Addressing Food Security Challenges in Lebanon: A Water-Energy-Food-Health Nexus Approach

As Lebanon faces compound challenges including a pandemic, economic, financial and political failure, a looming food security crisis is rapidly approaching. Much of this crisis could be attributed to the lack of long-term planning and investment in the sustainability of the agricultural sector. Another challenge lies in the existing disconnect between decision making between the agricultural sector, and other interconnected sectors, including water, energy, health, economy, among others. This is exacerbated by the lack of integrative national tools that allow for quantifying the trade-offs associated with possible plans and interventions, which could play a role in facilitating a dialogue be-tween multiple sectors and stakeholder groups.

Supported by the Food and Agriculture Organization of the United Nations, the Faculty of Agriculture and Food Sciences at the American University of Beirut has worked toward 1) identifying and quantifying the critical interconnections between water, energy, and food systems in Lebanon; 2) developing a framework to assess the trade-offs associated with adopting interventions within current water, energy, and agriculture portfolios and practices.

Key messages

- Invest in strategy for increasing local production of high nutrition-low resource intensive crops including lentils, beans, and chickpeas which currently have low levels of self-sufficiency (<50 percent).
- Importance of coordinating agricultural strategy planning with water, energy, and economic planning.
- Given the uncertainty in currency exchange rates and the devaluation of the Lebanese Pound, invest in specialized high value crops for export.
Current status overview

- Water: 60 percent of water in Lebanon goes to agriculture; in Beqaa, home to 42.5 percent of total crop land, percent of local available water is allocated to agricultural.
- Irrigation water: springs, public wells, private wells, ponds and hill lakes; Groundwater (80 percent), Surface water (20 percent).
- Majority of farms are small farm holdings that do not exceed 1 hectare.
- Electricity generation: 96 percent of total generation from fossil fuels; 3 percent from hydro-power plants, 0.35 percent from photovoltaic (PV) panels.

Agriculture:

<table>
<thead>
<tr>
<th>100% self sufficiency</th>
<th>90% self-sufficiency</th>
<th>Medium and low self sufficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>230</td>
<td>Peas (dry)</td>
</tr>
<tr>
<td>Grapes</td>
<td>146</td>
<td>Beans (green)</td>
</tr>
<tr>
<td>Banana</td>
<td>145</td>
<td>Onion (dry)</td>
</tr>
<tr>
<td>Oranges</td>
<td>138</td>
<td>Pepper (green)</td>
</tr>
<tr>
<td>Grapefruit</td>
<td>131</td>
<td>Strawberry</td>
</tr>
<tr>
<td>Peach</td>
<td>123</td>
<td>Peas (green)</td>
</tr>
<tr>
<td>Cherries</td>
<td>116</td>
<td>Walnuts (with shell)</td>
</tr>
<tr>
<td>Tangerines</td>
<td>110</td>
<td>Beans (dry)</td>
</tr>
<tr>
<td>Lettuce</td>
<td>110</td>
<td>Garlic</td>
</tr>
<tr>
<td>Potato</td>
<td>109</td>
<td>Chickpeas</td>
</tr>
<tr>
<td>Apricot</td>
<td>107</td>
<td>Lentil</td>
</tr>
<tr>
<td>Lemons</td>
<td>103</td>
<td>Broad Beans</td>
</tr>
<tr>
<td>Almond</td>
<td>101</td>
<td></td>
</tr>
</tbody>
</table>

- Majority of energy for water on farms comes from diesel;
- energy for agricultural production is 70 percent Diesel, 30 percent Gasoline;
- currency exchange rate: 1USD = 1500LBP;
- all values are according to a 2017 base scenario.
Developing an agricultural strategy requires a holistic analysis of the interconnection between the agriculture system and other resource systems interconnected with it. Decisions across these resource systems is often done with limited coordination. It is also often challenging to suggest an optimal strategy given the diversity and complexity of the involved stakeholders and decision makers, given their varying goals and interests.

Therefore, scenario planning tools can play a role in highlighting the trade-offs associated with different decisions, according to the developed assessment criteria. Below is an example of the framework developed for the case of Lebanon to evaluate the resource requirements expected for different food, water, and energy portfolios, under currency conversion scenarios.

### Scenario A: Nutrition-centric
- Increase beans, lentils, chickpeas and peas to 100 percent SS;
- same energy and water sources;
- same currency conversion as 2017: USD 1 = 1500 LBP.
Scenario B: Shift from export to more local production

- Increase beans, lentils, chickpeas and peas to 100 percent self-sufficiency;
- decrease crops SS > 100 percent;
- 80 percent groundwater; 20 percent surface water;
- 100 percent diesel (energy for water);
- Same currency conversion as 2017: USD 1 equals 1500 LBP.

Scenario C: Nutrition-centric + Ren.Energy + treated water

- Increase beans, lentils, chickpeas and peas to 100 percent SS;
- 60-20-20 percent groundwater, surface water, treated water (water for food);
- 50-50 percent solar and diesel (energy for water);
- Currency conversion: USD 1 = 4000 LBP.

Moving forward: challenges to address

- Building a sustainable economic and environmental future in Lebanon requires a paradigm shift that acknowledges the nexus between water, energy and food (WEF) sectors to simultaneously address prevailing water scarcity, food insecurity and economic pressures.

- Trade-off analysis tools can play a critical role in catalyzing cross-sectoral dialogue between the stakeholders who regulate, manage, and consume these resource systems. Such dialogue enhances the processes of integrative planning toward a more robust agricultural strategy.

- Low yield is one of the main challenges that face further investment in crops like lentils, beans, and chickpeas. Further research on improving yields of such crops would improve the attractiveness of growing them locally.

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