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Land Grab, Food Security and Climate Change: A Vicious Circle in the Global South

Kihwan Seo and Natalia Rodriguez

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<http://dx.doi.org/10.5772/50876>

1. Introduction

The commercialization of public land in the Global South, which refers to the medium and low human development based on the United Nations development program report 2005 [1], has increased dramatically in recent years due to the wide spread leasing and sale of land to foreign companies and governments. The main goal of these investors is to secure food and energy production for their populations as multiple factors threaten their food security at home. On the one hand, the current population will increase worldwide from nearly 7 billion to over 9 billion by 2050 [2], a growth that would require the increase of food production from nearly 6 billion tons (gross) to 9 billion tons by 2050 [3]. Furthermore, competition for land, water, and energy will only intensify along with the need to reduce the many negative impacts of agriculture to the environment [4, 5]. Global food security has been further strained, notably during 2007-08 [6], by the growing volatility of the food market and the political controversy surrounding the use of grain to produce biofuels [7, 8]. Any one of these factors will likely pose significant challenges, but the sum of all of them could constitute a major threat to land ownership.

Overall, these factors have driven a change in perspectives of land ownership. Recent trends indicate that the need to provide food and energy security at home has led international corporations, sovereign wealth funds, foreign governments, private equity firms and domestic actors to buy or lease large tracts of land outside their national borders [9]. These land deals or “land grabbing”, as labeled by many Non-Governmental Organizations and the media, are certainly to be considered a prominent factor in the list of significant drivers of land change in certain parts of the globe, especially in southern hemisphere continents. The need to secure food supply comes as a result of the many international pressures that took place in the mid-2000s; and initiated the rise of food prices by 2006. Among these pressures some that stand out are [10]:

1. Extreme weather events, such as droughts and floods that affected cereal exports in 2005-06 and decreased cereal production worldwide by 10 percent.
2. World cereal reserves fell as major cereal producers such as the USA, EU and China reduced holdings of food stocks.
3. Fertilizer prices and transportation costs increased due to the oil price hike from 2003 to 2008.
4. The increased demand for the production of biofuels conflicted with food crops as land was diverted for the production of monocultures such as sugar, oilseeds, palm oil and maize.

These, along with other international and local pressures caused concern in the international market leading to an increase in market volatility as speculations of food supply were unfavorable [10]. In response to these price hikes many food-importing countries found a long term strategy to outsource their food production and guarantee their food supply at low costs in the leasing and purchasing of foreign land [11]. For example, China holds approximately 20 percent of the world's population but possesses no more than seven percent of the world's arable land [12]. For many years this Asian country has been a net exporter of agricultural goods. In recent years due to its rapid economic growth, higher population income, changes in diets, and limited arable land, among other factors, China has become a net importer of agricultural goods since the beginning of the 2000s. In order to ensure its food security and promote its current economic growth the Chinese government and private corporations are investing in land suitable for agriculture outside its national borders. In the same way some wealthy import-dependent countries, such as Japan and South Korea being directly affected by the 2007-08 food crises, have initiated policies along this line. On the other hand, arid, oil-rich countries from the Gulf States under "harsh climatic conditions, poor soils and scarce land and water" among other limitations [11], such as Saudi Arabia, do so in an attempt to reduce its domestic water use [13]. In recent years the scale of this type of business has increased dramatically with millions of hectares being bought or leased outside their borders. [11]

Due to the increasing global demand for food-stuffs production and alternative energy development, the southern hemisphere is portrayed as an idoneous reservoir of arable land capable of satisfying the international needs, a particular example constitute African countries due to their relatively low population density [9] and cheap land. As mentioned in De Shutter (2009) southern countries in Africa and Latin America are the main targets for investors seeking farmland as it is scarce in Asia [14]. This race to buy land has been described by many as a new neo-colonial approach by wealthy countries to take over the key natural resources of poor countries [15]. Some analysts perceive these land deals as a threat to the livelihood of local communities while others stress the positive effects derived from the income generated in these deals [9]. Such benefits could be perceived as the injection of the much-needed capital to sustain agriculture [16] and therefore the creation of on-farm and off-farm jobs, the development of rural infrastructure such as irrigation canals, and the construction of schools and health clinics that will improve local livelihoods. Along this line of thought, many of the host countries of land deals have encouraged this type of investment and are keen to develop it as a potentially lucrative activity [6].

2. Global land grabs

2.1. Land grabs undermine food security

Global land grabs have recently become a major point of international discussion [17] due to the global struggle to ensure food security [18]. “Land grabbing, generally referred to the mass purchase of agricultural lands by transnational companies or foreign countries” [19], refers to the lease (often for 30–99 years) or purchase of vast areas of land outside their national borders [20] mainly for agricultural production. One of the main drivers of this practice is the current international demand for cheap food after the food price hikes of 2007–08 [13]. During these years the dramatic increase in basic food prices reduced the access to food of millions of people as they reached the highest levels in 30 years [21]. According to global estimates this price hike brought around 915 million people to undernourished levels worldwide, and additional hundreds of millions were added to the count due to the effects of the global financial and economic crisis [10]. Although the highest levels of food insecurity were reached in developing nations many food-importing countries felt the effects of food prices in their own population.

According to Brown (2011), wealthy but food-insecure countries worried about tightening markets [20] are seeking to ensure their food production by leasing and buying land overseas (e.g. the Gulf States). By controlling farm land beyond their national borders these countries are gaining control of the international supply-chain of food-stuffs [22]. This practice is perceived as an innovative, long-term strategy to ensure the food security of its population at cheap prices [20]. The majority of the investors are Asian countries such as China and India, which according to the Food and Agriculture Organization's (FAO) 2009 report, are currently food self-sufficient. Likewise import dependant countries, particularly affected by the food crisis, such as Saudi Arabia, Japan and South Korea, are also in the search for fertile farmland in African countries like Uganda, Madagascar, Mali, Somalia, Sudan and Mozambique, as well as in other developing countries such as the Philippines, Indonesia, Laos, Thailand, Vietnam, Cambodia, Pakistan, Burma, Brazil, Argentina, Kazakhstan, Ukraine, etc. [16, 20, 23]. (Table 1. Shows the most recent estimates of land deals worldwide linked to the countries that are the major sources of land grabbers).

The governments of ‘host’ countries, such as Madagascar, Sudan and Cambodia, generally welcome foreign investment [24], even though much of their own population lacks sufficient food [17]. Large-scale land acquisition for food security by richer countries is increasingly contested, since it is not considered ethical to export food from countries in which there is widespread hunger. For example, Daewoo Logistics, the South Korean commercial group, failed its attempts to acquire 1.3 million hectares (over half the arable land of the country) of land in Madagascar for the production of maize for human consumption food and palm oil used in biofuels [16]. By doing this the company would have ensured future fuel stocks and guaranteed the countries’ food security “by providing half of its maize imports from Madagascar alone” [25]. Ultimately the deal ran into trouble and was a direct factor in the overthrow of the country’s government in 2009 [16].

Countries involved in land grabbing	Land purchased or leased (including deals still in process in ha)	Number of deals
UK	4,941,765	40
US	4,162,394	42
UAE	3,182,950	19
India	2,101,400	28
China	1,953,527	36
South Korea	1,412,394	16
Saudi Arabia	1,132,945	20
Germany	525,345	22

Note: Estimates have been calculated from GRAIN (2012) "GRAIN releases data set with over 400 global land grabs" Available at <http://www.grain.org/article/entries/4479-grain-releases-data-set-with-over-400-global-land-grabs>

Table 1. 2012 global estimates of major land deals carried out by governments and private companies.

In developing countries, land deals result most of the time in the displacement, dispossession and disenfranchisement of local communities. Most of the land utilized by small farmers in local communities is used under customary tenure arrangements; as a consequence, they often lack formal property titles over the land and can easily risk losing access to it [9]. In addition, most of the deals between foreign investors and local governments are arranged outside the public scope and therefore, smallholders may not even know they are losing their land. Women, who make up 70 percent of farmers in the developing world, are often the most vulnerable to this practice as they may not be able to protect their own land tenure claims in court due to local laws.

The general perception under the land deals scope is that most of the land available for buyers is abundant and underutilized; although in many cases it is already being used [6]. Existing land use is usually overlooked due to the lack of formal land rights of smallholders or their access to proper legal assistance [16]. For example, in Gambela, Ethiopia, the Ethiopian government has signed deals with investors from India, Saudi Arabia, China and other countries since 2008 for large-scale agricultural projects in the region (see Table 1). The deals give foreign investors control of half of Gambela's arable land [26]. All land allocations recorded are classified as involving 'wastelands' with no pre-existing users. As the Anywaa Survival Organization was able to verify, these are ancestral lands from which indigenous communities such as the Anuak have been dislocated. Without any information or consent for the sale and purchase of such territories, the surrounding communities have lost from these forests their refuge in times of violence, an excellent source of medicinal plants, and a valuable reserve of food during famines [26].

Land grabber	Base	Sector	Hectares	Production	Projected Investment	Status of the deal
Hunan Dafengyuan	China	Agribusiness	25,000	Sugar Cane	-----	Completed
ARS Agrofoods	India	Agribusiness	3,000	Cotton, groundnut, sesame, soybean	US \$5 million	In process
BHO Agro	India	Agribusiness	27,000	Cereal, oil seeds, pulses	US \$8/ha/yr (lease)	Completed
Karuturi	India	Agribusiness	311,000	Maize, palm oil, rice, sugar	US \$1.2/ha/yr (after first 7 years)	Completed
Ruchi Group	India	Agribusiness	50,000	Soybeans	US \$4 million (lease cost for 25,000 ha)	Completed
Al Amoudi	Saudi Arabia	Finance	140,000	Livestock, maize, oilseeds, rice sugar cane, teff	US \$2,500 million	Completed

Note: Estimates have been calculated from GRAIN (2012) "GRAIN releases data set with over 400 global land grabs"

Table 2. Examples of land deals initiated in Gambela since 2008.

These large-scale land deals increase local food insecurity as the export of locally produced agricultural products force farmers to purchase agricultural goods elsewhere as opposed to benefiting from the harvest of their own lands [27]. The country of Ethiopia claimed as the epicenter of current land deals [29], shows the direct relationship between food insecurity and land grabs. Since 1984, Ethiopia has been well known for its extreme food shortages [22]. In 2010 ten percent of its population relied on food aid [27], and in 2011, due to the dearth of rain in the Somali and Oromiya regions, the nation appealed for emergency food aid at the United Nations. Betting on economic growth projections, the Ethiopian government promised that the country would be food self-sufficient within five years. Although the economic speculation is promising it comes at the expense of the displacing and dispossession of the population as the government is closing deals with private investors over the citizen's lands [22]. The detrimental effects of these land deals were evident during the 2008 famine in which food instability levels increased among the population while food was being exported [30]. The USAID, which has been one of Ethiopia's largest aid donors, is strong critic to this practice, and argues that the right way to

ensure the country's food security is by guaranteeing the complete ownership of land by its citizens and to stimulate the local consumption [31]. Nevertheless, the irony of these land deals continued as a \$116-million food aid package is planned to reach the African nation for a five-year period, while, contradictorily in 2009 there was a simultaneous \$100-million Saudi investment to grow and export rice, wheat and barley back to itself [22].

2.2. The “food and biofuels conflict”

The recent global awareness of anthropogenic climate change and the resulting growing interest in green energy, including biofuels, have been another important motivation for land investments. Currently biofuel production is the dominant reason for land deals in countries such as Madagascar and Ethiopia, where jatropha, palm oil and sugar are major crops. According to the Global Land Report 2010 (GLP) biofuels production is an important driver for the international land investments in Africa [9]. These deals are driven in part by the international demand for renewable fuels and the shifts in energy policy among Southern African countries to fulfill their energy needs with their own natural resources [32]. This growing interest on green energy is leading investors to invest in productive land overseas which results in the opening of new land for agriculture [9]. Many see this as a strategy by the private sector to take advantage of the emerging market of green energy. For instance, countries like China wish to diversify its domestic energy sector [9] due to the increasing demand of oil and its high global prices. Hence, the growing production of biofuels has started to affect the current food production as land deals keep taking place in the international scope.

On the other hand, many Southern African countries have actively embraced the biofuels productions in their lands, as they wish to limit their dependence on future oil imports and exposure to price volatility [32] by becoming oil producers. Mozambique is a perfect example. With the goal of becoming an ‘oil exporting country’ on 2004 the Mozambique government urged farmers to plant jatropha - a Latin American shrub which seeds produce an oil that upon extraction can be refined to produce biodiesel - on all marginal and unused lands [33]. Although there is evidence that this crop will perform poorly under harsh agro-ecological conditions, the building of cultivation and processing facilities for the production of biodiesel derived from this plant have been initiated.

2.3. Seeking land and water

When seeking arable land overseas foreign investor's main targets are lands with access to irrigation for better potential production of food or biofuels [13]. According to the International Institute for Sustainable Development, the ultimate goal of the purchase or long-term lease of land in foreign countries is the acquisition of the water rights [34]. This practice allows major investor countries facing water scarcity to shift their domestic irrigation water to municipal water supplies [13]. We find China, India, Saudi Arabia, Kuwait, Qatar, and Bahrain among this type of investors group. African and Asian countries rich in land and water resources are the primary targets for their land investments [6]. For

example, Central Africa only uses irrigation resources in two percent of its land, making an investment in this untapped water resource a very appealing proposition [35]. However, as abundant as water may seem, predictions from the Intergovernmental Panel on Climate Change (IPCC) suggest that fresh water supplies are likely to be depleted in some parts of Africa. As a result of climate change, lands will become drier, with less rainfall, affecting crop yields and making livestock farming impossible. In this possible scenario the water required to slake the investors' fields could be considerable [13]. Along this line, biofuels have been described as "one of the thirstiest products on the planet". For example, to produce one liter of biodiesel from soya (soybeans) requires 9,100 liters of water. As for the production of bioethanol from corn or sugar cane there is a requirement of as much as 4,000 liters of water for one liter of bioethanol. Still, even those biofuels considered to be optimal for arid places require large amounts of water in order to grow [24].

3. How land grabs can exacerbate climate change

Climate change as defined by the IPCC refers to "... a statistically significant variation in either the mean state of the climate or in its variability... Climate change may be due to natural internal processes or external forcing to persistent anthropogenic changes in the composition of the atmosphere or in land use." The atmospheric changes associated with this phenomenon can be observed at all spatial levels from local to regional to global. It affects average global surface temperatures and sea levels, soil moisture and local precipitation, among other variables [36]. Currently, human society practices are negatively influencing these variables and thus, exacerbating this atmospheric phenomenon. Practices such as fuel burning and deforestation for agricultural purposes can have great influence in the world's climates.

As referenced in Cotula et. al (2009), 80% of the global farmland is located in Africa and South America [37]. Most of these areas are either tropical rainforests, protected natural regions or are already used for shifting cultivation or grazing of animals [38]. However, they represent the most suitable regions for land deal investments. But the conversion of tropical forests to crop land, (mostly monocrops) come as an inevitable threat to the region's biodiversity, carbon stocks and water resources [6]. Tropical forests do not only serve as reservoirs, sinks, and sources of carbon in the world, but also provide several ecosystem services that have impacts on a region's climate. Among these services are the maintenance of elevated soil moisture and surface air humidity, reduction of sunlight penetration, weaker near-surface winds and the inhibition of anaerobic soil conditions [39]. This environmental arrangement is responsible for the rich biodiversity of tropical ecosystems [40]. However, as tropical landscapes are converted to agricultural and pasture areas, the productivity of this soil decreases as less rainfall, associated with changes in the solar radiation partitioning, is observed [39].

Many studies have demonstrated that changes in land surfaces (such as land clearing for agriculture) can influence both local and regional climates and can even have major impacts on climates in distant parts of the Earth [36]. For example, the Amazon Basin landscape is

well known for having a direct influence in the flux and exchange of moisture into the atmosphere, regional convection, and hence regional rainfall. However, recent works have determined that the changes in the forest cover of the region have consequences on climates of distant places. The Sahelian drought associated with the destruction of regional vegetation [36] serves as another example of the relationship between changes in land cover and distant climates. In this sense, land deals can be considered major drivers of ecological impacts at both local and global scales. Such impacts can affect the ecosystem services that sustain human livelihoods as conversion of tropical forests to pastures takes place globally.

4. Food security under climate change

Food security defined by the United Nation's FAO is "a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active healthy life" [40]. The definition encompasses four important dimensions of food supplies; -food availability, stability of food supplies, access to food, and utilization of food - all of which are closely linked with impacts of climate change. First, food availability refers to whether or not the agricultural productivity of a region can satisfy food demand in that region. Second, food stability is an indication of how consistently the supply meets that demand. Third, access to food literally means the ability of individuals to buy proper food resources for their dietary needs. Lastly, utilization of food references how well individuals can consume food resources without undue concern for quality and safety of food [41].

Climate change affects almost every aspect of human society and natural environment, especially production of agriculture and food in multiple ways. Since many agricultural regions in the world have already suffered from extended drought and abrupt flood induced by global climate change, weather and climate variability will possibly change conditions of land suitability and agricultural productions [41]. Although temperate regions and higher latitude zones may get benefits of agricultural productivity by increasing temperature due to climate change, negative effects such as heavy rainfall, drought, and increased evapotranspiration on other regions (e.g., rain forest, semi arid region, and Mediterranean region) may hinder food availability in general [42].

Many predictions indicate that global and regional weather fluctuations and extreme weather events are expected to increase in frequency and intensity [43]. Because of the weather fluctuations, crop yields and local food supplies will also fluctuate and thus food stability and security could be adversely affected [41]. For example, extreme weather events like typhoons, hailstorms, and droughts will bring failure of crop yields. Specifically, sub-Saharan Africa and parts of south Asia, where most of high climate variable and arable lands are located, will be exposed to the highest instability of crops and livestock production [44]. Although the FAO predicted that access to food will be getting better in the long term based on falling food prices and increasing income level [45], this prediction might not consider the effects of global climate change that can possibly deteriorate the progress of food accessibility. Thus, if the situations - food prices,

amount of crop yields, and supplies - of world food markets change under certain weather events, the ability to access food would also be changed as the recent food crisis in 2007 and 2008 suggests. In addition, the IPCC recently reported that increasing temperature will increase incident of more food poisoning, specifically in temperate areas, and cause food and water-borne diseases [43]. This means that individuals will need to more cautiously select and consume their foods. Thus food utilization, the last key dimension of food security, will also be affected by climate change.

All the key dimensions of food security induced by climate change consequently affect land deals in terms of both “host” and “investor” countries. Many host countries already face food shortages and difficulty to access food within local areas where land deals take place. Since land has shifted to foreign buyers, local communities cannot utilize their immediately surrounding land to produce food [13]. Many foreign investor countries, however, may take advantages of all dimensions of food security such as food availability, stability, accessibility, and utilization. Host countries are willing to sell their land in order to take advantage of short-term economic growth opportunities, due to the large-scale nature of land acquisition by investors. [37]. This tends to increase and accelerate land grabs in developing countries overall. Therefore climate change causes food insecurity in a way that changes temperature and precipitation in the first place and then food insecurity brings us more land grab to mitigate food shortages. Those three elements - climate change, food security, and land grab - are interconnected and, unfortunately, are detriment to each other.

5. Vicious circle among climate change, food security, and land grab

In the previous sections of the chapter, each two of three elements (i.e., food security and land grab, land grab and climate change, and climate change and food security) have been investigated through literature reviews in relation to climate change, food security, bio-fuels, and land grab. Explanations gained by reviewing relationships between each two elements, however, do not efficiently reveal the causal relationship among the elements and how closely coupled they are with each other. In this section, we attempt to describe the causal relationships among them in terms of a vicious circle framework.

Causal relationships among climate change, food security, and land grab make current situation worse in Global South, where people already have been suffering from food shortage and severe weather events, and increase vulnerability to climate change. Each of three elements adversely affects people in Global South in different ways that particularly threaten their livelihood, safety, and health. As discussed in the previous sections many other factors influence each of the three phenomena. For instance, land grab did not evolved due to food insecurity alone but growing global population, green energy demand, economic growth, and political reason [9]. Climate change and food security also have many reasons other than the factors in the Figure 1, however, since climate change, food security, and land grab in the circle are closely coupled, each of three elements will be treated as main driving forces in the vicious circle framework.

Figure 1 shows a vicious circle of climate change, food security, and land grab that is proposed by this chapter based on the review of relevant studies. As noted previously, climate change is likely to affect food security by increasing extreme weather events (e.g. extended drought, frequent and severe flood, cyclones, and hailstorms) which change land suitability for food production. In addition, demands to reduce carbon dioxide and other greenhouse gases, increased by human activities, lead the international society to seek alternative energy sources, biofuels and agrofuels thus esteemed as alternative energy sources that produce less CO₂ and greenhouse gases. However, enormous amount of crops and crop fields are required to produce alternative green energy [24]. Since climate change is, again, a common driving force of increasing severe weather events and green energy demands, it degrades food security and increases demand of land grabs in general.

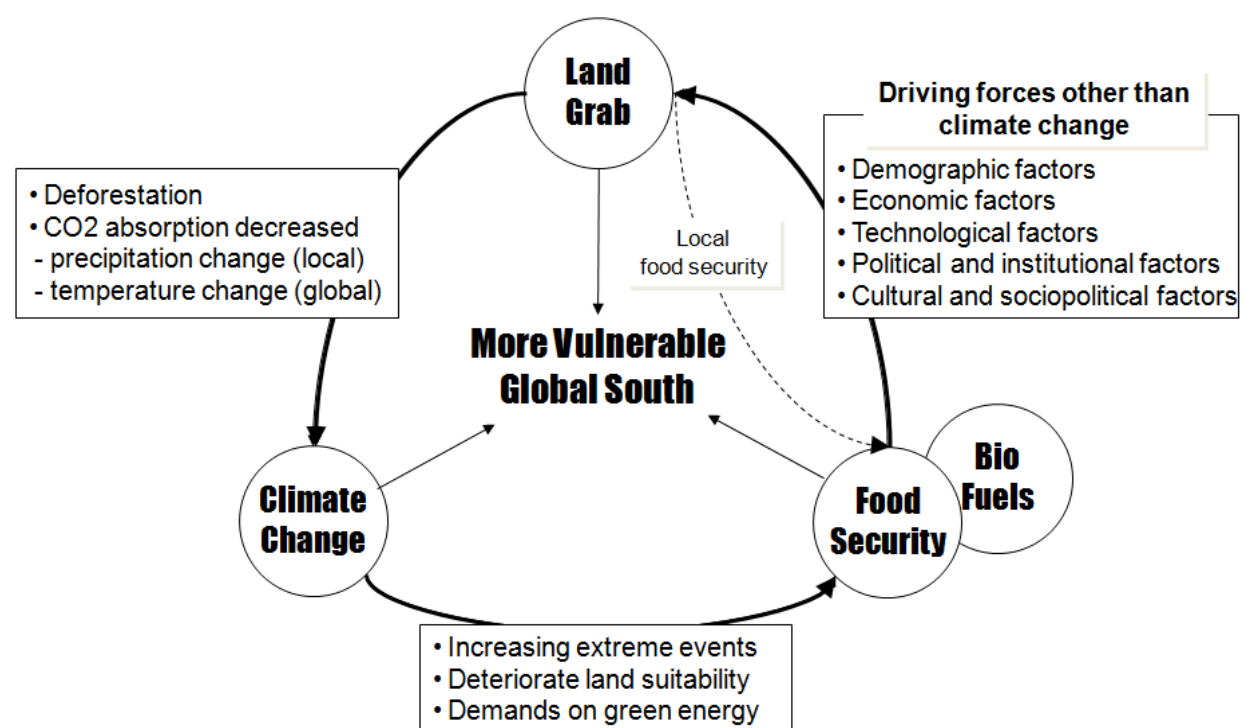


Figure 1. Vicious circle of climate change, food security, and land grab

Along with food security and biofuels, there are many other underlying driving forces that accelerate land grabs such as demographic, economic, technological, political, institutional, cultural, and sociopolitical factors [9]. For example, world population has been increasing about 34% for 2 decades by 2007 and will keep increasing until 2050 under the medium scenario projection of the United Nations [46]. This means that the average amount of land per person will keep decreasing and population disparity at the global scale will consequently increase cross-national land deals [9]. The global economy also acts on land deals when agriculture attracts as an investment opportunity. At the same time, land grab exacerbates local food insecurity; because most of the regions, where land deals take place, have already been experiencing famine for a long time, even if the regions themselves have plenty of fertile lands.

The influence of land grabs to climate change significantly increases with deforestation in tropical rainforests where protected natural areas are also located [38]. Deforestation itself, particularly in tropical rainforest, has an adverse effect on reducing carbon dioxide and greenhouse gases through the process of photosynthesis. For example, some studies show that large amount of trees cleared for palm oil crop field can actually hold up to 150 years of carbon savings, and biofuels, which are initially proposed to decrease carbon dioxide and greenhouse gases, also negatively affect climate change by increasing CO₂ and greenhouse gases [24].

Analysis of causal relationship among climate change, food security, and land grab confirms existence of a vicious circle that exacerbates vulnerability of poor and small farmers to climate change, and the safety and health of the Global South. Therefore it is important that efforts should be dedicated to disconnect each element of vicious circle or, if it is possible, focused on changing vicious circle into virtuous circle, since climate change, food security, and land grab have already threatened people there.

6. Discussion

Studies have shown that global land deals have increased dramatically in recent years, especially during the food crisis of 2007 and 2008. Some countries that need to guarantee food security and biofuels production as a strategy to cope with impacts of climate change and some other factors (i.e., demographic and economic factors) increased a scale of land deals in Global South. Consequently land deals have increased possibility of the climate change impacts by increasing deforestation. Deepening climate change once again can exacerbate food security and increases biofuels demands. This implies that the relationships between land grabs, climate change, and food security make vicious circle. However, it is not easy to approach for solutions from climate change perspective to ameliorate the vicious circle, while it is relatively easy to approach solutions from land grabs and food security perspective. That is because land grabs and food security are specific issues compared to the climate change discourse - one of the most complex issues of our day. This part of the chapter thus approaches to deal with land grabs and food security issues to dismantle the vicious circle.

As illustrated in Figure 1, climate change, food security, and land grabs are connected, and each element has harmful effects to the one next to it in a predominantly counter clockwise direction. This is why we named the framework as the vicious circle and it has causal relationship among elements. Although climate change, food security and land grabs are the main subjects of our conceptual model, they do not stand alone (see in the boxes of Figure 1). Some of them affect reverse direction (e.g. land grab causes local food insecurity). However, the three elements are core sources of making vicious circle to people in Global South. It is important to dismantle and neutralize this circle, as each element is primarily responsible for the damage done to the next. There are both short-term and long-term policies or strategies that may accomplish this. For example, long-term strategies should be suggested for climate change issues. However, this chapter will not touch any policies and strategies on mitigation, adaptation, and vulnerability directly to climate change, since nature of climate change cannot shortly be improved by any efforts due to the complexity of

the climate change itself. Instead, policies for land grab and food security (include biofuels) can be discussed as short-term policies.

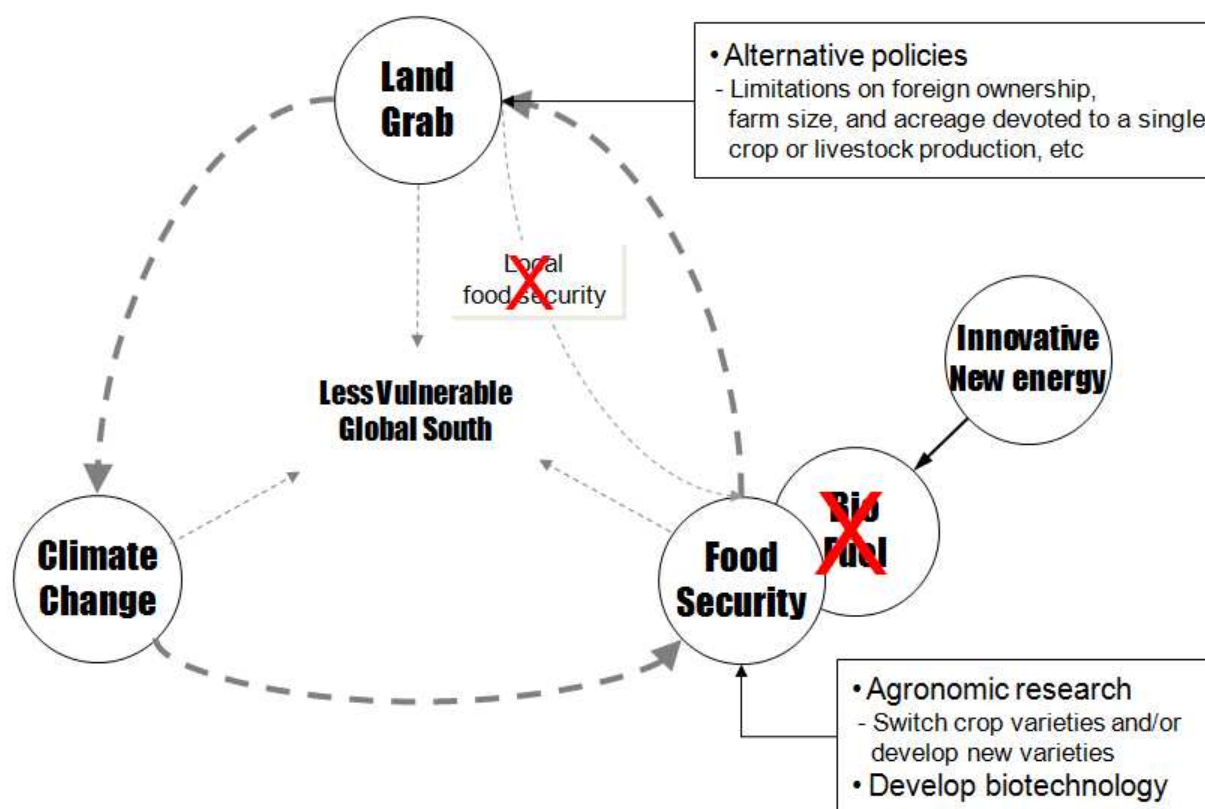


Figure 2. Loosely-coupled and disconnected by applying alternative policies over time

First, land grab can be reduced and controlled relatively in short time period, if countries targeted for land deals recognize the outcomes and tradeoffs of these deals (e.g. local food insecurity) and regulate it through alliance with countries in similar condition. In fact, some host countries are already considering alternative policies such as “strict limitations on foreign ownership of land; limitations on farm size/land ownership; limitations on the farm acreage dedicated to a single crop or livestock production (soy monoculture, for example); limitations on the total national acreage devoted to a single crop or livestock production, and; limitations on the strict controls on foreign investment in food and agriculture.” [17]. Second, there might be alternatives for food security that may lead to reduce land grabs. Governments depending on imported food could help domestic farmers to increase production by agronomic research. For instance, farmers in food importing countries switch crop varieties and/or develop new varieties better able to produce in terms of volume, and develop biotechnology as well. Third, as a direct competitor to food production and another driving force of the land deals the biofuel production should be alternated by technologically innovative new energy sources [47], since production of biofuels does not really help reduce greenhouse gases, but increases land grab and worsen climate change. Countries seeking green and new alternative energy sources invest in, hydrogen fuel, wind power, solar power, and tidal power, for instance.

Innovative approaches to increase food and energy security suggested above will likely reduce land grabs. Each of the efforts suggested above will keep reducing issues along the line of vicious circle. Even though only a few short-term policies were suggested here, there might be more solutions and efforts to remove many issues in the vicious circle of climate change, food security, and land grab over time. Therefore, the short-term policies connected with long-term policies to climate change may pragmatically trigger a transformation of the vicious circle into a more virtuous circle or at least weaken the connection between each two of the elements (Figure 2).

7. Conclusion

There are many studies on the relationship between climate change and food security, food security/biofuels and land grab, and land grab and climate change. However, isolating and addressing one pair of issues at a time masks what is really going on in terms of the vicious circle which keeps each element in the circle locked into a downward spiral. The people in the Global South, especially in Africa, are thus more vulnerable to conditions out of their control. This chapter examined the relationship between climate change, food security/biofuels, and land grab as a concept of the vicious circle. To reduce problems in the vicious circle, first of all, each pairs were examined to figure out issues between pairs respectively. Second, causal relations among the elements were shown and explained as the vicious circle. Lastly, based on the examination, disconnecting solutions, in terms of policies, were briefly suggested.

Despite many other factors, this chapter has only focused on the three elements; climate change, food security, and land grab, as the vicious circle. This does not mean that policies suggested here may solve all the issues on climate change, food security, and land grab, but solve or weaken some issues of them. Furthermore, policies may trigger a disconnecting of the links in the vicious circle or transform the vicious circle into a virtuous circle with other possible policy efforts, and can be starting point of reducing vulnerability of people in Global South.

Author details

Kihwan Seo*

School of Geographical Sciences and Urban Planning, Arizona State University, USA

Natalia Rodriguez

School of Sustainability, Arizona State University, USA

Acknowledgments

The authors would like to thank the editor Netra Chhetri who gave us valuable advice and opportunity to write a chapter. We also thank Helme Castro and Evan Palmer for their careful and quick proofreading of our manuscripts.

* Corresponding author

8. References

- [1] Damerow H (2010) International Politics, web lecture note. Available: http://faculty.ucc.edu/egh-damerow/global_south.htm. (accessed 18 June 2012).
- [2] Lutz W, Samir KC. Dimensions of global population projections: what do we know about future population trends and structures? *Phil. Trans. R. Soc. B* 2010; 365, 2779–2791.
- [3] Borlaug N, Carter J. “Food for Thought”. *Wall Street Journal*. Oct 14, 2005 p. A10.
- [4] MA (2005) *Ecosystems and Human Well-being: Synthesis*, Washington. DC, Island Press.
- [5] Scherr SJ, McNeely JA. Biodiversity conservation and agricultural sustainability: towards a new paradigm of ‘ecoagriculture’ landscapes. *Phil. Trans. R. Soc. B*. 2008; 363, 477–494.
- [6] von Braun J, Meinzen-Dick R “Land grabbing” by foreign investors in developing countries: Risks and opportunities. IFPRI Policy Brief 13. International Food Policy Research Institute, Washington 2009.
- [7] Abbott P, Hurt C, Tyner W. “What’s Driving Food Prices?”, Issue Report, Farm Foundation, July 2008.
- [8] Pretty J, et al. The top 100 questions of importance to the future of global agriculture. *International Journal of Agricultural Sustainability* 2010. <http://ucanr.org/blogs/food/blogfiles/5698.pdf>. (accessed 29 November 2011).
- [9] Friis C, Reenberg A. Land grab in Africa: Emerging land system drivers in a teleconnected world. GLP Report No. 1. GLP-IPO, 2010 Copenhagen.
- [10] Liverman D., Kapadia K. Food Systems and the Global Environmental Change: An Overview. In: Ingram J, Ericksen P, Liverman D. (ed.) *Food Security and Global Climate Change*. London: Earthscan; 2010 p. 3–24.
- [11] Haralambous S., Liversage H., Romano M., 2009. The growing demand for land Risks and opportunities for smallholders farmers. IFAD, 32d session of Governing Council, Rome, 17 p.
- [12] Freeman, D., J. Holslag & S. Weil (2009), ‘China’s Foreign Farming Policy: Can Land Provide Security?’, BICCS Asia Paper, vol. 3, nr 9, Brussels Institute of Contemporary China Studies, Brussels
- [13] Food and Water Europe: Global Land Grab Undermines Food Security in the Developing World. — <http://www.foodandwaterwatch.org/factsheet/global-land-grab/> (accessed 15 November 2011)
- [14] De Schutter. United Nations. “Large-scale land acquisitions and leases: A set of core principles and measures to address the human rights challenge.” June 11, 2009
- [15] Hall R. Land grabbing in Southern Africa: the many faces of the investor rush, *Review of African Political Economy* 2011; 38:128, 193–214
- [16] Cotula, L. Land deals in Africa: What is in the contracts? IIED, London 2011.
- [17] Zoomers A. Globalisation and the Foreignisation of Space: Seven Processes Driving the Current Global Land Grab. *Journal of Peasant Studies* 2010; 37:429–447.
- [18] Brown L. *World on the Edge*. Earth Policy Institute: London 2011.

- [19] Scoones I. A Global land grab? Institute of Development Studies.(IDS) 2009. <http://www.ids.ac.uk/go/news/a-global-land-grab>. (accessed 16 November 2011)
- [20] GRAIN: Seized! The 2008 land grab for food and financial security. <http://www.grain.org/briefings/?id=21>. (accessed 14 November 2011)
- [21] FAO: The State of Food Insecurity in the World 2008 (SOFI): High Food Prices and Food Security- Threats and opportunities, Rome 2008, FAO.
- [22] Cochrane L. Food Security or Food Sovereignty: The Case of Land Grabs. Journal of Humanitarian Assistance. <http://sites.tufts.edu/jha/archives/1241>. (accessed 20 October 2011)
- [23] Taylor M, Bending T. Increasing commercial pressure on land: building a coordinated response. Discussion paper. Rome: International Land Coalition 2009.
- [24] Burley H, Bebb A. Africa: up for grabs – the scale and impact of land grabbing for agrofuels. Friends of the Earth Europe, Brussels, Belgium 2010. http://www.foeeurope.org/agrofuels/FoEE_Africa_up_for_grabs_2010.pdf. (accessed 14 October 2011)
- [25] Ramiaramananana D. 'Impacts of land grabbing in Madagascar'. Presentation at the Regional Workshop on Commercialisation of Land and 'Land Grabbing', Southern Africa hosted by the Institute for Poverty, Land and Agrarian Studies (PLAAS), University of the Western Cape; 2010 Mar 24-25.
- [26] GRAIN: Grabbing Gambela. http://www.grain.org/bulletin_board/entries/4387-grabbing-gambela#. (accessed 14 November 2011)
- [27] Food First: Landmark Conference on Land Grabbing. <http://www.foodfirst.org/en/Land+grabbing>. (accessed 23 November 2011)
- [28] Vidal J. Ethiopia at Centre of Global Farmland Rush. The Guardian [newspaper online] <http://www.guardian.co.uk/world/2011/mar/21/ethiopia-centre-global-farmland-rush>. (accessed 16 November 2011)
- [29] Reuters: Ethiopia, UN launch food appeal for 2.8 mln people. <http://af.reuters.com/article/topNews/idAFJOE7160MB20110207>. (accessed 16 November 2011)
- [30] Dominguez A. Why was there still malnutrition in Ethiopia in 2008? Causes and Humanitarian Accountability. Journal of Humanitarian Assistance. <http://sites.tufts.edu/jha/archives/640>. (accessed 24 November 2011)
- [31] USAID Ethiopia – FY 2010 Implementation Plan. Available: http://www.feedthefuture.gov/documents/FTF_2010_Implementation_Plan_Ethiopia.pdf
- [32] Sulle E, Nelson F. Biofuels, land access and rural livelihoods in Tanzania. London: International Institute for Environment
- [33] Schut M, Slingerland M, Locke A. 'Biofuel developments in Mozambique: Update and analysis of policy, potential and reality'. Energy Policy 2010; 38(9), 5151-5165.
- [34] Smaller C, Mann H. "A Thirst for Distant Lands: Foreign investment in agricultural land and water." International Institute for Sustainable Development (IISD) 2009. <http://www.iisd.org/publications/pub.aspx?id=1122>. (accessed 20 November 2011)
- [35] FAO (2008) "Ministerial Conference on Water for Agriculture and Energy in Africa: The Challenges of Climate Change." Dec 15-17.

- [36] Rosenzweig C, Tubiello F N, Goldberg R., Mills E, Bloomfield J. Increased crop damage in the US from excess precipitation under climate change, *Global Environmental Change* 2002; 12 197-202.
- [37] Cotula L, Vermeulen S, Leonard R, Keeley J. Land grab or development opportunity? Agricultural investment and international land deals in Africa. Rome/London, UN (FAO) / (IFAD) /(IIED) 2009. <http://www.iied.org/pubs/display.php?o=12561IIED>
- [38] Ramankutty N, Foley JA, Olejniczak. NJ. People on the land: Changes in global population and croplands during the 20th century. *Ambio: A Journal of the Human Environment* 2002; 31(3): 251-257.
- [39] Pielke Sr, R.A, Marland G, Betts RA, Chase T.N, Eastman JL, Niles JO, Niyogi D, Running SW . The influence of land-use change and landscape dynamics on the climate system—relevance to climate change policy beyond the radiative effect of greenhouse gases. *Phil. Trans. R. Soc. Lond. A* 2002; 360, no. 1797 1705-1719.
- [40] Food and Agriculture Organization. (2002) *The State of Food Insecurity in the World 2001*, Food and Agriculture Organization, Rome.
- [41] Schmidhuber, J. & Tubiello. F.N. (2007) *Global food security under climate change*, *Proceedings of the National Academy of Sciences*.
- [42] Rosenzweig, C., Tubiello, F. N., Goldberg, R., Mills, E. & Bloomfield, J. (2002) Increased crop damage in the US from excess precipitation under climate change, *Global Environmental Change* Vol.(12): 197-202.
- [43] Intergovernmental Panel on Climate Change. (2007) *Climate Change: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge Univ Press, Cambridge, UK, in press.
- [44] Bruinsma, J. (2003) *World agriculture: towards 2015/2030, a FAO perspective*, Earthscan, London.
- [45] Food and Agriculture Organization. (2006) *World agriculture: towards 2030/2050*, Interim report. Food and Agriculture Organization, Rome.
- [46] United Nations. (2004) *World Population to 2300 - Economic & Social Affairs*, United Nations, New York.
- [47] Atkinson, R., Chhetri, N., Freed, J., Galiana, I., Green, C., Hayward, S., Jenkins, J., Malone, E., Nordhaus, T., Pielke, Jr. R., Prins, G., Rayner, S., Sarewitz, D., & Shellenberger, M. (2011) *Climate Pragmatism: innovation, resilience and no regrets - The Hartwell analysis in an American context*.