“Using GIS to guide decision making processes in reforestation”

Lebanon Reforestation Initiative
Joseph Bechara
August 27, 2019

ESCWA Beirut
Introduction
Lebanon Reforestation Initiative

- Founded in 2014 to address Long-term sustainable land restoration and forest management across Lebanon

- LRI aims to conserve and expand Lebanon’s forests through a community-based approach and public-private partnerships. In addition, LRI also aims to empower communities to advocate to better manage their forest resources.
Introduction
Lebanon Reforestation Initiative

- Objectives of the NGO
  - Improve the management and conservations of forests across Lebanon
  - Contribute to the LDN national targets through Afforestation/Reforestation; Quarry restoration; land use planning; Education and Awareness and Stabilization of degraded lands.
Lack of data slows progress in Lebanon: U.N. report

BEIRUT: While Lebanon is considered to have high human development rates compared to other countries in the region, the lack of data presents many obstacles to growth, delegates heard at the launch of the Human Development Report 2011 in Beirut Thursday.

The annual U.N. Development Program report, this year entitled, "Sustainability and Equity: A Better Future for All," ranked Lebanon 71 out of 187 countries, one place higher than its last appearance in the HDR in 2009. Lebanon was not included in last year's report due to a lack of statistics, and this dearth was again cited as a major obstacle to national progress.

The U.N. measures human development on three basic dimensions: a long and healthy life, access to knowledge and a decent standard of living.

This year's report makes special reference to the relationship between the...
LRI strategy for data collection and management

Lebanon Reforestation Initiative

- Set objectives
- Identify needs and opportunities
- Plan and design
- Survey / field collector
- Data Storage
- Data Sharing/interpretation

LRI Partners
1. Daily Planting Inspection steps

- Daily area planted is delineated at the end of each planting day
2. Inspection of planting quality

![Graph showing average worker productivity and average crew size across different locations.](image-url)
3. MONITORING survivability RESULTS

- Baseline monitoring for the seedlings status at Rachaya planting site
4. Web mapping platform
5. Story maps
6. Fire risk maps
5. Drone aerial photo
Data Collection Timeline

2000-2005

2005

2010

2013

2015
Data ARCHITECTURE

1. PDA

2. Content management system: ArcGISonline

3. Applications
   Collector for ArcGIS
## Comparative table between paper based data collection and ArcGIS collector

<table>
<thead>
<tr>
<th>Paper based</th>
<th>Electronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 days process (Data entry)</td>
<td>1 day (Sync)</td>
</tr>
<tr>
<td>Time consuming and costly</td>
<td>Reduced labor</td>
</tr>
<tr>
<td>Marked spatial location to be integrated</td>
<td>Accurate spatial location</td>
</tr>
<tr>
<td>Need to be cleaned to be analyzed</td>
<td>Directly fed for analysis</td>
</tr>
<tr>
<td>Need to be reviewed</td>
<td>Minimize human error</td>
</tr>
</tbody>
</table>

### Advantages

<table>
<thead>
<tr>
<th><strong>Fast</strong> : Information stored and managed can be retrieved almost instantly</th>
<th><strong>Economic</strong> : over time it reduced the costs of managing data by a significant margin.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficient</strong> : Summary documents and related reports can be automatically and quickly generated.</td>
<td><strong>Easily sharable</strong>:</td>
</tr>
</tbody>
</table>
M&S (Modeling and Simulation) is defined as a discipline for developing a level of understanding of the interaction of different parts of a system with the system as a whole. M&S develops a mapping scheme that allows the re-production of the final output map using relevant and updated data.

M&S is explained by:

- Modeling is the static representation of a real system used to promote understanding of the real situation. A model enables an easy and accurate **updating** of results. The implementation of the model over time helps track Rangeland map changes in alignment with environmental and social modifications. The map which serves as a communication tool will be replicable and easy to compare over time and space.

- Simulation is the manipulation of the model in a way to **predict** the response of a system to a change in one or more variables. It can predict the impact of changes using different scenarios.
Random Forest model

• Data mining technique for ecological data procession and investigation

• Based on a forest of decision trees
Maxent

• Species Distribution Model also known as Ecological Niche Modelling

• MaxEnt is also known as Multinomial logistic regression and for further explanation it is a discriminative model that assigns a class to an observation by computing a probability
Presence points

Observed distribution of Pyrus syriaca

Legend
- Municipality
- Pyrus syriaca

Parameters

Normalized Difference Vegetation Index (NDVI)

NDVI Value
- High
- Intermediate
- Low

Legend
- 0 50,000 Meters
- Lambert Conformal Conic
- Prepared by Christel Bercahy
Prediction maps of potential distribution of 27 species used in reforestation.
THANK YOU