

Emerging Economies and Large Land Investments

Maria Bruna Zolin • Marco Braggion

Abstract Since 2008, and following dramatic increases in prices, international commodities markets systems have begun changing after decades of relative indifference. The reasons for high, volatile food prices are manifold and widely analyzed by the abundance of literature on the subject, that deals essentially with imbalances in demand and supply. On the global demand for food, a factor with a huge impact is the change in diet, especially in emerging countries where, an increase of per capita income corresponds to an increase in the demand for animal-based foods. As the demand for food increases, demand for land increases and pushes prices up, thus fuelling speculation that mainly affects countries where land prices are lower. The paper aims to highlight the behaviour of China and India –which are among the most important emerging countries in terms of economic growth, concentration of population and surface area – with regard to the large-scale land investment phenomenon. We have aimed to identify those macroeconomic indicators (such as biofuels production, food price index, GDP per capita, cereals production and crude oil prices, usually referred to in order to explain the trend) which best exemplify how they can affect the two countries analyzed in the rush for land. The paper is divided into sections. Following a brief presentation of adopted methodology, an overall picture is presented of agriculture, renewable energy and land investment in China and India and, by means of a correlation matrix, the impact that some macroeconomic variables have on the phenomenon have been described.

Keywords Agricultural economics - Land investments - Food security - Energy security - Emerging economies

JEL Classification O13 - P28 - Q15 - Q18 - Q41 - Q42

Maria Bruna Zolin (✉) • Marco Braggion
Department of Economics, Ca' Foscari University, Venice, Italy
e-mail: zolin@unive.it; marco.braggion@unive.it

1. Introduction

Since 2008, and following dramatic increases in prices, international commodities markets systems have begun changing after decades of relative indifference. According to Engel's law, high food trends have a major impact on the food security of the world's poorest people (McMichael and Schneider 2011; Nelson et al. 2010; FAO 2009a; Headey and Fan 2008; Zolin 2012; Doeward 2013).

The reasons for high, volatile food prices are manifold and widely analyzed by the abundance of literature on the subject (Gilbert 2010; Andreosso-O'Callaghan and Zolin 2010a; FAO 2009b; World Bank 2010a), that deals essentially with imbalances in demand and supply. On the demand side, a factor with a huge impact on the global demand for food, is the change in diet, especially in emerging countries where, an increase of per capita income corresponds to an increase in the demand for animal-based foods. Also on the demand side, the production of biofuels, aimed at compensating for the limited resources of non-renewable energy, has helped to push up the requests for energy resources production. In recent years, among the supply determinants in developing countries, such as low and stagnating productivity, weak rural and agricultural infrastructure together with market and trade restrictions, speculation based on food, financial instruments and rising oil prices, land has come to the fore because of its quantity scarce productive factor.

As the demand for food increases, demand for land increases and pushes prices up, thus fuelling speculation that mainly affects countries where land prices are lower. The African continent has seen a rapid increase in foreign investment in fertile and less expensive lands. Investments could be perceived positively, because of the introduction of technical innovations (World Bank 2010b), but the phenomenon has few selected enthusiasts. As a result of the impact it has on local populations, it forces small farmers to compete with companies/organizations (public or private) with highly professional skills and plentiful financial resources putting the former at an extreme disadvantage.

Our analysis of land investment, and its implications on food and/or energy security, focuses on China and India. China ranks first (or in some cases second) as the world's largest consumer of agricultural products, mainly owing to its large population. China is also experiencing a shift in its eating patterns where the consumption of traditional staples (such as rice, wheat) is decreasing in favour of other products such as meat, fruit and processed food. India is an important consumer of agricultural commodities, also because of its sizeable population; it is one of the world's largest consumers of tea, sugar, wheat, rice, cotton and palm oil. From a general point of view, the economic rise of these countries is creating a growing demand for raw materials and commodities. It is predicted (FAO 2009c) that demand for cereals will increase by 3 billion tons by 2050 (about 2,1 billion tons in 2009) and for other food products (livestock, dairy products, vegetable oils) the demand is expected to grow even faster mainly as a result of higher incomes in developing

countries.

The paper aims to highlight the behaviour of China and India –which are among the most important emerging countries in terms of economic growth, concentration of population and surface area – with regard to the large-scale land investment phenomenon. We have aimed to identify those macroeconomic indicators (such as biofuels production, food price index, GDP per capita, cereals production and crude oil prices, usually referred to in order to explain the trend) which best exemplify how they can affect the two countries analyzed in the rush for land.

The paper is divided into sections. Following a brief presentation of adopted methodology, an overall picture is presented of agriculture, renewable energy and land investment in China and India and, by means of a correlation matrix, the impact that some macroeconomic variables have on the phenomenon have been described. The findings and conclusions sum up our research.

2. Material and Methods

To our knowledge, the most reliable data sets available for the measurement of the phenomenon of land large investment are GRAIN (www.grain.org), Matrix Land (International Land Coalition 2012), FAOSTAT and the World Bank Data Catalog.

The GRAIN data set, started in 2006, considers the food crops deals, involving large areas, signed by foreign investors (it does not take into consideration the production of jatropha and cotton). The data set displayed, at the end of 2011, regards 416 deals involving 35 million hectares in 66 countries.

The FAOSTAT database (FAOSTAT 2013) collects data on agricultural land-use, including country area, land area, agricultural area, arable land and permanent crops and other descriptive measures of how the land is used. It does not, however, report records of land acquisition between countries. The same is true for the World Bank Data Catalog (World Bank 2013). As reported in a recent review on the topic, “there is no consensus on the methodologies of identifying, counting, and quantifying land grabs” (Borras Jr. et al. 2013).

The Land Matrix public online database was activated in 2000, when the value of the FAO real food price index was at its lowest. Between 2000–2011, 924 deals (both domestic and foreign investments) were signed, involving about 50 million hectares. Records derive from a variety of sources (Land Matrix website, media reports, reports by international and local organisations and NGOs and field-based research projects, company websites and government records). In some parts of the world land investment partnership networks are strong, while in others they are very weak (as in Eastern Europe and Central Asia). There is a time lag between the deal taking place and its being recorded in the database. The initial dataset was revised in September 2011, thus, recent deals are poorly represented and in some

cases incomplete. Taking into account all the critical issues, and with a view to examining the phenomenon of large-scale land investment as a whole (therefore also including domestic investments, in our analysis), we used the Matrix Land data set and Stata 12 software to compute statistics.

Domestic and foreign land investments are now investigated. International investments usually create more concerns and tend to attract the attention of researchers. National and foreign investments generally have different purposes: internal investment strategies tend to respond to domestic public policies, while private companies (domestic or multinational) tend to focus on profit maximization, regardless of the nationality of the investor country. If not compensated, however, in both cases, the negative impacts on the local population could be larger than the positive ones. Regarding the structure of local farms they also seem to be inversely proportional to the size: the smaller they are, the greater the negative externalities from the acquisition (of any kind, domestic or international) of large portions of land. The paper, therefore, considers all deals regardless of the nationality or the legal status of the investor.

In order to calculate correlations between the amount of large-scale land investment and the indexes (commodity food price index, world biodiesel production, world ethanol production, crude oil price, Gross Domestic Product (GDP) per capita and cereals production), we used a pairwise correlation coefficient. We also applied Bonferroni and Sidak corrections to take into account multiple testing issues; p-values are calculated with a significance level $\alpha=0.05$. Time series behaviours of the data were analyzed using autocorrelation and partial autocorrelation functions.

The yearly commodity food price index, world biodiesel and ethanol production and crude oil petroleum price indexes were calculated as an average of the respective monthly indexes from the Indexmundi (www.indexmundi.com) database. The crude oil (petroleum) price is measured in US Dollars per barrel and it is calculated as a simple average of three spot prices: Dated Brent, West Texas Intermediate, and the Dubai Fateh. The Commodity Food Price Index (2005=100) includes the cereal, vegetable oils, meat, seafood, sugar, banana and orange price indices. World ethanol fuel production is measured in thousands of barrels per day, and it is intended solely for use as fuel. World biodiesel production is measured in thousands of barrels per day; biodiesel is derived from soybean, canola or other vegetable oils, animal fats and recycled grease. We used GDP per capita on a purchasing power parity basis divided by population as of 1 July for the same year (CIA World Factbook and Indexmundi). With regard to cereals production (measured in metric tons), we used the definition and the database of the World Bank (production data on cereals relate to crops harvested for dry grain only. Cereal crops harvested for hay or harvested green for food, feed, or silage and those used for grazing have been excluded).

3. Land Investment: The Role of China and India

The current boom in the global investment of land has been defined in many ways, but the label ‘land grabbing’ appears to have gained a sort of official status when describing the phenomenon (Borras Jr. et al. 2011). One of the most concise and informative definitions of land grabbing can be found in a report by Daniel and Mittal (2009); for these two authors, the grab “refers to the purchase or lease of vast areas of land by wealthier, food-insecure nations and private investors from mostly poor, developing countries with a view to producing crops for export”.

This practice has gained momentum over the last ten years, especially after the so-called world food price crisis in 2006-2008. In those years, average world prices for rice rose by 217%, wheat by 136%, corn by 125% and soybeans by 107% (Steinberg 2008). This phenomenon was extensively analyzed by: international organizations (Anseeuw et al. 2012; IFPRI 2012; World Bank 2010b; Cotula et al. 2009), journalists (Pearce 2012; Neuman 2011; Blas 2010), and academia, as well (Matondi et al. 2011). In the majority of cases the purchase regards land water (Rulli and D’Odorico 2012), alternative energy (mainly crops for biofuel production, see Matondi et al. 2011) and labour (Li 2011).

This peculiar form of neo-colonialism is deeply influencing the food security policies of underdeveloped countries. To date, official reports by the World Bank (2010b) and the International Food Policy Research Institute (IFPRI, 2012), have described a ‘win-win’ scenario: land grabbing could be a pro, both for purchaser and seller alike. For the former, there should be an increase in food security, for the latter, an increase in knowledge about new agrarian technologies and in rural development. This last analysis has been criticised by Borras Jr. and Franco (2010).

Even if, the main efforts in land grabbing analysis have taken place in Africa and South America, over the last twenty years however, two of the biggest countries involved in large-scale land investment have been China and India (GRAIN 2012; Baka 2011).

Economic growth is usually accompanied by improvements in the production and consumption of food and in the gradual reduction of food shortages. The phenomenon of urbanization that accompanies such paths affects consumption patterns by itself. Income growth generally changes the demand for food that moves from vegetables to animal proteins. The growth in demand for meat, however, has a more than proportional increase in the demand for cereals as feed for animals. These trends are reflected in the emerging countries.

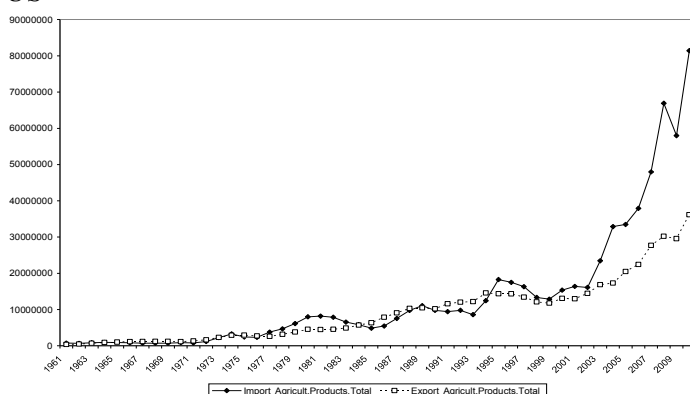
According to a recent research report (IGD 2012), China has become the largest global food market, thanks to its population size, its economic growth and the consequent modification of the diet. The liberalization of the Chinese economy by Deng Xiaoping and the opening of the soybean market for animal feed in the late 90s, deeply altered the balance between the domestic and the transnational agro-

business. In the last five years, China has been the biggest importer of oilseeds compared to the rest of the world. From a general point of view, imports are constantly rising as well as the country's domestic consumption of major protein meals.

Because of the scarcity of arable land, China has always used labour-intensive methods; nevertheless it has periodically suffered from interludes of severe food shortages. Since 1978, Family Production Responsibility has resulted in more power and autonomy for family businesses. As a result of the pressure of population size and limited arable land per household, land availability shrank (less than one hectare per household). A large share of the land is used for growing crops. Rice occupies the most significant portion, followed by corn and wheat. Among other important Chinese food crops are oil seeds. The livestock (swine) population is large. Indeed, according to FAOSTAT (2012), China's agricultural production in 2010 saw pork at the top of the list (in terms of value of production), followed by rice, vegetables, eggs, tomatoes, beef and chicken, wheat and apples (in line with the Chinese diet). China is also the world's leading producer of cotton. There is homogeneity in the production of commodities, at least as far as the first four top commodities are concerned; these maintained the same ranking between 2008 and 2010.

According to FAOSTAT, China's agricultural trade (imports and exports) have shown a deficit over the last ten years. In 2010, China imported commodities for 81,415,408 (1000 US \$) with a ten-year growth of 530%. At the top of the list of agricultural products imported by China are soybeans (their value is more than fourfold that of the second highest ranked commodity), palm oil (raw materials that can be used for the production of renewable energy), cotton (China is the world's largest importer, followed by other products classified as raw materials for the manufacturing or food industry. Chinese exports are mainly processed products. In the period under review, there were no significant changes in the top five products on the list, with the exception of garlic when high market prices boosted its production in 2009 and 2010.

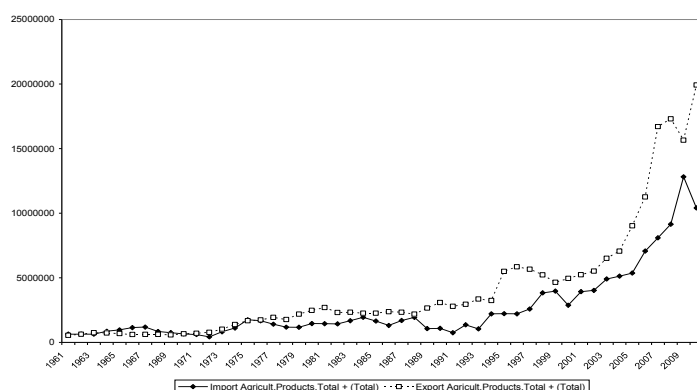
Figure 1 Import and Export of Agricultural Products (Totals per year), China: 1961-2010. Values in 1000 US



Source: Authors' elaboration of FAOSTAT Database (FAOSTAT, 2013).

Following the Green Revolution, India has been self-sufficient in food production since the mid seventies. Agriculture is an important sector with a workforce equal to about 50% of the total (including forestry and fisheries), with a percentage of GDP at 16.6% in 2009 (CIA Factbook 2008).

Figure 2 Import and Export of Agricultural Products (Totals per year), India: 1961-2010. Values in 1000 US \$.

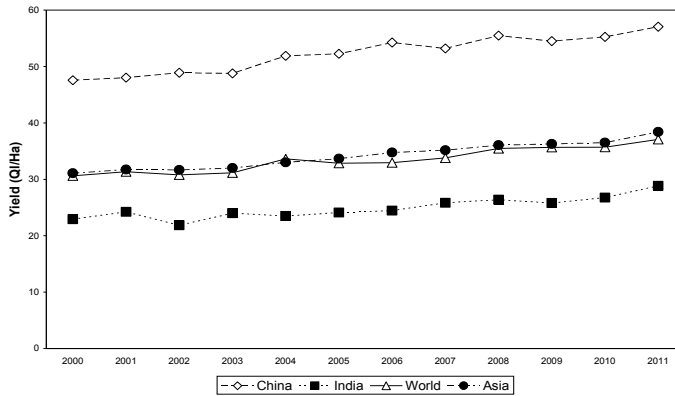


Source: Authors' elaboration of FAOSTAT Database (FAOSTAT, 2013).

In 2010 the agricultural trade surplus was almost US \$ 9.527 million. The agricultural structure consists mainly of small farms based on subsistence levels. In addition to these small family businesses, there are large, highly specialized companies, which are able to compete on international markets.

The most important domestic productions are rice and milk (from buffalo and cows), followed by wheat, sugar and tropical fruits. Palm oil is the by far the most imported product. If other oilseeds (soybean oil, sunflower oil) are included, it can be inferred that the requests for Indian agricultural commodities are essentially linked to the dependence of raw materials destined to the production of renewable energies. When ranking the most exported Indian products, rice occupied first place between 2008-2009 and slipped to second place in 2010. Rice was followed by: cotton (with an upward trend), soybean cake, buffalo meat and tobacco.

In 2009 a fall in exports corresponded to an increase in imports (palm oil). The drop in exports was mainly due to a fall-off in rice exports. In the period being considered, high rice prices led the Indian Government to adopt protectionist measures, due to the decline in exportable quantities. However, the balance has generally been positive since the start of the Green Revolution.

Figure 3 Cereals yields (Ql/Ha) time series for China, India, Asia and World.

Source: Authors' elaboration of FAOSTAT Database (FAOSTAT, 2013).

Because of its surging economic activity, China has accelerated its energy demand. In India, energy supplies are also growing, albeit at a slower rate than in China. The main energy source in India is coal, which is non-renewable and is poorly energy efficient. As far as renewable energy is concerned, China is the third largest ethanol producer in the world. In 2002, it produced 76 million gallons; in 2010 the figure was almost eight times higher (according to the Earth Policy Institute, it produced 555 million gallons that year). However, China does not figure among the five top producers of biodiesel (Licht 2010). India has a marginal role when considering the more important worldwide renewable energy producers.

Considering the land run as a positive aspect -agriculture needs investment to increase productivity- we analyzed the yield per hectare both in China and India, comparing it with the Asian continent and world averages. The selected crops are cereals and oils.

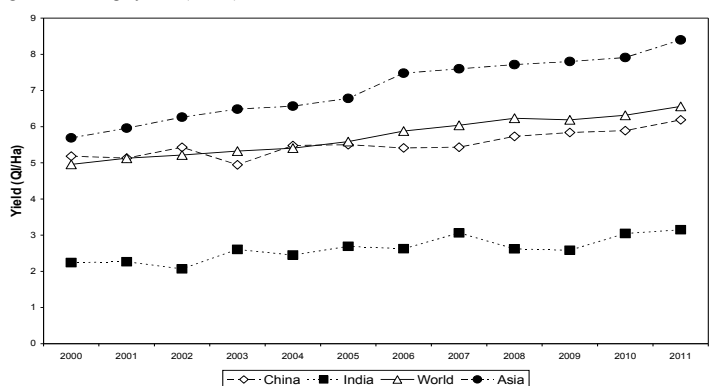
The trend of cereals was upward across the board, except in 2009, despite the high prices reached by cereals in 2008 which, in theory, should have resulted in an increase in productivity (according to the cobweb model, production plans are dictated by the prices prevailing at the time when decisions are made to produce). China yields per hectare were by far higher than world and Asian continent averages, while India reached much lower levels (about half those of China). Oil crops showed China at a disadvantage. The yields were slightly lower than the world yields, but far below the average of the Asian countries. India's productivity was half that of China, and reduced, according to productivity indices during the beginning of the food crisis, however, production rebounded in 2010-2011.

One possible reason for India's low productivity may be the limited size of individual farm holdings, however, comparison with China is crucial. China's private farms are on average much smaller than those in India, but their agricultural productivity is higher. Both countries have a high concentration of the workforce employed in agriculture, uncultivated land is in short supply and the primary sector

continues to be a strong contributor to the economy.

The relationship between land and its productivity generally obeys the law of diminishing returns. The fixed factor in agriculture is the land itself, and labour is assumed to be a variable factor. Output can be increased by raising the number of workers, however, if the number of workers continues to increase it will eventually produce proportionally less in relation to the original workforce. Small businesses tend to have an abundance of labor and the ability to work outside the agricultural sector is rather low. This implies that small firms tend to remunerate family labor with low wages, probably below the market wage. For small businesses, however, the cost of additional land is high and this prevents loss of labour due to the capital outlay. This is not the case in China, where, according to Bosworth and Collins (2008), productivity growth is due to an increase in capital per worker and inputs applied to a Chinese agricultural worker are almost twice those of Indian ones.

Figure 4 Oil crops yields (Ql/Ha) time series for China, India, Asia and World.



Source: Authors' elaboration of FAOSTAT Database (FAOSTAT, 2013).

With regard to India, the analysis of yields highlights the opportunity for a sizeable enhancement of productivity, both in the case of cereal grains and oil crops. In China, where intensive productivity methods were applied to the cultivation of cereals, the improvement in yields seems less likely. China, instead, can still improve yields. According to the Land Matrix Database, the total amount of hectares involved in large land investment between 2000 and 2011 totalled 48,829 thousand hectares, with 924 deals in total.

Table 1 Large Land Investments (in hectares) and percentages on world total.

Target Continent	Hectares	%	Investor Continent	Hectares	%
Asia	23.105.941	47,3	Asia	27.080.206	61,4
Africa	16.902.509	34,6	Europe	6.778.319	15,4
America	6.557.461	13,4	America	5.986.239	13,6
Europe	1.775.601	3,6	Africa	3.429.339	7,8
Oceania	487.681	1	Oceania	861.521	2
Total	48.829.193	100	Total	44.135.624	100

Target Countries	Hectares	% (on w o r l d total)	I n v e s t o r countries	Hectares	% (on world to- tal)
China	1.108.396	2,3	China	1.547.324	3,5
India	4.616.760	9,5	India	6.331.016	14,3

Source: Authors' elaboration of Land Matrix Database (International Land Coalition, 2012).

The major targeted continents in terms of hectares are Asia (47.3% of the world amount), and Africa (34.6%). In terms of targeted regions in Eastern Africa, deals for 8,822 thousand hectares were made; in South-East Asia for 17,340 thousand hectares; in South America for 6,417 thousand hectares; in South Asia for 4,652 thousand hectares; in Western Africa for 3,829 thousand hectares. South-East Asia and South Asia are the main targeted regions involved in land large land investment in terms of hectares. China and India -as targets- account for 2.3% and 9.5% respectively of world land grabbed.

Among the top 10 investor regions South-East Asia, South-Asia and Eastern Asia are respectively in first, second and fourth place (in third place is the Middle East), with 18,599,295 Ha of investments (125 deals), 4,554,772 Ha (36 deals) and 3,911,580 Ha (87 deals) respectively. The land grab of these regions is mainly directed towards inbound investments: of the 27.080.206 of total Asian land grab, only 14% made deals with non-Asian regions.

The main investors in terms of surface area are Asia (61.4% of total amount of world land grabbed), Europe (15.4%) and America (13.6%). In terms of hectares, the investors grabbed land for a total of 6,402 thousand hectares in South Asia; 13,891 thousand hectares in South-East Asia; 2,799 thousand hectares in Eastern Asia; 1,544 thousand hectares in Western Europe; 1,888 thousand hectares in South America. Asia is still the main driver for large land investment also from the point of view of and investments in general (South Asia and South-East Asia are the two biggest investors). China pours 3.5% of world investments into large land investment, while India invests a much higher 14.3%.

According to the Land Matrix Database, in terms of numbers of deals, the land grabbing phenomenon boomed between 2005 and 2009: the majority of deals were signed during this period (71.5% of the 235 deals recorded in the database), while the number of deals in the following two years (2010 and 2011) was 26 (11.06% of the total number of deals that were recorded in the database for that year).

As an investor, China made 43 deals between 2000 and 2009. The mean size of each deal was 35,984 Ha (median: 7,000 Ha). India instead made a total of 120 deals between 2001 and 2010. The mean size of each deal was of 52,758 hectares (median: 1,023 Ha). The mean size of each Land Matrix database deal was of 52845 Ha (median: 9,742 Ha). Detailed statistics are reported in Table 2.

Table 2 Descriptive statistics of land deals (Ha)

Area	Mean (Ha)	Standard Error of Mean (Ha)	Coefficient of variation (sd/mean)	Median (Ha)	Interquartile Range (Ha)
World	52,845	5,654	3.3	9,742	27,989
China	35,984	17,472	3.2	7	8,8
India	52,758	21,403	4.4	1,023	9,184

Source: Authors' elaboration of Land Matrix Database (International Land Coalition, 2012).

China invested in East Asian lands (1,547 thousand hectares total land investments) specifically for agricultural purposes. Conversely, India invested only in South Asia (6,331 thousand hectares: total land investments) mainly for industrial purposes. The transactions are mainly in-country, i.e. China and India are investing in Chinese and Indian lands for most of their deals; India reinvests in Indian land for 69.6% of the total budget of its large land investment, China reinvests 59.7% in Chinese lands.

Outbound Chinese investments are mainly made by private actors, while inbound investments are public. The same is true for India: outbound investments are private, but the inbound ones are public. China and India dedicate the majority of their -cultivated lands to the production of jatropha (46.9% of total agriculture investments for China, and 70.9% for India).

As far as targeted land is concerned, India has been involved in 4,617 thousand hectares of large land investment deals; China instead made deals for a total of 1,108 thousand hectares, transactions are introverted since the only non-Asian investor is Finland (with a 3.6% of the total of land investments). The main investor in China (except for China itself) is the Hong Kong Special Administrative Region, represented by just one deal for 100 thousand hectares.

4. Findings

In China the phenomenon of large land investment appeared in 2006 and reached a peak in 2008. In India, the concentration of the deals, in terms of area was observed in the period 2008-2010, in the midst of the economic crisis.

In order to better estimate the magnitude of the connection between large land investment and main food and energy indexes, a correlation matrix was calculated (Table 3).

Table 3 Correlation matrix¹¹

		Worldwide	China	India
		Large land investment	Large land investment	Large land investment
Energy	World bio-diesel production	75.8*	29.6	71.7*
		(0.007)	(0.377)	(0.020)
		(0.146)	(0.999)	(0.412)
		(0.136)	(0.999)	(0.340)
	World ethanol production	74.1*	27.5	75.3*
		(0.009)	(0.196)	(0.012)
		(0.191)	(0.999)	(0.252)
		(0.175)	(0.999)	(0.224)
	Crude oil price	76.9*	42.2	43.0
		(0.006)	(0.196)	(0.215)
		(0.119)	(0.999)	(0.999)
		(0.112)	(0.999)	(0.993)
Food	Commodity food price index	74.5*	37.4	56.1
		(0.009)	(0.258)	(0.092)
		(0.179)	(0.999)	(0.999)
		(0.165)	(0.999)	(0.868)
	GDP per capita	70.7*	-5.1	37.6
		(0.015)	(0.890)	(0.319)
		(0.313)	(0.999)	(0.999)
		(0.271)	(0.999)	(0.999)

¹¹ Large land investment and indexes: total amount of land deals (in hectares) for world, China and India. For each cell we reported the correlation index, with the uncorrected, the Bonferroni's and the Sidak's corrections respective p-values. We starred statistically significant values.

	Worldwide	China	India
	Large land investment	Large land investment	Large land investment
Cereals production	82.8*	33.4	48.6
	(0.002)	(0.315)	(0.155)
	(0.034)	(0.999)	(0.999)
	(0.034)	(0.999)	(0.970)

Source: Authors' elaboration of Land Matrix Database (International Land Coalition, 2012).

Positive and relatively high correlation was detected (around 75%) between world bio-diesel production, world ethanol production, the commodity food price index, oil prices, GDP per capita, cereals production and worldwide large land investment (for the significant amounts see Table 3). There is also a relatively low (or negative) correlation between the six indexes and the quantity of Chinese large land investment. The correlations for China's large land investment are not significant. Conversely for India the correlation values are quite high (around 50%) and positive. The correlations between world bio-diesel (71.1%) and ethanol (75.3%) production with India's land investment are significant.

Finally, the main drivers of worldwide land investment are cereal production (food security), followed by the production of renewable energy and the price of oil (energy security), the prices of food and GDP (for changing diets). China has low correlation indices in the considered variables and a negative sign in the case of GDP. India, however, has significant correlation indices in the case of renewable energy, in support of the fact that the energy problem is still far from being resolved, even if this country has achieved food self-sufficiency.

5. Conclusion

According to updated official sources, the population of China and India in 2011 represented 36.20% of the world population. According to The World Factbook, the total area of China covers 9,707 thousands km² (UN 2010) and 6.7% of total world land mass; the total surface area of India is 3,287 thousands km² (US Library of Congress, 2004), 2.2% of total world land mass. China is a net food importing country, India, became self-sufficient in the mid-seventies, and is facing a problem of scarcity of energy sources and supply difficulties. Population growth, changes in consumption, fears over greenhouse gas emissions and the awareness of the scarcity of non-renewable energy resources, increased the pressure on food prices and their volatility, after years of relative stability. In countries where the availability of land has reached saturation level, other solutions have been considered in order to increase production and ensure food self-sufficiency.

With regard to the land run, Asian countries rank at the top of the list of investor and target countries and, among them, India and China share the highest positions. Unlike African countries, the percentage of total domestic investment is very high in Asian countries. Both Chinese and Indian investments are concentrated mostly in the countries themselves with a total of 59.7% of total land investments in China and 69.6% in India". China invested in more than 1.5 million hectares in East Asian countries for agricultural purposes. Conversely, India invested mainly in South Asia (6.3 million hectares), essentially for industrial purposes.

Our calculations have identified other drivers who are affecting the phenomenon of land investment in the world and have compared them with China and India. The results are interesting at the worldwide level. They confirm expectations and, at the same time, reveal deep differences between China and India and between those driving countries and the phenomenon as a whole. In China, the determinants appear to be related to the index of food prices and the price of crude oil. This is not surprising since China is a net importer of food. The scenario changes in India, where the phenomenon of large land investment seems to be induced by the production of energy from renewable sources and is closely related to (lagged) prices of food and oil. During the global economic crisis the variables showed a similar trend. Large land investment appears to be driven by a variety of factors that are destined to augment in the long run (population growth, changing food consumption and growing demand for energy).

While Chinese and Indian outbound investments are largely underwritten by private actors, the inbound investments are public. These countries utilize most of their lands for the cultivation of jatropha (46.9% of the total agriculture investments for China and 70.9% for India). Jatropha oil can be used as bio-diesel for energy, as cake for fish or animal feed or for high-quality organic fertiliser and bio-pesticide production. Large land investment, food security and energy security appear to be extremely closely related (Andreosso-O'Callaghan and Zolin 2010b). Therefore, the variables that affect the price of food and energy products also influence the extent of land acquisition.

In the assessment of positivity or negativity of the phenomenon, relevant issues have to be considered. Is the land subjected to large land investment fertile, marginal or unproductive? If the second case is true, can domestic investment in abandoned lands provide, at an aggregate level, an increase in production that may help achieve food security or energy security? Can they offer new job opportunities, facilitate the introduction of new technologies and improve the poor quality of life in rural areas? Regardless of the circumstances, the land rights of the local population should be insured. In India and China farms are extremely small and unable to compete with major investors (public and/or private). Among the three positions listed in the Transnational Institute's Primer on The Global Land Grab (pages 21-23 of Franco et al. 2013) the first calls for regulation to facilitate investment (attributable to the World Bank), the second proposes the enforcement of new

regulations to mitigate the negative impacts on the population and to maximize opportunities (FAO, civil society) and the third is based on regulation to abolish large land investment (social movements and peasant groups). The authors support the second position.

Additional research is needed. An initial approach should measure and analyze situations in different countries and the impact of large land investment on the local population. Pinpointing these negative externalities would identify whether or not intervention was required and, subsequently which would be the appropriate tools for correcting and mitigating the impact on local populations. Other tools that already exist should be increased, for example, Oxfam Behind the Brands Initiative (2013) which, of the seven themes identified, includes: “land, both rights and access to land and sustainable use of it” or the role that international organizations could play in raising awareness in the world population, while waiting for more in-depth assessments with a higher degree of detail.

References

- Andreosso-O’Callaghan B, Zolin MB (2010a) Long-term Cereal Price Changes: How Important is the Speculative Element? *Transition Studies Review* 17(4): 624-637
- Andreosso-O’Callaghan B, Zolin MB (2010b) Land, biofuels and food security: another “impossible trinity theorem”? in: Andreosso-O’Callaghan B, Zolin MB (eds) *Current Issues in Economic Integration: Can Asia inspire the “West”?* Ashgate Publishing: Aldershot: 113-134
- Anseeuw W, Boche M, Breu T, Giger M, Lay J, Messerli P, Nolte K (2012) Transnational land deals for agriculture in the ‘Global South’. Analytical Report Based on the Land Matrix Database. CDE/CIRAD/GIGA, Bern/Montpellier/Hamburg
- Assunção JJ, Ghatak M (2003) Can unobserved heterogeneity in farmer ability explain the inverse relationship between farm size and productivity? *Economic Letters* 80: 189-194
- Bardhan PK (Nov-Dec. 1973) Size, Productivity, and Returns to Scale: An Analysis of Farm-Level Data in Indian Agriculture, *Journal of Political Economy*, Vol. 81, No 6: 1370-1386
- Baka J (2011) Biofuels and wasteland grabbing: How India’s biofuel policy is facilitating land grabs in Tamil Nadu, India. Paper presented at the International Conference on Global Land Grabbing, 6-8 April 2011, Institute of Development Studies, University of Sussex
- Blas, J (2010) World Bank warns on ‘farmland grab’, *Financial Times*, July 27, 2010.
- Borras Jr SM, Franco JC (2010) From threat to opportunity? Problems with the idea of a ‘code of conduct’ for land-grabbing. *Yale Human Rights and Development Law Journal* 13(2): 507-523
- Borras Jr SM, Hall R, Scoones I, White B, Wolford W (2011) Towards a better understanding of global land grabbing: an editorial introduction, *The Journal of Peasant Studies* 38(2): 209-216
- Borras Jr SM, Franco J, Wang C (2013) The challenge of global governance of land grabbing: changing international agricultural context and competing political views and strategies. *Globalizations*, 10(1): 161-179
- Bosworth B, Collins SM (2008) Accounting for Growth: Comparing China and India *The Journal of Economic Perspectives*, Vol. 22, No. 1 Available at: <http://www.jstor.org/stable/27648223>. Accessed: 20/03/2013
- Cornia GA (1985) Farm Size, Land Yields and the Agricultural Production Function: An Analysis for Fifteen Developing Countries; *World Development*, Vo. 13, No. 4: pp 513-534
- Cotula L, Vermeulen S, Leonard R, Keeley J (2009) Land grab or development opportunity? Agricultural investment and international land deals in Africa, IIED/FAO/IFAD, London/Rome. ISBN:

978-1-84369-741-1

Daniel S, Mittal A (2009) The great land grab. Rush for world's farmland threatens food security for the poor, The Oakland Institute, Oakland, CA

Dorward A (2013) Agricultural labour productivity, food prices and sustainable development impact and indicators, *Food Policy* 39: 40-50

FAO (2009a) The state of agricultural commodity market, Rome

FAO (2009b) Feeding the World, Eradicating Hunger. Available from: <http://www.fao.org/fileadmin/templates/wsfs/Summit/WSFS_Issues_papers/WSFS_Background_paper_Feeding_the_world.pdf>. [Accessed 12 February 2013].

FAO (2009c) Global agriculture towards 2050 Available from http://www.fao.org/fileadmin/templates/wsfs/docs/Issues_papers/HLEF2050_Global_Agriculture.pdf [Accessed 4 March 2013]

FAOSTAT (2013) Homepage of the Food and Agriculture Organization of the United Nations. Available from: <<http://faostat.fao.org/>>. [Accessed 6 February 2013]

Franco J, Borras Jr S, Alonso-Fradejas A, Buxton N, Herre R, Kay S, Feodoroff T (2013) The global land grab. A primer. Transnational Institute. Amsterdam, The Netherlands. Available from: <<http://www.tni.org/sites/www.tni.org/files/download/landgrabbingprimer-feb2013.pdf>>. [Accessed 15 March 2014]

Gilbert L (2010) How to Understand High Food Prices, *Journal of Agricultural Economics*, 61, 398-425

GRAIN (2012) Who will feed China: agribusiness or its own farmers? Decisions in Beijing echo around the world. Available from: <<http://www.grain.org/article/entries/4546-who-will-feed-china-agribusiness-or-its-own-farmers-decisions-in-beijing-echo-around-the-world>>. [Accessed 3 January 2013]

Headey D, Fan S (2008) Anatomy of a crisis: the causes and consequences of surging food prices. *Agricultural Economics*, 39 (S1):375-391

IFPRI (International Food Policy Research Institute) (2012) Global Hunger Index. Bonn / Washington, DC / Dublin, October 2012. Available from <<http://www.ifpri.org/ghi/2012>>. [Accessed 2 January 2014]

IGD (2012) China's grocery market overtakes the US as biggest in the world. Available from: <<http://www.igd.com/Media/IGD-news-and-press-releases/Chinas-grocery-market-overtakes-the-US-as-biggest-in-the-world>>. [Accessed 7 January 2014]

Indexmundi database (2013) Available at www.indexmundi.com database [Accessed 12 December 2013].

International Land Coalition. (2012) Land Matrix Database. Available from: <<http://landportal.info/landmatrix>>

Ivanic M, Martin W (2008) Implications of higher global food prices for poverty in low-income countries. *Agricultural Economics* 39: 405-416

Li MT (2011) Centering labor in the land grab debate. *The Journal of Peasant Studies*, 38(2), 281-298

Licht FO (2010) World Ethanol and Biofuels Report, 8(16)

Matondi PB, Havnevik K, Beyene A (Eds.) (2011) Biofuels, land grabbing and food security in Africa, London, UK: Zed Books

McMichael P, Schneider M (2011) Food security politics and the millennium development goals. *Third World Quarterly*. 32(1): 119-139

Nelson GC, Rosegrant MW, Palazzo A, Gray I, Ingersoll C, Robertson R, Tokgoz S, Zhu T, Sulser TB, Ringler C, Msangi S, You L (2010) Food security, farming, and climate change to 2050: Scenarios, results, policy options. Washington, DC: International Food Policy Research Institute

Neuman W (2011) In price of farmland, echoes of another boom, *The New York Times*, march 3, (2011)

Oxam America (2013) Behind the Brand Initiative Available from <<http://www.behindthebrands.org/en/about>> [Accessed 20 March 2014]>)

Otsuka K (2012) Food insecurity, Income Inequality, and the Changing Comparative Advantage in World Agriculture, Available from: <<http://www.agecon.purdue.edu/academic/agec640/Otsuka>>.

pdf> [Accessed 20 May 2014]

Pearce F (2012) *The Land Grabbers: The New Fight over Who Owns the Earth*, Boston, MA: Beacon Press

Provost C (2012) International land deals: who is investing and where - get the data. *The Guardian*. Available from: <<http://www.guardian.co.uk/global-development/datablog/2012/apr/27/international-land-deals-who-investing-what>>. [Accessed 9 January 2014]

Rulli MC, D'Odorico P (2012) Water resources assessment in agricultural foreign direct investment. Paper presented at the International Conference on Food Security in Dry Lands, Doha, November 2012

Steinberg S (2013) Financial speculators reap profits from global hunger, *Global Research*, April 24, 2008. Available from: <<http://www.globalresearch.ca/financial-speculators-reap-profits-from-global-hunger/8794>>. [Accessed 2 January 2013]

Transnational Land Deals for Agriculture in the Global South. Analytical Report based on the Land Matrix Database. CDE/CIRAD/GIGA, Bern/Montpellier/Hamburg

U.S. Department of Agriculture (2012) Oilseeds: World Markets and Trade, Monthly Foreign Agricultural Service Circular Series for oilseeds. Available from: <<http://usda01.library.cornell.edu/usda/current/oilseed-trade/oilseed-trade-12-11-2012.pdf>> [Accessed 8 January 2013]

US Library of Congress (2004) Country Profile: India. Library of Congress Country Studies Available from: <<http://lcweb2.loc.gov/frd/cs/profiles/India.pdf>>. [Accessed 15 January 2013]

World Bank (2010a) *Food Price Watch*. Poverty Reduction and Equity group, Washington, DC, May 2010

World Bank (2010b) *Rising global interest in farmland: can it yield sustainable and equitable benefits?* Washington DC: World Bank. World Bank. (2013) *Data Catalog*. Available from: <<http://data.worldbank.org/data-catalog>>. [Accessed 15 March 2013]

Zolin MB (2012) Agricultural Markets and Food riots: The European Union and Asia Compared, in: Andreosso-O'Callaghan B, Royall F (Eds.), *Economic and Political Change in Asia and Europe. Social Movement Analyses*, Springer: pp. 87-110