Development of Remote Sensing Tools to Evaluate In-Field Results of Best Management Practices (BMPs) for Peas

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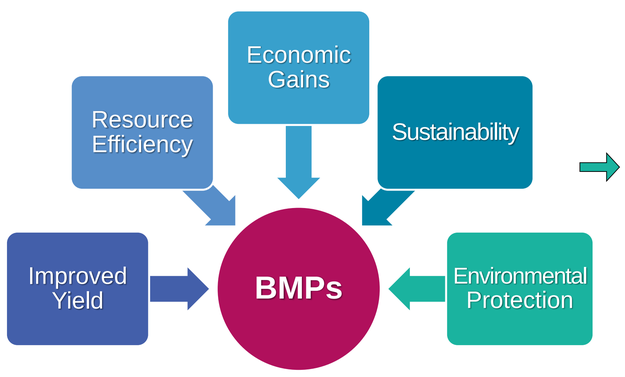
Introduction



Challenges in BMPs Development

- Limited Data Availability
- Often Destructive
- Limited Scalability
- Environmental Variability
- High Cost of Implementation

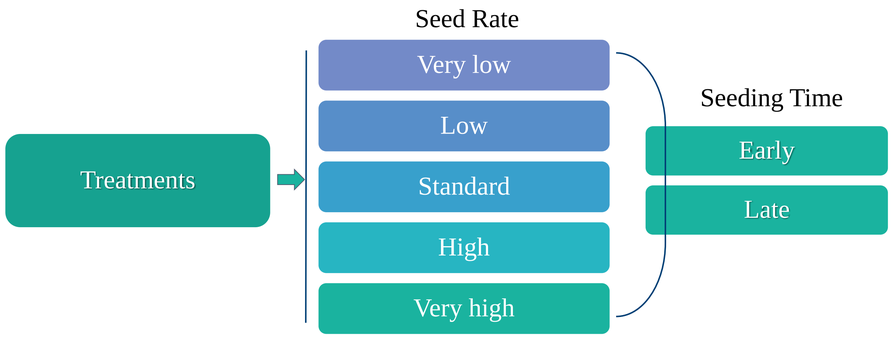
LiDAR in BMP Development

- Non-Destructive Monitoring
- Precision Measurements
- Temporal Growth Insights
- Cost and Labor Efficiency
- Data-Driven Decision Making

Objectives

- Develop structural remote sensing indices to capture pea growth and development over time.
- Determine the optimal time for crop growth stages to best predict crop yield from remote sensing data.

Methodology



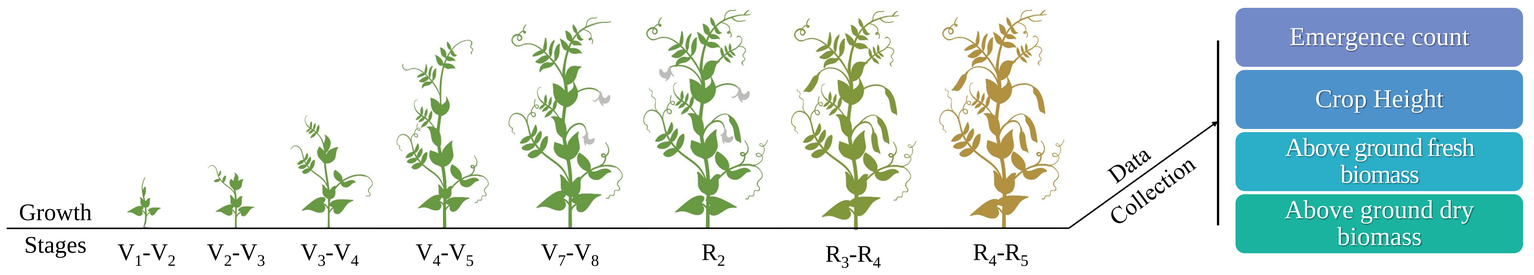


Fig: DJI Matrice 350 Drone

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Fig: Zenmuse L1 LiDAR Sensor

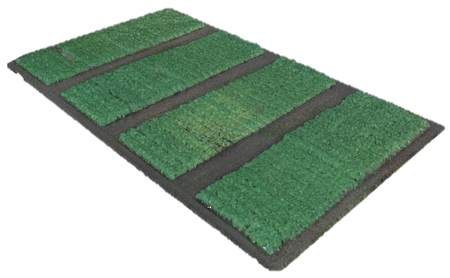
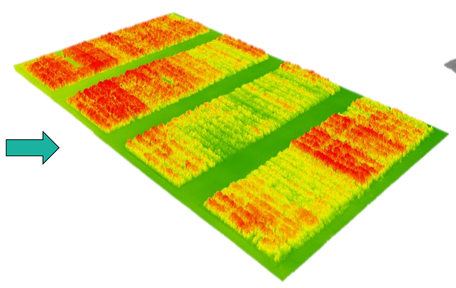


Fig: 3D Point Cloud



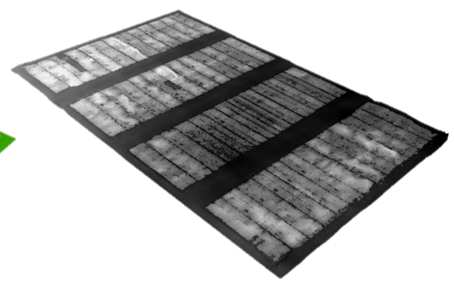


Fig: Digital Surface Model (DSM) & Digital Elevation Model (DEM)

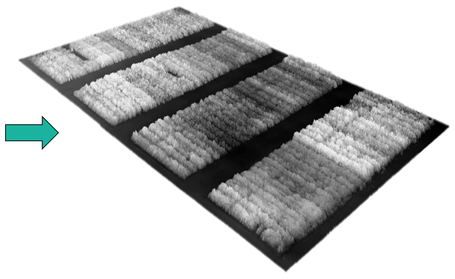


Fig: Canopy Height Model (CHM)

- Height
- Ground Cover
- Volume

Result

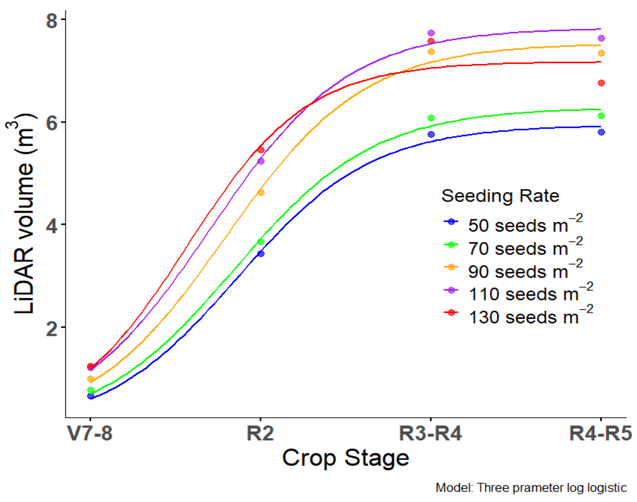


Figure 1: LiDAR Point Cloud Derived Volume Accumulation over time by seeding rate

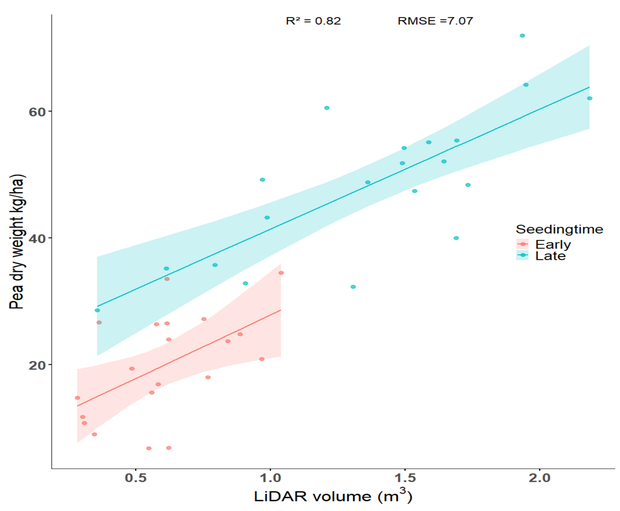


Figure 2: Relationship between the LiDAR point cloud-derived volume and the aboveground dry biomass

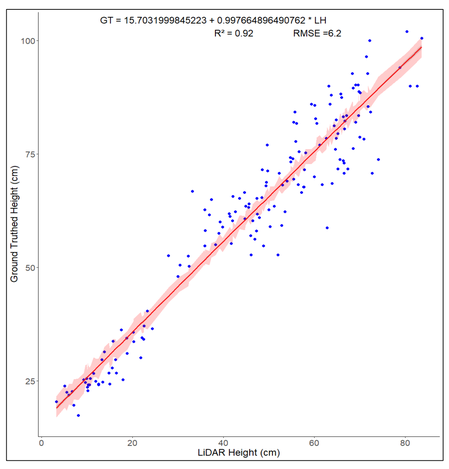


Figure 3: Relationship between the LiDAR point cloud-derived height and the ground truth data.

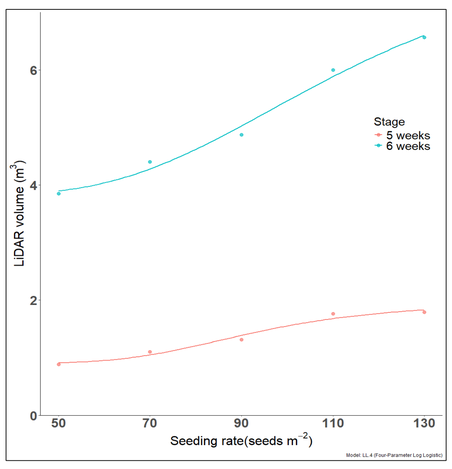


Figure 4: Response of LiDAR volume to increasing seeding rate

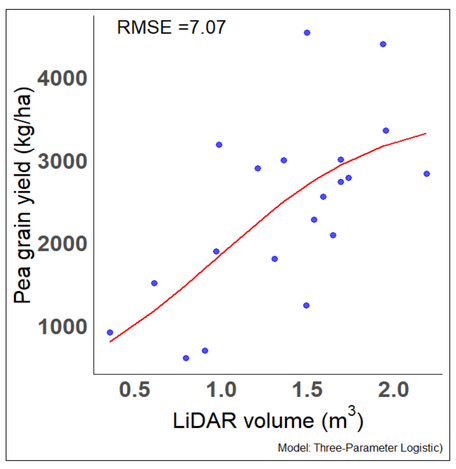


Figure 5: Relationship between LiDAR point cloud-derived volume and grain yield at V_7-V_8 stage

Conclusion

- This study demonstrates the effectiveness of LiDAR technology in evaluating best management practices (BMPs) for field pea.
- Preliminary results indicate that LiDAR can effectively distinguish between different BMPs, offering data-driven recommendations for optimizing seeding rates and sowing times.
- These findings contribute to precision agriculture by enhancing crop yield and sustainability.

Future Work

1. Repeat the experiment in summer 2025 → Validate initial findings
2. Utilize multispectral data → Develop a model to predict crop yield and maturity
3. Utilize thermal images → Detect variation in moisture level

Acknowledgement

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