-modified rates of natural disturbance have directly and indirectly altered the exchange of carbon dioxide (CO_2) between forests and the atmosphere. Most scientists agree that increased concentrations of CO_2 and other Green House Gas (GHG) are responsible for global climate warming (IPCC, 2001).

Figure 3. Annual net forest gain/loss (ha) by country (1990-2015). Source: FAO, 2015.



The net exchange of Carbon between the forest and atmosphere is described by the following equation:

$$CO_2 + H_2O \leftrightarrow CH_2O + O_2 .$$

Photosynthesis is the assimilation of CO_2 from the atmosphere by plants and the conversion to carbohydrates (CH_2O) that plants use to build organic matter. Respiration is the oxidation of carbohydrates and release of CO_2 to the atmosphere. The net difference between the two processes, over time, determines the net accumulation of C, unless the C is not removed by disturbance (Gower, 2003).

Land use influence a variety of ecosystem processes that impact greenhouse gas fluxes, such as photosynthesis, respiration, decomposition, and combustion. These processes involve transformations of carbon and nitrogen that are driven by the biological (activity of microorganisms, plants, and animals) and physical processes (combustion, leaching and so on).

4.3 Carbon stock change in biomass due to the conversion of land from Forest condition to Crop land condition in Africa.

Globally, about 50% of the total land surface has been transformed by direct human action, 20% of land ecosystems have been converted to permanent croplands, and 25% of the world's forests have been cleared for various scopes, such as crop cultivation and pastures (Moore, 2002). Land under cropland has been increased in some parts of the world to meet growing food and fibre demands. Most of the spread of cropland in the last two decades has happened in South-east Asia, parts of South Asia, the Great Lakes region of eastern Africa and the Amazon Basin (Millennium Ecosystems Assessment, 2005). Conversion to Cropland is the major land-use change following tropical deforestation (IPCC, 2006).

In order to estimate carbon stock change, I have followed methods described in IPCC, Intergovernmental Panel on Climate Change, 2006. The methods require estimates of carbon in biomass stocks prior to and following land use conversion, based on estimates of the areas converted during the period between land-use surveys, in my case I have used land survey from Land Matrix dataset. As a result of land use conversion, it is assumed that the dominant vegetation is removed entirely freeing emissions, resulting in near zero amounts of carbon remaining in biomass. The difference between initial and final biomass carbon pools is used to calculate carbon stock change from land use conversion. I should consider all carbon pools (i.e., above ground and below ground biomass, dead organic matter, and soils) in estimating changes in carbon stocks in Land Converted to Cropland, but there is incomplete information to provide a default approach to estimate carbon stock change in dead organic matter (DOM) pools. Moreover, the methodology, that I follow, considers only *carbon stock change in above-ground biomass* since limited data are available on below-ground carbon stocks in perennial Cropland. The IPCC Guidelines describe some alternatives that consider details on the areas of land converted, carbon stocks on lands, and loss of carbon resulting from land conversions. I have choose to adopt Tier 1 and Tier 2[13]. The Tier 1 method follows the approach in which the amount of biomass, that is cleared for cropland, is estimated by multiplying the area converted in one year by the average carbon stock in biomass in the Forest Land prior to conversion. At Tier 1, carbon stocks in biomass immediately after conversion (B_{AFTER}) are assumed to be zero, since the land is cleared of all vegetation before planting crops. Average carbon stock change per hectare for a given land use conversion is multiplied by the estimated area of lands bearing such a conversion in a given year. In my case I have estimated that conversation from forest to crop land occurs on the 30% of each contract of each country. In subsequent years, change in biomass of annual crops is considered zero because carbon gains in biomass from annual growth are counterbalance with losses from harvesting. The default assumption for Tier 1 is that all carbon in biomass removed is lost to the atmosphere through burning or decay processes. The inputs needed (see Annex 2) for the default method are: carbon stocks before conversion in the initial land use and after conversion to Crop land; and growth in biomass carbon stock from one year of cropland growth. The Tier 2 method should include some

13 For more details refer to IPCC, Guidelines 2006.

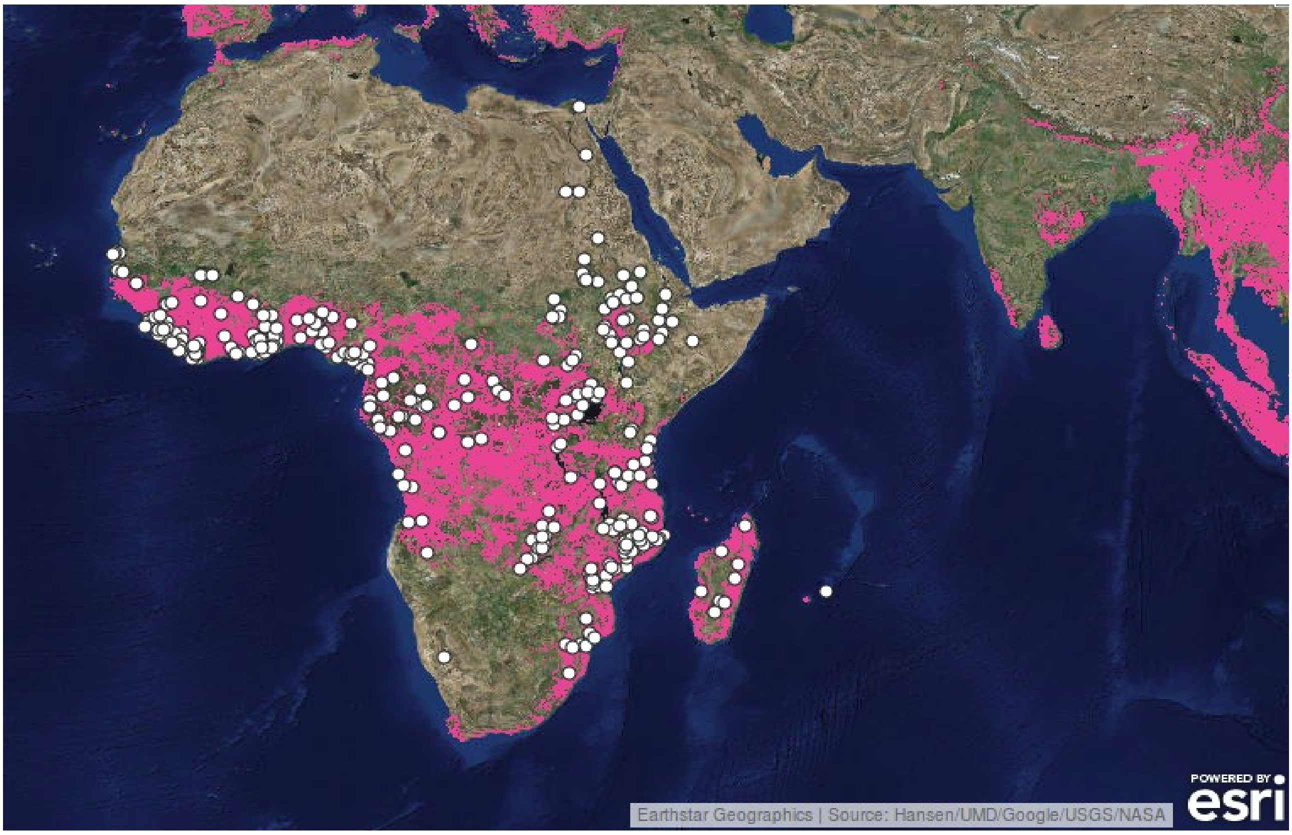
country-specific estimates for biomass stocks and removals due to land conversion, and also include estimates of losses due to burning and decay following land conversion to Cropland. Default parameters for emissions from burning and decay are provided in IPCC 2006. The IPCC Guidelines use a general default of 0.5 for the proportion of biomass burnt locally for both Forest Land and Grassland conversions.

4.3.1 Estimation to calculate carbon stock change.

My calculations are focused on Africa, because according to my previous results, one of the leading factor of deforestation is the land grabbing in this continent. In the Annex 1, list of contracts used and adapted from Land Matrix dataset.

I have mapped the investments according to Land Matrix and Global Forest Watch Map (Figure 4).

Figure 4. Map of Investments. The pink area depicts Tree Cover Loss between 2000-2014 instead the white circles depict the investments according to Land Matrix data between 2000 -2014.



Source: Author's elaboration
Source: Hansen/UMD/Google/USGS/NASA, accessed through Global Forest Watch

In Global Forest Watch data set, “tree cover” is defined as all vegetation greater than 5 meters in height, and may take the form of natural forests or plantations across a range of canopy densities. Tree cover loss is defined as “*stand replacement disturbance*,” or the complete removal of tree cover canopy at the Land-sat pixel scale. Tree cover loss may be the result of human activities, including forestry practices such as timber harvesting or deforestation (the conversion of natural forest to other land uses), as well as natural causes such as disease or storm damage. Fire is another widespread cause of tree cover loss, and can be either natural or human-induced.

My estimates of CO_2 emissions and removals from forest were computed following the carbon stock difference equation of the 2006 IPCC Guideline (see Annex 2), using Land Matrix data as input. I have considered only contracts that, according to the map in the Figure 4, occur in the pink area, namely area bearing significant tree cover loss. This is considered equivalent to an IPCC Tier 2, approach 2 method (FAO, 2014). In fact, I can not use the IPCC default method, because its application requires the use of statistically consistent time-series of national forest inventory data on net forest growth rates, harvest data and estimated losses from disturbances that are not available at the moment. More specifically, I used Land Matrix data for the period 2000-2014 (last accessed March 2015). I have estimated that at least 30% of cultivation (namely 30% of contracts measured in ha) happens on Forest Land. I have estimated annual C stock change, limited to changes in carbon only in woody biomass, and thus net CO_2 emissions and removals, over the period 2000–2014. The forest area and equations applied follow the IPCC (2006) guidelines are summarized for convenience in Table 1, together with the percentage of GHG emissions in every country that came from land use change and forestry in 2011. Summarizing, net C stock change was computed by applying: Approach 2 (IPCC, 2006, Ch. 3, Vol. 4) for land representation. The essential feature of Approach 2 is that it provides an assessment of both the net losses or gains in the area of specific land-use categories and what these conversions represent (i.e., changes both from and to a category). Thus, Approach 2 differs from Approach 1 in that it includes information on conversions between categories, but is still only tracking those changes without spatially - explicit location data, often based on political boundaries (i.e., locations of specific land use and land-use conversions are not known). Tracking land use conversions in this manner normally require estimation of initial and final land use categories for all conversion types, as well as of total area of changed land by category, in my case from Forest Land to Cropland. Only net forest area changes were considered, since data did not allow for quantification of gross area changes.

Following IPCC stock difference equation (IPCC, 2006; equation 2.15, equation 2.16, Ch. 5, Vol. 4) for the calculation of C stock change.

More specifically, net CO_2 emissions and removals were computed as follows:

Equation 2.15, Annual Change In Biomass Carbon Stocks On Land Converted To Other Land -USE Category (Tier 2): $\Delta C_B = \Delta C_G + \Delta C_{CONVERSION} - \Delta C_L$

ΔC_B = annual change in carbon stocks in biomass on land converted to other land-use category, in tonnes C yr^{-1}

ΔC_G = annual increase in carbon stocks in biomass due to growth on land converted to another land-use category, in tonnes C yr^{-1}

$\Delta C_{CONVERSION}$ = initial change in carbon stocks in biomass on land converted to other land-use category, in tonnes C yr-1

ΔC_L = annual decrease in biomass carbon stocks due to losses from harvesting, fuel wood gathering and disturbances on land converted to other land-use category, in tonnes C yr^{-1}

Conversion to another land category may be associated with a change in biomass stocks, e.g., part of the biomass may be withdrawn through land clearing, restocking or other human-induced activities. These initial changes in carbon stocks in biomass ($\Delta C_{CONVERSION}$) are calculated with the use of ***Equation 2.16*** (Initial Change In Biomass Carbon Stocks On Land Converted To Another

Land Category) as follows: $\boldsymbol{\Delta C_{CONVERSION} = \Sigma_i [(B_{AFTERi} - B_{BEFOREi}) * \Delta A_{TO\_OTHERSi}] * CF}$

$\Delta C_{CONVERSION}$ = initial change in biomass carbon stocks on land converted to another land category, tonnes C yr $^{-1}$

B_{AFTERi} = biomass stocks on land type i immediately after the conversion, tonnes d.m. ha^{-1} (Tier 2 assumes that carbon stocks immediately following conversion are zero)

$B_{BEFOREi}$ = biomass stocks on land type I before the conversion, tonnes d.m. ha^{-1}

$\Delta_{ATO\_OTHERSi}$ = area of land use i converted to another land-use category in a certain year, ha yr^{-1}

CF = carbon fraction of dry matter, tonne C (tonnes d.m.)$^{-1}$

i = type of land use converted to another land-use category

The calculation of $\Delta C_{CONVERSION}$ may be applied separately to estimate carbon stocks occurring on specific types of land (ecosystems, site types,etc.) before the conversion. The $\Delta A_{TO\_OTHERSi}$ refers to a particular inventory year for which the calculations are made, but the land affected by conversion should remain in the conversion category for 20 years or other period used in the inventory, the contracts, that I choose, are referring to a period between 30 to 99 years.

Table 1. Land Converted to Cropland: Estimates of annual net CO_2 emissions and removals from forest (woody biomass C stock changes only). Change in carbon stocks in biomass (Equation 2.15 and 2.16, IPCC, 2006).

Target Country	Estimate of change in Carbon stocks in biomass for 30% of total contracts in a period of 20 years. Tonnes C (thousand), by author's calculation.	The percentage of a country's greenhouse gas emissions resulting from changes in land use and forestry in 2011, as defined by the FAO. Source: Global Forest Watch	The total amount of carbon stored in living forest biomass, by FAO (2015). Source: Global Forest Watch
Angola	-1462820	24.9%	4,338 million metric tons of carbon stocks
Benin	-1248320	49.3%	248 million metric tons of carbon stocks
Burkina Faso	-28922	36.1%	247 million metric tons of carbon stocks
Cameroon	-3859401.5	57.6%	2,548 million metric tons of carbon stocks
Central African Republic	-207683	23.2%	2,843 million metric tons of carbon stocks
Democratic Republic of Congo	-132572074.5	82.0%	19,441 million metric tons of carbon stocks
Congo	-94023900	56.7%	3,427 million metric

			tons of carbon stocks
Côte d'Ivoire	***-3400096.5***	***15.6%***	***1,937 million metric tons of carbon stocks***
Ethiopia	***-9564098***	***18.0%***	***219 million metric tons of carbon stocks***
Gabon	***-22032600***	***6.4%***	***2,992 million metric tons of carbon stocks***
Ghana	***-30882991.5***	***53.5%***	***713 million metric tons of carbon stocks***
Guinea	***-5040285***	***47.4%***	***602 million metric tons of carbon stocks***
Kenya	***-234123.5***	***14.5%***	***634 million metric tons of carbon stocks***
Liberia	***-72239905.5***	***89.8%***	***583 million metric tons of carbon stocks***
Madagascar	***-1498944***	***53.0%***	***1,606 million metric tons of carbon stocks***
Malawi	***-279326***	***37.6%***	***140 million metric tons of carbon stocks***
Mozambique	***-79533137***	***56.8%***	***1,641 million metric***

			tons of carbon stocks
Nigeria	***-6796148***	***37.5%***	***835 million metric tons of carbon stocks***
Rwanda	***-127940***	***N.A.***	***43 million metric tons of carbon stocks***
Senegal	***-1230185***	***23.0%***	***348 million metric tons of carbon stocks***
Sierra Leone	***-51330248***	***50.1%***	***208 million metric tons of carbon stocks***
South Africa	***-6804554***	***0.25%***	***807 million metric tons of carbon stocks***
South Sudan	***-43130147***	***N.A.***	***N.A.***
Swaziland	***-792440***	***6.0%***	***22 million metric tons of carbon stocks***
Tanzania	***-7130768***	***59.1%***	***5,438 million metric tons of carbon stocks***
Uganda	***-1464692***	***37.6%***	***76 million metric tons***

			of carbon stocks
Zambia	***-6335753***	***61.3%***	***2,375 million metric tons of carbon stocks***

4.4 Conclusion.

My analysis quantified the relevance of forest-related CO_2 emissions, making available estimates based on official country data and international methodologies, highlighting the significant role of deforestation as a net source, and the importance of remaining forests as net sink. Despite the simplified carbon stock change methodology applied in this study, it is worth noting that the estimates of CO_2 emissions from conversation of forest land in 27 countries in Africa continent, in 20 years there will be a loss equivalent to *-21601908 million tons of carbon stocks on average* (Table 1). Knowing how and why forest area changes over time is important to achieve sustainable development because such changes may result in long-term deletions (e.g. forest conversion to agriculture) or additions (e.g. afforestation). Forests provide the majority of the world's forest products and a number of ecological and environmental services, such as water purification, erosion control and carbon sequestration. Changes in forest area can affect the ability of forest to provide globally important goods and services, such as employment, wood products, non-wood forest products and services. Monitoring and understanding changes provides a sound basis for policy/decision makers, investment at the national, regional and global levels.

South America accounted for the largest loss in natural forest. In this region, the area of natural forest decreased by an estimated 3.5 million ha per year between 1990 and 2000 and slowed down to 2.1 million ha per year between 2010 and 2015. A similar trend happened across sub-Saharan Africa. East Asia reported the largest increase in natural forest area: about 450 000 ha per year since 1990. In Europe, Oceania and the Caribbean the trend is relatively stable. The decrease in net forest loss rates in the tropics and subtropics, combined with stable or moderate increases in the temperate and boreal zones, suggests that the rate of forest loss will probably continue to decrease in the following years, but natural forest area will probably continue to decline, particularly in the tropics, primarily due to conversion of forest to agriculture. However, because of a growing demand for forest products and environmental services, the area of planted forests is likely to continue to increase in coming years. The preservation of ecosystems is a fundamental goal in order to mitigate global warming, and the destruction of ecosystems to prevent global warming would be a counterproductive and perverse strategy. Therefore, the cooling that could potentially arise from afforestation outside the tropics should not necessarily be viewed as a strategy for mitigating climate change since, apart from their potential climatic role, forests are crucial in preserving the biodiversity of natural ecosystems. In designing strategies to global challenges, it is vital to follow broad scopes and to avoid narrow criteria which may conduct to environmentally harmful consequences.

References.

- Anseeuw W., Wily A. L., Cotula L., Tyalor M., (2012). Land Rights and the Rush for Land. Findings of the Global Commercial Pressure on Land Research Project. Rome, Italy: International Land Coalition.
- Bala G., K. Caldeira, M. Wickett, T. J. Phillips, D. B. Lobell, C. Delire, A. Mirin. Combined Climate and Carbon-Cycle Effects of Large-Scale Deforestation. Proceedings of the National Academy of Sciences. UCRL-JRNL-225431.
- Boucher, O., Myhre, G. & Myhre, A. (2004) Climate Dynamics 22, 597-603.
- EC (European Commission), 2007, Limiting Global Climate Change to 2 Degree Celsius: The Way ahead for 2020 and Beyond, SEC (2007) 7/8, European Commission, Brussels.
- FAO, 2014. Agriculture, Forestry and Other Land Use Emissions by Sources and Removals by Sinks: 1990–2011 Analysis. FAO Statistics Division Working Paper Series, 14/01. UN FAO, Rome, Italy, at. http://www.fao.org/docrep/019/i3671e/i3671e.pdf
- Food Agric. Organ. U.N. 2001. Global Forest Resources Assessment 2000. FAO - For. Pap. 140. Rome. 479 pp.
- Food Agriculture Organization, (2015). Global Forest Resources Assessment 2015. How are the world’s forests changing? Rome.
- Global Forest Watch, 2015 at: http://blog.globalforestwatch.org/2015/09/2014-tree-cover-loss-2/
- Gower Stith T., 2003. Patterns And Mechanisms Of The Forest Carbon Cycle. Annu. Rev. Environ. Resour. 2003. 28:169–204.
- International Land Coalition (2011), Global assembly 2011, Tirana, Albania, May 24–27, 2011. (ILC 2011). Available at http://www.landcoalition.org/about-us/aom2011/tirana-

declaration

- IPCC, Intergov. Panel Clim. Chang. (2001). Third assessment report (TAR), climate change 2001: The scientific basis. Work. Group 1 Rep. Tech. Summ. IPCC Natl. Greenh. Gas Inventory Program, New York City.
- IPCC, Intergovernmental Panel of Climate Change, (2006). Volume 4, Agriculture, Forestry and other Land Use. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan. http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html
- IPCC, Intergovernmental Panel of Climate Change, 2007. Climate Change 2007: Working Group I: The Physical Science Basis at: https://www.ipcc.ch/publications_and_data/ar4/wg1/en/tssts-2-1-1.html
- Kurz WA, Apps MJ. 1999. The carbon budget of Canadian forests: sensitivity analysis of changes in disturbance regimes, growth rates, and decomposition rates. Environ. Pollut. 83:55–61.
- Land Matrix (2012), The Land Matrix Database. (Land Matrix 2012). Available at http://landportal.info/landmatrix
- Landsberg JJ, Gower ST. 1997. Applications of Physiological Ecology to Forest Management. San Diego, CA: Academic. 354 pp.
- Le-Yin Zhang (2011) Is industrialization still a viable development strategy for developing countries under climate change?, Climate Policy, 11:4, 1159-1176, DOI: 10.1080/14693062.2011.579263
- Mahmood, R., Roger A. Pielke, Sr., Kenneth G. Hubbard, Dev Niyogi, Paul A. Dirmeyer, Clive McAlpine, Andrew M. Carleton, Robert Hale, Samuel Gameda, Adriana Beltran-

Przekurat, Bruce Baker, Richard McNider, David R. Legates, Marshall Shepherd, Jinyang Du, Peter D. Blanken, Oliver W. Frauenfeld, U.S. Nair and Souleymane Fall. Land cover changes and their biogeophysical effects on climate. *Int. J. Climatol.* **34**, 929–953 (2013).

- Millennium Ecosystems Assessment (2005). Ecosystems and Human Well-being: A Synthesis. Island Press, Washington DC. 137pp.
- Mongabay, 2010, at: http://news.mongabay.com/2010/03/global-deforestation-slows/
- Mooney Chris, at: https://www.washingtonpost.com/news/energy-environment/wp/2015/09/02/scientists-discover-that-the-world-contains-dramatically-more-trees-than-previously-thought/
- Moore III, B. (2002). Chapter 2 Challenges of a changing earth. In, Challenges of a Changing Earth (W. Steffen, J. Jaeger, D.J. Carson, and C. Bradshaw, eds). Berlin: Springer-Verlag. pp. 7-17.
- New York Times, August 1, 2015 at: http://www.nytimes.com/2015/08/02/world/africa/palm-oil-company-is-accused-of-exploiting-liberias-ebola-crisis.html?_r=0
- Pereira HM, Leadley PW, Proneca V, Alkemade R, Scharlemann JPW, Fernandez-Manjarres JF, Araujo MB, Balvanera P, Biggs R, Cheung WWL, Chini L, Cooper HD, Gilman EL, Guenette S, Hurtt GC, Huntington HP, Mace GM, Oberdorff T, Revenga C, Rodrigues P, Scholes RJ, Sumalia UR, Walpole M. 2010. Scenarios for global biodiversity in the 21st century. Science 330: 1496 – 1501.
- Sampaio G, Nobre CA, Costa MH, Satyamurty P, Soares-Filho BS, Cardoso M. 2007. Regional climate change over eastern Amazonia caused by pasture and soybean cropland expansion. Geophysical Research Letters 34: L17709. DOI: 10.1029/2007GL030612

- Smaller C. and Mann H. (2009), A Thirst for Distant Lands: Foreign Investment in Agricultural Land and Water. International Institute for Sustainable Development, Winnipeg.
- Snyder PK , Foley JA , Hitchman MH , Delire C. (2004), Analyzing the effects of complete tropical forest removal on the regional climate using a detailed three-dimensional energy Gigabudget: An application to Africa. J Geophys Res Atmos. 109:D21102. UNEP, United Nations Environment Programme, 2011, at: http://www.unep.org
- UNDP (United Nations Development Programme), 2007, Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World, United Nations Development Programme, Palgrave Macmillan, Basingstoke, England, and New York, NY.
- UNEP, United Nations Environment Programme, 2011. Sustaining forests: Investing in our common future. UNEP Policy Series. Issue 5 August 2011.
- van der Werf G. R., D. C. Morton, R. S. DeFries, J. G. J. Olivier, P. S. Kasibhatla, R. B. Jackson, G. J. Collatz and J. T. Randerson (2009). CO_2 emissions from forest loss. Nature Geoscience vol. 2 (11):737-738, November 2009.
- Watson RT, Noble IR, Bolin B, Ravindranath NH, Verardo DJ, Dokken DJ, eds. 2000. Land use, land use change, and forestry. Spec. Rep. Intergov. Panel Clim. Chang. Cambridge Univ. Press, Cambridge, UK.
- WCED (World Commission on Environment and Development), 1987, Our Common Future, Oxford University Press, Oxford.
- Werth, D. & Avissar, R. (2004) Journal of Hydrometeorology 5, 100-109.
- World Resources Institute, 2015 at: http://www.wri.org/our-work/topics/forests

Appendix 1. List of Contracts and Tree Cover Loss adapted from Land Matrix and Global Forest Watch. I collected data from period 2000 – 2014.

Target Country	Contracts Size (ha)	Intention of Production	Tree Cover Loss (ha)
Angola	*37500*	*40% Food Crops, 30% Livestock, 20% Biofuel, 10% Non-food agricultural commodities (Flowers)*	*1740010*
Benin	*32000*	*100% Biofuel*	*31382*
Burkina Faso	*2644*	*40% Biofuel, 40% Food Crop, 20% Renewable Energy*	*131*
Cameroon	*82991*	*25% Food Crops, 50% Agriunspecified, 25% Non-food agricultural commodities (Rubber)*	*657057*
Central African Republic	*5317*	*100% Food Crops*	*546920*
Democratic Republic of the Congo	*2850993*	*22% Agriunspecified,6% Livestock, 28% Food Crops, 22% For wood and Fiber, 11% Non-food agricultural commodities (Rubber), 11% For carbon sequestration/REDD*	*7977009*
Congo	*2022000*	*10% For carbon sequestration*	*409526*

		-REDD, 30% For wood and fibre, 10% Food Crops, 10% Livestock, 20% Agrinspecified, 10% Renewable Energy, 10% Biofuel	
Cote d'Ivoire	73101	25% Agriunspecified, 37,5% Food Crops, 37,5% Non -food agricultural commodities (Rubber),	N.A.
Egypt	66839	66% Food Crops, 22% Non-food agricultural commodities, 12% Livestock	1510
Ethiopia	910756	44,8% Food Crops, 15% Biofuels, 35,6% Non-food agricultural commodities, 1% For Food and Fibre, 1% Livestock, 1% Conservation, 1% Renewable Energy	295611
Gabon	473800	22% Agriunspecified, 11% Livestock, 11% Food Crops, 11% For wood and Fiber, 22% Non-food agricultural commodities (Rubber), 11% For carbon	277413

		sequestration/REDD, 11% Tourism	
Ghana	***664131***	***25% Biofuel, 34% Food Crops, 3% Livestock, 3% For carbon sequestration – REDD, 10% For wood and Fibre, 6,25% Non food agricultural commodities (Rubber), 6,25% Renewable Energy, 12,5% Agriunspecified***	***616484***
Guinea	***129215***	***50% Food Crops, 25% Agriunspecified, 25% Non-food agricultural commodities***	***483224***
Kenya	***22187***	***50% Food Crops, 50% Renewable Energy***	***250306***
Liberia	***1553527***	***20% Non-food agricultural commodities, 20% Agriunspecified, 45% For wood and fibre, 5% Biofuel, 5% Food Crops, 5% For carbon sequestration/REDD***	***711476***
Madagascar	***32216***	***11,11% Forestunspecified, 11,11% Non-food agricultural commodities,***	***1971473***

		44,44% Biofuel, 33,33% Food Crops	
Malawi	*7154*	*75% Food Crops, 25% Livestock*	*106593*
Mali	***86845***	***50% Biofuel, 37,5% Food Crops, 12,5% Renewable Energy***	***2209***
Mauritius	***500***	***100% Food Crops***	***N.A.***
Morocco	***1531***	***100% Food Crops***	***28466***
Mozambique	***2039303***	***35% Food Crops, 8% Non-food agricultural commodities, 16% For wood and fibre, 2 % Renewable Energy, 24% Biofuel, 4% Tourism, 2% Agriunspecified, 4% Livestock, 5% Conservation, For carbon sequestration/REDD***	***2048678***
Namibia	***220***	***100% Food Crops***	***1210***
Nigeria	***174252***	***14,30% Agriunspecified, 39,70%Food Crops, 7% Livestock, 7% Non -Food Agricultural Commodities (Rubber), 22% Biofuels, 7% Industry, 3% Renewable Energy***	***439032***
Rwanda	***21130***	***33,33% Food Crops, 33,33%***	***19357***

		Biofuel, 33,33% For wood and Fibre	
Senegal	***117050***	***55,60% Biofuel, 33,40% Food Crops, 11% For carbon sequestration/REDD***	***2175***
Sierra Leone	***1316152***	***29,16% Food Crops, 20,84% Agriunspecified, 4,16% For wood and fibre, 16,6% Biofuels, 8,33% Renewable Energy, 4,16% Non-Food Agricultural commodities (Rubber), 16,6% For carbon sequestration/REDD***	***498424***
South Africa	***174446***	***42,86% Food Crops, 28,6% For wood and Fibre, 28,6% Livestock***	***1027884***
South Sudan	***1105893***	***42,86% Food Crops, 42,86% For wood and Fibre, 14,29% Conservation, For carbon sequestration/REDD***	***101812***
Sudan	***443298***	***41,18% Food Crops, 29,41% Non-food agricultural commodities,***	***838***

		11,76% Biofuel, 11,76% Renewable Energy,5.8% Livestock	
Swaziland	*32970*	*50% Food Crops, 50% For wood and Fibre*	*76708*
Tanzania	*182832*	*50% Food Crops, 7,7% Renewable Energy, 11,4% For wood and fibre, 3,9% Non-food agricultural commodities, 3,9% Agriunspecified, 7,7% For carbon sequestration/REDD, 11,4% Livestock, 3,9% Biofuels*	*1699305*
Uganda	*37548*	*11,11% Industry, 22,22% Agriunspecified, 33,33% Food Crops, 11,11% For carbon sequestration/REDD, 22,22% For wood and fibre*	*439968*
Zambia	*162447*	*62% Food Crops, 9,4% Biofuels, 4,8% Agriunspecified, 19% Livestock, 4,8% Non -food Agricultural Commodities*	*1025306*

Annex 2. Worksheet to calculate Annual Change in carbon stocks in biomass due to Land Converted to Crop land. Source: IPCC, 2006.

Sector		**Agriculture, Forestry and Other Land Use**						
Category		**Land Converted to Cropland: Annual change in carbon stocks in biomass**						
Category code		**3B2b**						
Sheet		**1 of 1**						
Equation		**Equation 2.2**	**Equation 2.16**			**Equation 2.15, 2.16**		
Land-use category		Subcategories for reporting year	Annual area of Land Converted to Cropland	Biomass stocks before the conversion	Carbon fraction of dry matter	Annual biomass carbon growth[2]	Annual loss of biomass carbon[3]	Annual change in carbon stocks in biomass
Initial land use[1]	Land use during reporting year		(ha)	(tonnes dm ha^{-1})	[tonnes C (tonne dm)$^{-1}$]	(tonnes C yr^{-1})	(tonnes C yr^{-1})	(tonnes C yr^{-1})
				Table 5.8	0.5	National estimates, or Table 5.9	National estimates, or Table 5.1	$\Delta C_B = \Delta C_G + ((0 - B_{BEFORE}) * \Delta A_{TO\_OTHER}) * CF - \Delta C_L$
			ΔA_{TO_OTHERS}	B_{BEFORE}	CF	ΔC_G	ΔC_L	ΔC_B
FL	CL	(a)			0.5			
		(b)			0.5			
Sub-total								
GL	CL	(a)			0.5			
		(b)			0.5			
Sub-total								
WL	CL	(a)			0.5			
		(b)			0.5			
Sub-total								
SL	CL	(a)			0.5			
		(b)			0.5			
Sub-total								
OL	CL	(a)			0.5			
		(b)			0.5			
Sub-total								
Total								

[1] If data by initial land use are not available, use only "non-CL" in this column.

[2] Annual biomass carbon growth (ΔC_G) is equal to the area of perennial crop that is not mature times biomass accumulation rate (G) using a national estimate or data from Table 5.9.

[3] Annual carbon stock in biomass removed (ΔC_L) is equal to the area of perennial crops that is annually harvested times the area-specific carbon stock value that is lost (L) using a national estimate or biomass carbon loss data from Table 5.1.