

Horticultural Nursery Workforce Dynamics: A Fundamental View

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ABSTRACT

Horticultural nurseries are sequentially dependent on human resource capital to do various operations. This paper addresses multidimensional challenges in labor management in nursery operations. The paper analyzes the problem involved and develops strategies for improving labor utilization through structured training, adoption of appropriate technologies, and strengthened policy support. Enhancing workforce proficiency by integrating modern management approaches with technology and human-centric management can significantly ameliorate task performance by ensuring labor welfare in compliance with labor laws. The study advances the development of more robust and efficient and sustainable nursery systems by offering better morale into effective labour management.

Keywords: Automation, high-Tech nursery, seasonal labor, SOP (Standard Operating Procedure), sustainability

INTRODUCTION

Agriculture is the driving force of our country's economy. A horticultural nursery aims to produce a huge volume of plants in a controlled environment; it plays a vital role contributing to the agrarian economy guaranteeing food security and rural livelihoods. Nursery works include nurturing, propagation, pruning, maintenance, and selling plants; to do these activities, a strong, dynamic workforce is required. Labors participate in various activities, ensuring safety and growth mechanisms from seedling to plant and its dispersal. Hence, streamlined labor management is essential to enhance productivity and survival and ensure plant quality.

Objectives Of The Study

- To conduct analysis of labor utilization in the nursery.
- To establish worker safety and welfare.
- To benchmark the application of technology in minimizing labor dependency.
- To propose strategies for improving workforce output efficiency.

LITERATURE REVIEW

The former studies indicate that labor inefficiency brings about increased production costs and reduced profitability. [2] Factors that limited new nursery hires included increased wages (26%), insufficient availability of qualified labor (32%), financial limitations (28%), and added automation systems/processes (9%). Survey results did not specify if the addition of automation limited new hires because it reduced labor needs or because it allowed operators to allocate existing labor more efficiently, reducing the need for new

workers. The research points out that mechanization and training significantly improve labor productivity. The studies also draw attention to the importance of skilled labor in modern nursery operations. Employers embraced a range of multi prolonged strategies; neutral, “wait-it-out” approaches included producing less manpower-intensive crops, downsizing expansion plans, leaving fields fallow, or assigning manual tasks to high-skilled workers.

RESEARCH METHODOLOGY

Effective management begins with a "Labor Calendar" that aligns manpower with the essential growth requirements of the plants. A nursery calendar helps plan necessary activities and purchase of seed, supplies, and equipment.

- Peak Periods

Labor is concentrated during seed sowing, watering, preparing beds, grafting, transplanting, packing, and distributing.

- Off-Peak Tasks

During slower months, workers shift to maintenance activities such as weeding, foliar spraying, pot cleaning, soil sterilization, packaging of seeds and fertilizers, and infrastructure repair during slower growth months.

- Standard Operating Procedures (SOPs)

SOPs ensure that every worker, regardless of experience, maintains the same quality and speed during their process.

Data Collection and Technique

A structured questionnaire was used to gather first-hand information directly from the labor force in the nursery, which facilitated data analysis and interpretation. The workers were interviewed about their job roles, employment type, break hours, working conditions, job responsibilities and job satisfaction. This method ensured consistency and reliability in the data collected.

Convenience sampling method was used to select workers based on their availability and willingness to participate during their working hours. It provided easy access to employees with varying work schedule and levels of work experience ensuring diverse range of respondents and their perspectives were included in the study.

Labor Management Tools Used In Nursery Operations

Effective labor management uses various tools that boost productivity by improving performance standards. The following tools are commonly used to manage labor activities in a nursery:

- **Worker attendance register:** It helps to maintain records of worker's names, time of arrival and departure, and their leave duration.
- **CCTV cameras:** CCTV cameras monitor workers while they are engaged in their duties, help to improve safety, and work efficiently.
- **Overtime work record:** The register ensures fair payment. Workers receive appropriate remuneration for the extra work hours they work.
- **Records of nursery output:** These records aid in effective planning and maintaining accurate records.

Table 1: Classification and Percentage Distribution of Labor Activities

Activity Type	Percentage (%)
General Nursery Operations	50
Manure Production	15
Potting Operations	10
Plant Health Care	10
Outdoor Nursery Work	10
Weed Management	5

Types Of Labor In Nursery

[1] Nursery operations are dependent on staff who are professional, careful, and honest; the casuals or technical workers do most of the work described here, everyone in the nursery must have as much knowledge about agro forestry tree propagation as possible. Labor in a nursery can be categorized into the following:

- **Family Labor:**

Common in small/large farms. They are from the family in need of wages or a means of support.

- **Highly Skilled Labor:**

Dedicated to grafting, budding, and laboratory-based tissue culture. These workers require specialized training and often command higher wages.

- **Semi-Skilled Labor:**

Focused on irrigation management, pest identification, and fertigation.

- **General Labor:**

Handling heavy lifting, weeding, pot filling, and loading/unloading for transport.

- **Seasonal Labor:**

Labor that only works for a particular time period or during emergency situations when need arises.



Fig. 1: Workforce in loading and unloading

Role Of Technology

Technological advancements such as automated systems, watering machines, and plant management software increase efficiency and also improve monitoring and decision-making processes. Labor-augmented investments increase the capacity of existing workers by training them to use the new software or potting machine attachments, fabricate repair parts for machines, or take on increased responsibilities managing workers operating the various automations.[3]Automation solves the problem of lack of workers and harvesting problems.

- Smart Irrigation: AI-enabled sensors and automated systems deliver water and nutrients only when needed, reducing waste.
- Climate Control System: Automated greenhouses use sensors to manage temperature, humidity, and CO2 levels for healthy growth.
- Automation System: Digital equipments handle labor-intensive tasks like soil filling, seed sowing, transplanting, and pruning.
- AI Powered Plant Monitoring: Cameras and apps recognize early signs of pests, diseases, and nutrient deficiencies.
- LED Lighting System: Specialized LED systems generate a specific spectrum output to drive up plant development.
- Digital Inventory: Software and QR codes track plant health and stock levels in real-time for better business planning.
- Drones: It is employed for large-scale monitoring, spraying, and mapping of outdoor nursery beds.

Challenges In Labor Management

Labor shortages have become increasingly common due to urban migration, as people seek higher-paying jobs and more sophisticated lifestyle changes in cities .This lack of skilled workers leads to increased cost and time .High labor costs make it difficult to sustain labors and manage nursery operations. Seasonal fluctuations in labor demand affect the efficiency and nursery productivity .Poor working conditions, which lead to low motivation, result in decreased performance.

FINDINGS AND DISCUSSION

As an essential part of agricultural systems, horticulture confronts several obstacles that affect its marketability, sustainability, and production. Continuous innovation and adaptation are required due to rapidly changing customer expectations, technology improvements, and environmental changes. The study highlights the effects of climate change, post-harvest losses, obstacles to technology adoption, and the changing role of cutting-edge digital technologies in horticulture management.

The study finds that nurseries adopting high-tech labor management practices achieve the following:

- higher productivity
- better plant health
- enhances labor attendance
- Safety and better payroll.

CONCLUSION

Effective labor management is essential for the successful operation of a nursery. By integrating technology, improving skills, and implementing effective management practices, laborers can enhance productivity and overall nursery performance. It also reduces manual errors and aids faster decision-making. AI and machine learning track new updates according to seasonal demand and provide necessary changes to historic available data. To further strengthen this, digital labor management and comparative tools could be used to enhance operational efficiency, increase profitability, productivity, quality and sustainability.

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