Wheat Mapping Within Major Producer Countries in the Context of Exploring Linkages Between Production Forecasts and Conflict

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Abstract

The issue of agricultural land use for food security has rapidly risen to the top of government agendas around the world as the recent lack of food access has led to unprecedented food prices, hunger, poverty, and civil conflict. With one in seven people estimated to suffer from hunger and malnutrition, global food production is facing immense challenges in this century. The devastating droughts in Russia, Ukraine and Australia were primary factors leading to the two recent food price surges of wheat and wheat products. Although the complex combination of factors leading to the grain price surges are still the subject of intense debate, it is clear that timely, trusted information on food supplies is a critical element for helping to reduce market uncertainty and to avert such volatility.

Components

1. Wheat yield forecast model for the primary wheat exporting countries
2. Potential impact for production forecasts on reducing price volatility
3. Examine the relationship between agricultural production, price fluctuations and civil unrest

Regions of Focus

Seven countries account for over 70% of world exports and 35% of total production, and production fluctuations in these countries largely govern international wheat prices.

Component 1: Wheat Yield Model

This component builds on a developed approach that utilizes a time series of sub-national crop yield and area statistics along with a time series of vegetation indices from MODIS (2000-present) and wheat percent masks to forecast wheat production at the national scale. This component has three steps: 1) Generation of national percent wheat masks 2) GLAM (Global Agricultural Monitoring initiative) wheat model application and tuning for production forecasting in the main wheat export countries 3) explore methods to improve timeliness of forecasts.

Component 2: Relationship Between Price Volatility and Production Forecasts

The factors governing recent food price volatility are complex and the subject of intense debate, yet it is often stated that improvement of timeliness, transparency and reliability of global agricultural information has a critical role to play in helping to stabilize grain markets. Following the 2010 drought international wheat prices increased over 80% in less than a year and the Russian grain production shortfall was cited as one of the primary instigators for this dramatic price hike.

Component 3: Conflict-Case Study Egypt

The objective is to characterize the causal links between crop production and local conflict so we are building a process tracing approach to create a projection of the sensitivity to risk from extreme price fluctuations. One case study is Egypt, the world’s largest wheat importer, where localized food riots and protests followed the food crises of 2008 and 2010.

Table 2. Ukraine RMSE in MMT of the simulated production versus the real production obtained from official statistics.

<table>
<thead>
<tr>
<th>Days before the peak</th>
<th>Original method</th>
<th>15</th>
<th>25</th>
<th>35</th>
<th>45</th>
<th>55</th>
<th>65</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSE (M)</td>
<td>0.99</td>
<td>1.30</td>
<td>1.37</td>
<td>1.39</td>
<td>1.56</td>
<td>1.62</td>
<td>1.73</td>
<td>1.97</td>
</tr>
<tr>
<td>RMSE (%)</td>
<td>12</td>
<td>15</td>
<td>17</td>
<td>18</td>
<td>20</td>
<td>25</td>
<td>28</td>
<td>31</td>
</tr>
</tbody>
</table>

The new model includes growing degree days, which improves the timeliness of the forecast to 2-2.5 months prior to harvest while still maintaining an accuracy within 10% in the winter wheat production forecast.