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|  |  | Date: | 22/04/2024 |
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**FORECAST DATA COLLECTION:** Scanning Mushroom Beds pre and post picking.

# The experiment name

Scanning Mushroom Bed experiment 1

# Experiment Rationales.

Collecting data from mushroom beds before and while mushrooms are picked; the mushroom beds should be on the first and second flushes. The collected data will be used to estimate the mushroom growing rate (MGR); the targeted mushroom size is between 15 mm and 80 mm. The collected data will include RGB images and depth information from the whole bed, in addition to environmental information captured using a set of sensors. Mushroom bed forecasting will be recorded, and the amount of picked mushrooms per day or between scans will also be recorded.

In each time-step scan, all available mushrooms will be compared in terms of growth over 4 hours to determine the growth rate. Growth rates will be calculated for individual sizes. Based on that, forecast data will be constructed, and depending on that data, the model would be architected.

# Methodology involved in the test

# Method:

1. Select two tunnels for scanning: one in the first flush and the second in the second flush.
2. Prepare the harvester for data scanning in the first tunnel before 8 am.
3. Collect mushroom size data (time series data) from the first flush and the second flush.
4. Preparing a harvester for scanning requires 20 minutes.
5. Scanning a bed will require 15 minutes.
6. Moving a harvester from one tunnel to another tunnel requires varying time based on the distance between tunnels, but on average, it will be 20 minutes.
7. Data collection will start the day before picking and continue until the end of the flush period.
8. Data collected per day will be scheduled as follows:
   1. Flush 1: scan at 8 am, 12 pm, and 3 pm.
   2. Flush 2: scan at 9 am, 10 am, and 5 pm.
9. Collect environmental information using a set of sensors which are:
   1. Temperature
   2. Humidity
   3. CO2
   4. Compost temperature and moisture.
   5. Air flow near the bed.
10. The mushroom bed forking will be recorded before the start of scanning and picking.
11. The weight of picked mushrooms between the scans will be recorded.
12. The total weight of picked mushrooms according to various grades will be recorded.
13. The picker performances/costs will be recorded.

# Hardware involved:

MK1 will be used for scanning the bed. Prior to the first day of data collection or scanning, MK1 will be prepared to perform necessary operations like scanning while mobbing across the bed or the shelf.

# Storing LMF forecast data and scan data day by day alongside pre and post picking data:

Scanning two beds in two tunnels: one bed in 1st flush and the 2nd bed in second flush every day during the flush period.

**The time map for the data collection**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task | Scanning | Day -2 | Day -1 | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | LMF (required) |
| T1. Setting up MK1 for scanning |  | 11am - 4pm |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| T2. Scan 1st flush bed before picking |  |  |  |  |  |  |  |  | Forecasting |
|  | Scan 1 |  | 8am |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  | Scan 2 |  | 12pm |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  | Scan 3 |  | 4pm |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  |  |  |  |  |  |  |  |  |  |
| T3. Scan 2nd flush bed after picking |  |  |  |  |  |  |  |  | Forecasting |
|  | Scan 1 |  | 9am |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  | Scan 2 |  | 1pm |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  | Scan 3 |  | 5pm |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  |  |  |  |  |  |  |  |  |  |
| T4. Scan 1st flush bed while picking |  |  |  |  |  |  |  |  | Forecasting |
|  | Scan 1 |  |  | 8am | 8am | 8am | 8am | 8am |  |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  | Scan 2 |  |  | 12pm | 12pm | 12pm | 12pm | 12pm |  |
|  |  |  |  |  |  |  |  |  | Kg (Picked Mushroom) |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  | Scan 3 |  |  | 4pm | 4pm | 4pm | 4pm | 4pm |  |
|  |  |  |  |  |  |  |  |  | Kg (Picked Mushroom) |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  |  |  |  |  |  |  |  |  |  |
| T5. Scan 2nd flush bed while picking |  |  |  |  |  |  |  |  | Forecasting |
|  | Scan 1 |  |  | 9am | 9am | 9am | 9am | 9am |  |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  | Scan 2 |  |  | 1pm | 1pm | 1pm | 1pm | 1pm |  |
|  |  |  |  |  |  |  |  |  | Kg (Picked Mushroom) |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |
|  | Scan 3 |  |  | 5pm | 5pm | 5pm | 5pm | 5pm |  |
|  |  |  |  |  |  |  |  |  | Kg (Picked Mushroom) |
|  |  |  |  |  |  |  |  |  | Environmental sensor data |

Summary of the time plan

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task | Scanning | Day -2 | Day -1 | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
| T1. Setting up MK1 for scanning |  | 11am - 4pm |  |  |  |  |  |  |
| T2. Scan 1st flush bed before picking |  |  |  |  |  |  |  |  |
|  | Scan 1 |  | 8am |  |  |  |  |  |
|  | Scan 2 |  | 12pm |  |  |  |  |  |
|  | Scan 3 |  | 4pm |  |  |  |  |  |
| T3. Scan 2nd flush bed after picking |  |  |  |  |  |  |  |  |
|  | Scan 1 |  | 9am |  |  |  |  |  |
|  | Scan 2 |  | 1pm |  |  |  |  |  |
|  | Scan 3 |  | 5pm |  |  |  |  |  |
| T4. Scan 1st flush bed while picking |  |  |  |  |  |  |  |  |
|  | Scan 1 |  |  | 8am | 8am | 8am | 8am | 8am |
|  | Scan 2 |  |  | 12pm | 12pm | 12pm | 12pm | 12pm |
|  | Scan 3 |  |  | 4pm | 4pm | 4pm | 4pm | 4pm |
| T5. Scan 2nd flush bed while picking |  |  |  |  |  |  |  |  |
|  | Scan 1 |  |  | 9am | 9am | 9am | 9am | 9am |
|  | Scan 2 |  |  | 1pm | 1pm | 1pm | 1pm | 1pm |
|  | Scan 3 |  |  | 5pm | 5pm | 5pm | 5pm | 5pm |

# People involved:

|  |  |  |
| --- | --- | --- |
| Task | Team | Days |
| T1. Setting up MK1 for scanning | Jason, Faraz, Rufus, Ajay, Ayan | 1 |
| T2. Scan 1st flush bed before picking | Ajay, Ayan | 1 |
| T3. Scan 2nd flush bed after picking | Ajay, Ayan | 1 |
| T4. Scan 1st flush bed while picking | Ajay, Ayan | 5 |
| T5. Scan 2nd flush bed while picking | Ajay, Ayan | 5 |

# Requirements from LMF

1. **Pre picking / Forecast:** ​
2. Forecast for the targeted bed before scanning and picking.
3. **Environmental** **sensor** **data (Growing card):​**
4. Environmental data from the tunnel where the scanned bed located.
5. **Post picking**:​
6. The weights and the sizes of picked mushrooms between the scanning.
7. Record after pick weight and passes involved every pick.
8. The total weights of picked mushrooms according to various grade.
9. The picker performances/costs.

# Data storage:

Scan data will be tagged by data and time so that fetching particular data at a particular time stamp becomes easy and accessible without cross linking to each other within the storage.

There has been a 1TB hard drive arranged for data storage. Each day, scan data will be transferred from MK1 computer to the hard drive. This drive will provide source for data utilisation and analysis.

# H&S Risk assessment and training

For this experiment existing AR risk assessment would be used.

Ayan and others involved in this experiment will be trained by AR team who have already used the harvester MK1 previously at the farm.

# outcomes

With this experiment a time series dataset with specific intervals having mushroom growth over time is the major expectation. Alongside this pre and post picking scan would be done, and the farm will receive a histogram of mushroom size bins before and after picking.

1. Mushroom growth rat estimation
2. Estimate forecasting.
3. Picking performance.