Imports of grain globally increased more than fivefold between 1960 and 2013 as more nations turned to international markets to help meet domestic food demand.¹ (See Figure 1.) For some countries, the imported share of domestic grain consumption has risen substantially.² In 2013, more than a third of the world’s nations—77 in all—imported at least 25 percent of the major grains they needed.³ This compares to just 49 countries in 1961, an increase of 57 percent over half a century.⁴ (See Table 1.)

Even more worrying, 51 countries—about a quarter of the community of nations—imported more than half of their grain in 2013, and 13 imported all of the grain they needed.⁵ Meanwhile, the number of grain-exporting countries expanded by just 6 between 1961 and 2013.⁶
Determining the food import dependence of people, rather than of countries, is more challenging, because imported food is often consumed in a few locations (such as a country’s capital city) rather than distributed equally among an entire population. But a 2013 study found that in 2000, some 950 million people—16 percent of the world’s population at the time—were using international trade to meet their food needs (although not just grain).\(^7\)

The major grains—corn, wheat, and rice—are considered a proxy for food overall, because a large share of the calories consumed by most people comes from grain either directly or indirectly in the form of meat, milk, cheese, and other livestock products.

Among developing countries, grain import dependence is greater than 50 percent in Central America, where land is relatively scarce, and in the Middle East and North Africa, where water is the chief constraint.\(^8\) (See Figure 2.) Sub-Saharan Africa imports about 20 percent of its grain, and the low- and middle-income nations of Asia import about 7 percent.\(^9\) On the other hand, Japan—with the wealth to outbid other nations in international markets—imports about 70 percent of its grain.\(^{10}\)

Food import dependence has several roots. One problem is the steady loss of fertile land and freshwater. A 2013 study concluded that in 22 countries the consumption of agricultural products (not just grains) requires more freshwater than each country can extract, and in 62 countries the area of farmland is insufficient to meet domestic consumption needs.\(^{11}\)

Already, importing food is a de facto water management strategy for many water-scarce countries, because their water supply problem can be shifted to exporting nations. Agriculture commands upward of two thirds of water withdrawals in most economies, so a smaller agricultural sector can save a great deal of water.\(^{12}\)

The water embodied in the production of goods and commodities, known as “virtual water,” gives a sense of the water savings possible through trade. At the global level, most embodied or virtual water is associated with agricultural output: some 76 percent of the global flows of virtual water is captured in crops, and another 12 percent is embodied in livestock products.\(^{13}\)
The biggest net exporters of virtual water are the United States, Canada, Brazil, Argentina, India, Pakistan, Indonesia, Thailand, and Australia. The biggest net importers are North Africa and the Middle East, Mexico, Europe, Japan, and South Korea. Jordan, for example, imports virtual water that is equivalent to five times its own yearly renewable water resources. At the same time, some countries with high external water dependence, like the United Kingdom and the Netherlands, are not actually water-scarce.

Pressure on water supplies for agriculture is becoming widespread. A 2012 study in the journal *Nature* estimated that some 20 percent of the world’s aquifers are pumped faster than they are recharged by rainfall, often in key food-producing areas such as the Central Valley and High Plains of the United States, the North China Plain, the Nile Delta of Egypt, and the Upper Ganges of India and Pakistan. And a 2002–09 study of satellite data revealed that the region encompassing the Tigris and Euphrates river basins had lost 144 cubic kilometers of freshwater, nearly as much as in the Dead Sea, largely from overpumping of aquifers. Similar depletions have been monitored by the satellite program in India, North China, North Africa, Southern Europe, and the United States.

Meanwhile, another 2012 study analyzing scarcity in 405 river basins that contain 75 percent of the world’s irrigated area documented severe water scarcity for at least one month a year in 201 of them (and somewhat lesser scarcity in other months). In 35 of the basins, severe water scarcity is the norm for at least half of the year.
Regarding farmland, the Food and Agriculture Organization (FAO) reports that essentially no additional suitable farmland remains in a belt around much of the middle of the planet, including countries in the Near East and North Africa, South Asia, and Central America and the Caribbean, many of which still have growing populations. Additional available land is found primarily in South America and Africa, but much of it is of high ecological value (for carbon sequestration or biodiversity conservation, for example) or of marginal quality.

Despite the importance of remaining farmland, land continues to be degraded or paved over on all continents. In 2011, FAO reported that 25 percent of land worldwide was highly degraded and another 8 percent was moderately degraded. Meanwhile, farmland near cities is regularly converted to accommodate housing, industry, and other urban needs. The United States, for example, lost 9.3 million hectares of agricultural land to development—an area the size of the state of Indiana—between 1982 and 2007.

Recently, another threat to national endowments of farmland has emerged in the practice of “land grabbing”—the purchase or leasing of land overseas by investment firms, biofuel producers, large-scale farming operations, and governments. Since 2000, agreements have been concluded for foreign entities to purchase or lease more than 42 million hectares, an area about the size of Japan. About half of this area is intended for use in agriculture, while 25 percent is intended for a mix of uses, some of which is agriculture. (Most of the remaining area is to be used for forestry.) Another nearly 9.8 million hectares are under negotiation. The bulk of the grabbed land is located in Africa, with Asia the next most common region for acquisitions. (See Table 2.)

<table>
<thead>
<tr>
<th>Region</th>
<th>Grabbed Area (Million Hectares)</th>
<th>Share of Global Grabbed Land (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa (40)</td>
<td>20.9</td>
<td>49.5</td>
</tr>
<tr>
<td>Asia (16)</td>
<td>10.0</td>
<td>23.7</td>
</tr>
<tr>
<td>Oceania (1)</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Latin America (16)</td>
<td>7.3</td>
<td>17.3</td>
</tr>
<tr>
<td>Europe (7)</td>
<td>4.0</td>
<td>9.6</td>
</tr>
<tr>
<td><strong>Total (80)</strong></td>
<td><strong>42.2</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

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Source: Land Matrix

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The largest source of land grabbing is the United States, where investors see an opportunity to make money on an increasingly limited resource. (See Table 3.) Target countries are often land-rich or water-rich—indeed, some land is acquired as much for its access to water as for the land itself. Indonesia, for example, is a water-rich nation that is among the most targeted countries for foreign acquisitions. In addition, contracts often do not take into account the interests of smallholders, who may have been working the acquired land over a long period.

Land grabbing surged from 2005 to 2009 in response to a food price crisis, according to a 2012 report from the Land Matrix. Demand for biofuels is another driver. The 2007 Energy and Independence Security Act in the United States called for a fourfold increase in biofuel production by 2022, while a 2009 European Union directive had a similar stimulative impact. In addition, droughts in the United States, Argentina, and Australia drove interest in land overseas.

Importing food as a response to resource scarcity has two clear pitfalls. First, not all countries can be net food importers; at some point the demand for imported food could exceed the capacity to supply it. Indeed, many major supplier regions are themselves experiencing resource constraints, as in the United States, where prolonged drought in California led to the fallowing of nearly 5 percent of that state’s agricultural land in 2014.

### Table 3 | Leading Investor and Target Countries for Land Investments Since 2000

<table>
<thead>
<tr>
<th>Investor Countries</th>
<th>Area Acquired (Million Hectares)</th>
<th>Target Countries</th>
<th>Area Acquired (Million Hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>7.6</td>
<td>Papua New Guinea</td>
<td>3.8</td>
</tr>
<tr>
<td>Malaysia</td>
<td>3.6</td>
<td>Indonesia</td>
<td>3.6</td>
</tr>
<tr>
<td>Singapore</td>
<td>2.9</td>
<td>South Sudan</td>
<td>3.5</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>2.8</td>
<td>Democratic Republic of the Congo</td>
<td>2.8</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2.4</td>
<td>Mozambique</td>
<td>2.2</td>
</tr>
<tr>
<td>India</td>
<td>2.1</td>
<td>Congo</td>
<td>2.1</td>
</tr>
<tr>
<td>Canada</td>
<td>2.1</td>
<td>Ukraine</td>
<td>2.1</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>1.6</td>
<td>Russian Federation</td>
<td>1.7</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>1.6</td>
<td>Liberia</td>
<td>1.3</td>
</tr>
<tr>
<td>Hong Kong (China)</td>
<td>1.4</td>
<td>Sudan</td>
<td>1.3</td>
</tr>
</tbody>
</table>

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**Source:** Land Matrix

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Second, excessive dependence on imports leaves a country vulnerable to supply interruptions, whether for natural reasons (such as drought or pest infestation in supplier countries) or political manipulation. An import strategy may now be unavoidable for some nations, but it should be considered only reluctantly by countries that can meet their food needs in more conventional ways. A better strategy may be vigilance in conserving agricultural resources wherever possible.\textsuperscript{38}

\textit{Gary Gardner is the director of publications at Worldwatch Institute and co-director of State of the World 2015.}

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Volatile Cotton Sector Struggles to Balance Cost and Benefits

2 Ibid.
3 Ibid.
4 Worldwatch calculation based on data in USDA, note 1.
5 Ibid.
6 Ibid.
8 USDA, op. cit. note 1.
11 Ibid., op. cit. note 7.
14 Ibid.
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Land Matrix, op. cit. note 27.

Ibid.

Ibid.

Ibid.

Ibid.


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Ibid.

Ibid.

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Richard Howitt et al., Economic Analysis of the 2014 Drought for California Agriculture (Davis, CA: Center for Watershed Sciences, University of California, July 2014); 5 percent is a Worldwatch calculation based on total irrigated farmland in California from U.S. Geological Survey, at pubs.usgs.gov/circ/2004/circ1268/htdocs/table07.html.

Hoekstra and Mekonnen, op. cit. note 13.