How can foreign direct investment in agriculture contribute to more sustainable land management and improved food security?

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APEC Workshop on sustainable land management to enhance food production of APEC members
Chiang Mai, 30 November 2012

Content

- High food prices: causes and impacts on food security
- Renewed interest and rationale for FDI in agriculture
- Negative impacts on economic, social and ecological sustainability – and how to prevent them
- Positive impacts: higher global production of cereals and lower world market prices
  - Simulation of the OECD-FAO projection augmented with a price equation
  - Simulation of an econometric model of production, utilisation and price
- Conclusion: possible contribution to strengthening sustainability and food security
FDI in agriculture offer opportunities to strengthen sustainable land use and food security, but negative effects are observed and must be minimised

- Large scale foreign and domestic land acquisitions in developing countries (summarised under the term "FDI") can contribute to more sustainable land use (ecologically, economically, and socially).
- A priori there is no reason that FDI in agriculture should be less sustainable than domestic investments (or that large investments should be less sustainable than small investments).
- However, effects of FDI that contradict principles of sustainable land use have often been observed, and these negative effects must be minimised.
- FDI in land and agricultural production can contribute to increase productivity and global production of food (cereals are at the focus of this paper) and help to bring down high food prices. As the majority of the extremely poor are net food buyers, FDI may contribute to reduce poverty and hunger and strengthen food security.
- In the paper presented here we analyse with two simulation models the possible impacts of FDI in cereal production on world market prices.

In recent years food prices on world markets are significantly higher than in the past

Food price index includes: Meat, diary products, cereals, oils and fats, sugar (FAO 2012a)
Causes of the food price hike

- High demand growth due to population growth and income growth in emerging economies and other developing countries.
- Increasing demand for bio-fuels, particularly in North America and Europe.
- Global production was in many years lower than global utilisation: stock-utilisation ratios declined from more than 35% in the 1990s to levels around 20% in 2007/08 (FAO 2012).
- High energy prices increased costs of production, transportation and storage.
- The US-Dollar depreciation contributed to increasing prices of Dollar-denominated commodity prices.
- Trade barriers in (net) exporting countries exacerbated shortages on world markets and the price hike.
- The effect of financial investors on prices on futures markets is ambiguous and controversial.
On balance, high food prices are bad for the poor

- Although many poor smallholders produce food, they often benefit not at all or only to a small extent from higher food prices: they have hardly the means to increase production (low price elasticity of supply).
- The majority of the absolute poor (consumption per day and per capita < 1.25 Dollars PPP) are net food buyers – also in rural areas.
- Scientists and FAO estimate that the price hike in 2007/08 increased the number of hungry people by 75 million (Tiwari and Zaman 2010; FAO 2008) – and already undernourished people are worse off.
- Estimates of the World Bank indicate that the price hike increased the number of the absolutely poor by 40 million (World Bank 2011) – and people below that poverty line are worse off.

The food price hike has triggered an “explosion” of FDI-deals in agriculture

- In 2007/08 net food importing countries feared that food security could no longer be secured through imports: trade barriers of net export countries led to a loss of faith in the world trade system.
- As a consequence, FDI in land and agricultural production became more important for the food security of countries with scarce land and water resources, particularly in countries where demand was (and still is) fast growing.
- Before the price crisis annual FDI in land and agriculture in developing countries comprised about 4 million ha.
- In 2008 investment deals of more than 50 million ha were recorded – mostly foreign, but also domestic large land acquisitions (Görgen et al. 2009; Deininger et al. 2011).
Who invests in what?

- Investors are, above all, private companies, state owned enterprises, and sovereign wealth funds from countries that:
  - face high demand growth for bio-fuels due to energy and climate policy mandates (above all North America and Europe);
  - face high demand growth for food and feed and scarce land and water resources for agricultural production (above all countries in North Africa, the Middle East and Asia).
- FDI in land usually means that land is leased, for up to 99 years; in some cases it is actually bought as property.
- The costs of land acquisition are often relatively low; high upfront costs are caused by land clearing and land preparation as well as the installation of infrastructure and industrial capacities (transport, irrigation, power supply, storage facilities, processing factories, etc.).

Most large land acquisitions take place in Africa: examples

<table>
<thead>
<tr>
<th>Country</th>
<th>Projects</th>
<th>Area (1,000 ha)</th>
<th>Median size (ha)</th>
<th>Domestic sharea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>61</td>
<td>958</td>
<td>8,985</td>
<td>70</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>406</td>
<td>1,190</td>
<td>700</td>
<td>49</td>
</tr>
<tr>
<td>Liberia</td>
<td>17</td>
<td>1,602</td>
<td>59,374</td>
<td>7</td>
</tr>
<tr>
<td>Mozambique</td>
<td>405</td>
<td>2,670</td>
<td>2,225</td>
<td>53</td>
</tr>
<tr>
<td>Nigeria</td>
<td>115</td>
<td>793</td>
<td>1,500</td>
<td>97</td>
</tr>
<tr>
<td>Sudan</td>
<td>132</td>
<td>3,965</td>
<td>7,980</td>
<td>78</td>
</tr>
</tbody>
</table>

(Deininger at al. 2011)
Many African countries have large land reserves and yield gaps

FDI deals often contradict principles of sustainable land use: “land grabs”

- Traditional user rights of allegedly “unused” or “marginally used” land are often not observed.
- Traditional land users (e.g. smallholders, pastoralists, indigenous people, forest dwellers) are often displaced and not adequately compensated, and they often do not benefit from new user schemes.
- Sometimes land is acquired but not used for agricultural purposes.
- Land use plans and investment contracts (which contain commitment of contract partners, land prices, user rights, etc.) are often unknown to the local population, and it is often only a few local officials and private actors that benefit from land deals.
- The new land use schemes may lead to undesirable environmental effects, e.g. through the destruction of forests, loss of biodiversity, soil degradation, over-utilisation of water resources, etc.

(Deininger at al. 2011)
Anecdotal evidence of discrimination (1)

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases selected</th>
<th>Key Insights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congo, Dem. Rep.</td>
<td>Maize (10,000 ha, grown, 3,000 ha planted); Millet (25,000 ha).</td>
<td>Project design changed from sugar to maize in response to potential disuse of land.</td>
</tr>
<tr>
<td>Liberia</td>
<td>Rice (4,999 ha)</td>
<td>Investor encouraged illegal on fertile land, displaced 30% of the population (1,000 people). Unfair jobs created but often tied with foreigners willing to work for lower wages, leading to swelling.</td>
</tr>
<tr>
<td>Mexico</td>
<td>Maize (3,000 ha), Maize (2,000 ha)</td>
<td>Investment restricted local access to forest products in context of increasing population and decreasing farmland. Dispute above investor's right to expand beyond originally allocated area exacerbated by the age of the grant (from MINAG).</td>
</tr>
</tbody>
</table>

(Continued)

Anecdotal evidence of discrimination (2)

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases selected</th>
<th>Key Insights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanzania</td>
<td>Tobacco (29.12 ha, owned), 7,000 planted</td>
<td>Investors create local benefits through employment and social infrastructure projects.</td>
</tr>
<tr>
<td>Ukraine</td>
<td>Multiple crops (30,000 ha)</td>
<td>Profitable companies employ local people at competitive rates, use modern production methods, and train workers.</td>
</tr>
<tr>
<td>Zambia</td>
<td>Export-oriented crops (10,000 ha)</td>
<td>No progress toward implementing government land-based program. Investors appear to be interested in this land.</td>
</tr>
</tbody>
</table>

(Deininger et al. 2011)
Conditions to be fulfilled for FDI deals (e. g. FAO 2011, FAO 2012b, Deininger et al. 2011)

- Traditional user rights should be made transparent and should be recognised by governments and investors.
- Land transactions should be voluntary; traditional land users should be compensated adequately and should be able to participate in a fair manner in new land use schemes.
- The new land use should technically be feasible and economically viable.
- Information about land use plans and conditions of contracts (land prices, user rights, commitments of contract partners, etc.) should be made transparent and should be supervised and enforced by impartial authorities.
- Negative social and environmental externalities should be minimised.
- If investors do not comply with agreed conditions and commitments governments should have the right to cancel land leases.

Cereal production 1996-2010 and OECD-FAO projection 2011-2020

(OECD-FAO 2011; Kappel, Pavletic, Schüpbach 2012)
Global equilibrium with demand for stocks: the supply of storage hypothesis

Figure 1: Global equilibrium with demand for stocks

$$P_t = a_{10} + a_{11} P_{t-1} + a_{12} SU_{t-1}$$

$$U_{At} = \frac{(1+\eta_U) (P_{Ft} - P_{Rt})}{P_{Rt}}$$

$$P = \text{price index}; SU = \text{stock-utilisation ratio}; U_A = \text{adjusted utilisation}; \eta_U = \text{price elasticity of utilisation}; P_F = \text{price with FDI}; P_R = \text{price}$$

Reference scenario; $U_R = \text{utilisation reference scenario}$

The estimated price equation confirms the hypothesis that prices are the higher the lower the stock-utilisation ratio is – and vice versa.

Augmented OECD-FAO projection

(1) $P_t = a_{10} + a_{11} P_{t-1} + a_{12} SU_{t-1}$

$U_{At} = (1+\eta_U) (P_{Ft} - P_{Rt}) / P_{Rt}$

$P_{Rt1}$

$U_{At}$

Constant

No. of observations

$R^2$ adjusted

DV transformed

Numbers in brackets are p-values.

<table>
<thead>
<tr>
<th>Equation</th>
<th>1.1</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable</td>
<td>$P_t$</td>
<td>$P_t$</td>
</tr>
<tr>
<td>$P_{Rt1}$</td>
<td>0.657</td>
<td>0.622</td>
</tr>
<tr>
<td>$U_{At}$</td>
<td>-307.916</td>
<td>-218.165</td>
</tr>
<tr>
<td>Constant</td>
<td>128.529</td>
<td>105.483</td>
</tr>
<tr>
<td>No. of observations</td>
<td>14,030</td>
<td>14,003</td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>0.734</td>
<td>0.641</td>
</tr>
<tr>
<td>DV transformed</td>
<td>1.972</td>
<td>1.854</td>
</tr>
</tbody>
</table>
OECD-FAO projection: price index with FDI of 5, 10, and 15 m ha (fully additional), 2011-20

Econometric model for price, production, and utilisation

(2) \( \ln P_t = a_{20} + a_{21} \ln P_{t-1} + a_{22} \ln SU_{t-1} \)

PredictlnP*

(3) \( y_h = a_{30} + a_{31} t \)
\( dy_h = (y_h - y_h^*) / y_h \)

(4) \( \ln X_t = a_{40} + a_{41} \ln P^* + a_{42} dy_h + a_{43} t + a_{44} t^2 + a_{45} t^3 \)

(5) \( \ln U_t = a_{50} + a_{51} \ln P^* + a_{52} \ln Y_t + a_{53} dy_h \)

P = price index; SU = stock-utilisation ratio

yh = yield / hectare; dyh = yield shock (deviation from trend)
yh* = predicted yield trend; P* = predicted price;
U = utilisation; Y = world income (GDP)
Estimates

<table>
<thead>
<tr>
<th></th>
<th>(1) ln P_t</th>
<th>(2) ln Q_t</th>
<th>(3) ln U_t</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln P_t</td>
<td>0.209</td>
<td>0.067</td>
<td>0.455</td>
</tr>
<tr>
<td>ln Q_t</td>
<td>0.139</td>
<td>0.000</td>
<td>0.004</td>
</tr>
<tr>
<td>ln SU_t</td>
<td>0.820</td>
<td>1.092</td>
<td>0.722</td>
</tr>
<tr>
<td>ln Y_t</td>
<td>0.007</td>
<td>0.007</td>
<td>0.007</td>
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<tr>
<td>t</td>
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<tr>
<td>t''</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>ln Y_t</td>
<td>0.522</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Constant 6.928  Constant 6.626  Constant 2.416

R² adjusted 0.802  R² adjusted 0.797  R² adjusted 0.793

Numbers in italic are p-values

Simulation of econometric model: price index with FDI of 5, 10, and 15 m ha (fully additional), 2011-20

Graph showing the simulation results with different FDI scenarios.
Simulation of econometric model: price index with FDI of 5, 10, and 15 m ha (not fully additional), 2011-20

Error correction model

As the time series for P, X, Y, SU, and U are not stationary, our t-tests can be doubted. We must estimate an error correction model and test for cointegration.

Error correction model, general form:
\[ dY_t = \alpha + \beta dX_t - \gamma (Y_{t-1} - a + bX_{t-1}) = \alpha + \beta dX_t - \gamma r_{t-1} \]
\[ d = 1^{st} \text{difference}; r_{t-1} = \text{residual of lagged level equation} \]

(6) \[ d\ln P_t = a_{60} + a_{61} d\ln P_{t-1} + a_{62} d\ln SU_{t-1} - a_{63} r_{2t-1} \]
(7) \[ d\ln X_t = a_{70} + a_{71} d\ln P^* + a_{72} ddy_{ih1} + a_{73} dt + a_{74} dt^2 + a_{75} dt^3 - a_{76} r_{4t-1} \]
(8) \[ d\ln U_t = a_{80} + a_{81} d\ln P^* + a_{82} d\ln Y_{t-1} + a_{83} ddy_{ih1} - a_{84} r_{5t-1} \]
Estimates

The residuals of equations (1, P) and (2, X) are stationary, i.e., ln P and ln SU, and ln X and ln P are cointegrated.

The residuals for equation (3, U) are not stationary, i.e., ln U and ln Y and ln P are not cointegrated.

Nonetheless, given that it can hardly be doubted that the utilisation of cereals is determined by income and price, the results of equations (3) and (6) seem quite reliable.

### Simulation of error correction model: price index with FDI of 5, 10, and 15 m ha (fully additional), 2011-20

![Simulation of error correction model](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>FDI 5 m ha</th>
<th>FDI 10 m ha</th>
<th>FDI 15 m ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
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<tr>
<td>2013</td>
<td>120</td>
<td>120</td>
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<td>2014</td>
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<td>2016</td>
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<td>2017</td>
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<td>2018</td>
<td>120</td>
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<tr>
<td>2019</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>2020</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
</tbody>
</table>

- Reference: -6.7%
- FDI 5 m ha: -13.0%
- FDI 10 m ha: -18.5%
Conclusions

- FDI in agriculture contradicting principles of sustainable land use have been observed in many cases. These negative effects must be reduced as much as possible. Various organisations have proposed codes of conduct for investors and host governments. A priori there is no reason why foreign investments in agriculture should be less sustainable than domestic investments.
- Despite the risks, FDI can have positive impacts on agricultural production, productivity, employment, infrastructure, income, poverty, and food security.
- Additional FDI to the tune of 5, 10, and 15 million ha between 2011 and 2020 can have discernible impacts on world market prices for cereals:
  - Our simulations indicate that prices would decline between 2011 and 2020 by about 7% and 21% relative to reference scenarios, if we assume production from FDI to be fully additional.
  - When allowing for repercussions from declining prices on global production the impacts vary between about 5% and 13%.
- Given that the majority of the poor are net food buyers, such FDI-induced price declines would be a welcome contribution to reducing hunger and poverty and to strengthening food security.

References

Deininger, Klaus, Byerlee, Derek, Lindsay, Jonathan, Norton Andrew, Selod, Harris, and Mercedes Stickler (2011): Rising Global Interest in Farmland. Can It Yield Sustainable And Equitable Benefits? The Wold Bank, Washington D.C.