

Population growth and urbanisation in China:
land grabbing as a way to compensate
the potential loss of farmland?

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Preface

What started out as a train of thought on three separate events, with a simple $A+B=C$ hypothesis on population growth, urbanisation and land grabbing, quickly became a complex research. While encountering issues and finding results I did not foresee at the start, I managed to move through the research process towards a surprisingly interesting conclusion. It always turns out to be more complex than you image at the start.

You are about to read the final part of my journey to graduate from the Environmental Infrastructure and Planning master programme. It has been a long journey with both ups and downs. I really came to face myself during the writing and researching of this thesis. In that perspective you could say that writing this thesis was not only a way to research an interesting topic but also a lesson for life. However, it is now finally finished and I could not be happier to be done with it and focus myself on to the next stage of my life.

Acknowledgements

But, saying I have done it all on my own would not give credits to those who guided me through the thesis process or supported me in other ways.

Firstly I would like to thank my Academic Supervisor from the Faculty of Spatial Sciences, dr. ir. T. (Terry) van Dijk. Terry guided me through the start up process to form the layout of the research and he provided frequent feedback on the ongoing process. It was a pleasure to have you as a supervisor.

Secondly, I would like to thank Linda Schouwenaars who helped me to check the spelling errors in this thesis.

Thirdly, I would like to thank a fellow student who helped me by providing a critical view of my work in progress.

And last but certainly not least, I would like to thank my parents, Theo and Marianne, who have been a constant supporting factor during my student career. I would also like to thank the rest of my family for supporting me as well.

I hope you will enjoy reading my Master Thesis.

Jorrit Bijkerk

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Abstract

China is going through a transition which could increase their population growth. The country is moving from a one-child to a two-child policy. The expected population growth, combined with the increasing urbanisation rate creates a tension between the available agricultural land and the required agricultural land. As a country with 21 percent of the world's population and only 7 percent of the arable land, it is facing a dilemma in its land use. Urbanization and industrialization have boosted the economy over the last 60 years. But this economic growth has left its marks on the environment and its agricultural production capabilities. In this research we look at the process of population growth due to the two-child policy, urbanisation and farmland protection. We also look at the demand for food, a changing diet due to increased income among the Chinese population, the negative effects of soil degradation and pollution and improvements that can be made in the agricultural sector. By doing so, we can determine if there is a tension between the AAL and the RAL and if so, is this tension the reason for large scale overseas investments made by China.

Keywords:

Population growth, Urbanisation, China, Land grabbing, Food security, World Food Crisis, Farmland, Land tenure, Diet change

Abbreviations

OCP - One-Child Policy

PRC - People's Republic of China

AAL - Available Agricultural Land

RAL - Required Agricultural Land

GDP - Gross Domestic Product

FDI - Foreign Direct Investment

FAO - Food and Agriculture Organization of the United Nations

OECD - Organisation for Economic Cooperation and Development

NBSC – National Bureau of Statistics of China

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Chapter 1: Introduction

1.1 Context of population growth and urbanisation in China.

The vast scale of China makes an interesting subject for research. China has provinces with numbers of inhabitants that could resemble an entire country. Changes in China affect the rest of the world, as for instance can be seen in the enormous demand for raw materials for the growing economy. This results in an increase of the national GDP and a rise in welfare levels across the population. The latter consequently keeps on moving to the cities, where the wages are higher, leading to more urbanisation to house them. "*The structure of the Chinese diet is changing with improved income, particularly in the low- and middle income groups*" (Du, et al., 2004, p. 1512). The increase in income leads to changes in diets e.g. less grain and more meat. At the same time, the increased wages push the demand for more luxury items and with that an increased demand for energy.

1.2 Motivation

The topic of this research is based on various news articles and an interesting book.

1. On the 24th of September 2013 the NOS¹ reported a news article on the large scale land rental of farm land in Ukraine by China. The land deal starts with an area of 100.000 hectare but will gradually be expanded to three million hectares which equals to five percent surface area of Ukraine. Also a number of infrastructure projects in the form of highways and bridges will be built by China. This seemed strange to me, why would China invest all the way in Ukraine?
2. The Dutch newspaper NRC Next dedicated a two page special² on the population growth of China and its one-child policy. It stated that the Chinese government is planning to end the one child per family rule in favour of a maximum of two children per family. Therefore the already large population of China is expected to increase rapidly in the coming years.
3. Due to a guest lecture on Chinese Megacities at the TU Delft, I came across the book: '*How the city moved to Mr Sun, China's new megacities*' by Michiel Hulshof and Daan Roggeveen. The book discusses the process of urban growth and expansion by megacities and the loss of farmland in China. It also discusses other social and economical changes China has to face.

¹ <http://nos.nl/artikel/554791-china-gaat-boeren-in-oekraïne.html>

² NRC Next, page 4-5, Tuesday august 6th, 2013 (Garschagen, 2013)

On their own, these three do not appear to be so special to begin with. But there seems to be a connection that links them together. Due to the transition of the one-child policy towards a two-child policy in China, its population is predicted to increase rapidly and so could its cities. Currently already more than 50 percent of the Chinese population live in cities. With the growing population, those cities will continue to grow in size, and with the expansion of those cities precious farmland will come under pressure to be converted into urban areas. With the reduction of farmland, the amount of food produced will most likely decline. This could potentially lead to large amounts of farmland being rented by the Chinese government and private Chinese corporations in countries all around the world. Just like the large amount of farmland rented in the Ukraine by China.

The three topics described on the previous page were all relevant in the media in the last few years, making them currently interesting to research. Especially the topic of land grabbing is a fairly new phenomenon over the last few years, and it is getting more and more attention in the world. It has both social and spatial implications for now and especially in the future. The main focus of the research will therefore be the tension between the amount of land needed and the amount that is available in order to feed the population. The sub focus will be on land grabbing. In this way, a possible connection between population growth, urbanisation and land grabbing can be researched.

1.3 Problem statement

The act of land grabbing seems to be a new developing trend of the past decade, as Cotula (2012, p. 649) explains: *“Over the past few years, agribusiness, investment funds and government agencies have been acquiring long-term rights over large areas of farmland in lower income countries.”* A number of countries in the world, one of which is China, seem to be more and more interested in renting or grabbing land in other countries in order to mine for resources or cultivate vast amounts of farmland for the production of food. This process of land grabbing can benefit the supplying country by providing new livelihood opportunities in lower income countries where farmland would otherwise be undeveloped or mining would come to a halt. Also extra ‘development aid’ could be received in exchange for land use, or the construction of infrastructure.

On the other hand, this leads to a loss of farmland for the domestic food production. Food or other resources are flowing out of the country, possibly creating food shortages. Corruption and bribery are often associated with these land deals. Although the arguments concerning mining and corruption are beyond our topic, they are nevertheless important to mention.

The reason for this act of land grabbing has never been clearly expressed by China in a publication. The immediate cause remains a guess for researchers and everyone else. A huge country like China can have many reasons and influential

factors which lead to the act of land grabbing. An increase in the population due to a change, like the conversion from a one-child to a two-child policy, increases the need for food. Also, a growing population influences the urban growth of already large cities. Urbanization puts pressure on the conversion of agricultural land into urban areas.

Another effect of the megacities is the growing need of energy. In order to provide in the energy demand, megaprojects (e.g. Three Gorges Dam) that generate this energy have been realised. But an adverse effect of this is the loss of (potential) farmland. The Three Gorges Dam alone relocated over two million people and caused 40.500 hectares of flooded farmland (Sullivan, 2005).

1.4 Goal of the research and question

The first goal of this research is to explore the tension between the AAL and the RAL. This possible tension could be the result of population growth and urbanisation. This could lead to the compensation of agricultural lands via land grabbing. More specific, is China compensating its possible decline of available agricultural land with land grabbing elsewhere in the world?

The second goal of this research is to find out if this decline in China's available agricultural land is caused by China's population growth. Thirdly, with this thesis research we attempt to find out whether the hypothesis is correct: *'Is there a connection or link between land grabbing, population growth and urban growth, or not?'*

The research question will be:

Is China's land grabbing a way to compensate the tension between available- and required agricultural land due to population growth and urbanisation?

Sub questions that aim to help answering this research question are:

- Which are the driving forces for land grabbing?
- What is China's population growth prediction for the coming decennia?
- What is the process of farmland conversion in urban areas like?
- Which other factors influence the tension between AAL and RAL?
- Which sectors is China investing in overseas?

1.5 Outline

In chapter 2 we provide a background in which the one-child policy is further explained together with the effects this policy has had on the population and why China is moving to a two-child policy.

The chapter further provides a background on land grabbing, with a discourse to provide an overview on the topic. Furthermore, a number of general drives for land grabbing are listed to indicate a possible reason for land grabbing which could be used in the conclusion of this research.

Lastly, a small background is provided on the world food crisis as this event has led to increasing food prices around the world. It also underlines the importance of food self-sufficiency.

The chapter ends with an overview of the most important points and the conceptual model which forms the backbone to the rest of the research.

Chapter 3 contains the methodology of the research.

Chapter 4 displays the collected data. It is presented without a definitive conclusion, in the following order:

- Chapter 4.2: Population growth
- Chapter 4.3: Urbanisation
- Chapter 4.4: Demand for food
- Chapter 4.5: Soil degradation and pollution
- Chapter 4.6: Improved agricultural engineering
- Chapter 4.7: Tension overview
- Chapter 4.8: Areas China invests in

In chapter 5 we come to the conclusion of this research. The collected data are repeated in a short overview of the conceptual model. A conclusion is given to each step. These sub-conclusions are followed by the main conclusion.

The second part of the chapter contains the discussion, a number of questionable issues are discussed.

In chapter 6 the author reflects on the research process and the lessons that were learnt during the research.

Finally, the bibliography is listed in chapter 7.

Chapter 2: Background

This chapter consists of four parts. Firstly, a background on the one-child policy is provided. This background is helpful if we are to understand why China is moving to a two-child policy which could lead to a rapid population growth.

Secondly the discourse on land grabbing is presented. It explains land grabbing and how it takes place. This is followed by an overview of general drives for land grabbing. Thirdly, there's an overview of the world food crisis.

Lastly is the overview and the conceptual model.

2.1 One-child policy

The one-child policy was implemented in 1979 as a set of government regulations in order to control the rapid population growth. These regulations worked by introducing fines and the exclusion of free obstetric care services to families who exceeded the prescribed family sizes. The fine for an unapproved birth was ten-twenty percent of the family's annual income. In addition to the financial repercussions there was also the social pressure against an unapproved family expansion. According to Doherty (2001) unapproved pregnancies in a village would force families with an approved pregnancy to wait a year in order to not exceed the community's yearly birth quota. This led to social tension in villages. China's National Population and Family Planning Commission (NPFPC) was responsible for the policy implementation which, according to Alcorn (2013, p. 983), has prevented the birth of over 400 million baby's.

Although the one-child policy is the most known family planning policy in China, it is not the first. There have been several other attempts to maintain a grip on the population growth by the Chinese government. Bongaarts and Greenhalgh (1985, p. 586)³ explain that the first two planning attempts were limited and ineffective due to the implementation of the 'Great Leap Forward' and the 'Cultural Revolution' programs. However, the following two policies, the later-longer-fewer campaign and the one-child policy proved much more effective. *"Launched in 1971, the later-longer-fewer (wan xi shao) campaign introduced three reproductive goals - later marriage, longer spacing between first and subsequent children, and fewer children"* (1985, p. 586). "Fewer children" was interpreted as two children for urban families and three for rural.

Under Deng Xiaoping's regime, the fewer children goal was tightened to a maximum of two children for all families. The regime argued that: *"rapid population growth would retard achievement of the "four modernizations" (in industry, agriculture, science and technology, and defence) by hampering*

³ Not only Bongaarts and Greenhalgh but also Zhang and Goza (2006), Yang (2007), Doherty, et al. (2001) and Liao (2013) describe the history, implementation and the effects of the one-child policy.

attainment of full employment and by cutting into increases in capital accumulation, living standards, and education" (1985, p. 586). Bongaarts and Greenhalgh further explain that, studies of optimal population sizes suggested drastically limiting population growth. The studies, based on economic development, food resources, diets, ecological balance and fresh water resources, indicated the highest levels of well-being in the mid-twenty-first century if China's population could be reduced to around 700 million.

However, the rational argument of an optimal population size was quickly dropped in favour of birth planning and mandatory birth control in the constitution of 1978 and the Marriage Law of 1980. The concluding factor to implement a one-child policy was: *"the government's realization that the young age structure of the population would generate growth for decades if couples were permitted two children"* (Bongaarts & Greenhalgh, 1985, p. 587). As a consequence, the policy was implemented in 1979 in order to stabilize the population at 1.2 billion by the end of the century.

Nevertheless, there were a number of exceptions to the policy for families to exceed the prescribed family size throughout the years. First of all, the one-child policy only applied to Han Chinese. Therefore, minorities from a different background were allowed to have more than one child. Secondly, local variations appeared: *"some areas allow couples to have only one child, other areas permit a second birth if the first child is a daughter and the remaining areas allow two or more children"* (Yang, 2007, p. 2044).

The effects on the population

The effect of the policies is visible in figure 1 where the total population suddenly stops growing at a high speed and flattens off to a constant growth rate around 1970, the year in which the first population growth policies were implemented.

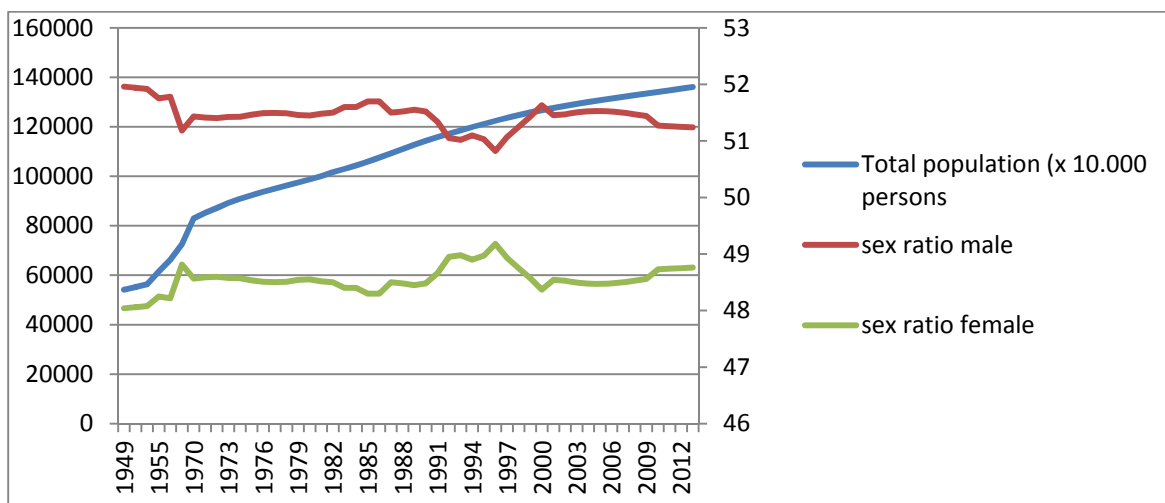


Figure 1: Total population of China (National Bureau of Statistics of China, 2014)

As a consequence of the one-child policy, fertility rates dropped from around 6 children per woman at 1950 towards 1.51 in 2000, as illustrated in figure 2.

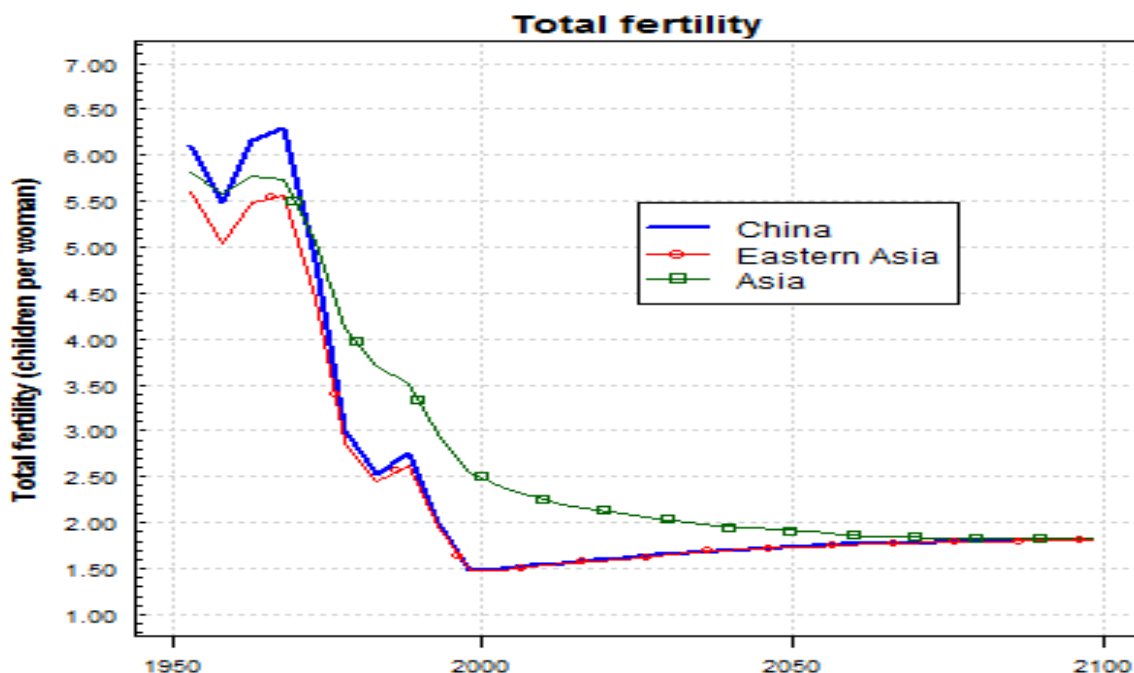


Figure 2: Total fertility rate China (United Nations, 2015)

As a consequence of the falling fertility rate, the demographic of the Chinese population has shifted between 1950 and 2015. Alcorn points towards the danger of suddenly changing a country's fertility rate: "...the country's fertility policy has contributed to a grave demographic imbalance that will emerge in the coming decades as the country's elderly outstrip its labour force" (2013). This demographic imbalance is visible in the demographics, as seen in figure 3, figure 4 and figure 5. The dotted line indicates the excess male or female population in certain age groups. The data are in millions.

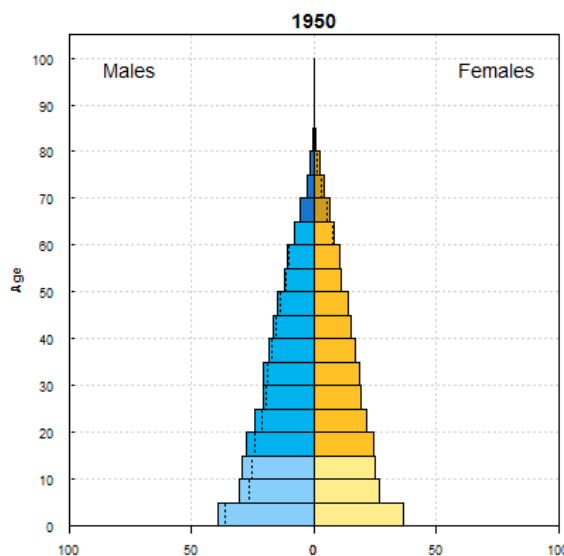


Figure 3: Population by age in 1950 (United Nations, 2015)

According to Yang (2007, p. 2046), this shift in the demographic was to be expected as he notes that: "the policy rules are implemented by out-of-plan birth fines, one-child subsidies and family planning responsibility system (FPRS) ... [...] ...strong FPRS are found to reduce the sex ration of children". This is a consequence of Chinese culture: the son and his spouse are responsible to take care of his parents. As Zhang and Goza (2006, p. 152) further explain: "In an attempt to ensure a son, some Chinese families have taken drastic measures

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that will have long lasting repercussions". "In addition, Chinese children are expected to shoulder the responsibility of family fame and realize parental dreams" (Jing, 2000).

Figure 6 shows a broad age group of children, the working population and the retirees. It confirms that China is currently experiencing a rapid aging of its population. The graph also shows that with the current population growth, the total workforce in China is decreasing, which could have consequences on its economy.

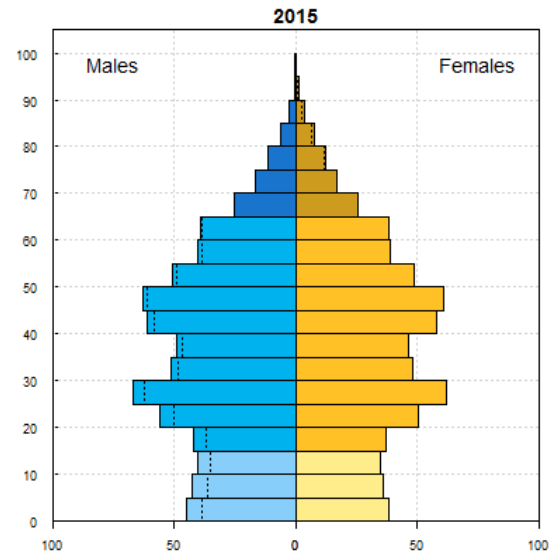


Figure 4: Population by age in 2015 (United Nations, 2015)

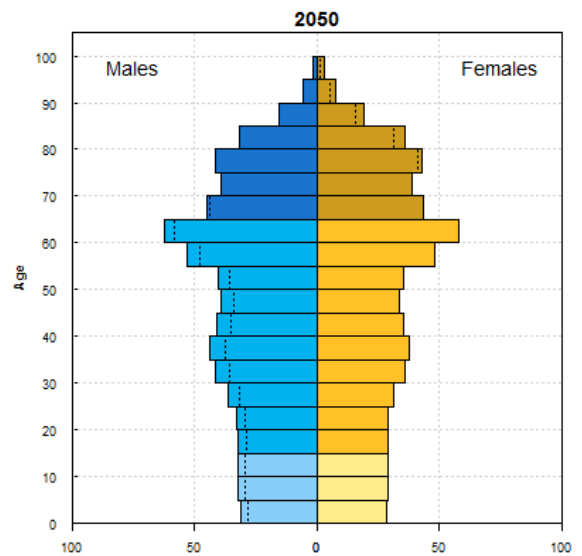


Figure 5: Population by age in 2050 (United Nations, 2015)

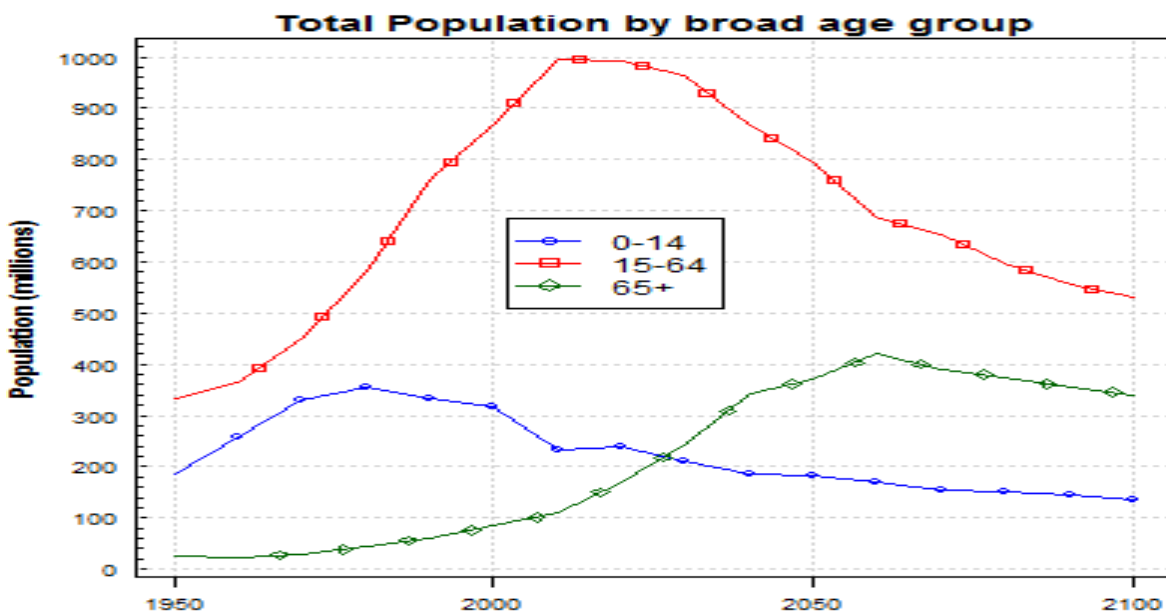


Figure 6: Total population by broad age group (United Nations, 2015)

The change towards a two-child policy

As the previous data are showing, China is facing a shortage in its workforce, an aging population and a shifted demographic of its population. The Dutch newspaper NRC Next⁴ printed a cover story and double page special about the ending of the one-child policy in China. The article states that Chinese couples, who at the time were not entitled to a second child via the exception rule, can expand their family with a second child. This action means that the well known one-child policy of 1979 is being replaced with a two-child policy. According to Chinese authorities, the complete removal of the policy will not occur due to the fact that raw materials, land and water remain scarce.

A major motivation for the change in policy is the expected shortage of youngsters between the age of 19 and 24 by 2025, in order to replace the current ageing population. The shortage of workers could have a negative effect on China's economy. Even the pension age, currently 55 years for women and 60 years for men, is probably being raised to keep enough workers available in the factories. The change in policy is also pushed by Chinese demographers who have noticed a misaligned demographic of the nation's population. In 2012 the ratio was 100 girls to 117.7 boys. Normally, this should be around 100 girls to 103 boys (Garschagen, 2013). This can also be seen in figure 4 and figure 5. As a consequence, a surplus of men in the rural areas can't find a woman to marry.

The change in policy should lead to an increase of around 9.5 million births on top of the current 16.3 million births, according to calculations of Chinese business media and the Bank of America. This number only concerns the urban couples who at the moment can't make use of the exception rule. However, these rules differ per province.

The change in policy is part of a trend in the population planning of China over the past couple of years. The exception rules to the one-child policy have been altered to stimulate growth in the rural areas. Although some two-child exceptions also apply to urban couples, they sometimes decide not to make use of this exception because of their demanding jobs, the high costs or the couple's expensive lifestyle.

Alcorn explains how the previous methods can be used to initiate the move to a two-child policy. *"The Chinese Government's adherence to the one-child policy reflects a deeply held belief about the relation between population and prosperity. A lot of people are really wedded to this policy and, rationally or irrationally, they believe it has contributed to China's economic growth. When the*

⁴ NRC Next, page 4-5, Tuesday august 6th, 2013 (Garschagen, 2013)

policy is finally dismantled, reformers may rely on that same logic to take it apart. [...]...in the context of a diminishing workforce, population growth may promote economic growth. Now they can reject the policy, in a sense, by affirming the need for economic growth and new people coming into the workforce. So it's the same argument but absolutely reversed in terms of the policy" (2013).

2.2 Land grabbing

This chapter contains the background on land grabbing. A lot has been written on this topic. At first we will focus on the discourses in a review on land grabbing. This is followed by the international view of land grabbing. Then, a variety of general drives for land grabbing are presented. Lastly, we will look at the world's food crisis and food security. The chapter ends with a theoretical model.

2.2.1 Discourses on land grabbing

There is no clear description of the term 'land grabbing' as organisations and researchers all use different standards in their papers and articles. Hofman and Ho (2012, p. 1) refer to China's overseas land based investments as '*developmental outsourcing*', which they argue, is different from a conventional interpretation of outsourcing since it refers to: "*global off-shoring in which the state plays a key role in planning, intervention and regulation*". This description is compact and covers the role of the state quite well. However, it lacks the perception of scale.

Zoomers, in contrast, uses a more extensive description by using the term as stated by GRAIN (2008). "*The term 'land grab' generally refers to large-scale, cross-border land deals or transactions that are carried out by transnational corporations or initiated by foreign governments. They concern the lease (often for 30–99 years), concession or outright purchase of large areas of land in other countries for various purposes*"(Zoomers, 2010, p. 429). This description covers about all the factors of the term, including the scale, the instigators, duration, type of land deal and the use. But I think this definition is too extensive.

Borras et al. (2011) state that the 'Global land grab' has become a coinciding phrase to research and describe the increasing amount of large scale (trans)national commercial land transactions. This explanation is fine on its own, but it does lack the more specific details.

Similarly, Cotula (2012, p. 649) uses 'land acquisitions' in context of the global land rush. He further describes this as the acquiring of long-term rights over large areas of farmland in lower income countries by agribusiness, investment funds and government agencies. Here we have a similar description Zoomers

uses, but way more compact. The use of this term is limited to only farmland and not used for various purposes as described by Zoomers.

Nonetheless, researchers in general seem to agree that the term 'land grabbing' is quite negative and therefore they prefer to use more neutral terms. The description of the term applied in the following of this research is a mixture of the previous four: 'The acquiring of long-term rights over areas of land or investments in lower income countries by foreign agribusiness, investment funds and government agencies'.

Both Zoomers and Sommerville et al. (loc. cit., p. 249 & 250) similarly point out that land grabbing is made possible by the liberalisation of land markets. This shift became an important policy goal around the 1990s and led to the commoditization of natural resources and land plots. In addition, the spread of the neoliberal model made more and more governments in Africa, Asia and Latin America give priorities to creating transparent, dynamic and free land markets. It should be noted that the term 'transparent' is quite sceptical as land deals are not always made in a legal and correct way, but are often part of back room deals.

However, governments of developing countries aim to attract as many foreign investors and foreign capital by creating an entrepreneurial climate in the sense of good governing. By doing so, they create the necessary condition for economic growth in their country. Although economically this is a positive thing, the downside of this is that foreign investors can now easily be the new owners of real estate, land and natural resources. Especially the liberalisation of the land markets eased this development. Zoomers (2010) claims this could lead to a rapid increase in the real estate business and the number of land grabs, which seems reasonable as these are booming markets in developing countries.

Many African governments are in need of FDI to boost their economies and they accept most land deal proposals in order to promote their rural developments. However, these deals are usually made without the consensus of the local communities and smallholders who in many cases lose access to their land (Zoomers and Sommerville et al. (op. cit.).

As expected, Cotula (op. cit. P. 649) and Sommerville et al. (2014, p. 246) explain that the current farmland rush of the 'global land grab' is creating debates among civil society groups, international development agencies and national governments. Broadly, the opinions and reasonings can be divided into proponents and critics of foreign/overseas agro-investments. The proponents argue that this type of investment will:

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- Increase the global food supply
- Reduce poverty
- Promote rural development by reversing the decade's long neglect by international donors as well as domestic governments

Together this should create a win-win situation that generates profits for both host countries (including their communities) and investors. Profit in the host country can be accomplished by enhanced taxes and revenues, employment opportunities, the modernisation of the agricultural sector and infrastructural investments.

In contrast, critics of foreign/overseas agro-investments argue that this will:

- Enable the expansion of export-oriented and industry modelled agricultural production
- Continue the course of former colonialism and more recently the processes of neoliberal restructuring of markets by dispossession geopolitics

In a nutshell it could be stated that by neglecting local land rights, foreign/overseas agro-investments undermine the livelihoods, environments and food security of local communities.

On a global scale, land grabbing is responsible for radical changes in the ownership and use of land. Sommerville et al. (2014, p. 245) state that local ownership is more and more taken over by foreigners. This, as a result, leads to a loss of local ownership. Due to land grabs, local populations consider both money and food as a loss of profits as they disappear in the act of wealth conversion. In most reported cases, the ownership is held by long-distance actors.

As a consequence, Cotula(2012, p. 650) shows that the '*commercial pressures on land*' keep building up and the demand is mostly met with the sale of state owned land, the granting of concessions for land-use or with the sale of land by private individual landowners. The landowners wish to profit from the rising land prices or are no longer willing to work in the agricultural sector.

As stated at the description of land grabbing in the beginning of this chapter, lease contracts are usually signed for a long period of time but they also include the most higher-valued lands. These lands have access to irrigation or infrastructures (to nearby markets).

According to the World Bank Investment Report by the United Nations(2008), the investments in developing countries have increased over the last years. Although many of the investments were made in a large number of sectors, the

majority of the investments includes the exploitation of natural resources, the production of food and bio fuels and the development of infrastructure, services and tourism. This list of investments provides in the exploration of potential drivers of China's land grabbing which are discussed in the next paragraph.

Historical context

The general perspective in the literature on the origin of land grabbing is found in colonial histories in many of the recipient countries of the Global South. The current dispossession of land and the farming of cash crops is showing signs of neo-colonial or agro-imperial phenomenons. As a result Borras Jr. et al. (2011, p. 209) state that the purchases of land both in these days and in the colonial era show significant similarities, such as the use of colonial tenure norms to limit rights of local communities or the strong use of anti-smallholder farming sentiment. However, according to Sommerville, et al. (2014, p. 246) these similarities are now no longer limited to North-South relations between countries. Surprisingly there is an increase of South-South relations in land acquisitions and a form of '*internal colonialism*' in a range of national projects.

2.2.2 General drives for land grabbing

The main process driving the current global land grab that is highlighted in the media and the emerging literature, is the production of food for export to finance-rich, resource-poor countries in the aftermath of the food crisis of 2007–2008. This is correct, and is indeed quite dramatic (Zoomers, 2010, p. 429).

This quote highlights that, according to media and (scientific) publications, food security is one of the main incentives for global land grabbing. More implicitly it suggests that resources for bio fuels are an important drive given that the land grabbing countries are resource poor.

In the same article Zoomers, distinguishes seven FDI related processes for land grabbing that do not fit the more traditional types of foreign investments. These traditional types comprise land purchases for cattle farming, agribusiness for export and investments in mining. The more modern drives of foreign investments are:

1. Offshore farming: FDI in food production
2. FDI in non-food agricultural commodities and bio fuels
3. Development of protected areas and nature reserves
4. SEZs, large-scale infrastructure works, urban extensions
5. Large-scale tourist complexes
6. Retirement and residential migration
7. Land purchases by migrants in their countries of origin

Similarly, these drives are also found in papers of other researchers that cover one or more of these seven drives. The papers will be mentioned at the respective drives. As a consequence, these seven drives will therefore act as a framework for this chapter and therefore will be described in more detail.

However, there are only three drives that are relevant in relation to our topic of the tension between the AAL and the RAL. Therefore, only number 1: offshore farming, number 2: farming for bio fuels and number 4: SEZs and infrastructure works will be covered. The other drives may be discussed shortly if there is a possible connection with the tension field.

1. Offshore farming: FDI in food production

According to Zoomers, much of the current land grabbing is a result of the increasing demand for cheap food crops. Food supply problems and uncertainties are created by:

- Constraints on agricultural production related to the limited availability of water and arable land
- Bottlenecks in storage and distribution
- The expansion of bio fuel production, which is an important feature in the competition for land and crop

- Increasing urbanisation rates and changing diets put pressure on global food demands. This is supported by the articles of Weis (2013, p. 66) and Sommerville et al.(2014, p. 253)

The food price hikes of 2007 and 2008 marked the end of continuous low food prices on the world markets. Even when the summer of 2008 demonstrated that some food prices dropped, some of the structural factors underpinning rising prices, such as the continuous demand for bio fuel crops and cattle food, are likely to remain (Cotula, et al., 2009, p. 5).

The rising prices that occurred since 2007 and pronounced volatility in international food markets have combined and refigured the global food security quite dramatically into what we now call the 'global food crisis'. Sommerville et al. (2014, p. 240 & 250) state that the rising food prices and growing unrest in the world have led governments to reconsider their agricultural and food policies. In general, exporting countries began to decrease their export quotas and import-dependent countries increased their FDI in food production. Countries began to fall back onto old forms of export control, national protectionism and food self-sufficiency. In contrast, 'food-insecure' governments relying on imports to feed their populations (e.g. the Gulf States) are seeking to outsource their domestic food production by buying and/or leasing vast areas of farmland abroad for their own offshore food production. Sommerville et al. (loc. cit. p. 245) argue that in the perspective of the country, this approach is an innovative, long-term strategy to feed their populations at a good price and with greater security than hitherto. The list of countries that invest abroad in favour of their food security is a long one. The biggest players are China and the Gulf States.

The 'host' governments generally welcome this foreign investment, even if their own population is facing a lack of food. Their GDP increases considerably as the economy is given a boost. Corruption could also play a part. Land acquisition for food security by richer countries in poorer countries is questioned critically: it is not considered ethical to export food from countries in which there is hunger.

Nonetheless, during a symposium on global food security in Washington in 2012, US President Barack Obama⁵ stated that the danger of food riots and price volatility producing global geopolitical instability "*will grow if a surging global population isn't matched by surging food production.*" Investment in agricultural productivity that reduces the incidence of hunger and vulnerability, argued Obama, "*advances international peace and security... .*"(Sommerville, et al., 2014, p. 242) According to Obama, FDI's in food production are a necessity to continue to feed a growing world population.

⁵ (Obama, 2012)

2. FDI in non-food agricultural commodities and bio fuels

Another reason for the current land grabbing as described by Zoomers (op. cit.), Cotula et al. (2009, p. 5 & 100) and Sommerville et al. (2014, p. 240 & 246) is the global demand for bio fuels and non-food agricultural commodities, combined with expectations of increasing returns in agriculture and of rising land values. Hungry for profits in the midst of the financial crisis, both financial corporations and private investors saw investments in foreign farmland as an important new source of revenue. The food and financial crises have turned agricultural land into a strategic asset that is seen as a new source of profit. Foreign private corporations are increasingly gaining control of farmland, which in many cases threatens small-scale farming and rural livelihoods as is claimed by Grain (2008), Cotula et al. (lit. cit.) and Zoomers (lit. cit. p. 435).

The current world economy is fuelled by the hydrocarbons from oil and gas inputs. Replacing the crude oil with the more 'sustainable' agro fuels, or bio fuels, is increasingly accepted to be a viable solution to high gas prices and could eventually replace oil. According to Sommerville et al. (2014, p. 255) it also provides steady incomes for rural areas and it counters emissions.

With regard to bio fuels, government consumption targets e.g. the European Renewable Energy Directive (RED) and Fuel Quality Directive (FQD), and financial incentives are a key driving force. Given the diminishing supplies of non-renewable oil, bio fuels are likely to remain an option in the longer term. Examples of bio fuel crops are jatropha, soya, sugar cane, palm oil and corn ethanol.

Foreign investors (supported by governments) are controlling increasingly large areas of farmland, which they use for agribusiness development (the large-scale production of wheat, rice, soya beans and maize) and bio fuel crops, most of which are destined for export markets (Zoomers, 2010, pp. 435-436).

3. Development of protected areas and nature reserves

Although this drive was not explicitly mentioned at the start of this chapter, it does have a small overlap with the possible land grab drive by China. In order to increase their sustainability as one of the most polluting countries, China could possibly invest in protected areas for the use of emission reduction.

Sustainability has been a hot topic for the last couple of years. With emphasis on providing a planet for future generations many sustainability related (window) policies and international agreements have been developed. An example of this is the Kyoto Protocol, which has, just as other agreements and policies, (limiting) implications for individual countries. In this agreement carbon dioxide (CO₂) emission reduction or compensation is one of those implications. Foreign companies also want to invest in land for reforestation projects within the

context of the Clean Development Mechanism (CDM) of the United Nations. The CDM "... allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol ... to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO₂, which can be counted towards meeting Kyoto targets"(United Nations, 2009). Being able to decrease the emissions by implementing reforestation projects is easier than decreasing the CO₂ emission. These projects are having mass appeal among the contributing countries. The lands are usually 'empty' lands which are either controlled or maintained for CO₂ compensation.

At the same time, forests and nature areas are being bought up by international organisations or private individuals for the purpose of nature conservation. These areas are mostly 'empty' with unspoiled nature, according to Zoomers (2010, p. 436). Together with the already existing nature reserves this is putting pressure on local land markets and land prices.

Another well-known project to increase the amount of protected 'empty' areas is the REDD project by the United Nations, or the Reduced Emissions from Deforestation and Forest Degradation. Its goal is to create new protected areas for 'biodiversity protection and reforestation'. These protected areas are often combined with wildlife reserves and conservations, which in turn are developed with (eco)tourism.

4. SEZs, large-scale infrastructure works, urban extensions

The need for more foreign investments to achieve economic growth has led to the formation of specific areas to promote these investments. These areas are called Special Economic Zones, or SEZs and they focus on the onset of globalisation and foreign investments. They consist not only of land to invest in, but also provide the infrastructure to support and connect them, like airfields, ports and ring-roads. However, these SEZs also contribute to the forced move of the local population in order to make way for land investments and its infrastructure. According to Zoomers (2010, p. 437), the population doesn't always receive compensation or a new place to live. This is known as 'development-induced displacement' and it is a direct effect of the creation of SEZs. Besides, the majority of the local population does not have the necessary skills to work in the newly created jobs. Employment is created for only a small part of the population.

An example of population displacement can be found in China, with the building of the Three Gorges Dam. Sullivan (2005) describes that the dam was built to generate more fresh water and hydroelectric power. Also the flooding in the valleys downstream had to be controlled. It forced two million people to move.

So, while land is needed for the formation of SEZs, it also creates a need for land to resettle the people that have been forced to move. The allocated SEZs create a double impact on land markets.

2.3 Globalization and the world food crisis

"Globalization has made the world flatter (Friedman, 2006, p. 11) and made it possible to cover large distances very quickly" (Zoomers, 2010, p. 430). The world population has expanded to almost every corner of the world but at the same time has kept intensive, cross-border contacts through networks. These networks are both social and political.

In the global world, as Harvey(1989) states in her article, developments at a local level are more and more influenced by events that happen on the other side of the world due to the increasing worldwide social links and relations. In return, local events can influence the rest of the world. The connections between people have made it easier to learn and adapt to global events.

Since the end of World War II the governance of agriculture and food was envisioned with continued improvements on the sustainable expansion of food supplies with the use of Green Revolution methods and technologies in order to industrialise and intensify the global agricultural production. Adjustment programmes beginning as early as the 1980's and the liberalisation of agricultural trade by the WTO after 1995 were meant to stretch the food system even more through supranational governance and regulatory structure. This would bring the benefits of liberalised market dynamics to poor farmers and consumers on a global scale. However, *"the increasingly hegemonic geopolitical practices of a globalising agro-industrial model were rendered largely invisible by universalising discourses of neoliberal development that depoliticised the model's social and environmental consequences"* (Sommerville, et al., 2014, p. 244).

World food crisis

The sudden explosive increase of food prices in the years 2007 and 2008, as depicted in figure 7, has burst the bubble that the world will have low food prices on the global food markets. The causes of this crisis are still debated in literature, as Zoomers explains. Draughts, bad harvests and a general increasing world population are considered as probable causes. Countries that are dependent on food imports to feed their population, have increasingly responded with investments in food production abroad, as was discussed in the previous subchapters. Although some food prices dropped at the end of 2008, the underlying factors still remain. The event has left a scar on the world food market and on the way countries depend on this market.

The increase of food security as a geopolitical concern is popular in the press which continues to provide a steady stream of reports about rising food prices,

food shortages, poor or lost harvests and famine over the past decade (Sommerville, et al., 2014, p. 241).

The rising food prices and growing unrest in the world made governments reconsider their agricultural and food policies. As a consequence, exporting countries began to decrease their export quotas and import-dependent countries increased their FDI in food production, contributing to the 'global land grab' (Sommerville, et al., 2014, p. 240). The new 'global food crisis' which followed up on the first crisis of 2007-2008 continued into 2013 and triggered more FDI's associated with agriculture (Weis, 2013, p. 65). This re-prioritisation of food security by governments is an upcoming trend on the geopolitical agenda. As a result, a major drive for China is to maintain as agricultural self-sufficient as possible.

The food crisis has revealed that interventions in the global agro-food systems and geopolitical discourses are closely connected with the political economy of food consumption and agricultural production. Interventions turn out to be an integral constitutive of this political economy (Sommerville, et al., 2014, p. 244).



Figure 7: FAO Food Price Index 1996 – 2015 (FAO, 2015)

Meat production is responsible for climate change due to enclosures, methane emissions and deforestation (both for growing animal feed and the expansion of livestock). Weis (2013) demonstrates in his article that meat production and (over)consumption drives a decent amount of the global 'food deficit'. This means that the world food crisis is not only caused by agricultural 'underproduction' of developing countries, but it is also a problem of diet among the world population. As meat-centred diets increase in developing countries,

more and more animal feed will be needed to keep up with the global demand of the industrial livestock production.

2.4 Concluding and conceptual model

We started out by describing the term 'land grabbing' according to the view of various researchers. By looking at each interpretation of 'land grabbing' and comparing them to one another it became clear that every researcher preferred to use a neutral term, as the discourse on land grabbing is divided into neo-liberal or critically anti-globalist camps. However, media reports on 'land grabbing' tend to be quite negative. Especially when dealing with China's land deals. This seems a bit overreacted because the very first investments by China in Africa were development aid projects.

Next, the drives of land grabbing are outlined in a divergence way to cover the full extent. For the following up we will, in relation to population growth and urbanisation, determine only a few motives for land grabbing as relevant:

1. Offshore farming: FDI in food production
2. FDI in non-food agricultural commodities and bio fuels
3. SEZs, large-scale infrastructure works, urban extensions

The literature has also brought forth possible motives for land grabbing like diet changes due to increased income, food (in)security and self-sufficiency of import dependent countries. The latter is a direct result of the world food crisis of 2007-2008.

By integrating these topics into the goal of the research we can create a conceptual model, as shown in figure 8, to further streamline the research.

If we are to research the possible compensation of farmland by overseas investments, we have to regard the tension between the available (AAL) and the required agricultural land (RAL). In this research we consider four factors that influence this tension directly and one factor that is indirect. The direct factors are urbanisation, the demand for food, soil degradation and pollution and improved agricultural engineering. The indirect factor is population growth, which influences the tension both by urbanisation and the demand for food.

After assessing the tension between the AAL and the RAL we come at a crossroad in the research. In the case of no tension the research is in fact finished, with overseas investments not being the result of a shortage in domestic agricultural land. However, if there does seem to be a tension, we must review the areas China invests in. These investments can be linked back to the drives for land grabbing in chapter 2. The three drives that have been discussed in chapter 2 do not all connect with these investments, but are mentioned to display the larger picture of land grab drives.

Conceptual model

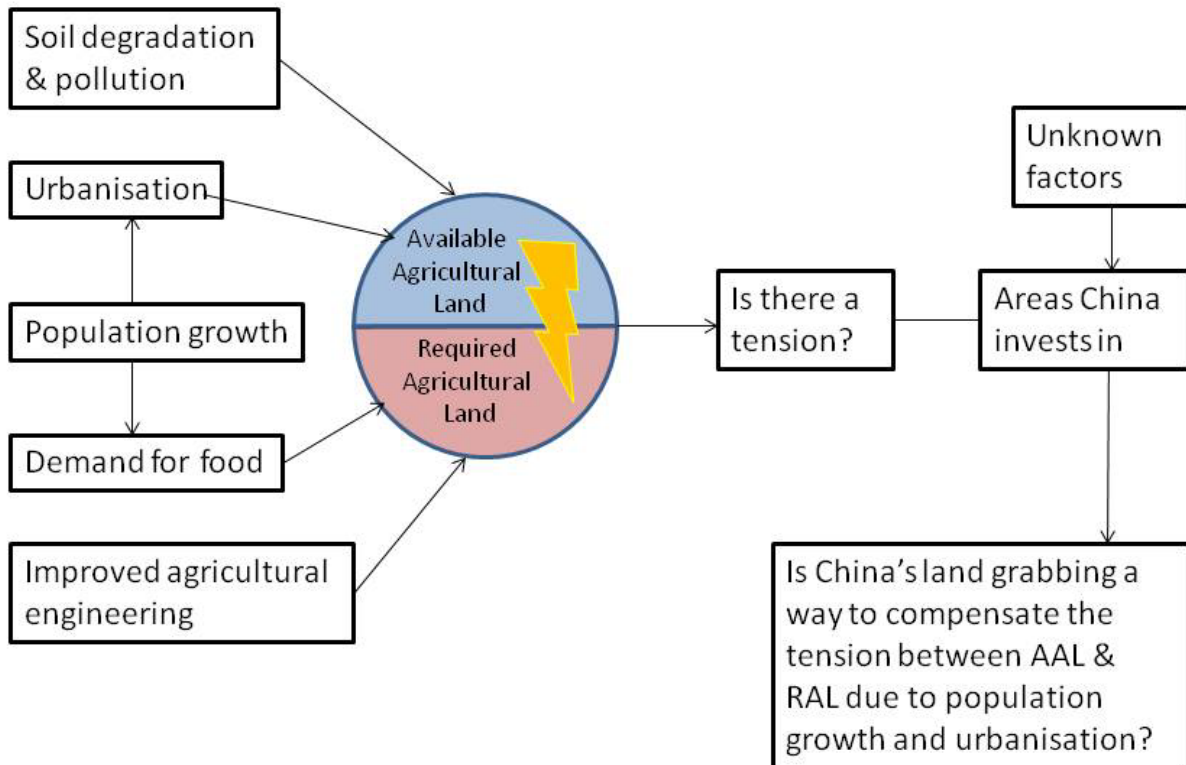


Figure 8: Conceptual model

Chapter 3: Methodology

To capture the complexity of land acquisitions by China, three things need to be taken into consideration:

1. A comprehensive inventory of the debate on China's 'land grabs' in connection with available data
2. Conduct fieldwork research on the ground
3. Assess the resulting research results case by case, country by country

It is beyond the reach of this research to complete the second and third points, the fieldwork and the case-by-case analysis. This research should therefore be seen as part of a greater research plan in which I only perform the first step of the research, the hypothesis research based on available data.

3.1 Method

Data research

I found the research topic of interesting 'happenings' in paper articles. The location and scale of China make it hard to conduct field work in order to collect data. However, the story in the book⁶ (which is also an interesting starter) describes the field work for me. Having interviews and conducting questionnaires are unsuitable methods for the research question in this case. Therefore the data collection and analysis remain and, as mentioned, this research is also a means to provide an overview of how a field work study could be continued. This means that all the data are from secondary sources, although the book could possibly be classified as a primary source: it describes the fieldwork made by the authors.

The goal of this research is to investigate the tension between the AAL and the RAL in order find indications which could prove a connection between the population growth in China, the potential farmland loss due to urbanisation and the overseas investments in land by China. For a quick overview see the conceptual model in figure 8, chapter 2.4.

The steps taken to come to an answer in this research are divided into three; they are supported by the research design in figure 9:

The first step in this research is an exploratory background of the one-child policy and land grabbing with the help of a literature review. You may have read this already in the previous chapter. This exploration will include academic articles, journals, reports and books which form the basis of these topics. With the one-child policy we have covered the workings and history, the effect of the policy on the Chinese population and the reasons why China is moving to a two-child policy. With land grabbing we first focused on the general discourse of land

⁶ 'How the city moved to Mr Sun.' (Hulshof & Roggeveen, 2011)

grabbing. After that, the different drives for land grabbing were highlighted in order to link to a possible drive by China at the conclusion of the research. The last aspect covers the world food crisis of 2007-2008 which made clear that a global food market can be a risk for food import dependant countries.

The second step in this research is the empirical part of the research where the data are collected on topics that influence the tension between the AAL and the RAL. The topics are limited to five, in order to keep the focus on the relation between the population growth, urbanisation and land grabbing, as can be seen in the conceptual model in figure 8. The five topics are:

- Population growth
- Urbanisation
- Demand for food
- Soil degradation and pollution
- Improved agricultural engineering

After these five topics there is a tension overview in which the influences are merged into a single overview. A last data analysis of the areas China invests in is then performed as a result of the tension overview.

In the third step the conclusion is formed on the basis of the collected data. The collected data are reviewed in relation to the research question.

Research design

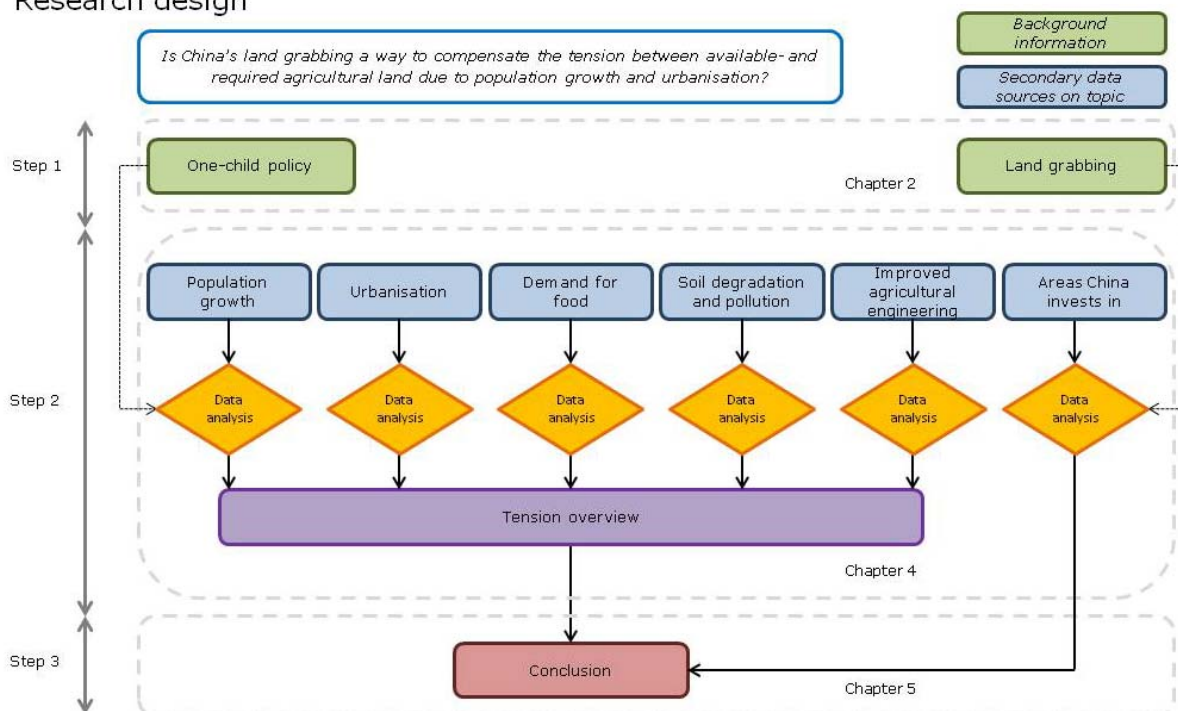


Figure 9: Research design

3.2 Data collection and processing

The collection of first hand data on China are hard to come by and therefore the choice was made for a full secondary data source based research. This serves to question how reliable the used sources are. But it does provide a way to research the selected topics.

Data collection

The data collected for this thesis are based on secondary data sources. These sources mainly consist of academic papers, non-governmental organisations reports (NGOs) and reports by the Chinese Government. The sources and how they are used are now discussed.

The order in which the data are collected is as follows:

- First the book⁷ is read to create a view of the inland situation. The book can be used as a form of fieldwork as it discusses a variety of topics in Chinese cities where the authors spent two years travelling and interviewed various people, including some governmental officials. The book could also provide the research with additional topics which were not thought of in first instance.
- Then the literature on the discourse of land grabbing is collected in order to write that chapter.
- The next step is the collection of the data on the six main topics. They will be gathered within a short time frame in order to minimize differences in collected years. All data will be collected in one wave in order to avoid going back and forth between collecting data and processing it.
- After the first data collection wave, a second wave of all the topics will be conducted in order to explore missing data points or new entries that have come up in the first data collection wave.

Academic papers

The academic papers from other researchers were collected from the library of the Rijksuniversiteit Groningen (RUG). These papers were collected digitally. Each paper was scanned for usefulness on the appropriate topic. Then read completely, useful statements and data were selected and marked. The marked pages are put into a matrix to create an overview of articles and the topic they connect with. This process of document analysis ensures that only the important and useful data are used. All the collected data are used to write the findings in chapter 4.

⁷ 'How the city moved to Mr Sun.' (Hulshof & Roggeveen, 2011)

The book 'How the City moved to Mr Sun'

The book forms an inside view on the development in several Chinese megacities throughout the country. Therefore it provides a kind of fieldwork study. Every important part is noted in a separate notebook to create a short summary of the most important findings on a variety of topics.

Reports from NGOs

The following NGOs are used to collect the necessary data on the topics:

- FAO – Food and Agriculture Organisation of the United Nations
- OECD - The Organisation for Economic Cooperation and Development
- The World Bank
- The United Nations

The organisations' reports are collected from their corresponding websites, or when available from the RUG library. The reports show an international view of China's data. Each document is selected when it has a corresponding theme or topic that fits the research. Subsequently, there is a document analysis from which only the important data are extracted. The analysis is then used in chapter 4 and in the timeline graphic.

Reports by the Chinese Government

- The China Statistical Yearbook
- Policy reports

The China Statistical Yearbook and other statistical Chinese data are accessible on their website, <http://www.stats.gov.cn/english/>. The yearbook is used to provide data with the national view of China. By means of document analysis the important data are selected and used to write chapter 4.

The NGOs' reports and the reports by the Chinese Government each give a different view of the data. The NGOs provide an international view, but China expresses a national view. This offers an opportunity to form a reliable data set. The academic papers show national and international views. This cross view of the same data, when available at both types of sources, provides a reliable secondary data source for the research to compromise the lack of first hand data.

Land grab data

Finding trustworthy data on land deals made by China will be the most difficult aspect of this research. Hofman and Ho (2012, p. 3) explain: *"It is difficult to make conclusive statements about the actual impact of Chinese land*

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investments. This is due to the fragmentation, inconsistency and, at times, complete absence of solid, scientific data from the ground. As a result, a reliable and sound quantification and qualification of Chinese land-based investments is beyond our reach”.

The problem is the constant media interest whenever a land deal is announced. For example, the news article by the NOS⁸ on the land deal by China in Ukraine: the deal covered 100,000 hectares of farmland, expandable to 3 million hectares and two infrastructure projects. The same article on the same day, but now by The Telegraph⁹. Their article contains some extra information that is quite interesting. According to The Telegraph, KSG Agro, Ukraine’s leading agricultural company, claims to have made a deal which only covers 3000 hectares which will be modernised by the Chinese and ‘may gradually expand to cover more areas in the future’. The stories haven’t been confirmed by both news agencies, meaning there are still no hard data on the land deal. And as a result, these data are unreliable.

An alternative that will be used is the website: <http://www.landmatrix.org/en/>. This site lists all the land deals between countries and tries to collect as many data and evidence for each deal. But even this site does not contain everything.

Definitions

Arable land: in this thesis I define arable land the same as cultivated land, which refers to land mainly for the regular cultivation of farm crops (including vegetables), with some fruit trees, mulberry trees and others; it also covers cultivated land, newly-developed land, reclaimed land, consolidated land, fallow, beach land that can guarantee one harvest per year on average.

Urbanisation: The use of land for housing, industry or infrastructure which used to be land for the production of food.

3.3 Ethic issues

Land grabbing is a hot topic with a primarily negative debate concerning the ethical side of land rights. As stated before in chapter 2, most researchers prefer to handle a more neutral term instead of ‘land grabbing’. I will keep a neutral view on the subject as well.

“Large-scale land acquisition for food security by richer countries in poorer countries is increasingly contested, because it is not considered ethical to export food from countries in which there is hunger”. (Zoomers, 2010, p. 434)

⁸ <http://nos.nl/artikel/554791-china-gaat-boeren-in-oekraïne.html>

⁹ <http://www.telegraph.co.uk/news/worldnews/asia/china/10332007/China-to-rent-five-per-cent-of-Ukraine.html>

Chapter 4: Data

4.1 Introduction

The data in this chapter are divided into the five factors that influence the tension between the AAL and the RAL and the areas China invests in. This can be seen in the conceptual model from chapter 2.4 and in figure 10. Each subchapter has a small figure of the concept model in order to show where the presented data fit in the research.

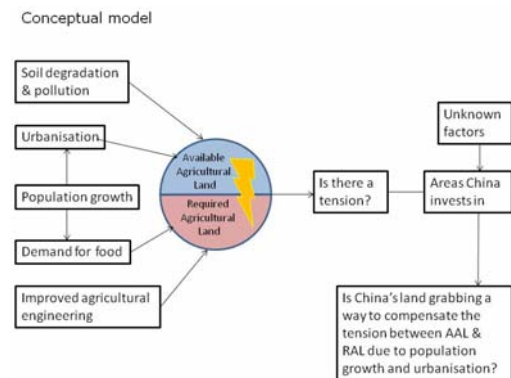


Figure 10: Conceptual model

The data are presented in the following order:

- Chapter 4.2: Population growth
- Chapter 4.3: Urbanisation
- Chapter 4.4: Demand for food
- Chapter 4.5: Soil degradation and pollution
- Chapter 4.6: Improved agricultural engineering
- Chapter 4.7: Tension overview
- Chapter 4.8: Areas China invests in

Certain data which are presented in figures or tables can be elaborated in the text. In large tables or figures the important data will be circled or coloured red in order to identify these more easily.

Gross Domestic Product

The data on DGP are presented here in the introduction chapter because they are general data which do not fit in one of the subchapters. They are used for both the chapters on urbanisation (4.3) and on demand for food (4.4).

Due to the constant economic growth of China its GDP has continued to increase in 35 years, as can be seen in figure 11 and as GDP per capita in figure 12. Both graphs show that the fastest increase in GDP starts around 2000 when the Chinese government initiated the 'Go West Policy' (Hulshof & Roggeveen, 2011, p. 27). The financial crisis around 2008 is also clearly visible as a small dent.

land grabbing as a way to compensate the potential loss of farmland?

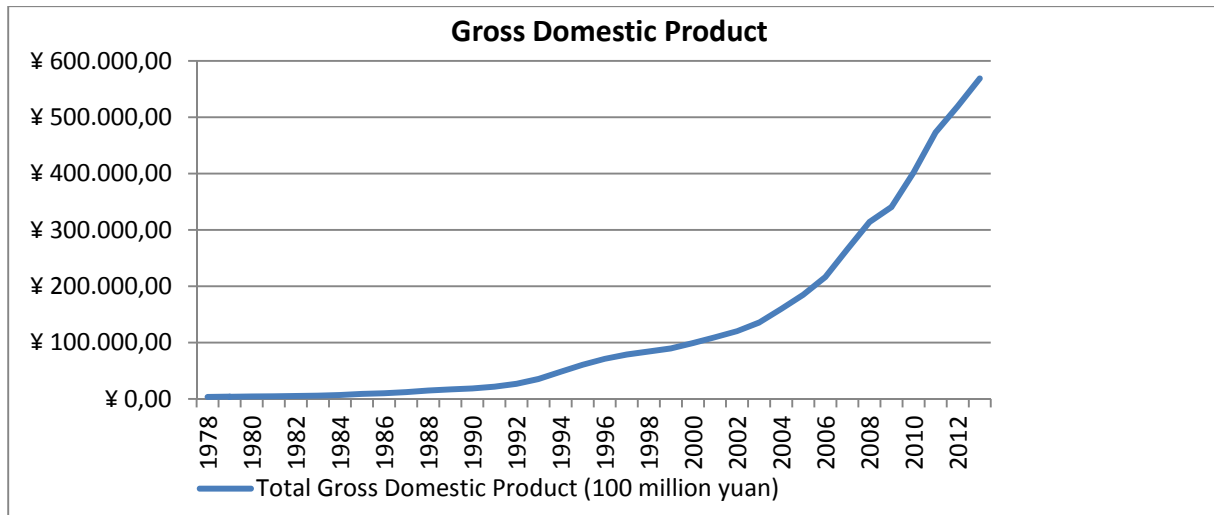


Figure 11: Total GDP (National Bureau of Statistics of China, 2014)

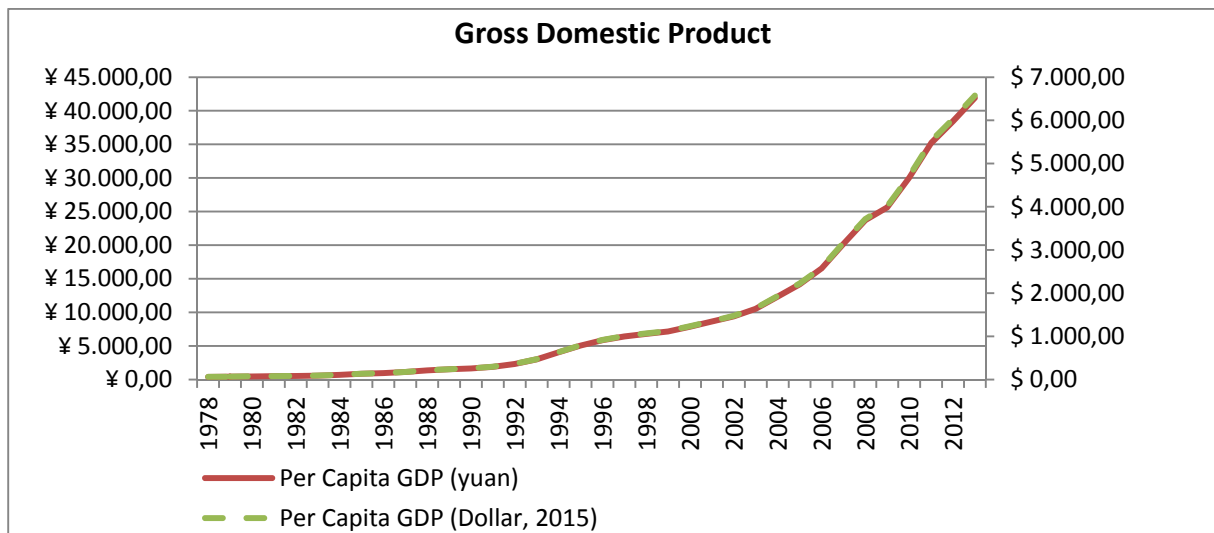
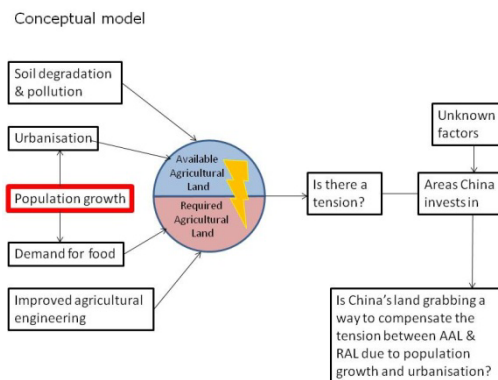


Figure 12: GDP per capita(National Bureau of Statistics of China, 2014)

4.2 Population growth

In this chapter the indirect factor of population growth is presented. The motivation to collect data on the population growth of China is the recently announced ending of the one-child policy in favour of a two-child policy.

The background of the one-child policy, its effects on the population and the motivation to move towards a two-child policy are presented in chapter 2.1.



Projections

The report of the United Nations, the *World Population Prospects: The 2015 Revision*, projects the expected total fertility rate and the expected total population. These can be seen in figure 13 and figure 14.

Fertility rate

The first thing to look at is the fertility rate, or the average number of children that will be born to a woman over her lifetime. This is shown in figure 13 below. The effect of the one-child policy is clearly visible in the observed TFR. The red median line is the projection in the situation where the one-child policy is maintained. The fertility rate will remain above 1, as there are some exceptions to the policy and the possibilities of having twins. The top blue dotted and dashed line comes close to the expected fertility rate when a two-child policy will be enabled.

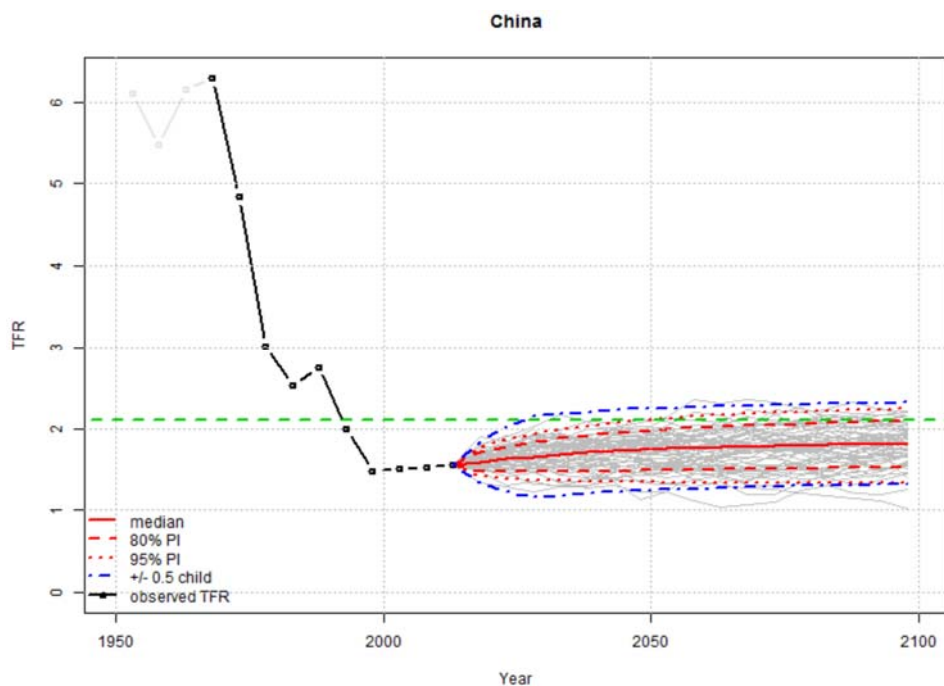


Figure 13: Total fertility rate projection(United Nations, 2015)

land grabbing as a way to compensate the potential loss of farmland?

Explanation: This chart is from the Bayesian Hierarchical Modelling of Total Fertility that has been carried out with fertility estimates from the 2015 Revision of the World Population Prospects. Please note that only a small selection of the probabilistic trajectories of total fertility is displayed (grey lines) for illustration. The model uses 60,000 trajectories of projected total fertility. The median projection is the solid bold red line, and the 80 percent and 95 percent projection intervals are respectively displayed as dashed and dotted red lines. The high-low fertility variants in the 2015 Revision correspond to +/- 0.5 child around the median trajectory displayed as blue dashed lines. The replacement-level of 2.1 children per woman is plotted as green horizontal dashed line only for reference.

Total population

When the projections for the total fertility rate are used to project the total population, the graph is as seen below in figure 14. The red median line indicates the total population if the one-child policy is maintained. This would lead to a decline in population growth after 2030. The top blue dotted and dashed line comes close to the expected total population when a two-child policy will be enabled. This would predict a steady population around the 1.5 billion people from 2035 onwards.

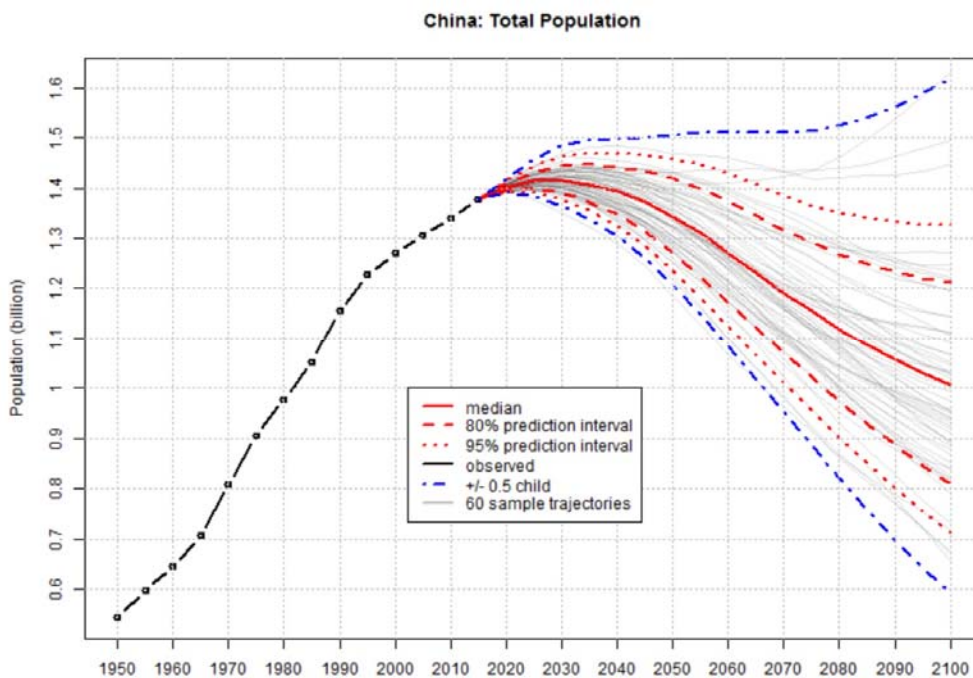


Figure 14: Total population projection(United Nations, 2015)

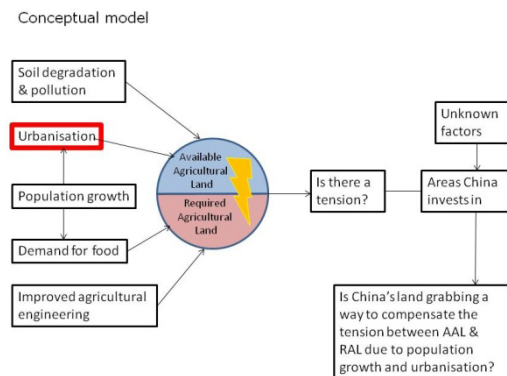
Explanation: This chart shows estimates and probabilistic projections of the total population for China. The population projection is based on the probabilistic projections of total fertility and life expectancy at birth, based on estimates of the 2015 Revision of the World Population Prospects. These probabilistic projections of total fertility and life expectancy at birth were carried out with a Bayesian Hierarchical Model. The figures display the probabilistic median, and the

80 and 95 percent prediction intervals of the probabilistic population projections, as well as the (deterministic) high and low variant (+/- 0.5 child) of the 2015 Revision of the World Population Prospects.

However, will the food production towards 2035 and onwards be sufficient? The increase in population means that another 0.12 billion people need to be fed. These people also require work and a place to live.

4.3 Urbanisation

The data presented in this chapter are part of the influence on urbanisation, on the tension between the required and the available agricultural land. The population change, as presented in the previous chapter, affects the data.



Move towards the city

The economic prosperity and the concentration of industries around cities have led to a Rural-to-Urban migration. Many people move towards the cities to find better work and they also fill in the demand for labour in the city. It is estimated¹⁰ that towards 2030, 280 million Chinese will be moving towards urban areas. With that, the urbanization rate will reach almost seventy percent in 2030. According to Hulshof and Roggeveen these people are called the 'luidong renkou' or 'flowing population', the peasants traversing the country in search of paid employment. Currently, their group consists of 70-300 million migrant workers, or ten to forty percent of the urban population. The rural – urban ratio over the last couple of years is depicted in figure 15.

However, because of the 'hukou' registration system, a system from the 1950's by Mao to record and control internal migration (Hu, 2012) and (Hulshof & Roggeveen, 2011, p. 69) these dwellers are not recognised as urban citizens. With this system citizens only have rights to health care, education and pensions in the areas they were born in.

Around 1980, this system loosened as Hu (2012) explains: *"in response to the demand of both the market and rural residents wishing to seek greater economic opportunity in cities. At the same time, China's 'Reform and Open' economic policy was already on track for creating unprecedented growth and ultimately resulted in a booming economy with increased incomes across China and large foreign investments directed to the manufacturing industry in eastern urban areas. Slower income growth for rural families, increased demand for cheap labour in China's new manufacturing sector, and booming development that*

¹⁰ (Kwan, 2010)

encroached on rural lands pushed a large amount of rural surplus labour to the cities."

Go West policy

In 2000 the Chinese government initiated the 'Go West policy' with the goal of bridging the gap in development between the east coast, the interior and the west of China. According to Hulshof and Roggeveen the GNP per capita in the west was only forty percent of that in the east coast (2011, p. 27). The policy consists of major investments in infrastructure like motorways, railways, pipelines, hydroelectric- and coal power plants and environmental projects such as the planting of forests. As a result of the policy, the central and western cities have expanded to alarming proportions as the economic growth in those areas was twelve percent per year between 1999 and 2008 (2011, p. 28). Critics claim the policy is inspired by the need for fossil fuels, located in the central and western parts of China.

Urbanisation

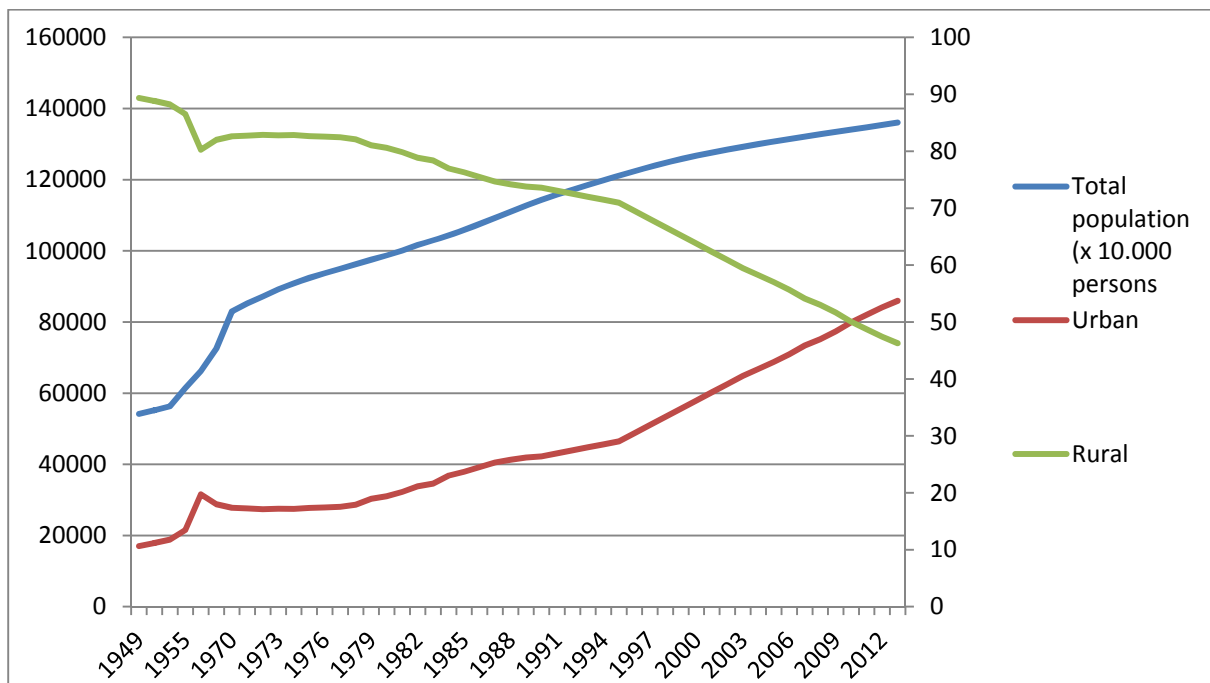


Figure 15: The rural - urban ratio (National Bureau of Statistics of China, 2014)

In their book: *How the city moved to Mr Sun – China's new megacities*, Hulshof and Roggeveen (2011) describe the process of farmland conversion due to the urbanisation of cities. At first, by keeping the urban percent line from figure 15 in mind, they explain the history of urbanisation in China. Secondly, the process is described by telling the story of Mr Sun. Although this is a small side step in the data on urbanisation, the story displays the process in which urbanisation is taking place in Chinese megacities. In case you prefer to not read this side step there is a summary of the urbanisation process following up on the story.

The story of Mr Sun

China was mainly an agricultural country with many villages and only a couple of cities. Industrialization commenced after the communist takeover in 1949, framing the start for the first urbanization. However, this came to a stop in the 1960s and 1970s because of Mao's return to agriculture.

After Mao, Deng Xiaoping (the new leader) opted for another economic model where cities were put in the central stage, restarting the urbanization, but slowly at first. Selected east coast cities were allowed to experiment with market forces and foreign trade. As a result, the coastal zones became richer. The migration of workers from rural areas started. Xiaoping believed that *'some must become rich first'* as an example to the rest of the country (2011, p. 25). A 'ladder-step doctrine' was introduced to divide the country into three regions: the coast, the centre and the west. The plan was to *'speed up the development of the coastal region, to put the emphasis on energy and raw material production in the central region, and to actively make preparations for the further development of the western region'*.

The story of Mr Sun* deals with the current city of Shijiazhuang, but former village of Jianling. Shijiazhuang is the capital of the Hebei province on the east coast (near Beijing).

In the 1980s, the village consisted of 1200 families, mostly farmers. The village only had a dirt road that connected the city of Shijiazhuang, it took half an hour to walk. The city was founded by the construction of a railway station in the beginning of the 19th century. A couple of villages melted together. In the 1950s and 1960s textile and chemical industries developed and as a result, the number of inhabitants increased to half a million.

At the end of the 1980s, the farmland around the city still existed. But, at the start of the 1990s more and more dwellers came towards Shijiazhuang to work in the factories. These dwellers were seeking affordable accommodation in Jianling. At the same time, the city was expanding and taking up more and more farmland that surrounded it. The local officials offered compensation, but the payments were low: *'Growing corn is more profitable'*. Together with other farmers Mr Sun submits a petition to the provincial authorities, but it does not help. The farms are sold to a developer who transforms them into a golf club.

The authorities lure the sulking villagers with promises. There will be jobs for everyone with the construction of a chemical factory in the city. The assurances never materialise. With no land or a job, the villagers have to rely on their own ingenuity.

* The story of Mr Sun is written in chapter 2 of the book(2011, pp. 40-61)

Fortunately, a solution presents itself: the constant stream of city dwellers. Mr Sun invests the little compensation he received for his land in a small building to rent out rooms, house a little shop and live in it himself. On top he plants a field of organic farmland to insulate the building and provide food for his own family.

He completes his house in the summer of 2002 and soon Mr Sun is not the only one. Many of the former farmers have turned their house into a small apartment building, creating a typical 'chen zhong cun' or 'village in the city'. This phenomenon can be found in all rapid expanding metropolises in China. These villages stand out from the rest of the city due to their diversity in form and character. By 2004, thousands of migrant workers have supplemented the former 1200 families of Jianling.

China's bubbling metropolises only reluctantly tolerate the urban villages. In the long run there can be no room for the former farmers' handiwork, which does not fit with the image of modernity envisaged by city administrators. Demolition is the road ahead and expropriations are the order of the day. Residents who refuse to leave are 'stubborn nails' blocking development.



(The image shows a 'stubborn nail', image from: <http://www.huffingtonpost.com>)

In China the urban planners' word is law, and planners and politicians from Western countries envy the possibility to 'follow through' or 'get things done' that would elsewhere take years to complete.

And so, the house and village of Mr Sun is to be demolished and redeveloped by a development project that will demolish forty-five villages in the city. The project will take only three years to demolish, relocate factories to the outskirts of the city and then rebuild the plots to 'give the city a new face'. Jianling village will become a shopping mall, housing some major brands, restaurants and cafés, a multiplex cinema, a five-star hotel, twelve office buildings and twenty-eight thirty-storey residential towers. The plan covers almost two million square metres.

Under pressure from the (corrupt) Jianling village committee, Mr Sun accepts a buyout and moves into the apartment of his son on the other side of the city. In April 2010 he receives the news that his house has been demolished.

To summarize the story of Mr Sun and with it urbanization:

- Former villages fuse together to form a city.
- With the arrival of industrialization the number of inhabitants quickly increases.
- More and more dwellers move towards the city in search of work in the factories, while the city starts to consume the surrounding farmlands.
- The former farmland in surrounding villages is bought up and many of the farmers use their compensation to rebuild their houses to rent out apartments and provide office space. In this way they create an income.
- The villages stand out due to lack of regulation and urban planners draft a new city plan.
- The villages are bought up, in many cases under massive protests, and a development project takes its place. These projects often have grand allure to give the city a modern face. All in the name of progress for its people.

The redevelopment of cities does come with some issues, as described in an interview with a planning authority in the city of Changsha, the capital of Hunan province.

Chief engineer Wang Huifang of the Changsha planning authority explains the problems:

“Within six years the number of inhabitants of the city core has to increase from three to six million, without changing the city borders. ...[...]... We have to, because we cannot expand indefinitely. This is the consequence of a strict national policy prescribing Chinese self-sufficiency in food supply, no simple task for a country with 22 percent of the world population and only 7 percent of the planet's arable land. The government in Beijing has ordered that China must hold on to at least 210 million acres of agricultural land, a 'red line' almost reached because of rapid urbanisation. In march 2010 Prime Minister Wen Jiabao once again insisted that *'we have to maintain the strictest possible system to defend agricultural land'* (Hulshof & Roggeveen, 2011, p. 171 & 172).

Farmland protection

Farmland conversion is described by Tan, et al. as: *“the change from agricultural to non-agricultural land uses, often provides needed space for urbanization and industrialization and is, therefore, almost unavoidable during economic development and population growth periods. However, it is the extent and type of farmland conversion that raises concern about issues such as urban sprawl, environmental degradation in suburban areas, loss of open space and food security”* (2009, p. 961)

There are currently three laws that form the legal basis for farmland conversion in China:

- The Basic Farmland Protection Regulation from 1994: the law requires governments at or above county level to designate a basic farmland protection zone in every village or township. There are two levels, the first is high-quality land with high productivity. This land cannot be converted to non-agricultural land. The second level is good-quality land with moderate productivity which under some circumstances can be converted (Lichtenberg & Ding, 2008).
- The New Land Administration Law from 1999: this law is intended to protect environmentally sensitive and agricultural lands. Article 33 states the focus on the dynamic balance, of no net loss. *“The concept of dynamic balance of cultivated land means that, if cultivated land is occupied by other land use in one provincial region, the same amount has to be reclaimed from unused land to ensure the total amount of cultivated land is not reduced in the region. This policy was issued in 1996, but has been criticized severely in recent years for difficulties in implementation”* (Tan, et al., 2009, p. 968).
- The New Property Rights Law from 2007: this law focuses on property rights, article 43: *“The State adopts special protection with regard to the agriculture land, strictly limiting the transfer of agriculture land to construction land so as to control the total quantity of the construction land. No expropriation of the collectively-owned land in violation of the authority and procedure prescribed by laws shall be allowed”* (Tan, et al., 2009, p. 968).

Both Lichtenberg (2008, p. 61) and Ding (2003, p. 116) support the fact that the motivation for China’s farmland preservation legislation is the result of maintaining a level of self-reliance in terms of food and crop production in order to continue the feeding of its growing population, despite the limited land base.

Land use

The following tables list the land use in dimensions and percentage. These data are from the China Statistical Yearbook. They cover two decades. However, the latest data are from 2008 and they were collected by surveying every few years. Therefore, some years contain the same numbers. The amount of cultivated land seems to have decreased between 2005 and 2010.

Land characteristics		
By land use (10 000 hectares)	2014	
	Area	(%)
Total Land Area	960,00	100
Cultivated Land	121,72	12,8
Garden Land	11,79	1,24
Forests Land	236,09	24,83
Area of Grassland	261,84	27,54
Other Land for Agriculture Use	25,44	2,68
Land for Inhabitation, Mining and Manufacturing	26,92	2,83
Land for Transport Facilities	2,50	0,26
Land for Water Conservancy Facilities	3,65	0,38

Land characteristics								
By Land Use (10 000 hectares)	2010		2005		2000		1996	
	area	%	area	%	area	%	area	%
Total Land Area	960	100	960	100	960	100	960	100
Cultivated Land	12172	12,68	13004	13,55	13004	13,54	9497	9,89
Forests	19545	20,36	17491	18,22	15894	16,56	12863	13,39
Water Area in Land	1747	1,82	1747	1,82	1747	1,82	1747	1,82
Area of Grassland	40000	41,67	40000	41,67	40000	41,67	40000	41,6
Usable Area	31333	32,64	31333	32,64	31333	32,64	31333	32,6
Others	22536	23,47	23758	24,75	25355	26,41	31986	33,28

Table 1: Land characteristics (National Bureau of Statistics of China, 2014)

Explanatory Notes on Main Statistical Indicators: (China statistical Yearbook)

Cultivated Land refers to land mainly for the regular cultivation of farm crops (including vegetables), with some fruit trees, mulberry trees and others, it covers cultivated land, newly-developed land, reclaimed land, consolidated land, fallow and beach land that can guarantee one harvest per year on average. It also covers fixed ditch, canal, road and sill (ridge) with width less than 1 meter in the South and 2 meters in the North, lands planted temporarily with herbs, grass, flowers and nursery stocks and other cultivated land with temporary change of use.

Garden land refers to land for intensive cultivation of perennial woody plants and herbs to collect fruits, leaves, roots, stems and juice, with a covering rate over 50 percent and plant number over 70 percent of rational plant number. Land for nursery is included.

Pastureland refers to land mainly for the growth of herbs.

Alternative land use data

The Ministry of Land and Resources is responsible for the surveying of the Chinese lands. Their latest report (2010) covers 2007 and contains the following points in comparison with 2006:

- the cultivated land declined by 0.03% (net reduction of 40,700 hectares)
- the garden land was reduced 0.04%
- the forestland diminished 0.002%
- the pastureland dropped 0.03%
- the land for residential and industrial/mining sites went up 1.11%
- the land for transport and communications grew 2.05%
- and the land for water conservancy facilities increased 0.37%.

“A total of 188,300 hectares were used for construction. [...] However, 195,800 hectares of cultivated land were newly added by land upgrading, reclamation and new development in the same period, being 4.0 percent more than the cultivated land used by construction.

The rate of farmland area reduction slowed down significantly, which was because farmland protection was further strengthened, the programs and plans concerning farmland were strictly enforced and various measures for farmland protection were implemented. We made strict checks on examination and approval of newly added land used for construction. The newly added land for construction approved in 2007 totalled 395,000 hectares, of which 175,600 hectares were farmland, and 13,400 hectares of land that were used unreasonably were checked and reduced, of which 4436.97 hectares were farmland” (Ministry of Land and Resources, PRC , 2010).

This seems to indicate that the current land use is monitored quite strictly by means of the farmland protection policies. However there remains a small decrease in the total amount of available arable land.

Other researchers have also looked at the land use of cultivated and constructed land. Their findings are as follows:

Over the past 60 years, a fast decrease in the cultivated land area and a clear difference in land-use among geographic regions started the economic reform and opening up policy. A significant amount of high quality cultivated land was converted to developed land, while low quality cultivated land was generated following the policy of compensation(Wang, et al., 2012).

Wang, et al. further (2012, p. 737) provide an overview of an analysis of land-use between 1996 and 2008. They conclude that the overall change in land-use was not significant, with small decreases in agricultural land and unused land. However, cultivated land, especially high quality cultivated land, decreased

significantly, with the serious consequence of high quality cultivated land being converted to developed land and low quality cultivated land being generated from other land-use types. This led to a threat to China's food supply.

In contrast, Lichtenberg and Ding (2008, p. 59) conclude that: *“The evidence suggests that a substantial share of farmland losses does not represent a reduction in food production capacity. It also suggests that increases in other factors of production can compensate for farmland losses and that farmland protection is not the most efficient –or even a necessary– means of meeting China’s food security goals.”*

According to their research, large areas of farmland in the coastal provinces have been converted, due to urbanization, industrialization, infrastructure and other non-agricultural uses (2008, p. 63).

Energy need

The following data on the energy consumption may seem like a small side step in the research, however it is important to understand that the energy need is closely connected with the growth of cities. Furthermore, the implications of energy production influence the available land and pollution levels via coal power plants.

Table 2 shows the consumption and environmental use by China. It also includes the growth rate of the energy use. This seems to correlate with the increase in Global National Income (GNI) and the increase in CO₂ emissions.

Growing cities need more power. Not only because of the development of new industries, but also because of the change in lifestyle. *‘If you live in the countryside, you live like a*

Country or area ^a	Population				
	Total population (thousands)	Projected population (thousands)	Population growth rate (per cent)	Proportion urban (per cent)	Urbanization rate (per cent)
	2015	2030	2010-2015	2015	2010-2015
Asia	4 384 844	4 806 846	1.0	48.2	1.5
Eastern Asia	1 637 550	1 688 300	0.5	60.0	2.0
China ³	1 401 587	1 453 297	0.6	55.6	2.4
China [Hong Kong SAR] ⁴	7 314	7 885	0.7	100.0	0.0
China [Macao SAR] ⁵	584	702	1.8	100.0	0.0
Country or area ^a	Consumption				
	GNI per capita ^b (current US\$) Latest from 2010	GNI growth rate (per cent) Latest from 2010	Per capita energy use ^b (kilograms of oil equivalent per capita) 2011	Total energy use (kilotons of oil equivalent) 2011	Average annual change in total energy use (per cent) 2005-2011
Asia	5 022		1 432	5 895 717	4.88
Eastern Asia	9 884		2 235	3 487 173	5.25
China ³	6 560	7.4	2 029	2 727 728	7.15
China [Hong Kong SAR] ⁴	38 420	3.5	2 106	14 894	2.70
China [Macao SAR] ⁵	64 050	8.9			
Country or area ^a	Environment				
	Per capita carbon dioxide emissions ^b (metric tons per capita) 2010	Total carbon dioxide emissions ^c (kilotons) 2010	Average annual change in total CO ₂ emissions (per cent) 2005-2010	Particulate matter concentration (micrograms per cubic meter) 2011	
Asia	3.83	16 153 382	5.45		
Eastern Asia	6.54	10 145 628	5.71		
China ³	6.19	8 286 892	7.17	82	
China [Hong Kong SAR] ⁴	5.17	36 289	-2.22	30	
China [Macao SAR] ⁵	1.93	1 030	-11.57	33	

Table 2: Population, consumption and the environment 2015 (United Nations, 2015)

land grabbing as a way to compensate the potential loss of farmland?

peasant. When you move to the city, you will use more energy' (Hulshof & Roggeveen, 2011, pp. 224-225).

As a result, the Chinese government is trying to integrate green thinking in its economic growth plans. To combat the pollution and provide clean power, the megaproject of the Three Gorges Dam in the Yangze River was constructed.

As seen in figure 16, the dam created a large reservoir behind it. It flooded 40.500 hectares of farmland(Sullivan, 2005). Consequently, 13 cities and over 1300 villages, archaeological locations and hazardous waste dumps were demolished (Central Intelligence Agency, 2013). However, with the dam in place, flooding downstream is controlled and devastating floods are prevented. Secondly, the large reservoir provides a water supply for the surrounding lands.



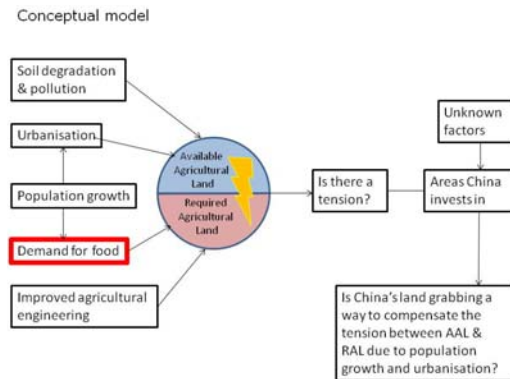
Figure 16: The Three Gorges Dam and reservoir (Central Intelligence Agency, 2013)

4.4 Demand for food

An increasing population results in an increasing need for food. But, this chapter also looks at the changing diet caused by an increased income.

Change of diet because of rising GDP

“High income urban residents consume less rice and wheat but substantially more vegetables, red meat, poultry, eggs, milk, and aquatic products than low income urban residents” (Lichtenberg & Ding, 2008, p. 62).



The same difference can be seen between the rural and urban households when looking at table 3 and table 4.

Per capita purchases of major foods of urban households								
Item		1990	1995	2000	2005	2010	2011	2012
Grain	(kg)	130,7	97,0	82,3	76,9	81,5	80,7	78,7
Fresh Vegetables	(kg)	138,7	116,4	114,7	118,5	116,1	114,5	112,3
Edible Vegetable Oil	(kg)	6,4	7,1	8,1	9,2	8,8	9,2	9,1
Pork	(kg)	18,4	17,2	16,7	20,1	20,7	20,6	21,2
Beef and Mutton	(kg)	3,2	2,4	3,3	3,7	3,7	3,9	3,7
Poultry	(kg)	3,4	3,9	5,4	8,9	10,2	10,5	10,7
Fresh Eggs	(kg)	7,2	9,7	11,2	10,4	10,0	10,1	10,5
Aquatic Products	(kg)	7,6	9,2	11,7	12,5	15,2	14,6	15,1
Milk	(kg)	4,6	4,6	9,9	17,9	13,9	13,7	13,9
Fresh Melons and Fruits	(kg)	41,1	44,9	57,4	56,6	54,2	52,0	56,0
Liquor	(kg)	9,2	9,9	10,0	8,8	7,0	6,7	6,8

Table 3: Food purchases in urban households (National Bureau of Statistics of China, 2014)

The shift from grain towards meat can be seen in both tables. The urban households' grain purchases have decreased from 130,7 kg in 1990 to 78,7 kg in 2012. For rural households this decrease is even bigger: from 262 kg in 1990 to 164,2 kg in 2012. The increase in the consumption of meat and meat products is also clearly visible in these tables. According to the OECD (2015) *“Meat consumption is related to living standards, diet, livestock production and consumer prices, as well as macroeconomic uncertainty and shocks to GDP. Compared to other commodities, meat is characterised by high production costs and high output prices. Meat demand is associated with higher incomes and a shift - due to urbanisation - to food consumption changes that favour increased proteins from animal sources in diets.”* So, if the GDP increases (chapter 4.1), the amount of meat in diets is also increasing.

Weis (2013, p. 67) states this as: *“Rising meat production and consumption has long been one of the most powerful trends in world agriculture. This is reflected in the ‘meatification’ of diets, a term which encapsulates the dramatic shift of animal flesh and derivatives from the periphery of human food consumption patterns, where it was for most of the history of agriculture, to the centre.”*

The shift towards more meat is also visible in the import statistics, as huge amounts of soybeans are imported in order to feed pigs and cattle. These numbers will be visualized in this chapter later.

Per capita consumption of major foods by rural households								
Item		1990	1995	2000	2005	2010	2011	2012
Grain	(kg)	262,0	256,0	250,2	208,8	181,4	170,7	164,2
Fresh Vegetables	(kg)	134,0	104,6	106,7	102,2	93,2	89,3	84,7
Edible Vegetable Oil	(kg)	5,1	5,8	7,0	6,0	6,3	7,4	7,8
Meat and Processed Products	(kg)	12,5	13,5	18,3	22,4	22,1	23,3	23,4
-Pork	(kg)	10,5	10,5	13,2	15,6	14,4	14,4	14,4
-Beef	(kg)	0,4	0,3	0,5	0,6	0,6	0,9	1,0
-Mutton	(kg)	0,4	0,3	0,6	0,8	0,8	0,9	0,9
-Poultry	(kg)	1,2	1,8	2,8	3,6	4,1	4,5	4,4
Eggs	(kg)	2,4	3,2	4,7	4,7	5,1	5,4	5,8
Milk	(kg)	1,1	0,6	1,0	2,8	3,5	5,1	5,2
Aquatic Products	(kg)	2,1	3,3	3,9	4,9	5,1	5,3	5,3
Fruits and Processed Products	(kg)	5,8	13,0	18,3	17,1	19,6	21,3	22,8
Nuts and Processed Products	(kg)		0,1	0,7	0,8	0,9	1,2	1,3
Liquor	(kg)	6,1	6,5	7,0	9,5	9,7	10,1	10,0

Table 4: Food consumption in rural households (National Bureau of Statistics of China, 2014)

Alternatively, the one-child policy has had an effect on the way children are fed as Jing (2000) and Yang (2007) both discuss in their articles. Jing explains that: *“Under the low fertility regime, parental aspirations now rest on the few or only children, who, with household resources concentrated on them, tend to be over-nourished.”*

“As it is often argued, under this policy regime, each household has few children. Each child, often described as the “little emperor” or “little sun” (Jing, 2000), has increasingly become the centre of attention in the household and has become more precious than ever to parents. As a result, parents tend to spoil their children by feeding them more and better food, which means a greater consumption of high-fat diets in the Chinese context” (Yang, 2007, p. 2044).

Improved food availability, together with modernization, urbanization, globalization of food markets, sedentary lifestyle and traditional attitudes toward body image, become the forces underlying the increase of obesity among children (Yang, 2007, p. 2044).

National production

The national production of Chinese agriculture shows an overall increase in the total sown area, as is visible in table 5. The rest of the table does not seem to show a significant increase or decrease. With the overall sown area growing, it seems that the national production is pushed to maximize its production.

Sown area of farm crops					
Item		2000	2010	2012	2013
Total Sown Area	(1 000 hectares)	156300	160674,8	163415,7	164626,9
-Grain Crops		108463	109876,1	111204,6	111955,6
•Cereal		85264,2	89850,6	92612,4	93768,6
»Rice		29961,7	29873,4	30137,1	30311,7
»Wheat		26653,3	24256,5	24268,3	24117,3
»Corn		23056	32500,1	35029,8	36318,4
•Beans		12660	11275,7	9709,4	9223,6
•Tubers		10538	8749,7	8885,9	8963,3
-Oil-bearing Crops		15400	13889,6	13929,8	14022,6
-Sugar Crops		1514,2	1905	2030,4	1998,3
-Vegetables		15237,3	18999,9	20352,6	20899,4
Area of Tea Plantations	(1 000 hectares)	1089	1970,2	2279,9	2468,8
Area of Orchards	(1 000 hectares)	8932	11543,9	12139,9	12371,4

Table 5: Sown area of farm crops (National Bureau of Statistics of China, 2014)

As table 6 below indicates, this maximizing seems to be visible here, as well as the fact that almost every farm product shows an increase, except beans. The amount of grain output has almost doubled between 1980 and 2013.

Output of major farm products											(10 000 tons)
Year	Grain	Cereal				Beans	Tubers	Oil-bearing Crops	Sugarcane	Beetroots	Fruits
		Rice	Wheat	Corn							
1980	32055,5		13990,5	5520,5	6260,0		2872,5	769,1	2280,7	630,5	679,3
1985	37910,8		16856,9	8580,5	6382,6		2603,6	1578,4	5154,9	891,9	1163,9
1990	44624,3		18933,1	9822,9	9681,9		2743,3	1613,2	5762,0	1452,5	1874,4
1995	46661,8	41611,6	18522,6	10220,7	11198,6	1787,5	3262,6	2250,3	6541,7	1398,4	4214,6
2000	46217,5	40522,4	18790,8	9963,6	10600,0	2010,0	3685,2	2954,8	6828,0	807,3	6225,1
2008	52870,9	47847,4	19189,6	11246,4	16591,4	2043,3	2980,2	2952,8	12415,2	1004,4	19220,2
2009	53082,1	48156,3	19510,3	11511,5	16397,4	1930,3	2995,5	3154,3	11558,7	717,9	20395,5
2010	54647,7	49637,1	19576,1	11518,1	17724,5	1896,5	3114,1	3230,1	11078,9	929,6	21401,4
2011	57120,8	51939,4	20100,1	11740,1	19278,1	1908,4	3273,1	3306,8	11443,5	1073,1	22768,2
2012	58958,0	53934,7	20423,6	12102,4	20561,4	1730,5	3292,8	3436,8	12311,4	1174,0	24056,8
2013	60193,8	55269,2	20361,2	12192,6	21848,9	1595,3	3329,3	3517,0	12820,1	926,0	25093,0

Table 6: National output of major farm products (National Bureau of Statistics of China, 2014)

Import / export

With globalization and a global food market it is also worthy to check the export and import of China. The status of 'net importer' does not imply that there is no export. Due to various policy changes since 2000, farmers have switched to alternative cropping patterns to make more profits. Moreover, since China accessed the WTO in 2001, the country has started to export cash crops such as vegetables and fruits, as seen in table 7 (Hofman & Ho, 2012, p. 8).

Main exported goods in volume and value (USD 10 000)					
Item		2012		2013	
		Vol.	Value	Vol.	Value
Live Hogs	(10 000 heads)	164	46056	168	45919
Live Poultry	(10 000 heads)	736	3094	717	2976
Frozen, Fresh Beef	(10 000 tons)	1	8060	1	4432
Frozen, Fresh Pork	(10 000 tons)	7	29504	7	32539
Frozen Chicken	(10 000 tons)	9	22175	10	24212
Aquatic and Seawater Products	(10 000 tons)	368	1811810	384	1942923
Fresh Eggs	(million units)	1230	11203	1074	10688
Cereals and Cereals Flour	(10 000 tons)	96	59373	95	66416
-Rice	(10 000 tons)	28	27213	48	41674
-Maize	(10 000 tons)	26	10117	8	3319
Vegetables	(10 000 tons)	741	755935	778	900551
-Fresh Vegetables	(10 000 tons)	485	317737	519	340171
Mandarins and Oranges	(ton)	942596	83932	866531	99121
Apples	(ton)	975878	95991	994664	102987
Pine Nut Kernels	(ton)	11576	17459	10683	21232
Soybean	(10 000 tons)	32	27913	21	20194
Peanuts	(10 000 tons)	15	27236	13	21907
Edible Vegetable Oil	(ton)	99519	18357	115491	19313
Sugar	(ton)	47144	4349	47771	4178
Natural Honey	(ton)	110158	21505	124901	24655
Tea	(ton)	313484	104226	325806	124631
Dried Capsicum	(ton)	51957	13748	47168	10993
Canned Pork	(ton)	48109	14967	48624	14944
Canned Mushroom	(ton)	307841	52250	275028	52716
Beer	(10 000 liters)	22574	14099	24944	16289

Table 7: Main food export (National Bureau of Statistics of China, 2014)

The table further shows basic farm products, such as cereals and meat. These basics are scarcely exported, as also stated in a report by the Earth Security Initiative: "China's self-sufficiency in the production of grains (only 2.2% of the cereal supply is imported) is an important part of its food security strategy. China's large imports of soybeans to feed its livestock, on the other hand, are likely to continue to grow as soybean was taken off the country's strategic commodity list" (Earth Security Initiative, 2013).

Main imported goods in volume and value (USD 10 000)					
Item		2012		2013	
		Vol.	Value	Vol.	Value
Cereals and Cereals Flour	(10 000 tons)	1398	478673	1458	510060
-Wheat	(10 000 tons)	370	110863	554	188056
-Paddy and Rice	(10 000 tons)	237	115335	227	108303
Soybean	(10 000 tons)	5838	3499017	6338	3800944
Edible Vegetable Oil	(10 000 tons)	845	969212	810	807489
Sugar	(10 000 tons)	375	224374	455	206867

Table 8: Main food import(National Bureau of Statistics of China, 2014)

The amount of imported soybeans is huge, compared to the other major food imports. These soybeans are almost entirely used as pig- and cattle feed in order to meet the national demand for meat. On the other hand there are more luxurious products that are being imported (not visible in the table) "...since the country's growing middle class pursues more luxurious life styles and consumption patterns. Popular food products, such as coffee, cacao, wine, and animal products, are more efficiently produced overseas, and necessitate investments abroad. As a result, the country has become a major player in the global land market over the past years" (Hofman & Ho, 2012, p. 8).

How much food is needed?

Wang et, al. (2012, pp. 743-744) have calculated the amount of food needed in combination with the minimum amount of hectares in agricultural land-use.

"The decrease in high quality cultivated land and the conflict between the demand for and supply of land resources are of serious consequence for the country. According to the national land-use planning framework, by 2020 China will have a population of 1.5 billion people, requiring 0.6 billion tons of food and an urbanization level of 55–60 percent. At least 0.11 billion hectares of cultivated land will be required. Meanwhile, there is insufficient arable land and nearly 2/3 of the reserved areas in the country are difficult to be developed and used. There is increasing tension between the need to protect cultivated land and the demand for land for urban and rural developments. It is estimated that the China population will reach its peak of 1.6 billion by 2033. Based on the fact that food consumption per capita is around 1000 kilograms in developed countries and around 500 kilograms in Japan and Korea, we can assume around 450 kilograms of food consumption per capita in China, which translates to 0.72 billion tons of food for its 1.6 billion people. If 50 million tons of food are expected to be imported (although many people think it should be the upper limit), China herself needs to produce 0.67 billion tons of grain annually to meet the demand. The grain growing area was 67 percent of the total crop growing area in 2005.

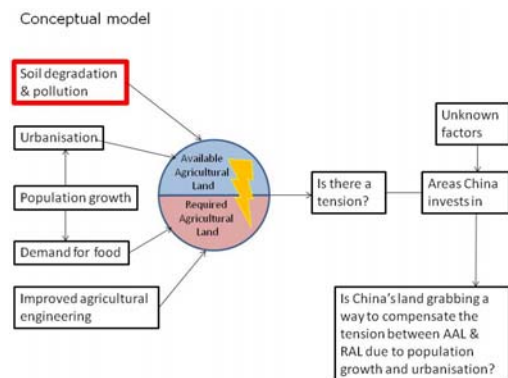
land grabbing as a way to compensate the potential loss of farmland?

Assuming that 75 percent of cultivated land in future is used for growing grain and the predicted cultivated land area is 0.11 billion hectares in 2030, the output per mu (equal to 0.06667 ha, as above-mentioned) must reach 525 kilograms. In the past 25 years, the unit (per mu) grain yield has increased by 110 kilograms. It is therefore reasonable to assume the unit grain yield can be increased by 135 kilograms in the next 25 years in view of scientific and technological progress. Thus, not more than 1000×10^4 ha of cultivated land can be used for development."

4.5 Soil degradation and pollution

This chapter contains the data on loss of farmland due to soil degradation and the influences of pollution in China on agricultural production.

As table 2 in the urbanisation chapter already showed, an increasing growth of energy is needed in China. This need follows the growing GNI and the CO₂ emissions.



The last twenty-five years have shown 'close correlations between economic development, population growth, and increases in resource consumption and polluting emissions.' Between 1978 and 2002 Guiyang's economy grew by more than ten percent annually, and energy use increased by six percent per year. This caused a "large-scale and in some cases irreversible damage to the local environment, including loss of biodiversity and degradation of natural resources, most notably water and soil" (Hulshof & Roggeveen, 2011, p. 208).

Three decades of Chinese economic advance are based on industrialization and urbanisation. These pushed the country into becoming the second economy in the world. But wealth comes at a price: 48 percent of Chinese townsmen live in areas with air quality so poor that it damages their respiratory tracts. The Chinese Academy for Environmental Planning calculates this causes 411,000 early deaths per year. Almost 60 percent of China's rivers do not measure up to international clean water standards. In comparison: for the United States that figure is eight percent. On top of this, China is rapidly increasing the use of two resources for which it has inadequate supply: energy and water. Especially in the northern half of the country, depletion of groundwater threatens the cities in the long run, which will result in an ecological and economic disaster. Chinese cities are the key to the debate on sustainability, as they are responsible for up to 85 percent of the national energy consumption. Considering continuing urbanisation, China's energy needs will double by 2025, compared to 2005 (Hulshof & Roggeveen, 2011, pp. 208 - 209).

For the military parade in Beijing the Chinese government ordered the closure of hundreds of factories and banned half of the cars from the streets. The result can be seen in figure 17 in the top part. The bottom part shows the smog pollution.



Figure 17: Smog in Beijing (image by Serena Dong - CNN)

Soil degradation

The centre Chinese province of Gansu has bad agricultural conditions. Years of low rainfall made large parts of the province almost infertile. Some farmers have to drill a minimum of two hundred meters before they hit water. The authorities have outlawed planting water intensive crops, and many farmers are moving away. Therefore many farms are barren and dry (Hulshof & Roggeveen, 2011, p. 189). The Ministry of Land and Resources states that: *“There is about 30 percent of cultivated land affected by soil erosion at varying degree while cultivated; and reserve is insufficient.”* (2007). Table 9 shows other agricultural land losses due to natural disasters. The main disaster in terms of amount of land loss is drought. This leads to the need of irrigation in order to water the crop fields.

Loss caused by natural disasters 2013 (1 000 hectares)										
	Total Areas Affected of Farm Crops		Drought		Flood, Water logging, Landslides and Debris Flow, Typhoon		Wind and Hail		Low-temperature, Freezing and Snow Disaster	
	Area Affected	Total Crop Failure	Area Affected	Total Crop Failure	Area Affected	Total Crop Failure	Area Affected	Total Crop Failure	Area Affected	Total Crop Failure
National Total	31350	3844,4	14100	1416,1	11427	1828,9	3387,3	412,4	2320,1	180,7

Table 9: Loss caused by natural disasters 2013 (National Bureau of Statistics of China, 2014)

Irrigation

“Half of China’s arable land is irrigated with 40,000 irrigation networks. Most of these were built over half a century ago; less than forty percent are in good condition” (Earth Security Initiative, 2013, p. 10).

“Water pollution is another Achilles heel of China’s resource security. More than half of the groundwater nationwide is categorized as polluted. This results from a combination of untreated industrial wastewater, the organic pollutants of livestock, and the overuse of agricultural inputs. China’s Ministry of Land and Resources estimates that pollution from heavy metals destroys 10 million metric tons of grain and contaminates another 12 million metric tons annually” (Earth Security Initiative, 2013, p. 10).

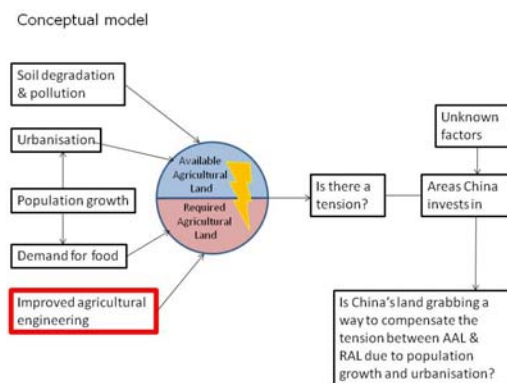
4.6 Improved agricultural engineering

This chapter contains improvements in agricultural engineering in order to improve agricultural production.

According to Lichtenberg and Ding (2008, p. 62) land is: *“not the only factor of production that matters in agriculture... [...] ...other production factors can and do*

compensate for reductions in farmland.” Increases in capital, agricultural fertilizers, energy, seed quality and other intermediate inputs can compensate for reductions in farmland. They further argue that: *“The technical keys to success in meeting China’s food security goals appear to lie in most notably irrigation, flood control, and R&D, along with modest increases in imports of selected, mostly nonstrategic commodities.”* Table 10 indicates that China is increasingly improving its agricultural production with more mechanisation, use of fertilizers and the use of irrigation. The major increases can be found in the number of large and medium sized tractors. The use of these machines has increased fivefold between 2000 and 2013. The number of irrigated hectares has also increased with almost 10000 areas towards 63473 (x1000 hectares). Lastly, the total amount of consumed electricity in rural areas has increased 3,5 times between 2000 and 2013. Although, it does not indicate how the electricity is used, it matches the overall increased energy consumption in China.

The increased use of these improvements in agricultural engineering has helped to maximize the output of farm products per hectare, visible in table 11.



Population growth and urbanisation in China:

Basic conditions in agricultural production					
Item		2000	2010	2012	2013
Total Agricultural Machinery Power	(10 000 kw)	52574	92780	102559	103907
Number of Large and Medium-sized Agricultural tractors	(unit)	974547	3921723	4852400	5270200
Number of Small Tractors	(10 000 units)	1264	1786	1797	1752
Number of Large and Medium-sized Tractor Towing Farm Machinery	(10 000 units)	140	613	764	827
Small Tractor Towing Farm Machinery	(10 000 units)	1789	2993	3081	3049
Number of Diesel Engines	(10 000 units)	688	946	982	1259
Irrigated Area	(1 000 hectares)	53820	60348	62491	63473
Consumption of Chemical Fertilizers	(10 000 tons)	4146	5562	5839	5912
Electricity Consumed in Rural Areas	(100 million kwh)	2421	6632	8105	8550

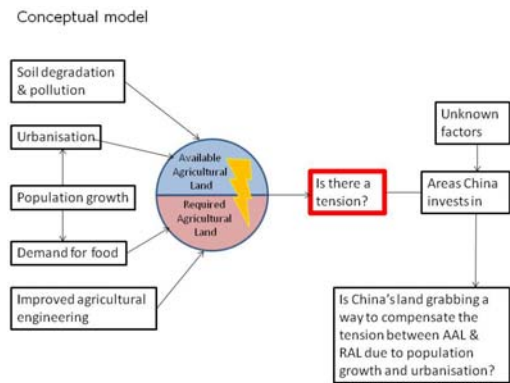
Table 10: Basic conditions in agricultural production (National Bureau of Statistics of China, 2014)

Output of major farm products per hectare							(kg/hectare)
Year	Cereals	Peanuts	Rapeseeds	Sesame	Sugarcane	Beetroots	
1980		1539,2	838,1	333,1	47561,7	14241,8	
1985		2008,1	1247,6	657,3	53429,9	15912,8	
1990		2190,7	1264,3	701,5	57117,5	21667,6	
1995	4659,3	2686,7	1415,5	907,7	58133,3	20132,5	
2000	4752,6	2973,3	1518,6	1034,2	57626,1	24518,0	
2008	5547,7	3364,8	1835,3	1243,2	71209,7	40754,4	
2009	5447,5	3360,6	1876,5	1306,8	68093,4	38536,2	
2010	5524,4	3455,5	1775,1	1312,1	65700,0	42498,1	
2011	5706,6	3502,5	1827,3	1385,3	66485,1	47361,1	
2012	5823,7	3598,5	1884,8	1463,2	68600,3	49792,8	
2013	5894,2	3663,3	1919,8	1490,0	70576,2	50922,4	

Table 11: Output of farm products per hectare

4.7 Tension overview

This chapter contains a small overview of the most important influences on the available and the required agricultural land. The tension overview graph is the last point in this chapter.



Population growth

The population is expected to grow towards 1.5 billion people in 2050. This is an increase of around 0.15 billion. This will both affect the amount of food needed and the available space to live and work.

Urbanisation

The data, as well as the alternative data and the results by other researchers, indicate that there is a small decrease in the total available agricultural land. However, the amount of agricultural land that is converted into urbanised area is smaller than previously expected. This is part of the stricter farmland protection policies implemented in 2007.

Demand for food

With the growing population the demand for food will also increase. Combined with the rise in GDP this will lead to more meat in diets and therefore more pig- and cattle feed is needed to provide this meat. However, a large part of this feed is being imported.

Soil degradation & pollution

The biggest impact on farmland degradation and lost crops are droughts. Currently 30 percent¹¹ of the cultivated land is affected by soil erosion. This means that almost a third of the total cultivated area has a smaller than average output.

Improved agricultural engineering

The improvements in agricultural engineering raise the outputs per hectare. The further use of irrigation and mechanisation in the agricultural sector help to maintain a high level of food self-sufficiency. Between 1995 and 2013, the average output increased with 68,8 kg per year.

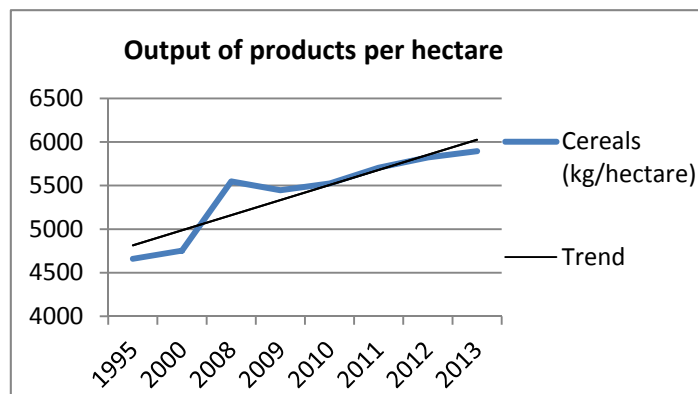


Figure 18: Output per hectare

¹¹ (Ministry of Land and Resources, PRC, 2007)

Tension overview

The available- and the required agricultural land are illustrated in figure 19. The tension can be seen as between 2000 and 2015 the lines are coming closer together. The stricter farmland protection implemented in 2007 is indicated with the orange dotted line. The decrease in the available agricultural land is less strong after 2007, indicating that there is indeed a stricter policy being implemented on the protection of cultivated farmland.

The green line displays the required agricultural land needed to feed the population. This line is influenced by the increasing output per hectare. This was on average increasing with 68,8 kg a year. The population in 2050 will be around the 1.5 billion people. These people need on average 450 kg¹² of food per person per year. As the improved agricultural engineering is pushing the output per hectare higher than the population is growing on average per year, the total needed agricultural land is decreasing.

'The red line' indicates the absolute minimum amount of 210 million acres of agricultural land as ordered by the Chinese Prime Minister Wen Jiabao (Hulshof & Roggeveen, 2011, p. 171 & 172).

Note: although the required agricultural land seems to decrease faster between 2015 and 2050, this is mostly influenced by the growing outputs per hectare. In case these outputs are increasing slower than used for this graph, the green line will decrease slower between 2015 and 2050. The five year intervals make it look steeper than it is in relation with the previous years.

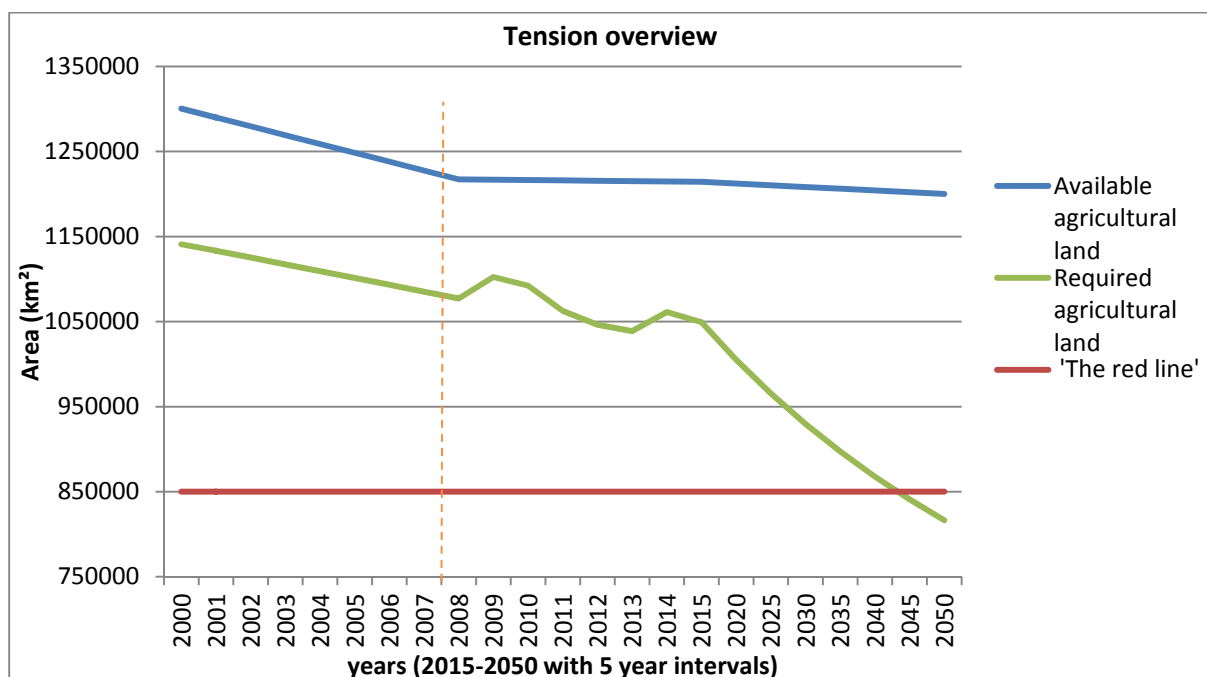


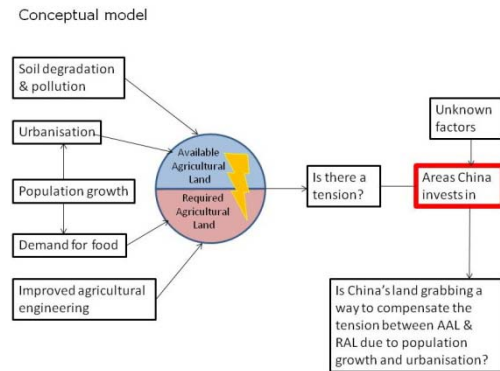
Figure 19: Tension overview

¹² (Wang, et al., 2012, pp. 743-744)

4.8 Areas China invests in

In this chapter the data on Chinese overseas investments are presented. The focus of the data is on land deals in overseas areas.

Because the tension overview seems to indicate a tension between the AAL and the RAL, it is necessary to examine the overseas areas China is investing in.



Hofman and Ho (2012) examine the Chinese 'land grabs' or 'developmental outsourcing'. A number of events and policies are highlighted in relation to the overseas investments made by China. They examine close to a hundred land deals with an agricultural destiny and they look at their history. The 'investments' seem to happen in three periods:

- 1949-1999, in this period the investments take place in Africa and in countries close to China. The investments in Africa turn out to be aid projects, not economical investments, although they are mentioned because many of these deals form the foundation for later investments. The other investments take place in neighbouring countries as Cambodia and Laos.
- 2000-2008, in which a policy was introduced by the Chinese government, the 'Going Global' policy. With this policy the Chinese government actively stimulated the collection of overseas resources by national companies. The number of overseas investments increased in Africa, but even more in countries around China. The investments seemed to follow a wrinkle effect, many near China and fewer further away.
- 2009-2011, at the time of the global credit crisis, the number of investments slowed down, only to increase afterwards. This time, newer regions were explored to invest in: Latin America, the Pacific, Central Asia and Eastern Europe. The shift towards these newer regions could partly be explained by a number of Chinese investments failing, due to protests among the local population. They considered the possible investments as neo-colonialist 'Yellow Peril'. However, Hofman and Ho argue that: "...the changing consumption pattern in China is visible in these investments in vineyards (Australia, Bulgaria and France), cattle farms, dairy farms and orchards (Australia and New Zealand). While rising domestic demand for wine and beef has obviously driven the investments in vineyards and cattle farms, the investments in dairy might have other reasons. Recent food safety scandals, such as the 2008 San Lu infant milk incident, have had and continue to have significant impact on the Chinese dairy sector."(2012, p. 19)

The Chinese Statistical Yearbook describes the term Overseas Direct Investment as follows: *“Overseas Direct Investment refers to investment made by domestic enterprises and organizations (referred to as domestic investors) in foreign countries and Hong Kong SAR, Macao SAR and Taiwan province in forms of cash, physical investment and intangible assets. The economic activities centring on operation and the management of those enterprises are under the control of domestic investors. The content of overseas direct investment mainly reflect one economic entity by investing in another economic entity to achieve its goal of lasting interest”* (2014).

It is further stated that the data of overseas direct investments mentioned in the Chinese Statistical Yearbook include the following: *“Overseas direct investment includes: basis situation of domestic investors and overseas enterprises, investment, earnings and their distribution between domestic and overseas invested enterprises, import and export of commodities through overseas enterprises, approval of overseas enterprises. Statistics cover all types of overseas corporate and non-corporate enterprises by direct investment of domestic investors. Data are from Ministry of Commerce through comprehensive survey”* (2014).

With the used terms described, we move on towards the data from the Chinese Statistical Yearbook.

Overseas direct investment by sector					(USD 10 000)
Sector Sorted by size in 2013		Net Overseas Direct Investment		Overseas Direct Investment Stock at the End of 2013	
		2012	2013		
Leasing and Business Services	# 1	2674080	2705617	19573354	
Mining	# 2	1354380	2480779	10617092	
Financial Intermediation	# 3	1007084	1510532	11707983	
Wholesale and Retail Trades	# 4	1304854	1464682	8764768	
Manufacturing	# 5	866741	719715	4197684	
Construction	# 6	324536	436430	1944574	
Real Estate	# 7	201813	395251	1542126	
Transport, Storage and Post	# 8	298814	330723	3222778	
Agriculture, Forestry, Animal Husbandry and Fishery	# 9	146138	181313	717912	
Scientific Research and Technical Services	# 10	147850	179221	866973	
Information Transmission, Software and Information Technology	# 11	124014	140088	738440	
Service to Households, Repair and Other Services	# 12	89040	112918	768855	
Production and Supply of Electricity, Heat, Gas and Water	# 13	193534	68043	1119660	
Culture, Sports and Entertainment	# 14	19634	31085	110067	
Management of Water Conservancy, Environment and	# 15	3357	14489	34242	
Hotels and Catering Services	# 16	13663	8216	94743	
Education	# 17	10283	3566	20105	
Health and Social Service	# 18	538	1703	6484	
Total		8780353	10784371	66047840	

Table 12: Overseas direct investment by sector (NBSC) (2014)

Table 12 displays the overseas sectors China invested in, covering the years 2012 and 2013. The main sector for 2013 is 'Leasing and Business Services' followed closely by 'Mining'. Ranked seventh is 'Real Estate', 'Agriculture, Forestry, Animal Husbandry and Fishery' is in 9th position. The same data, only diverged into overseas direct investments by country or region can be seen in table 13. However, these investments do not indicate land purchases or land grabs by China or Chinese corporations in other countries.

Overseas direct investment by countries or regions			(USD 10 000)
Country or Region	Net Overseas Direct Investment		Overseas Direct Investment Stock at the End of 2013
	2012	2013	
Asia	6478494	7560426	44740828
Hong Kong, China	5123844	6282378	37709314
Indonesia	136129	156338	465665
Japan	21065	43405	189824
Macao, China	1660	39477	340914
Singapore	151875	203267	1475070
Republic of Korea	94240	26875	196308
Thailand	47860	75519	247243
Vietnam	34943	48050	216672
Africa	251666	337064	2618577
Algeria	24588	19130	149721
Sudan	-169	14091	150704
Guinea	6444	10013	33858
Madagascar	843	1551	28610
Nigeria	33305	20913	214607
South Africa	-81491	-8919	440040
Europe	703509	594853	5316156
United Kingdom	277473	141958	1179790
Germany	79933	91081	397938
France	15393	26044	444794
Russia	78462	102225	758161
Latin America	616974	1435895	8609593
Cayman Islands	82743	925340	4232406
Mexico	10042	4973	40987
Virgin Is. (E)	223928	322156	3390298
North America	488200	490101	2860974
Canada	79516	100865	619619
United States	404785	387343	2189956
Oceania	241510	366032	1901712
Australia	217298	345798	1744968
New Zealand	9406	19040	54173
Total	8780353	10784371	66047840

Table 13: Overseas direct investment by countries or regions (NBSC)(2014)

Land Matrix

The data on Chinese overseas investments regarding land deals are displayed in an overview map in figure 20. The majority of the investments are conducted in South-East Asia, followed by Africa.

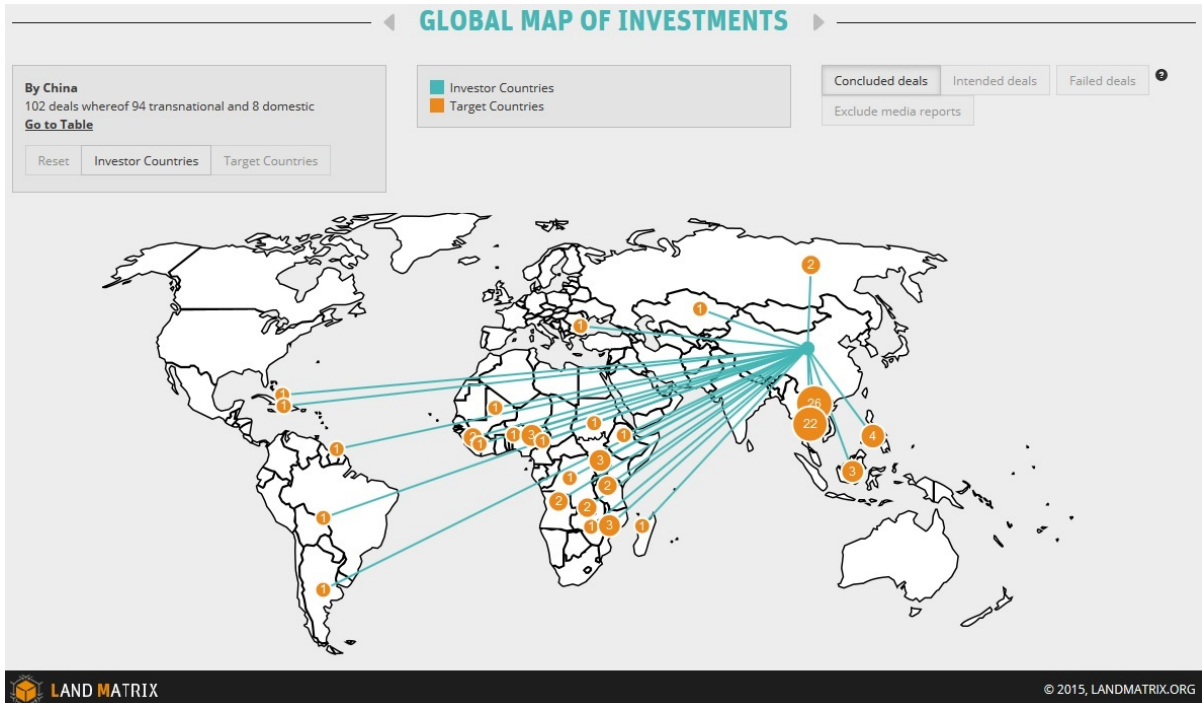


Figure 20: Chinese land investments by Land Matrix

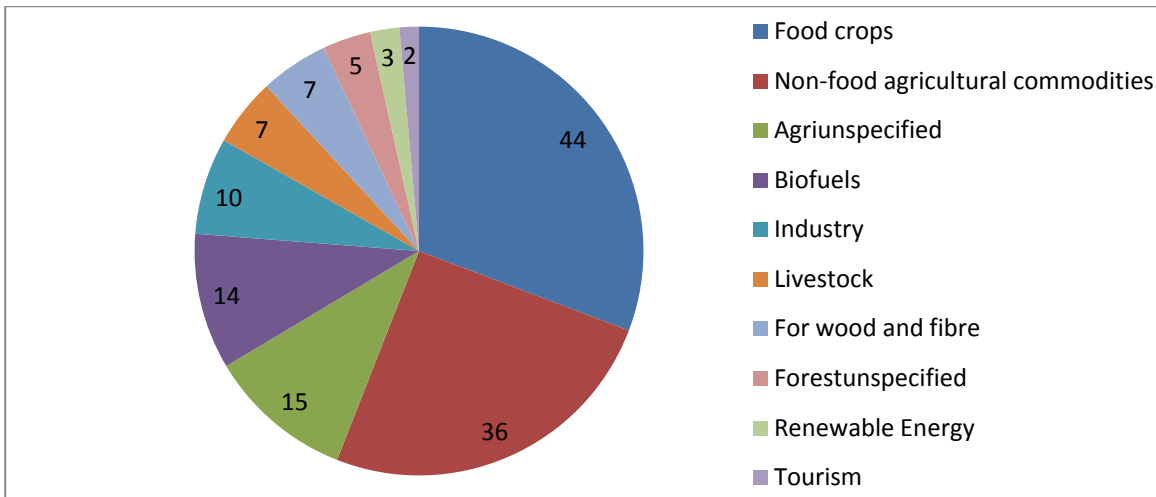


Figure 21: Intended use of land for investments

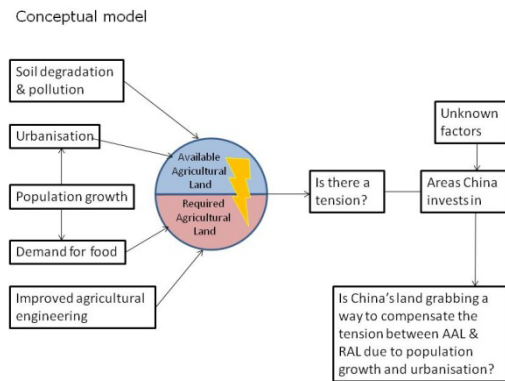
The Land Matrix has records for 94 transnational investments that have been concluded between China and another country. By analysing these deals a breakdown of the intended land use for each investment has been created in figure 21. A number of investments was labelled with multiple uses. In such cases, the multiple uses have been split, making a total of 143 uses over the 94 concluded investments. Unfortunately, the multiple uses per investment bring about a complicated presentation of the data concerning the size of these deals.

Chapter 5: Conclusion - Discussion

5.1 Conclusion

This research began as the result of a simple interest in three happenings in the field of land grabbing, population growth and urbanisation. After reviewing the background of the one-child policy and the general discourse in land grabbing, we

found ourselves digging through data on a number of topics which could all have an impact on the tension between the available- and the required arable land. With some small sidesteps we managed to investigate this tension and further researched the investments made by China in overseas markets. All this was done to come to this chapter where all the strings are tied together in order to come to a conclusion: to find out if the Chinese land grabbing takes place in order to compensate the tension between the AAL and the RAL due to population growth and urbanisation. Using the conceptual model, we can now go through the data and answer the research questions.



Population growth

The data show two scenarios. Firstly, the population is not going to increase thanks to the aging of the population. Still, the United Nations could have disregarded the data on the two-child policy and they are not clear on whether or not it is accounted for. On the other hand we notice the population growth which indicates a sudden change in policy. In that perspective, there will be an increase in population. With that, more food and houses are needed in the cities as the urbanisation rate also continues to increase. This scenario is much more likely to happen and should therefore be taken into account.

Urbanisation

The GDP per capita has shown a steady increase in the income of the nation and the population. The urbanisation rate has also shown a steady increase towards 70 percent in the coming years. However, as the cities are indeed expanding, they are also bound by farmland protection and a national 'red line' of minimal agricultural land which cannot be crossed in order to maintain self-sufficiency. Researchers are divided, with some arguing a net loss of farmland and therefore a danger to the domestic food production. Others claim that the amount of agricultural land is not the only factor in food production.

Demand for food

Because of the increased income many diets change and many urban residents have adopted a different lifestyle with different consumer wishes. This change has a greater influence on the need for different food than it has on the issue of

supplying more people. The import of many agricultural products proves this as well: China imports a huge amount of soybeans in order to raise cattle and produce more meat. In this way, China adjusts to the population's changing diets.

Soil degradation and pollution

As was visible in the urbanisation data, the amount of energy required increases in conjunction with the national income as well as the CO₂ (carbon dioxide) emissions. The air pollution is a problem in the majority of the Chinese megacities. Especially those along the east coast which have experienced the longest industrialization and urbanisation. The pollutions are also a threat to the water. Looking at the dependence of irrigation, this is a serious issue. Due to dry conditions in the north western parts of the country, many farms fail to produce crops.

Improved agricultural engineering

China already does a lot in research and development of new crops and as data show it uses more fertilizers and mechanisation in the crop production. However, to further improve agricultural results, an increase in irrigation could help. But with the bad state of the current irrigation systems and the pollutions in the rivers this still needs a lot of improvements in order to be fully effective. The output per hectare has increased over the past decades, which indicates that the output can be pushed harder in order to produce more, given that the irrigation can keep up with the water demand.

Tension between the AAL and the RAL

Looking back at the data we can conclude that there is indeed a tension between the AAL and the RAL. However, the tension is of a good kind. It keeps the government focused on providing enough room for its population in the cities which are a major economic factor. At the same time it strives to remain self-sufficient in its agricultural needs. There is a

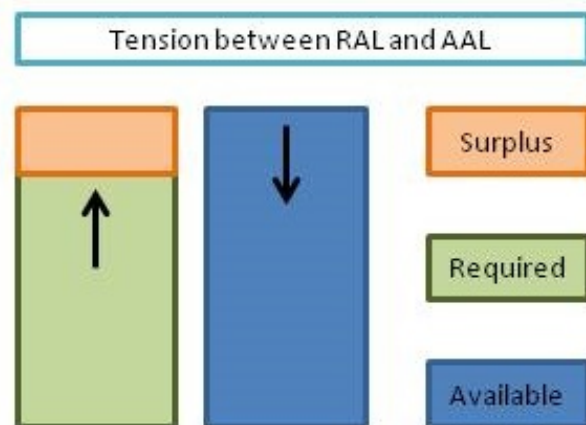


Figure 22: Tension between RAL and AAL

surplus as figure 22 displays however, this surplus is decreasing. Although the soil degradation and pollution do threaten the available agricultural land, there are still many improvements that could be made in agricultural engineering. Furthermore, the production capacity per hectare shows an increasing rise over the last couple of years, which technically means less land will be needed to produce the same amount of food.

Areas China invests into

As I have concluded that there is indeed a tension, the data on Chinese investments are essential to answer the second part of the research question. Is the tension compensated by land grabs overseas?

The data on land grabbing are not reliable enough to base a full conclusion on them. The sectors China invests in are most of all for resource gathering in mining and energy need. Only a small part is invested in agriculture and even then, the data on the amount of land being 'grabbed' are inconsistent to draw a conclusion.

To conclude

There is a tension between the AAL and the RAL which for a large part seems to be a result of population growth. However, the tensions seem to be only partly the result of urbanisation due to the stricter implementation of farmland protection. For the most part the tension is the result of a greater and different need for food. Although there are more influences like droughts and for a small part pollutions that create tension, it is simultaneously relieved by the improvements that are made in the agricultural sector which lead to higher outputs per hectare. With the major factors discussed, it is worth noting that there could be many more influences on the tension, however these were not in the scope of this research.

Now that we have concluded that there is indeed a tension between the AAL and the RAL, which seems to be a result of population growth and urbanisation, we have to take China's overseas investments into account. Due to the unreliable data on land grab deals, it remains difficult to provide convincing evidence to conclude that the overseas investments indeed happen to compensate for the tension between the AAL and the RAL. A logical explanation would be that China wants to keep up its self-sufficiency in food production as high as possible, to avoid the risks of being import depended, as became clear in some countries during the world food crisis. Again, there are many more influences for China to turn to overseas investments. However, those go beyond the limit of this research.

The link with planning theory and practice

This research study has displayed that it is important to assess the implications of policy changes in a population. It is necessary to accommodate the possible effects that are expected to come forth from these changes. This means that planners must take lessons from the past and use these for making plans in the future. At the same time it shows that practice does not always follow theory, as unforeseen events can change planned decisions, for instance a shift in becoming less import dependent and keeping up the food self-sufficiency after the world food crisis of 2008.

5.2 Discussion

Energy need

Chapter 4.2 describes the 'energy need'. During the feedback meetings with Terry it was expressed that this part seemed unnecessary, even as a side step in the data collection. However, I added it to provide an extra view on the relation between the population growth, urbanisation, the rise in GDP, pollution and its spatial impacts. With more population and an increasing urbanisation rate, the number of people living in the cities is growing fast. Combining this with the increasing GDP, people have more money to spend e.g. on electronic appliances which, in turn, demand more power. The more energy is needed, the more pollution is created by coal power plants, which has an effect on the crop production and on the rural surroundings of cities (although this seems a bit farfetched). On the other hand are the 'clean energy' solutions such as hydroelectric power plants (the Three Gorges Dam). Although this plant provides 'green' power, it does impact the agricultural land negatively by flooding high quality farmland in its reservoir. Because of these flights of thought and its connections with the research I have decided to include the 'side step' on energy need in the research.

Data on land deals

As Hofman and Ho write(2012, p. 12): *"Host countries boast of and the media breathlessly report investments that might never occur. Legitimate transactions are re-announced again and again. Moreover, a substantive proportion of Chinese land-based projects is rejected at a late stage by regulators, or run into problems during the execution phase leading to partial or complete cancellation. Perception of the 'Chinese taking over' leads to protests from civil society and political opposition parties, and is often a cause to reconsider or even cancel previously announced investments."*

- the available data on China's land-based investments are highly inconsistent, fragmentary and, at times, completely absent
- data quality is a critical issue: there is a lack of in-depth research 'in the field' with qualitative fieldwork and quantitative surveys

It is therefore hard to draw conclusions on the nature of Chinese overseas investments concerning land grabbing. There is no reliable way of concluding a realistic outcome on this topic.

Globalisation

Globalisation makes it easier to import and export food from and to other countries. Therefore, it is more difficult to determine whether the country's food production is sufficient or not and in what way the country is self-sufficient in its food production.

Other impacts

In this research I looked at the causality for the possible reason that China is conducting land grabbing in order to compensate its potential farmland loss. However, it remains impossible to take every factor into account. Therefore the research was limited to only the five basic impacts on the tension between the AAL and the RAL. Although there may be other impacts on this tension and also on the reasons why China is conducting land grabbing, they go beyond the scope of this research.

Items left out

Due to various scandals in the Chinese food industry, such as the baby milk powder poisoning in 2008, many Chinese no longer trust national produced food products. There may be enough domestic food production, but because of the high levels of pollution and the food scandals it is no longer trusted. Chinese producers therefore have to import the products from abroad, possibly by means of overseas investments and land grabs. An example is the large investment by the Chinese in Dutch milk powder factories. This is an interesting view of the topic of food security, but it is also incredibly hard to prove. As a result I left it out of the main research, but I think it should be mentioned.

Outcome of the research

In my opinion the outcome of the research is realistic. It was not what I had expected at the start of the research, but the result is convincing to me. The impact of urbanisation on the available agricultural land is smaller than I had originally anticipated, but the data have proven that the impact has decreased over the last couple of years due to stricter farmland protection policies. However, it is a shame that the results on land grabbing prove to be unreliable. Although they paint a picture of the overseas investments made by China, it remains unclear what the motives for doing so are, and if they are a response to the tension between the AAL and the RAL. In that case, the topic of land grabbing remains a grey area in terms of reliable land deal data.

Chapter 6: Reflection

The process

At first I aimed at constructing a timeline graphic to find a trend that would indicate if there was a possible connection between population growth, urbanisation and land grabbing by China. However, as I progressed with the research, this method turned out to be unreliable as a proof to the research question. Later on, the 'overview of the tension' was brought into the data chapter, as this follows the conceptual model. It displays a kind of overview which I first had in mind with the timeline graphic. However, the overview is less complicated and it does not express a conclusion yet.

In the beginning of the research I focused too much on finding 'proof' instead of remaining more neutral. As a result, I started making assumptions, but there was no evidence yet. I was not impartial. The research became more reliable and more convincing when I distanced myself from the research and took a more neutral approach in collecting the data.

As a result, working on the research became less frustrating, as I took it less personal to 'prove' my theory. I decided to search the data and base my conclusion on these data. The realisation that I would be judged upon the research and not upon the outcome, made it much easier.

What I have learned

I learned to create the main structure of the research early, it helps to create an overview. It also indicates which data you must collect. Adjust when needed, but try to stick to this structure. It also helps to plan the time needed more easily.

I often needed more time. I underestimated the required time. Don't think: "Oh that is quite easy, I can write that chapter in no time."

I made a wrong estimation of the time I would need to write a chapter. Then, when I was working on that chapter I realized that I had to include this and that. As a result, this thesis took far more time than I originally planned.

All in all I am happy with the result of the research and the result seems quite convincing.

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