Background and additional details about the KKL Climate Challenge

The Challenge

How can we improve the water supply technology for KKL forest plantings, by optimally adjusting quantity and frequency to match soil and environmental conditions, while creating ideal conditions for tree absorption.

Challenge's Details

Finding technological solutions for water supply for plantations in KKL forests, considering soil conditions, moisture levels, and the need of trees for precise water quantity.

Implementing technology to monitor soil and/or tree water ratio for accurate water supply, reducing consumption, and minimizing additional water costs. Additionally, identifying the optimal timing for planting new trees.

Creating a system to assess and measure the success rate of plantation establishment.

Problem's Background

Ensuring proper irrigation of plantings in KKL forests involves tackling a set of distinctive challenges. Each planting site demands meticulous planning for irrigation distribution, calculating water requirements for individual trees, and establishing optimal frequency of watering quantity. This planning process considers the varying climate conditions, soil characteristics, and the quantity and species of trees. The irrigation systems provide water support for a period ranging from 3 to 5 years until the saplings are firmly rooted in the ground.

Currently, the water supply requires a connection to a high-flow-capacity water source. Occasionally, the water source is located far from the planting area, necessitating the installation of a conveyance system that links to the water source. Another challenge involves safeguarding the irrigation lines from potential damage caused by wildlife, which may puncture the pipes and lead to unnecessary water wastage. Regular checks are conducted to verify the system's integrity before every irrigation cycle.

Furthermore, another aspect is adjusting the quantity and frequency of irrigation to match soil moisture and climate conditions. This complex task varies according to tree species, seasonal period, and soil type. For example, sandy soil, which typically has low water retention capacity, demands more frequent irrigation than clay soils. Occasionally, the irrigation schedule is determined based on the field manager's availability rather than the specific needs of the tree or soil moisture conditions.

A creative and strategic approach is essential to successfully tackle the presented challenges. This approach should encompass water supply planning alongside the evolving needs of the trees, all while considering the intricacies of soil and climate conditions.

Another longstanding concern for KKL foresters is enhancing the success rates of new plantation establishments by understanding diverse variables and cultivating a more conducive environment for plant development. selecting planting areas based on available infrastructure or areas distant from water sources, posing a challenge for establishing thriving forests.

Another significant factor involves the timing of new plantings. Planting usually occurs around Tu B'Shevat (TREE HOLIDAY), during the winter peak when temperatures are at their lowest and the ground is saturated, with the potential to affect and impact the establishment of trees.

Currently, two distinct surveys asses the success of plantings and the survival of trees. The surveys involve randomly selecting and sampling a specific area, with size determined by operational principles. Returning to the starting point after 1 or 5 years, depending on the type of survey, facilitated through GPS (with a certain degree of margin for error). The plantings survey is carried out one year after planting, examining tree quantity, species, and condition (alive/dead). The data is subsequently fed into the KKL information system, yielding percentages that reflect planting success.

The survival survey is conducted five years after planting, measuring a physical parameter—the tree height above ground. The height reflects success; taller indicates a higher level of success, and shorter indicates a lower level of success, compared to other species in the same sample area. The system generates data on the surviving trees from this survey.

KKL CLIMATE CHALLENGE

An experiment was conducted on the topic of irrigation quantities

Experiment Title: Enhanced Irrigation for Regenerating Forest Plantings.

Objective: The goal of the experiment was to examine the potential impact of increased irrigation on the growth of newly planted forest seedlings compared to the standard amount of irrigation.

Results and Conclusions: Findings from this experiment reveal that a substantial increase in irrigation (6 to 8 times from the standard amount) for young trees results in robust and distinct growth in both height and diameter across four tree species: Aleppo Pine, Atlantic Cedar, Tabor Oak, and Common Carob. The rapid and pronounced growth in stem diameter and height is critically essential for the establishment and survival of the young forest. This is particularly significant due to concerns about herbivore entry, leaning, friction, and gnawing on the growth trees. As young trees exhibit accelerated growth in height and diameter, their resilience against pest-related damages significantly improves.

Recommendations: It is recommended to augment the water supply after planting to 2,000–2,500 liters per tree per irrigation cycle, substantially increasing from the standard 300–400 liters per tree. This intensified irrigation practice should be maintained for at least two years to support optimal growth and survival of the new plant.

Criteria for a Successful Solution:

1. The solution should be practical, user-friendly, and easy to use.
2. The solution should include a function for the land manager, providing detailed monitoring results regarding water quantities and making the information accessible for timing plantings and ongoing monitoring of water supply to the trees.
3. The solution should incorporate a function for the land manager where physiological parameters, such as stem diameter, tree height, and tree condition (alive/dead), are measured and detailed.
4. The solution should integrate various monitoring tools for KKL-JNF systems.

KINNERET INNOVATION CHALLENGES

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