BLUE NORTH

THINKING. FUTURE

Packhouse Action Group Water and Energy Project

2022 Water Usage Results

February 2024

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List of Abbreviations

CA	Controlled Atmosphere
ORP	oxidation-reduction potential
PAG	Packhouse Action Group
RA	Regular Atmosphere
SOP	standard operating procedure

1 Introduction

In 2017, Blue North Sustainability (Pty) Ltd. (Blue North) was contracted by the Packhouse Action Group (PAG) to conduct a study on the water risks faced by pome fruit packhouse and cold storage operations and provide water consumption benchmarks for these facilities. Since 2017, Blue North has concluded four more phases of benchmarking (2018, 2019, 2020 & 2021).

This report concludes the sixth phase of water consumption reporting and includes data from **January to December 2022**. The objectives of this phase were to:

- replicate the water use benchmark study undertaken in the previous phases;
- increase packhouse participation;
- provide a year-on-year comparison of water use in the packhouse and cold storage operations;
- collect data on preventative maintenance;
- collect categorised data on water management practices;
- simplify the data collection where possible.

This report presents the results from Phase 6 (2022 data) and draws a comparison between the water index results of previous phases – Phase 1 (2017 data) to Phase 5 (2021 data). The report also summarises the different water management and recycling methodologies applied at the packhouses.

Electricity consumption results can be viewed in a separate report.

2 Methodology

Previous and potential new participants were approached via phone call, WhatsApp, and email. Packhouses new to the project were provided with the project details and, if required, offered virtual onboarding. The functionality of the data collection tool did not increase in complexity, thus in-depth training was not required.

2.1 Development of the Data Collection Tool

Data was collected via the data collection tool and sense checked by the project team. Data anomalies were discussed with participants and, where applicable, rectified or reasons for the anomalies recorded.

Phase 6 followed a similar approach to the previous phases, but included the following updates and changes to the data collection tool:

- additional data capture fields for hybrid pack line water use and;
- replacement of free text fields with checkboxes in the Water Recycling Technology and Water Management tabs for increased user-friendliness.

Participants were also invited to share their water management standard operating procedure (SOP), relating to flume cleaning, water treatment, and recycling, which could inform a best practice document.

2.2 Scope of the Data Collection

The following five areas in pome fruit packhouses were isolated in terms of water consumption:

- **Drenching** – This includes water consumption for the drenching of fruit or bins.
- **Dedicated presort** – This includes all dedicated presorting line water consumption.
- **Packing lines** – This includes all packing line water consumption, of which flume water use makes up the majority.
- **Hybrid line** – This includes the water consumption of all packing lines where presort and packing occur simultaneously.
- **Cold storage** includes the water consumption of Regular Atmosphere (RA) and Controlled Atmosphere (CA) facilities. Cooling tower water consumption makes up the majority of cold storage water consumption.
- **Ablutions, canteen & offices** – This includes staff water consumption.

2.3 Participation

Twenty-two packhouses were invited to participate, of which 12 packhouses provided data.
Three packhouses (A, B, C) have been participants since the first phase of the project.
Three packhouses (O, P, Q) are new to the project and participated for the first time.

The primary reasons for packhouses not participating, displayed in Figure 1 are:

- Limited capacity for data collection and record-keeping, e.g., no metering. The lack of installed meters is the major reason for non-participation. This is represented as "No data".
- Limited resources (time and human resources) for data capturing.
- No interest. The three packhouses that were "not interested" provided different reasons. One does not want to share data, while the other two (with the same manager) do not see the benefit as they already have low water use.

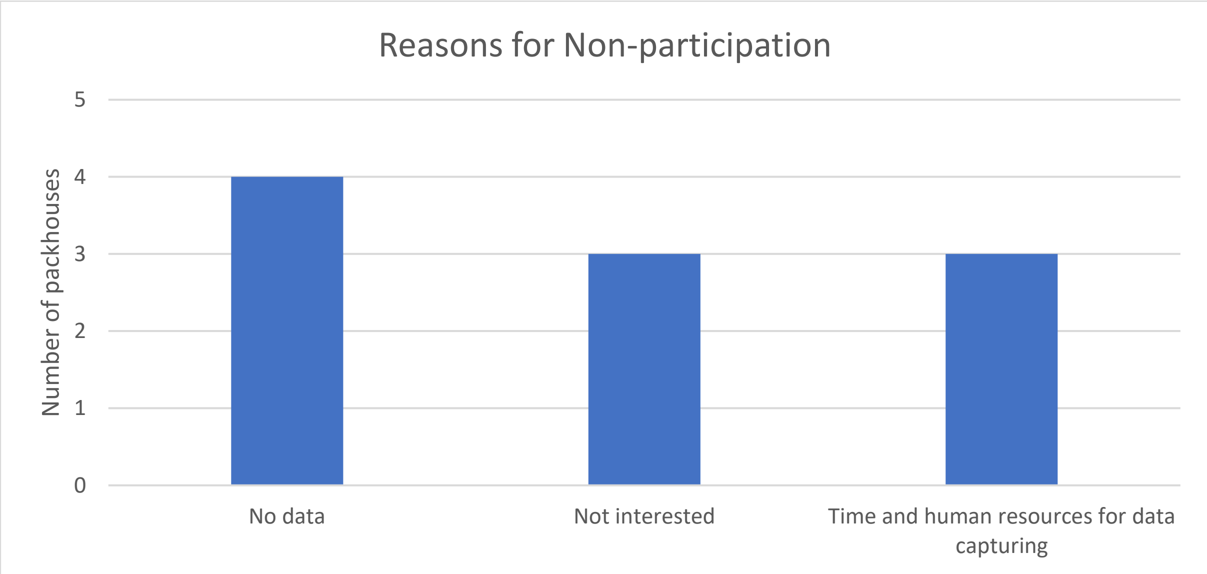

Figure 1: Reasons provided for non-participation by packhouses

No packhouses shared a water management SOP, as in most cases such documentation is not in place.

2.4 Data Quality and Notes

Table 1 summarises the quality of the data received from each of the participating packhouses, for each area of operation.

Table 1: Summary of packhouse data quality for the different areas/activities

Packhouse	Drenching	Dedicated Presort	Dedicated Packing line	Hybrid Line	Cold storage	Ablution canteen offices
A	Metered	Metered	Metered	Metered	Metered	Metered
B	Metered	N/A	Metered	N/A	Metered	Metered
C	N/A	N/A	Estimated	N/A	Estimated	Estimated
D	Did not participate in Phase 6					
E	Did not participate in Phase 6					
F	Did not participate in Phase 6					
G	No data	N/A	Metered	N/A	Metered	Estimated
H	Estimated	N/A	Estimated	N/A	Estimated	Estimated
I	No data	Estimated	Estimated	N/A	Estimated	Estimated
J	Did not participate in Phase 6					
K	No data	No data	No data	N/A	No data	No data
L	N/A	Estimated	Estimated	N/A	Estimated	Estimated
M	Metered	Estimated	Metered	Metered	Metered	Estimated
N	Did not participate in Phase 6					
O	No data	N/A	Estimated	No data	No data	No data
P	N/A	Estimated	Estimated	Estimated	Estimated	Estimated
Q	No data	N/A	No data	N/A	No data	No data

- All datasets for Phase 6 correspond to the 2022 calendar year (January to December).
- Packhouses are anonymised in the report (named A to Q).
- Most packhouses (Packhouses B, I, K, O, P, Q) cannot do allocation, as they do not have separate water meters to measure water consumption of the different facilities e.g., packing operations, cooling, and ablutions.
- Packhouses K, O, and Q do not have any water meters installed. Packhouses K and O provided estimates, while Packhouse Q could only report on their water management practices and water recycling technologies.

3 Water Use Intensity

3.1 Drenching

3.1.1 Calculation: Drenching per tonne (litres per tonne)

The drenching water use intensity, expressed in litres of water per tonne of pome fruit, is calculated as follows:

Drenching water consumption (m^3) x 1 000 / Tonnes of pome fruit drenched

3.1.2 Calculation: Drenching per bin (litres per bin)

The drenching water use intensity, expressed in litres of water per bin of pome fruit drenched, is calculated as follows:

Drenching water consumption (m^3) x 1 000 / Number of pome fruit bins drenched

3.1.3 Results

The drenching results include packhouses that provided drenching data. Some packhouses do not drench.

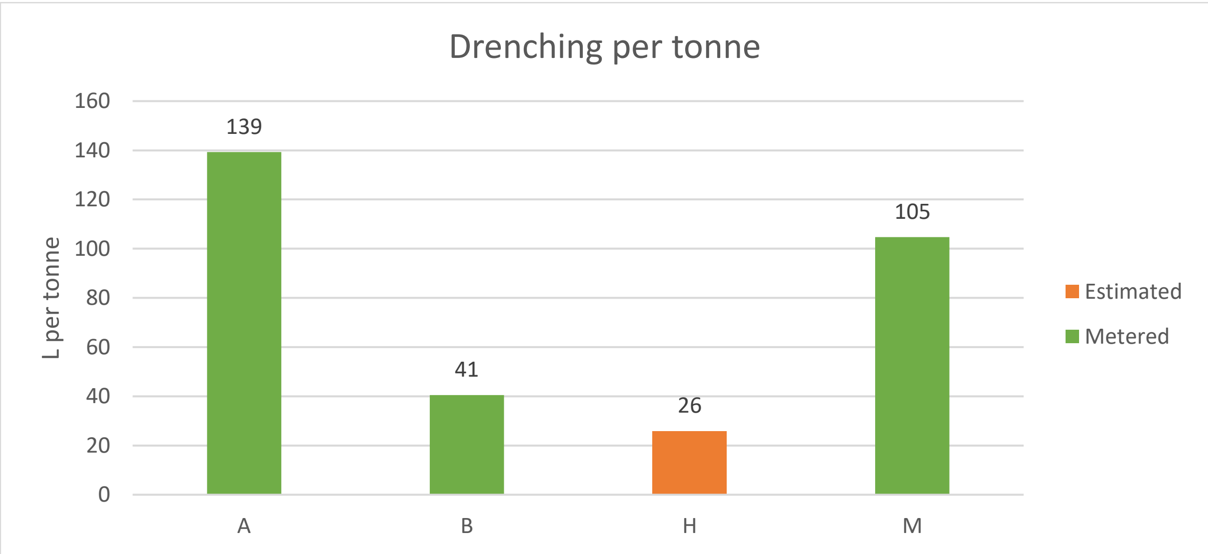

Figure 2: Drenching per tonne of fruit

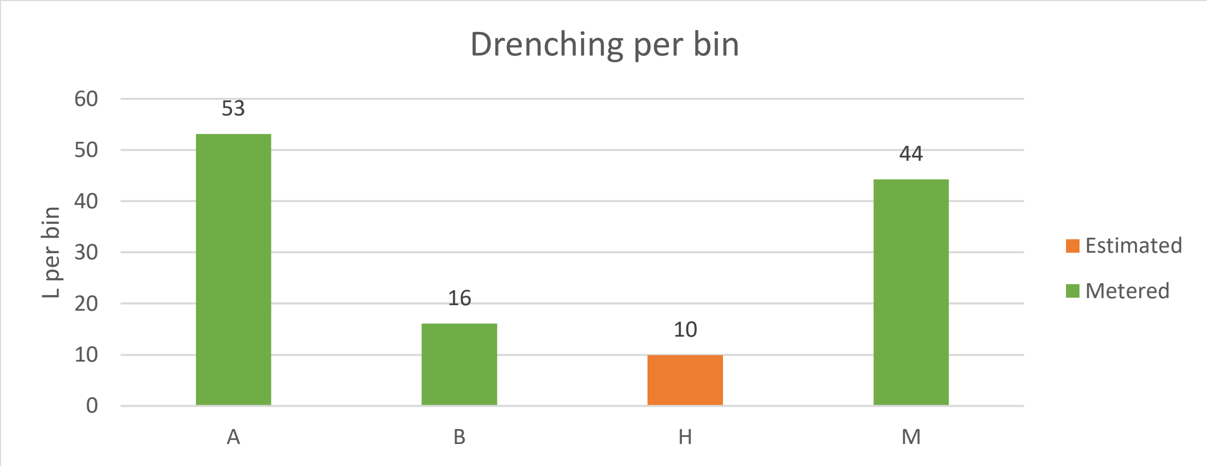

Figure 3: Drenching per bin

Water used in drenching by Packhouse H was estimated due to insufficient metering. This packhouse drenches only a small volume of fruit (51% of received tonnage) and does not have meters to measure drenching water separately.

Packhouse K & Q:	The two packhouses drench pome fruit, but the water used for drenching is not recorded and could not be estimated.
Packhouse I:	Drenching takes place at another facility that does not have water meters installed and could not provide estimated data.

The variation in the drenching intensities could be attributed not only to metering inaccuracy but also to different drenching protocols applied by the packhouses (e.g., tonnage drenched, number of times fruit gets drenched). The water recycling technologies and water management practices are explored in subsequent sections of this report.

3.2 Dedicated Presort Water Use Intensity

3.2.1 Calculation

The water use intensity for a dedicated presort line, expressed in litres of water per tonne of pome fruit, is calculated as follows:

Presort water consumption (m^3) x 1 000 / Tonnes of pome fruit for dedicated presort line

3.2.2 Results

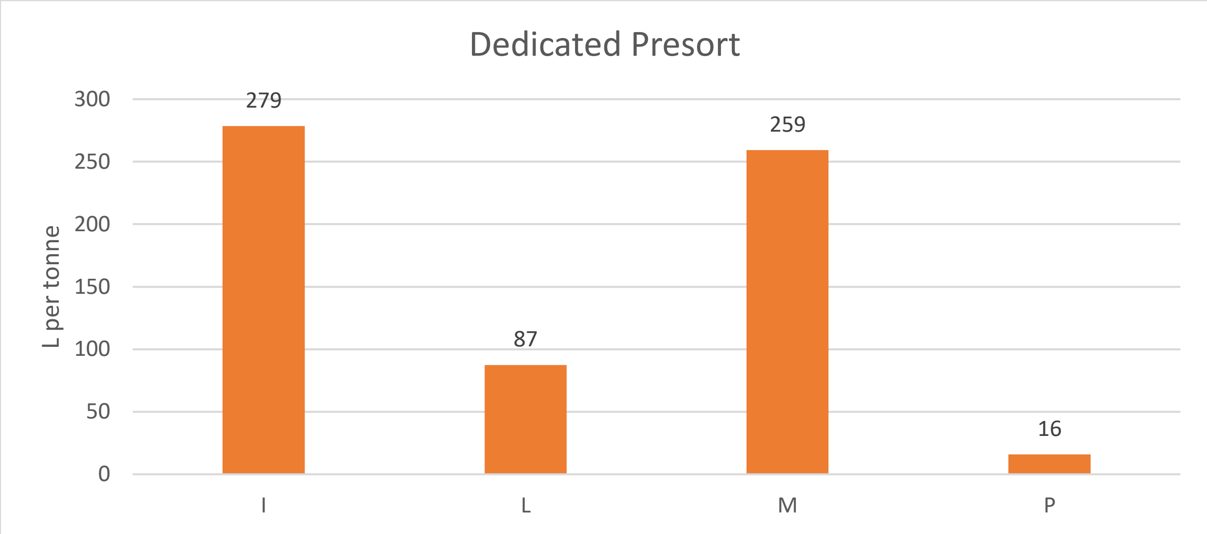

Figure 4: Dedicated presort line water use intensity

Only Packhouses I, K, M, L and P make use of a dedicated presort line. However, Packhouse K does not have water meters installed and could not provide estimated data.

All dedicated presort values are estimated. Packhouse M does have separate water meters installed at the presort line, but they were faulty during the 2022 data period.

Differences in intensities can be ascribed to different practices. For instance, at Packhouse L, presort flumes are filled only once per season if no breakages occur, while Packhouse M replaces the water in its presort plants every four weeks after filling them.

3.3 Dedicated Packing Line Water Use Intensity

3.3.1 Calculation

The water use intensity for a dedicated packing line, expressed in litres of water per tonne of pome fruit packed, is calculated as follows:

Dedicated packing line water consumption (m^3) x 1 000 / Tonnes of pome fruit packed

3.3.2 Results

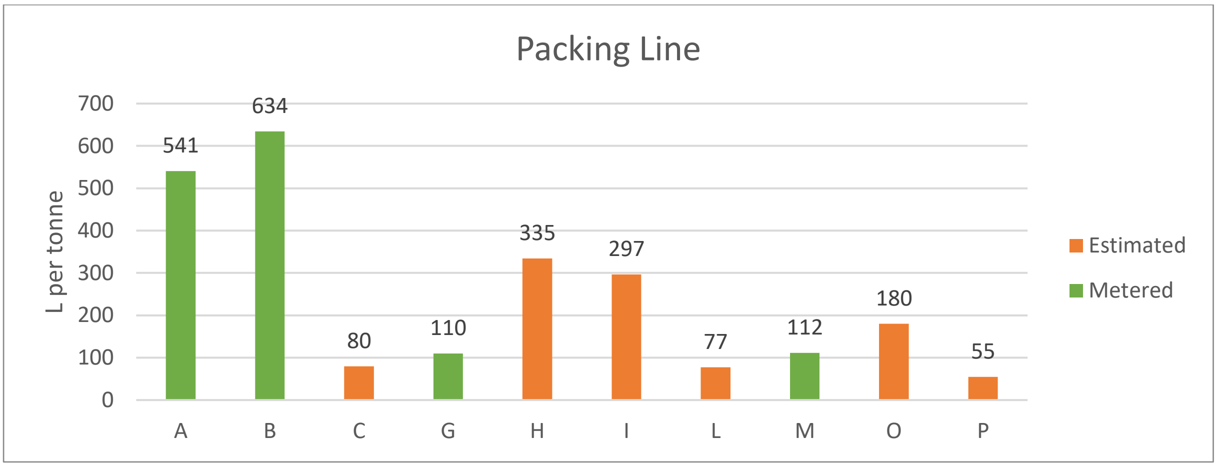

Figure 5: Packing line water use intensity

Water consumption of Packhouses C, H, I, L, O and P were estimated due to insufficient metering.

Packhouses A, C, H, O and Q have flume technologies older than 10 years, while the other packhouses have newer flume technology. Flume technology is also discussed in Section 7.1 in this report.

Packhouse B indicated that their data is metered, but this meter measures water from other areas as well, and thus the value may be overestimated.

The low values of Packhouses C, L and P could be due to a water allocation issue or inaccurate estimation.

Packhouse C also had very low comparative packing line usage in the previous phase. They also indicated that they drain their flumes once a week, while flumes were drained once every two weeks in the previous phase. The water consumption for each section of the packhouse was estimated (calculated, not metered). Therefore, the low value could be due to a water allocation issue.

Packhouse L also had a very low packing water use intensity in the previous phase. This packhouse's flume draining occurs two or three times a year. The total water consumption is metered, but water consumption for each area of activity is estimated (not metered).

The packing line is a major water consumer in the packhouses. The lack of packing line water metering should be addressed to improve data quality.

3.4 Hybrid Line Water Use Intensity

3.4.1 Calculation

The hybrid line refers to simultaneous presorting and packing. The water use intensity for a hybrid packing line, expressed in litres of water per tonne of pome fruit for hybrid packing line, is calculated as follows:

Hybrid packing line water consumption (m^3) x 1 000 / Tonnes of pome fruit packed

3.4.2 Results

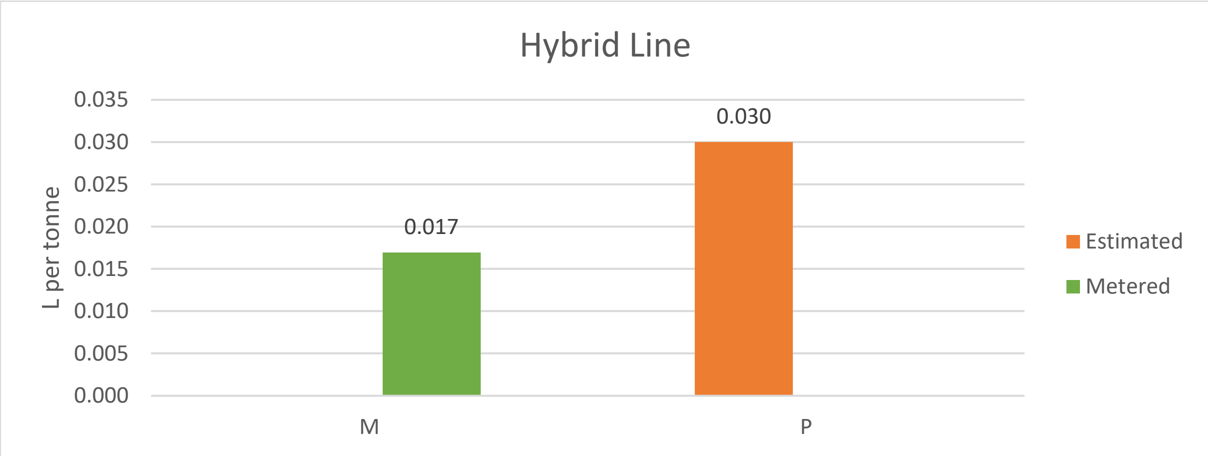

Figure 6: Hybrid Packing Water Use Intensity

The hybrid line water intensity of Packhouse P is based on an estimated water volume, and an estimated fruit tonnage (which is based on bin mass). The water volume may be an overestimate or the fruit mass an underestimate.

3.5 Cold Storage

3.5.1 Calculation

This metric includes all cold storage water consumption, of which cooling towers comprise the majority.

The water use intensity for cold storage, expressed in litres per tonne.day of fruit stored is calculated as follows:

Cold storage water consumption (m^3) x 1 000 / (CA & RA tonne.days)

The unit [tonne.days] is explained in more detail below.

The cold storage benchmark cannot only be based on the tonnes of fruit stored as cold storage because protocols vary widely from one operation to the next. Some packhouses store pome fruit for short periods (days or weeks), while other packhouses store fruit for longer periods (several months to almost a year). A tonne.day addresses this issue by representing the storage of one tonne of pome fruit for one day, for example, if:

- 200 tonnes are stored for 1 day = 200 tonne.days
- 200 tonnes are stored for 3 days = 600 tonne.days

3.5.2 Results

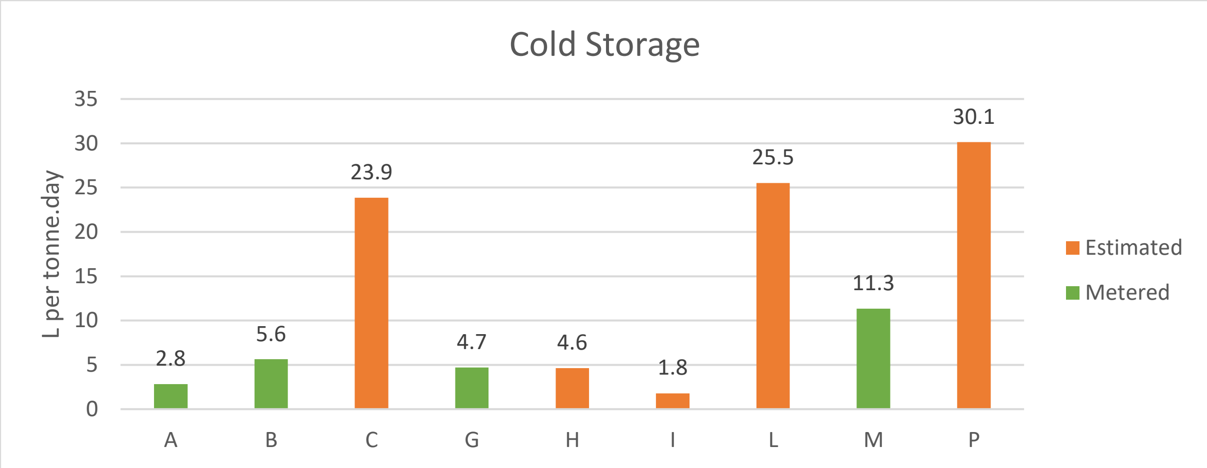

Figure 7: Cold storage water use intensity

Water consumption of Packhouses C, H, I, L and P was estimated due to insufficient metering.

Considering only packhouses with good quality data, Packhouse M used four times as much water for cold storage as Packhouse A. Packhouse A uses automated bleeding[1], which has a big impact on savings. Furthermore, Packhouse A makes use of harvested rainwater and defrost water to supply water for their refrigeration plant (condensers).

[1] Bleeding cooling tower blowdown water can be done by manually turning the valve, but an automatic system paired with a controller increases consistency. The amount of cycles of concentration water in the tower can go through varies, based on various factors e.g., the water hardness.

3.6 Ablutions, Canteens & Offices Water Use Intensity

3.6.1 Calculation

This metric includes the water consumption of ablutions, canteens & offices, and is measured in litres of water per person per day. It is calculated as:

Ablutions, canteens & offices water consumption (m^3) x 1 000 / (Staff man-days)

3.6.2 Results

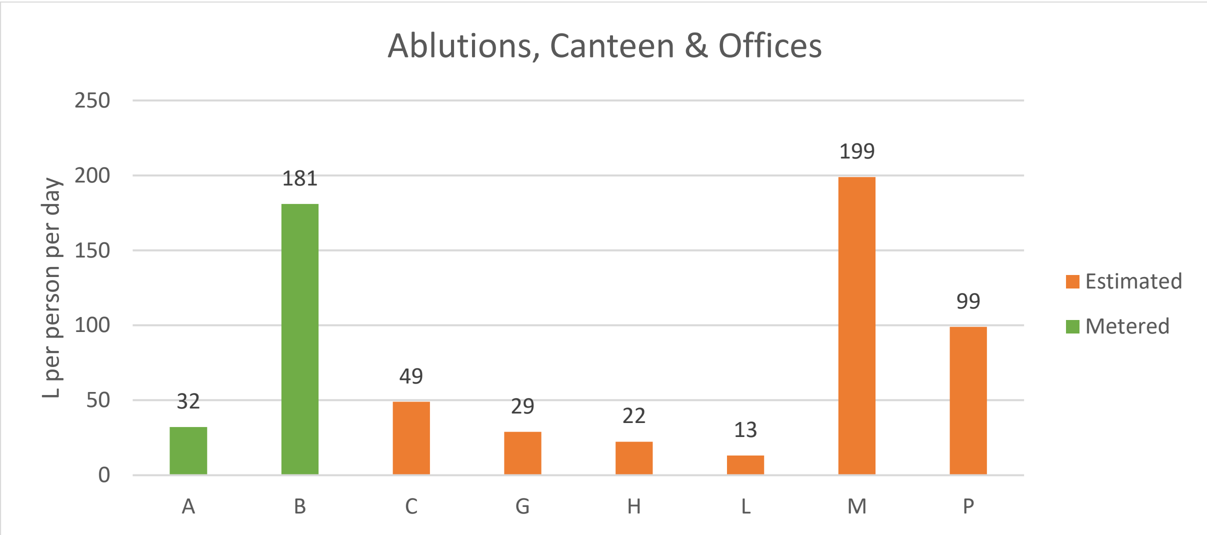

Figure 8: Ablutions, canteens & offices water use intensity

As seen in Figure 8, water used by staff is not typically measured separately.

Any value above 50 (the daily allowance during the "Day Zero" drought of 2017, which included showering) can be considered very high.

As noted in the previous phases, there is potential for improvement in this area of the packhouse facilities. Besides improved record-keeping, key solutions include raising awareness, offering training to staff, and implementing inexpensive recycling technology, especially for ablutions.

3.7 Overall Packhouse Water Use Intensity

The overall usage for each packhouse incorporates all sections of the packhouse, except for water consumption allocated as "other", for example, housing, gardening and other non-production uses. It is acknowledged that cold storage protocols, especially, vary from one operation to the next, thereby impacting overall water use results. The unit of measure for this metric is kilolitres (or cubic metres) of water per tonne of pome fruit packed. Overall Packhouse Water Use Intensity is particularly relevant to packhouses who have participated in the project for several years, and for which year-on-year trends (see Chapter 6) are presented in this report. Figure 9 displays the results per packhouse. The solid line represents the average of metered data which indicates that packhouses with metered data consumed just below 1.5 kL of water per tonne of fruit packed in 2022.

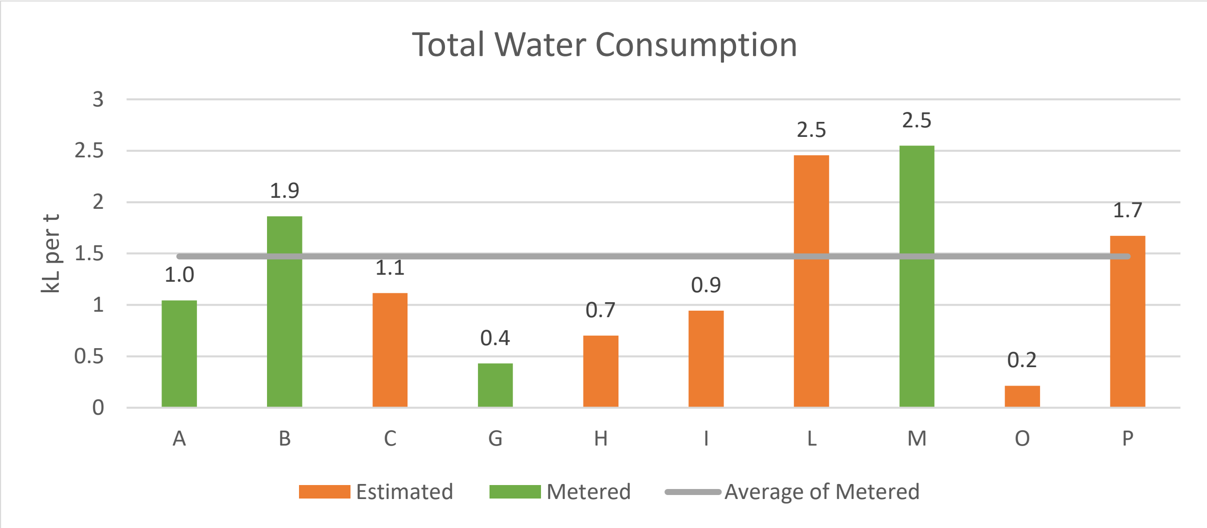

Figure 9: Overall pome fruit packhouse water use intensity

There is a large variation in the overall water use intensities, which can be ascribed to different water management practices applied at the packhouses (e.g., flume drainage cycles, flume technology age, cold storage protocols, cold storage duration, water recycling technology, etc.).

4 Water Usage Profiles

It is valuable to compare the water use profiles of different packhouses to identify which areas of the operations use the most water (hotspot areas).

4.1 Results

Figure 10 displays the percentage of water consumed by the different areas/activities in each participating packhouse and excludes water use allocated to "other". As seen in the figure, cold storage comprises a large portion of the water consumption. In all packhouses with cold storage water values, cold storage consumes more than half of the total water used. Packhouse A provided accurate data for all areas of operation and this profile can be used for comparison.

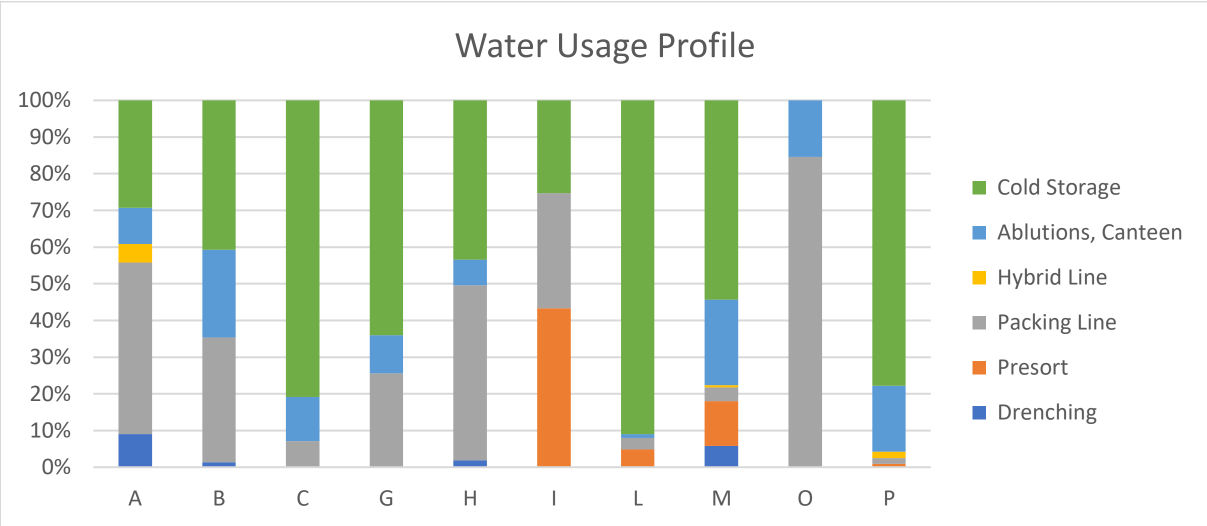

Figure 10: Water use profiles of the packhouses

There is a large variation in the water use profiles of participating packhouses. This could be attributed to:

- A lack of metering (thus estimations).
- Water allocation – i.e., where totals are metered, but individual areas of use are not.
- Lack of, or errors in, water consumption records.
- The use of different types of flume technology.
- The application of different water recycling technologies.

5 Water Sources

When investigating the water sources used by the participating packhouses, it is interesting to note that the largest volumes are obtained from dams and boreholes, with municipal water being the third largest source. Figure 11 displays total water volumes per source, while Figure 12 provides a breakdown per packhouse.

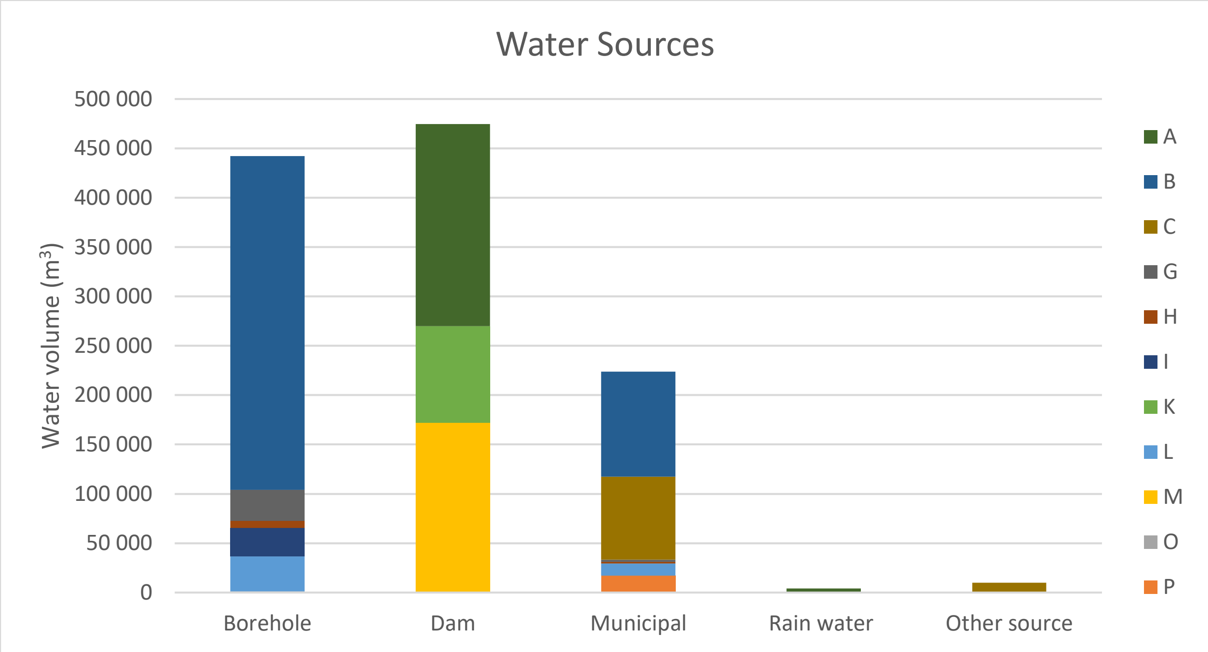

Figure 11: Water volumes obtained per source per packhouse

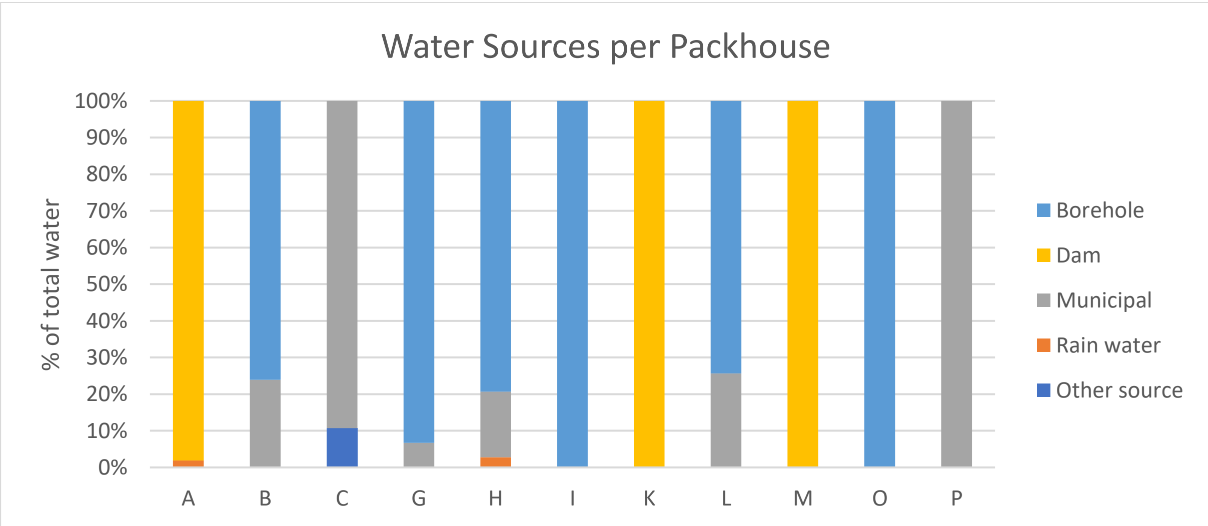

Figure 12: Water sources per packhouse

6 Year-on-Year Comparison of Water Use Intensities

To reduce water consumption, it is beneficial and necessary to consider year-on-year comparisons. This section presents a year-on-year water usage intensity comparison for Phases 1 (2017) to 6 (2022) of this project. For the visualisation of trends, only packhouses with more than two years of data were included. Outliers were also detected and removed.

For comparison purposes, Packhouse A's data was of good quality.

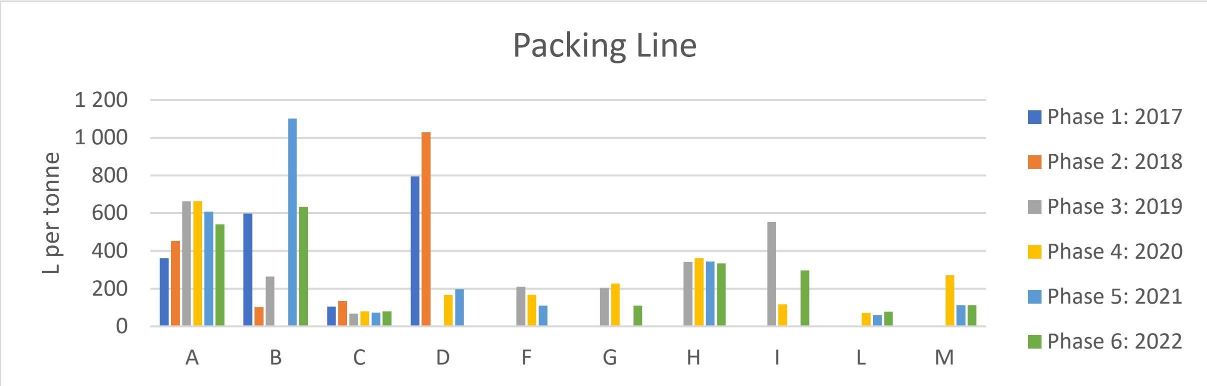

Figure 13: Year-on-year comparison of packing line intensities

Figure 13 presents a rather positive outlook, showing a downward or neutral trend in the packing line water intensities of most packhouses.

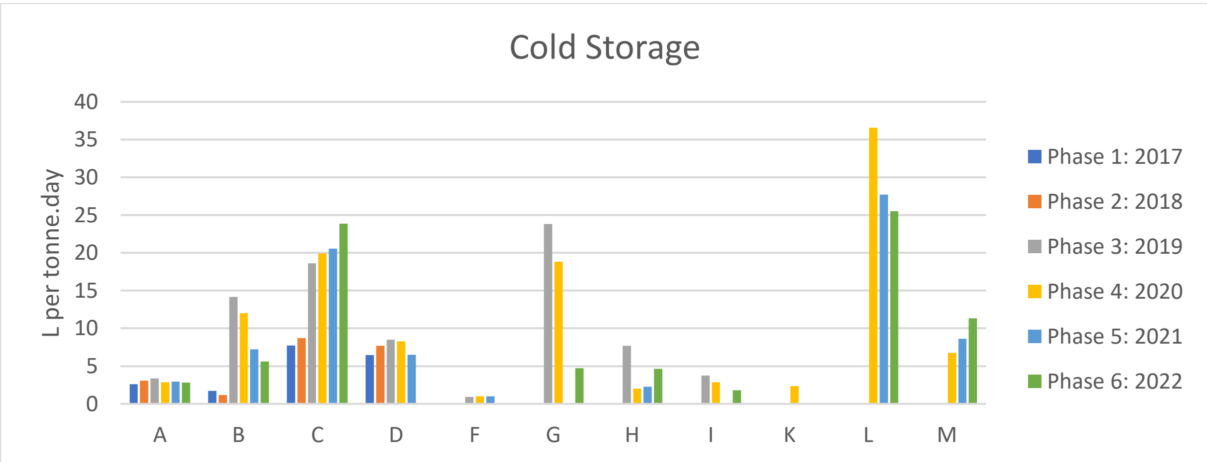

Figure 14: Year-on-year comparison of cold storage water use intensities

Cold storage water use increased at several packhouses, particularly at Packhouses C, H, and M. Credibility of these trends must be ensured by increased data quality.

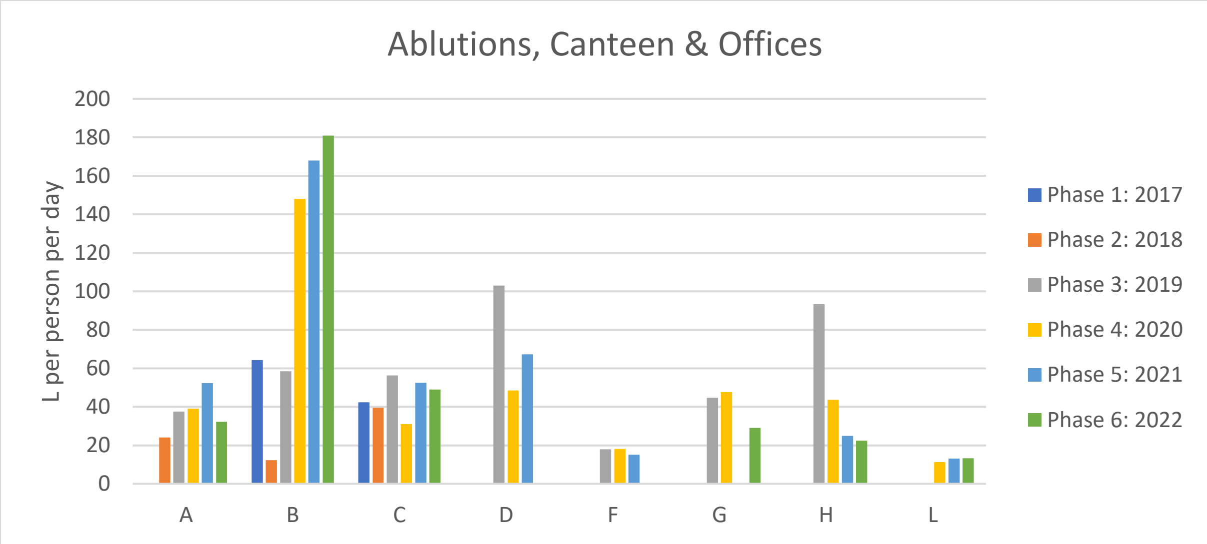

Figure 15: Year-on-year comparison of ablutions, canteen & offices water use intensities

It is positive to note that four of the packhouses (A, C, G and H) showed a downward trend for daily staff water use in 2022 in comparison to 2021. Packhouses B, L, and M saw a rise in water use for ablutions, canteens, and offices in 2022 compared to 2021.

Implementing water-saving measures, like installing low-flow faucets, dual flush cisterns, repairing leaks, and implementing awareness campaigns, in these areas is crucial to enhance water use efficiency.

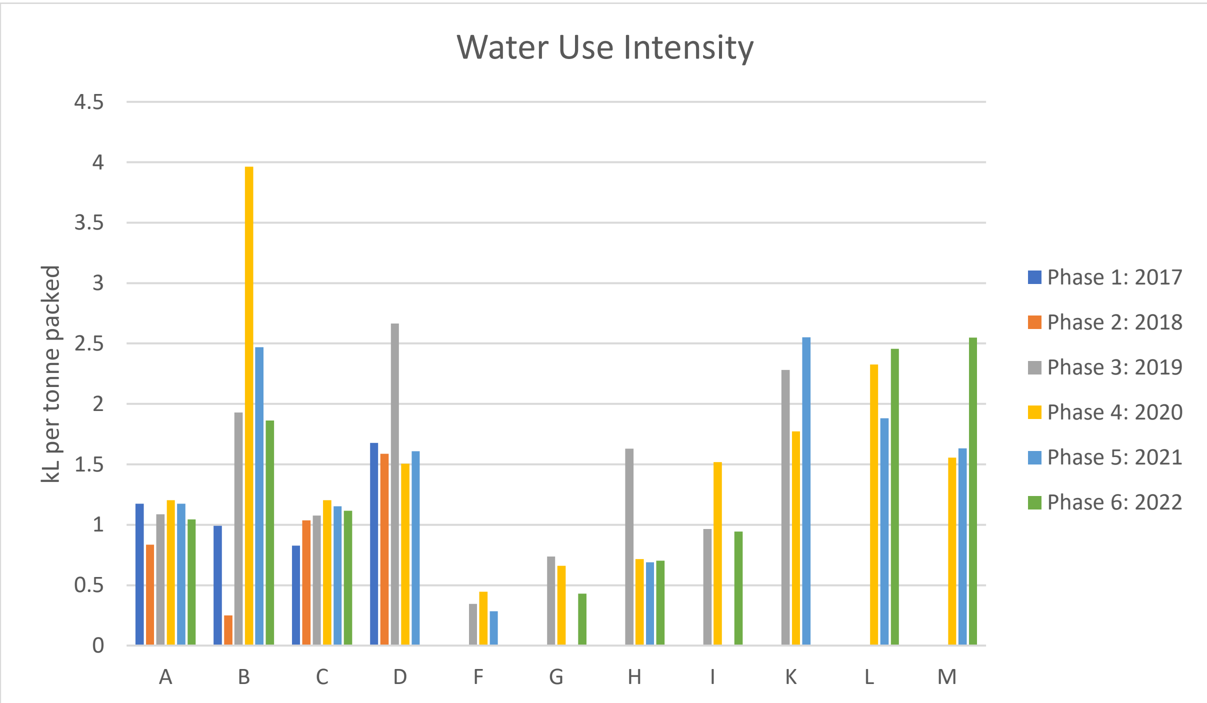

Figure 16: Year-on-year comparison of overall packhouse water use intensities

The overall water use intensity, measured in cubic meters per tonne of pome fruit packed, considers total water consumption excluding "other" water use. While seasoned participants show a positive downward trend, recent joiners require additional effort to achieve similar improvements. It is important to note that packhouses cannot be compared to one another, but trends can be explored per packhouse.

7 Water Management Practices

Participating packhouses indicated their water management practices via qualitative and quantitative data, using checkboxes and free text in the data collection tool. These questions aim to understand the management practices and water reuse technologies implemented throughout the packhouse. This section presents the summarised results.

7.1 Flume Technology Age

As in previous phases, the flume technology age remains almost evenly split between more than and less than ten years old (Figure 17). Note that this information was not available for all participants.

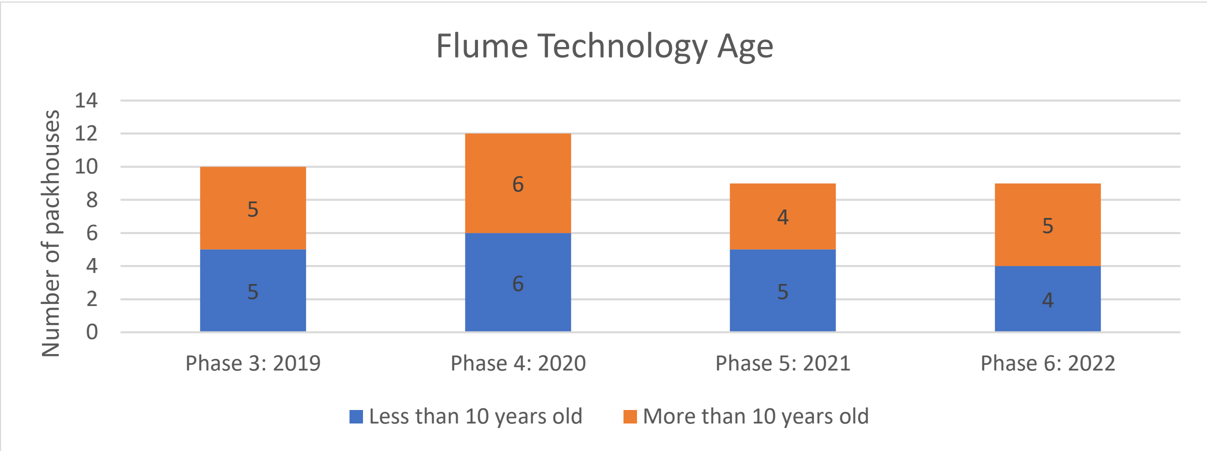

Figure 17: Flume technology age of the packhouses

7.2 Flume Water Management

In previous phases, participants were required to provide written descriptions of their flume water management practices. Using previous responses, these questions were simplified with check boxes and optional free text in this phase of the project.

7.2.1 Standard water management processes

7.2.1.1 pH management

pH is measured to determine the acidity or basicity of solutions.

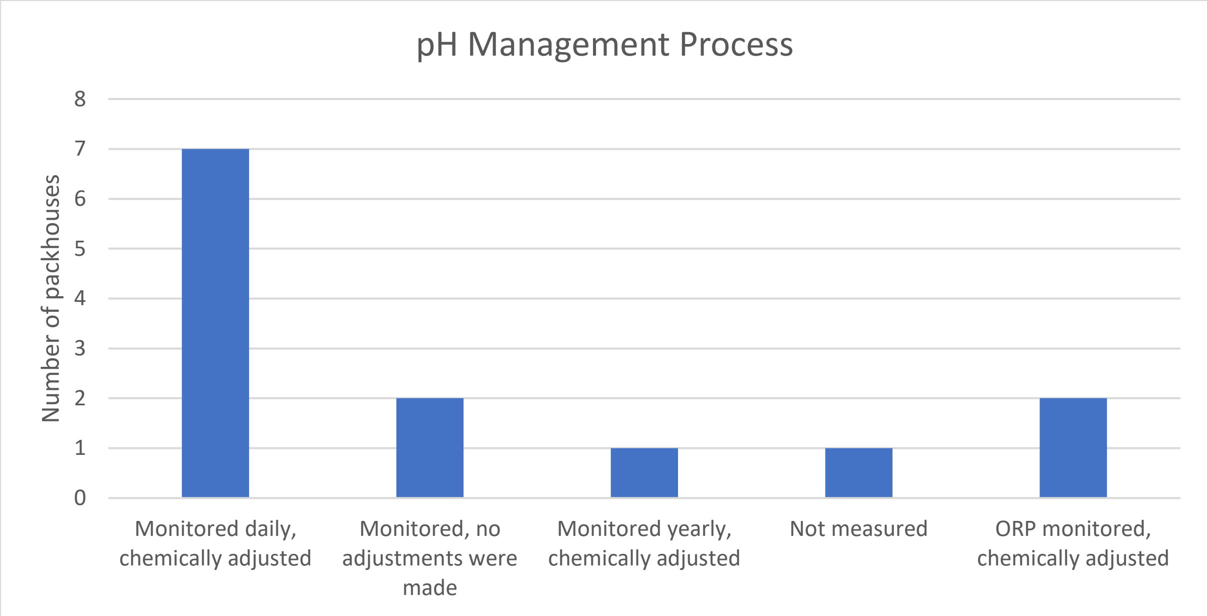

Figure 18: pH management processes of the packhouses

Seven of the 12 packhouses monitor their flume water pH levels at regular intervals throughout the day, while Packhouses L and P manage their oxidation-reduction potential (ORP) levels. Packhouse Q does not measure pH levels (Figure 18).

7.2.1.2 Chlorine management

Chlorine compounds are often used in flume water as a disinfectant to kill bacteria. The management of chlorine levels is vital for fruit quality and food safety.

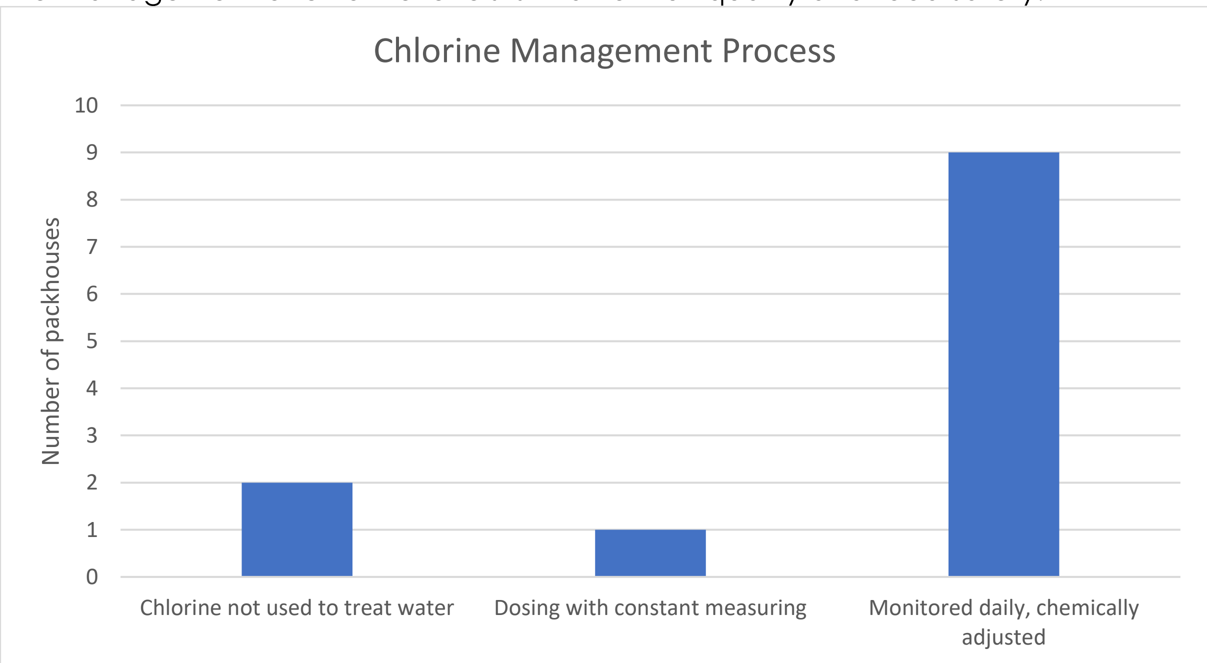

Figure 19: Chlorine management processes of the packhouses

Figure 19 shows how chlorine is managed by the packhouses. Packhouses L and O indicated that chlorine is not used in water treatment.

Acceptable chlorine levels were not reported in this phase because the data from previous phases indicated a very wide range – from 1-3 ppm for a packhouse's presort flumes, to 75 ppm for a pear packing line.

7.2.2 Flume water drainage cycle

Significant water savings can be achieved by minimising flume drainage and refill frequency. Implementing efficient presorting and optimised flume systems can further enhance water conservation in this area.

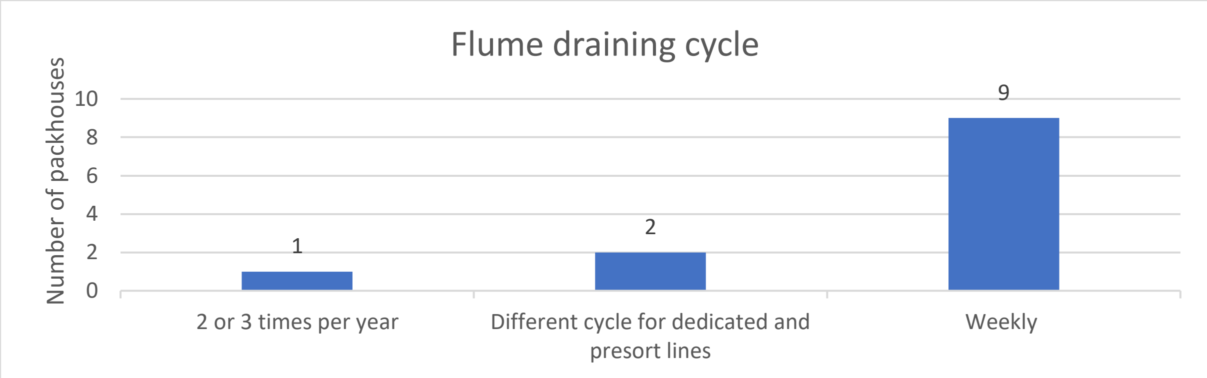

Figure 20: Flume draining cycle of the packhouses

Nine of the 12 packhouses drain 100% of their flume water once a week.

Packhouse L drains its flumes only two or three times per year, otherwise, the flumes are just topped up.

Packhouse K drains its flume water weekly, while in the previous phase, it only replaced its flume water on an indication of raised pathogen levels. Unfortunately, this packhouse could not provide quantitative data to investigate the impact of this protocol. Packhouse I and M have different cycles for the different lines. Packhouse M drains its packing line flumes twice a week, its pear packing line flumes weekly and its presort plant flumes every month.

7.3 Water Saving and Water Treatment Methods

Fruit packing operations present numerous opportunities for both water conservation and reuse. This section provides a summary of specific water conservation and treatment methods employed by the participating packhouses in different areas of their operations. The purpose of this section, apart from showcasing successful implementations, is to identify potential areas for further collaboration and knowledge sharing.

By highlighting best practices, this report aims to encourage packhouses to adopt sustainable water management strategies, contributing to a more responsible and environmentally conscious industry.

7.3.1 Flume water

The chart in Figure 21 answers the question, *What happens to flume water once drained, e.g. is it recycled?*

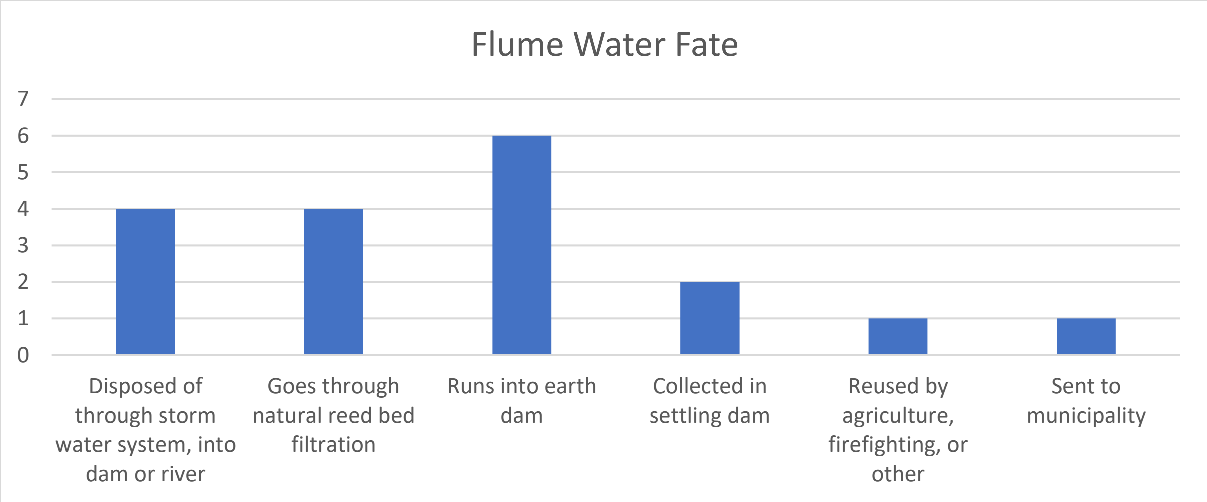

Figure 21: Destinations of drained flume water

Most packhouses let the flume water run into an earth dam. Only Packhouse M reuses the water for irrigation, firefighting or other uses.

7.3.2 Rainwater

Capturing and utilising rainwater for non-potable uses can significantly reduce reliance on finite freshwater sources. This strategy offers environmental and some economic benefits. Figure 22 shows how harvested rainwater is used by the packhouses.

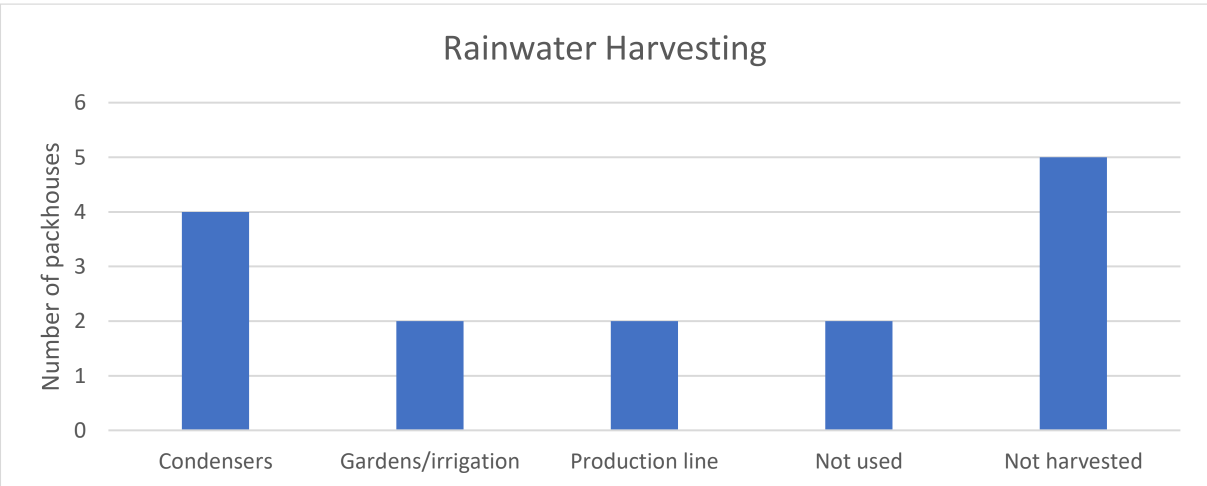

Figure 22: Use of harvested rainwater at packhouses

Only five out of the twelve packhouses do not harvest the rainwater. In the previous phase, only three out of the nine packhouses harvested rainwater. There is, however, still room for improvement, as seven of the twelve do not use rainwater.

7.3.3 Drenching

Four packhouses use recycling technologies in their drenching process (Figure 23).

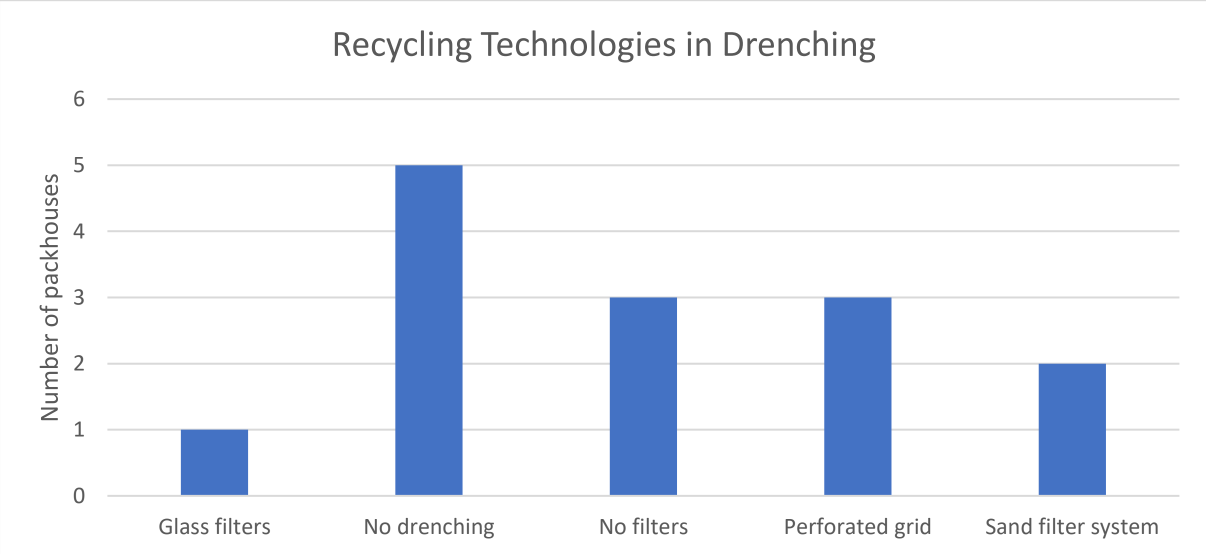

Figure 23: Recycling technologies used in the drenching process

Three packhouses use a perforated grid in the drenching line to separate particles, consisting of leaves and other matter, from the water flow. This increases the chlorine's active duration. Two packhouses have a sand filter system.

7.3.4 Presort/packing line

Nine packhouses make use of recycling technologies in their presort line and/or packing line (Figure 24).

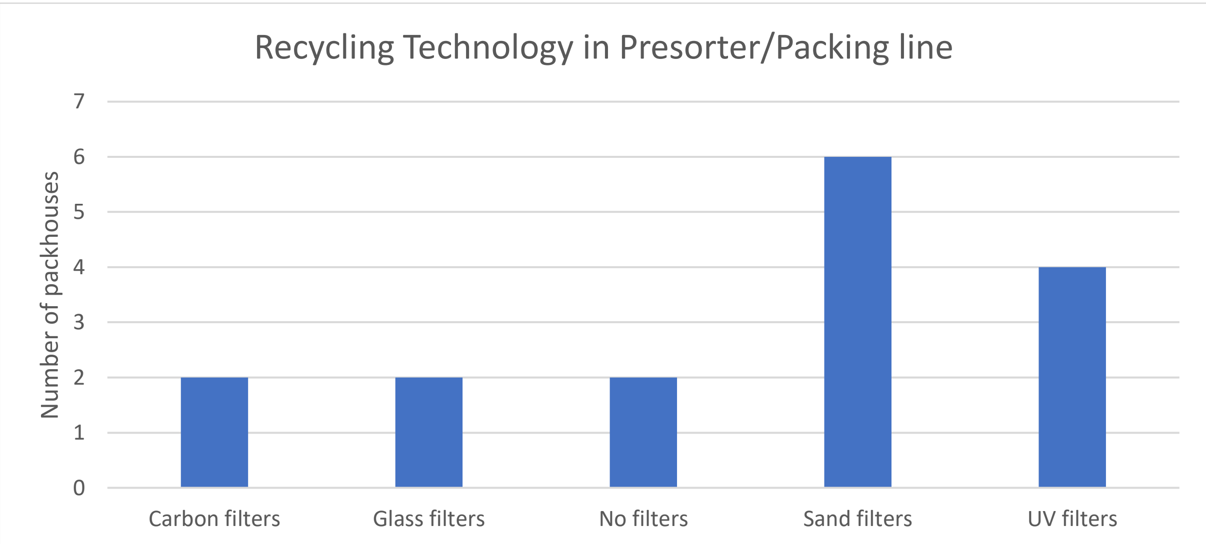

Figure 24: Recycling technologies used in the presort line and packing line of packhouses

Only Packhouses A, B, and Q did not indicate that filters are used in the packing line. The most popular technologies are sand filters and UV treatment.

7.3.5 Cold storage

Packhouses A, M and O make use of recycling technologies in their cold storage.

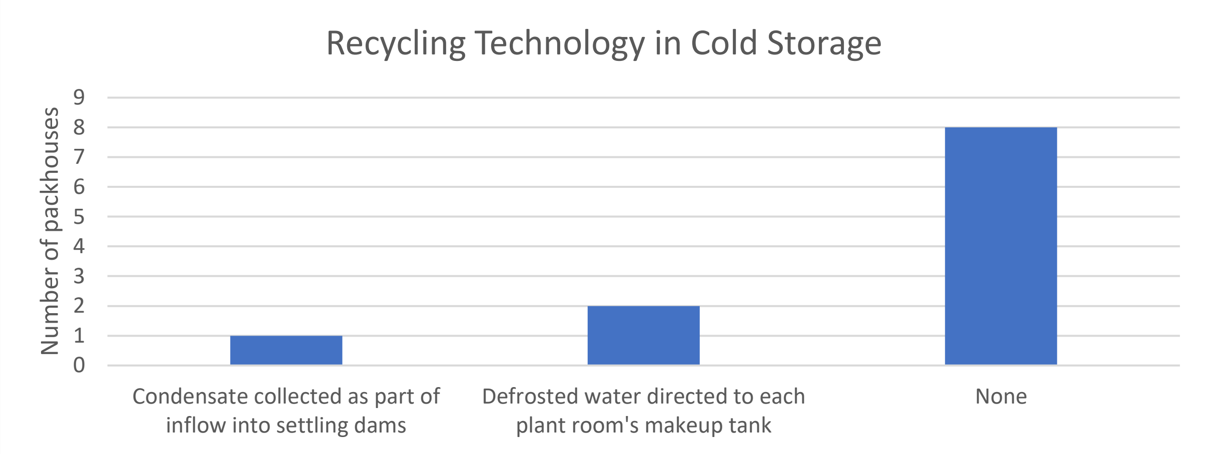

Figure 25: Recycling technologies used in the cold storage of packhouses

7.3.6 Ablution, canteen and offices

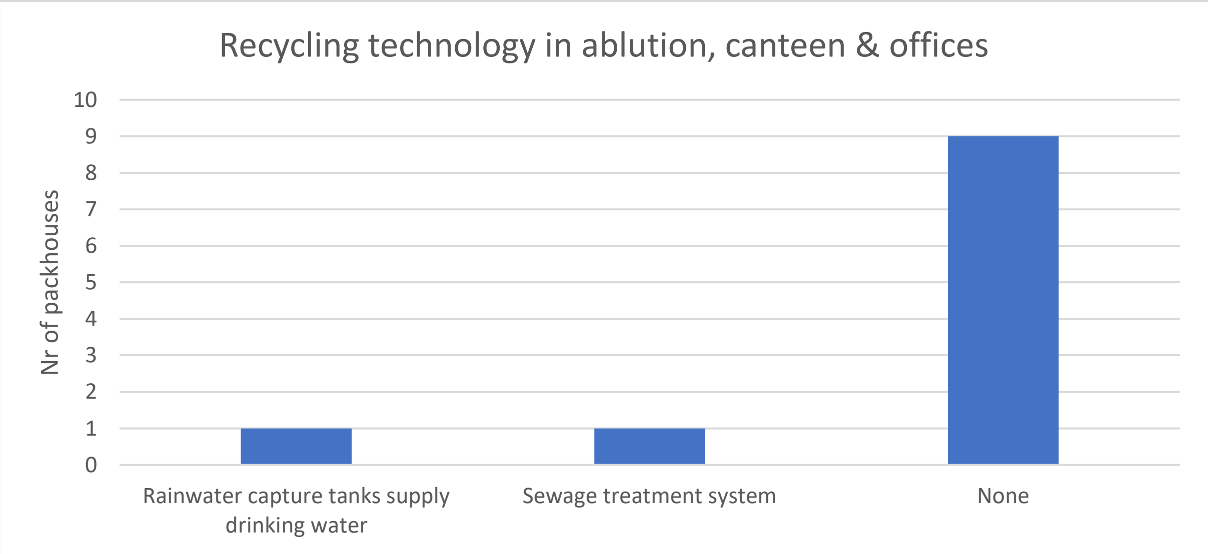

Figure 26: Recycling technologies used in the ablutions, canteens and offices of packhouses

Recycling of water used in the ablution, canteen and offices is not as common. One packhouse has a sewage treatment system, while another utilises rainwater capture tanks exclusively to supply drinking water for staff due to occasional issues with the municipal water's drinkability (Figure 26).

7.3.7 Wastewater treatment method

Wastewater holds potential for reuse, and its environmental impact can be greatly reduced when properly treated to remove contaminants. To prevent environmental contamination, packhouses must treat their wastewater using appropriate filtration or treatment methods before discharge. Figure 27 shows the different treatment methods used by the packhouses.

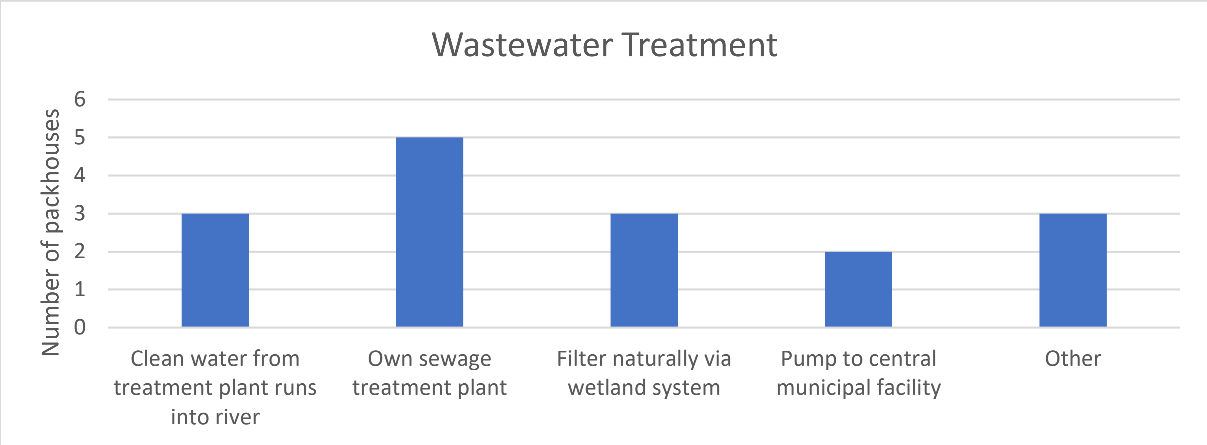

Figure 27: Wastewater treatment methods used by the packhouses

Two packhouses did not indicate their wastewater treatment methods. One packhouse uses a silver bromide solution during the production process.

8 Conclusion

Phase 6 of the water benchmarking project showed encouraging signs of packhouse engagement and promising trends in water use efficiency. While the continued participation of several packhouses emphasises the project's value, increasing participation is crucial to the analysis of trends and the impacts of practices.

Efforts to raise awareness during Phase 5 yielded positive results with three new participants joining the project for the first time. Addressing the key barriers to participation, such as lack of metering infrastructure and data collection capacity, remains critical. Encouraging even those without established systems to join the project provides valuable learning opportunities and supports their journey towards efficient water use.

The year-on-year data comparisons are of even more value as the database grows, and observed reductions in water consumption, particularly at the packing line, are promising.

The project has highlighted opportunities for, and implementation of, water reuse, alternative water sources, and waste reduction, demonstrated by packhouses implementing rainwater harvesting and wastewater treatment. Fostering knowledge exchange through the sharing of water recycling technologies among participants encourages wider adoption of these practices. While variations in water management and recycling technologies contribute to benchmark variances, more accurate data is essential to quantify their impact definitively. Packhouses were also asked to share their SOPs, but none was received. The use and sharing of SOPs, or water efficiency plans, could be encouraged in the future.

Key concerns remain:

- Incomplete metering: Not all packhouses meter specific areas, hindering a comprehensive understanding of water use patterns.
- Data collection capacity: Attracting new participants is hampered by limited data collection capacity within some packhouses.
- Limited use of renewable water sources. For example, rainwater harvesting remains underutilised.

It is encouraging to see growing interest in meter installation for future phases, which will significantly enhance the report's value.

9 Recommendations

This section highlights recommendations for implementation at the packhouses, and also for future phases of this project.

The following are recommended for the project's subsequent phases.

Understanding Metering and Data Challenges:

- Conduct an in-depth analysis of packhouse challenges regarding metering and data recording. This will inform targeted support and improve future data reliability.

Sharing Future Water Efficiency Plans:

- Integrate a section for packhouses to share their ongoing and planned water-saving initiatives (e.g., rainwater tank installations, and planned meter upgrades), to encourage knowledge exchange and collaborative learning.

Continuous Improvement:

- **Data Collection Tool Feedback:** Solicit feedback from participating packhouses to continually refine the data collection tool and processes for further user-friendliness and efficiency.

Industry-Wide Action:

- **Metering Campaign:** Launch an industry-wide campaign or standard to promote consistent metering, recording, and data integrity across packhouses.
- **"Water Heroes" Initiative:** Implement a recognition program (e.g., "Water Heroes") to celebrate and incentivise packhouses demonstrating water use excellence, encouraging wider participation. Year-on-year reductions in water consumption can be recognised through a designated award system.

The following recommendations on water management practices apply to the packhouses:

- **Metering and Data Recording:** Implement consistent monthly/annual water consumption record-keeping using accurate meters. Focus on the allocation of water use per activity or area of operation, which will enable increased accuracy of water use intensities and usage profiles in the project.
- **Formalised Strategy and Plan:** Establish a water policy and a detailed water management plan to guide water-saving decisions.
- **Water Reduction Targets:** Set ambitious yet achievable water reduction targets to drive ongoing improvement.
- **Staff Training and Water-Wise Behaviour:** Educate staff on water conservation and promote water-conscious practices within the packhouse.
- **Alternative Water Sources:** Explore and utilise alternative water sources like rainwater and treated wastewater where feasible.

- **Water Reuse:** Implement water reuse wherever possible, such as for floor cleaning, ablutions, or cooling tower make-up.
- **Wastewater Treatment and Reuse:** Treat and reuse wastewater appropriately to minimise freshwater consumption.
- **Cooling Tower Optimisation:** Implement automated bleeding systems for cooling towers.
- **Drenching and Flume Water Management:** Extend retention times for drenching and flume water to minimise waste of water.
- **Leak Detection and Repair:** Conduct regular inspections and repairs to address leaks and faulty equipment promptly.
- **Water-Efficient Technologies:** Install and utilise water-saving technologies like flow restrictors, tap aerators, and automatic shut-off valves.

Following these recommendations, packhouses can significantly improve their water use efficiency, contributing to a more sustainable and environmentally responsible fruit industry.