


Handling and storage of fresh sweetpotato roots

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Presented at the 9th Annual SPHI meeting – Nairobi, Kenya, 24 & 26 September 2018

Background

- Supermarket using OFSP puree to produce vitamin A rich bread
- **Puree processor needs year-round supply of high quality OFSP roots**
- But sweetpotato production is rain-fed, with gluts, shortages and price fluctuations during the year
- Could storage of fresh roots help overcome this challenge?

Objective

Commercial-scale solar-powered storage of fresh orange-fleshed sweetpotato roots for processing into puree,
in a tropical area of Sub-Saharan Africa

Sweetpotato stores

- Commercial-scale storage of sweetpotato roots for ≤12 months, in US and South Africa in sophisticated purpose-built stores
- In Sub-Saharan Africa, sweetpotato storage work has focused on small household-level pit stores, or traders keeping roots in piles

- A series of trials were run from 2015, assessing root quality after different storage durations and with different treatments
- Initially, two evaporatively-cooled stores were created at Organi Ltd. – one powered by mains electricity the other by solar power
- Results of main trial (LTS4) in the store rooms - shared at SPHI 2017

- We then wanted to achieve cooler storage temperatures, to reduce or delay root rotting and sprouting, prevent weevils developing within roots and retain β-carotene content
- The NRI postharvest engineer converted a shipping container into an insulated solar-powered controlled temperature and relative humidity storage chamber

Storage trial 6

STORAGE

Solar-powered insulated container store at Organi

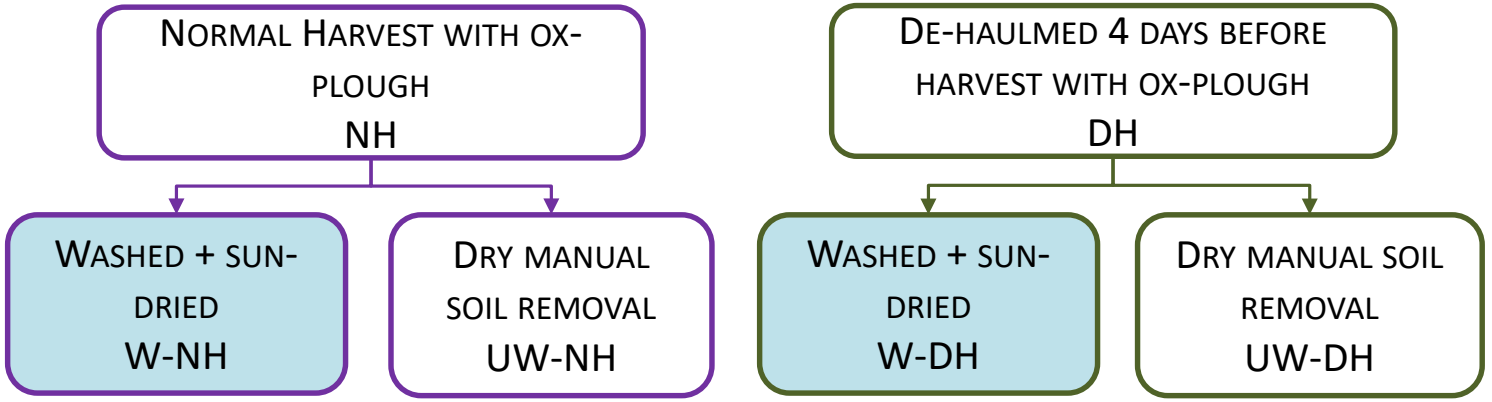
Curing at: 28°C (82.4°F) and 95% rh for 4 days

Storage at: **15°C** (59°F) and ~90% rh for 4 months

TREATMENTS

Harvesting: NH or DH

Soil removal: W or UW



De-haulming *Harvesting* *2nd sorting* *Washing* *Sun-drying* *Mixing, loading, weighing* *Store loading*

Natural Resources Institute

LTS6: CP11 data logger temperature and relative humidity readings (20 Feb - 6 Jun 2018)

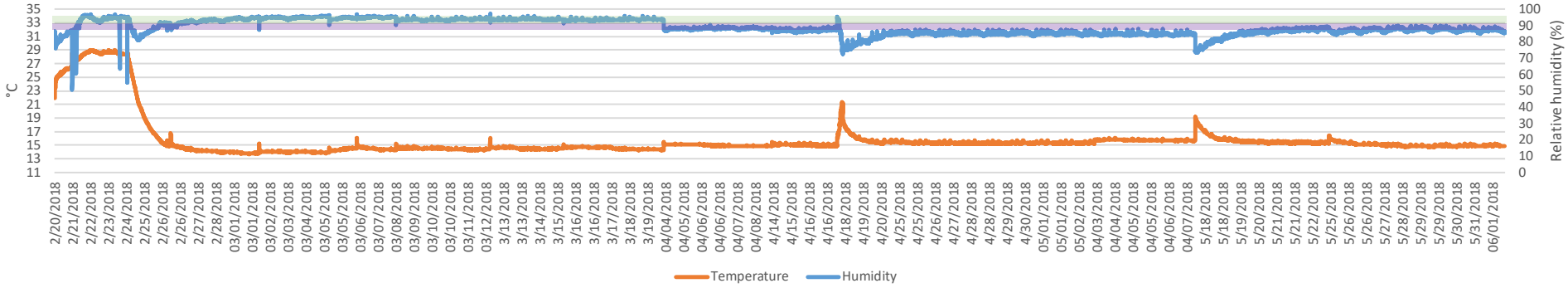
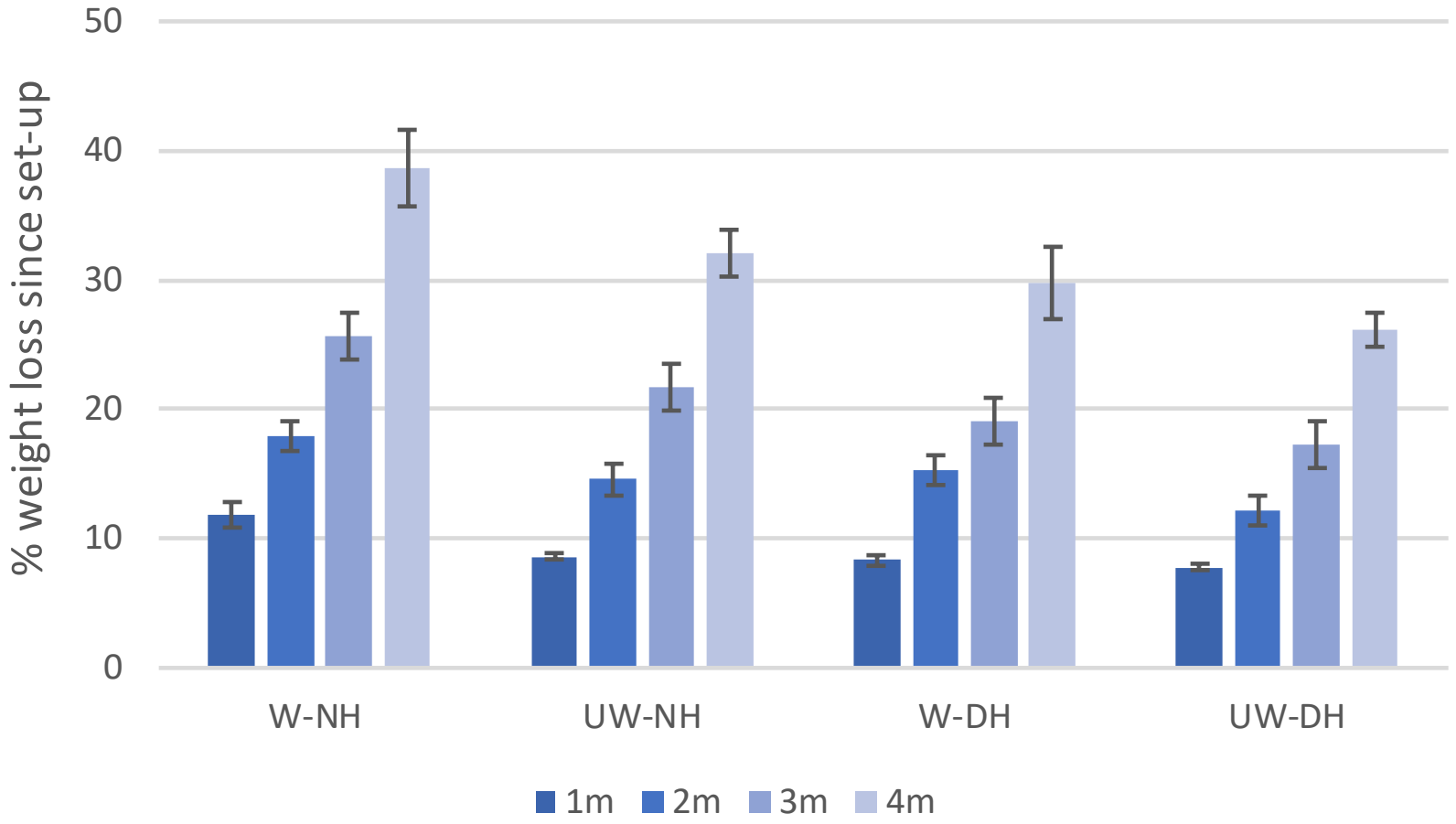
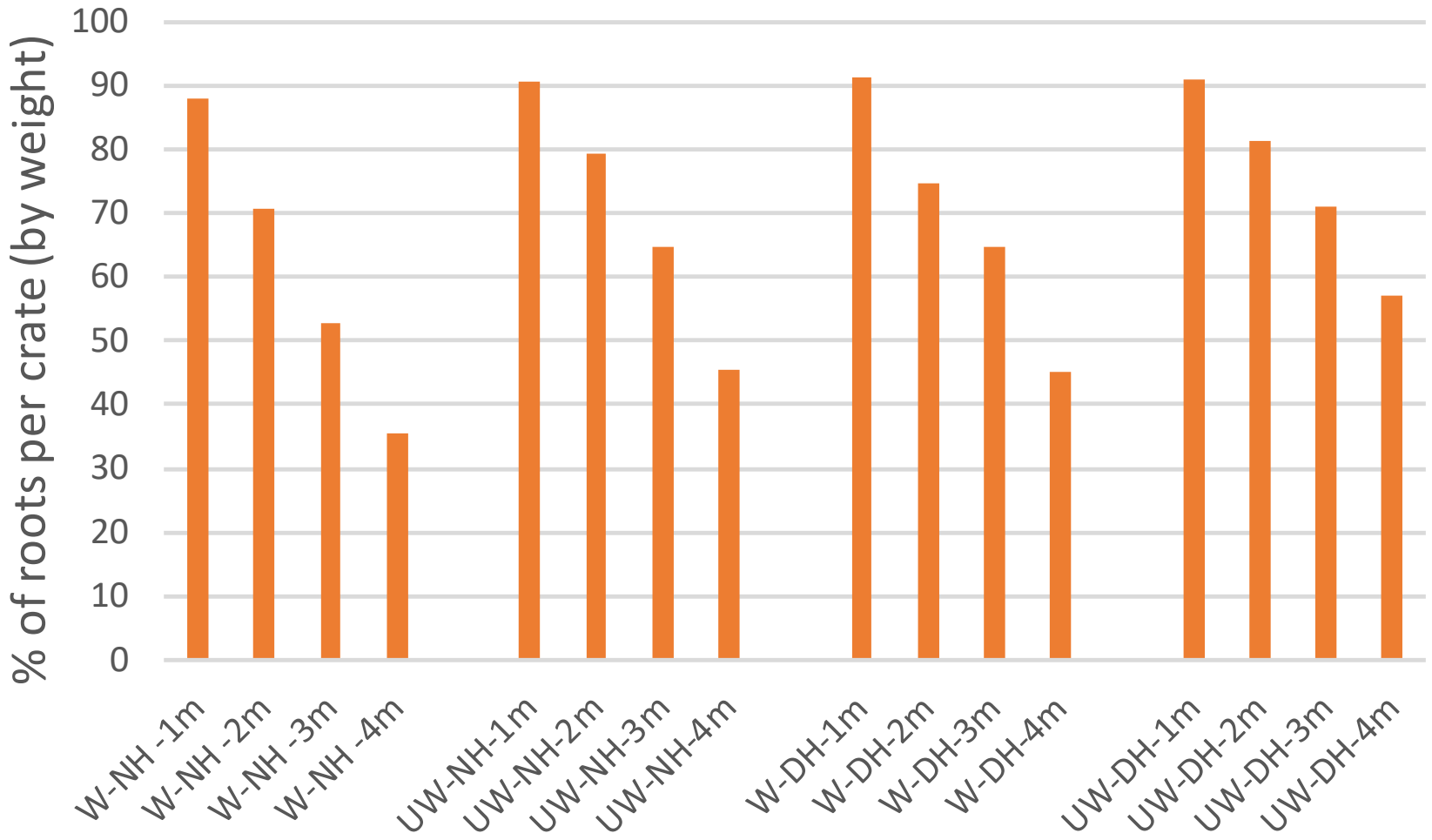


Figure 1. Weight loss of roots during storage



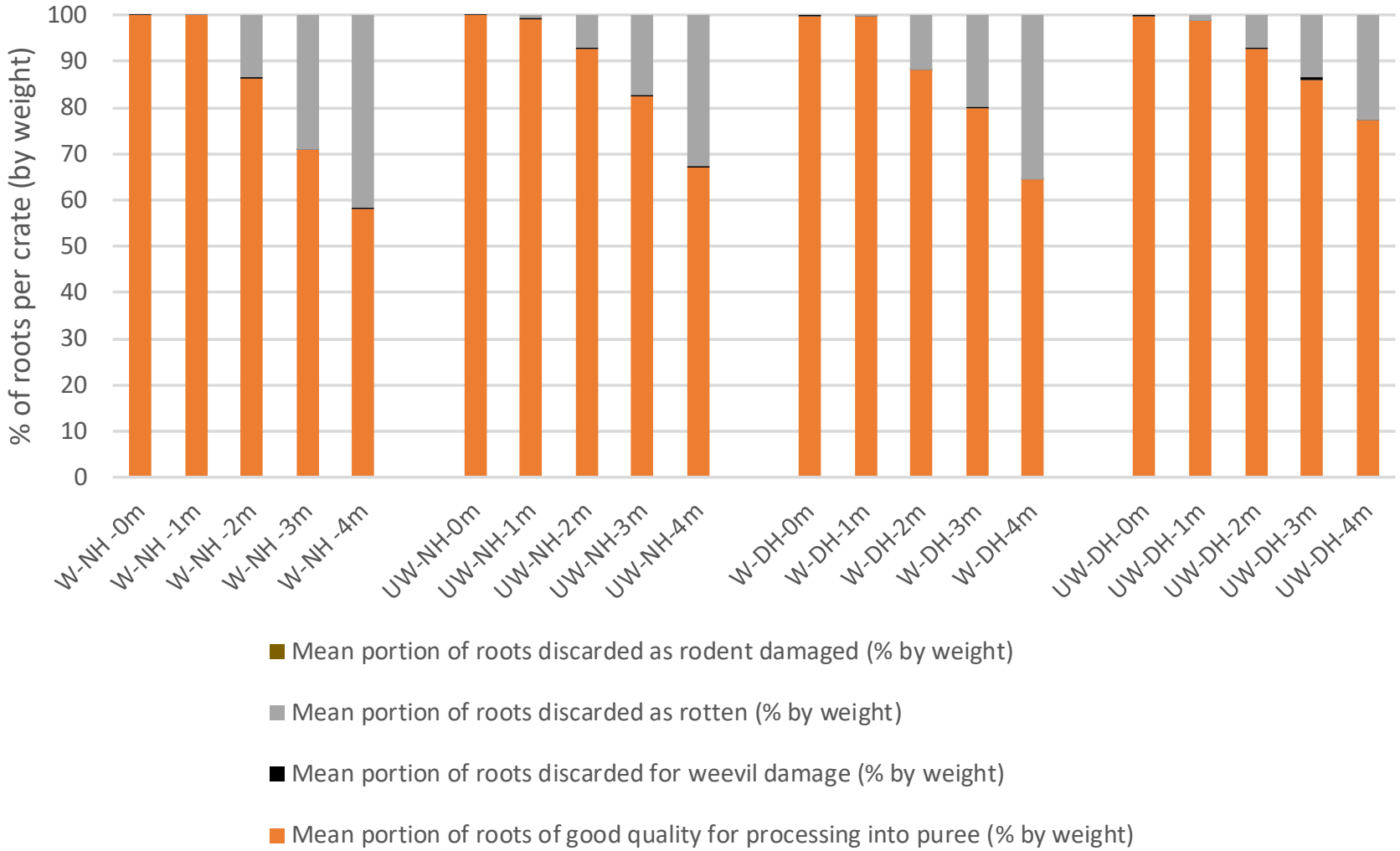
W-NH = Normal Harvest then Washed, UW-NH = Normal Harvest UnWashed, W-DH = De-Haulmed then Washed, UW-DH = DeHaulmed UnWashed

Figure 2. Percentage root weight suitable for processing into puree relative to initial weight



W-NH = Normal Harvest then Washed, UW-NH = Normal Harvest UnWashed, W-DH = De-Haulmed then Washed, UW-DH = DeHaulmed UnWashed

Figure 3. Usable and unusable portion of stored roots per crate



W-NH = Normal Harvest then Washed, UW-NH = Normal Harvest UnWashed,
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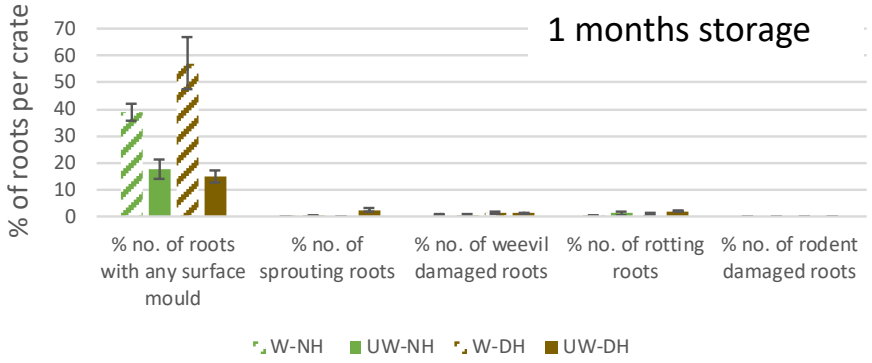
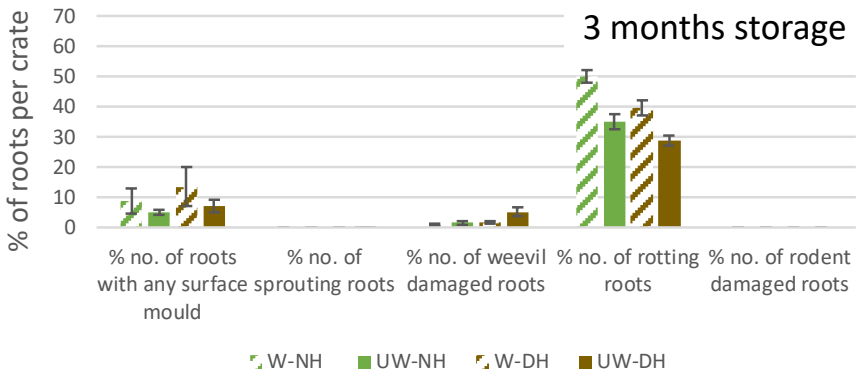
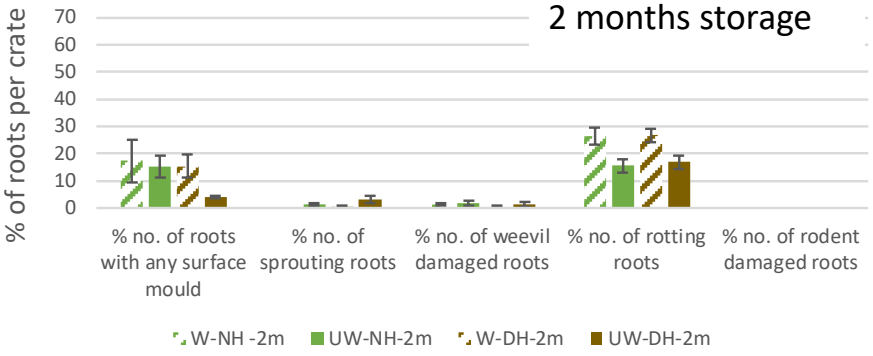
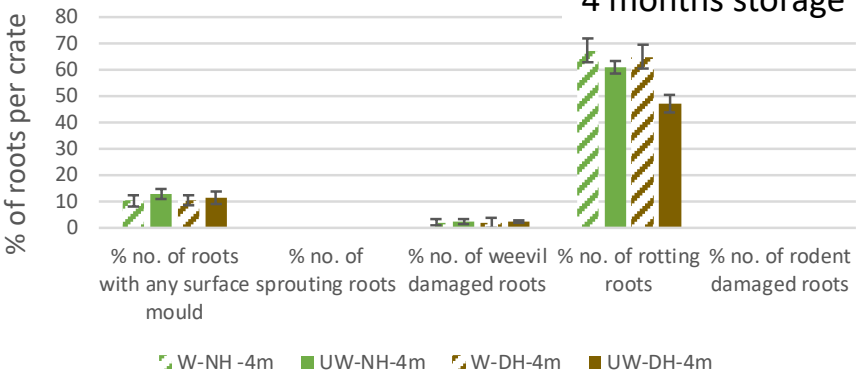
Figures 4a-d. Percentage of roots with surface mould, sprouting, weevil damage or rots by storage duration









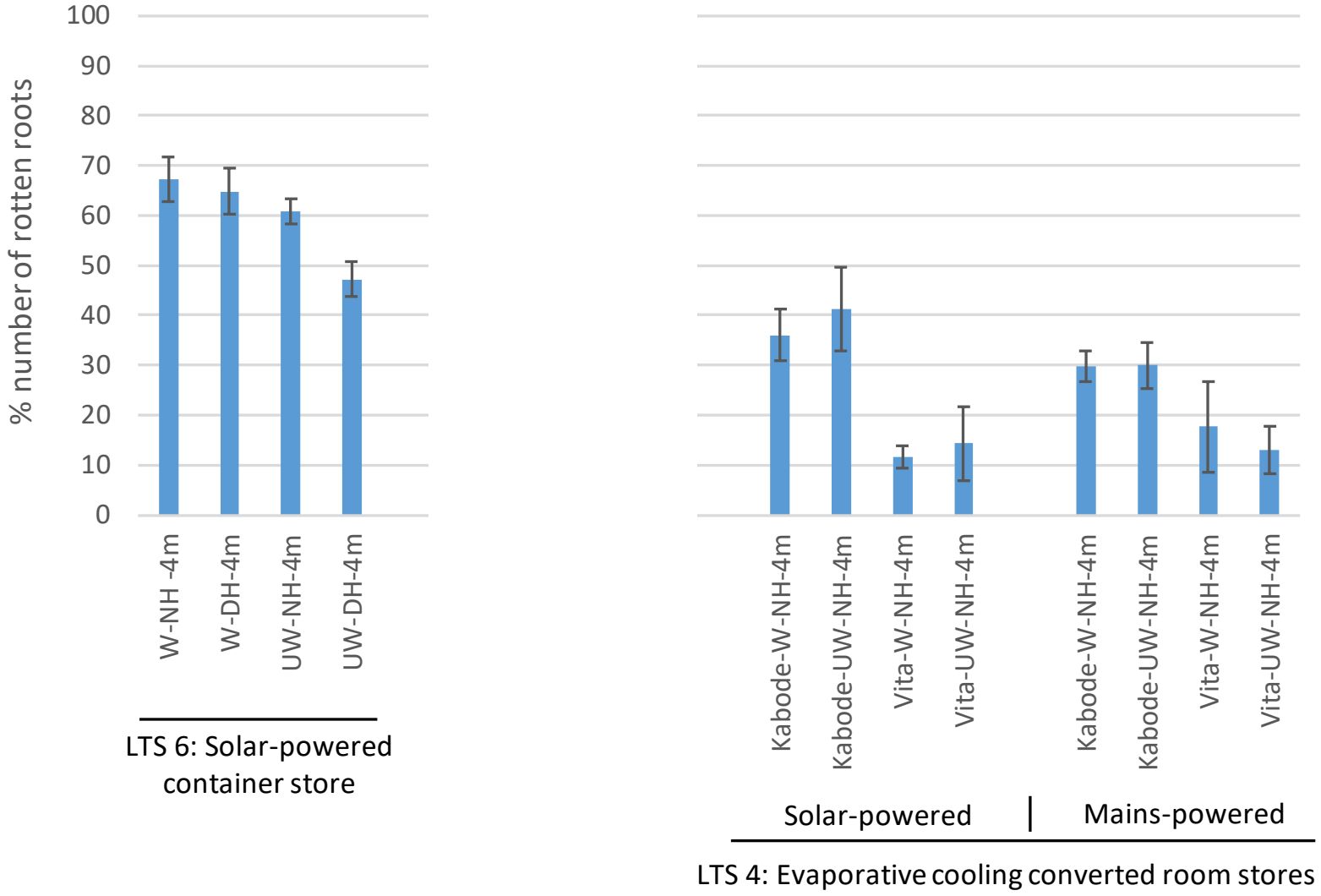
W-NH = Normal Harvest then Washed, UW-NH = Normal Harvest UnWashed, W-DH = De-Haulmed then Washed, UW-DH = DeHaulmed UnWashed

UW-NH – at set-up

UW-NH – after 4 months storage

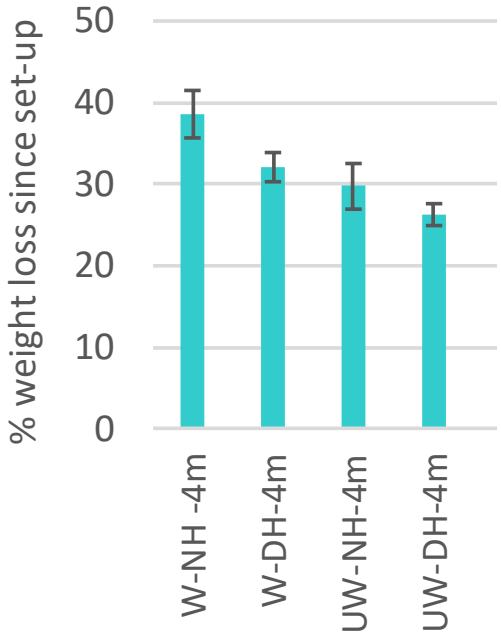
Storage trial 6 (LTS6)

Figure 5. Comparison of root rotting incidence between storage trials

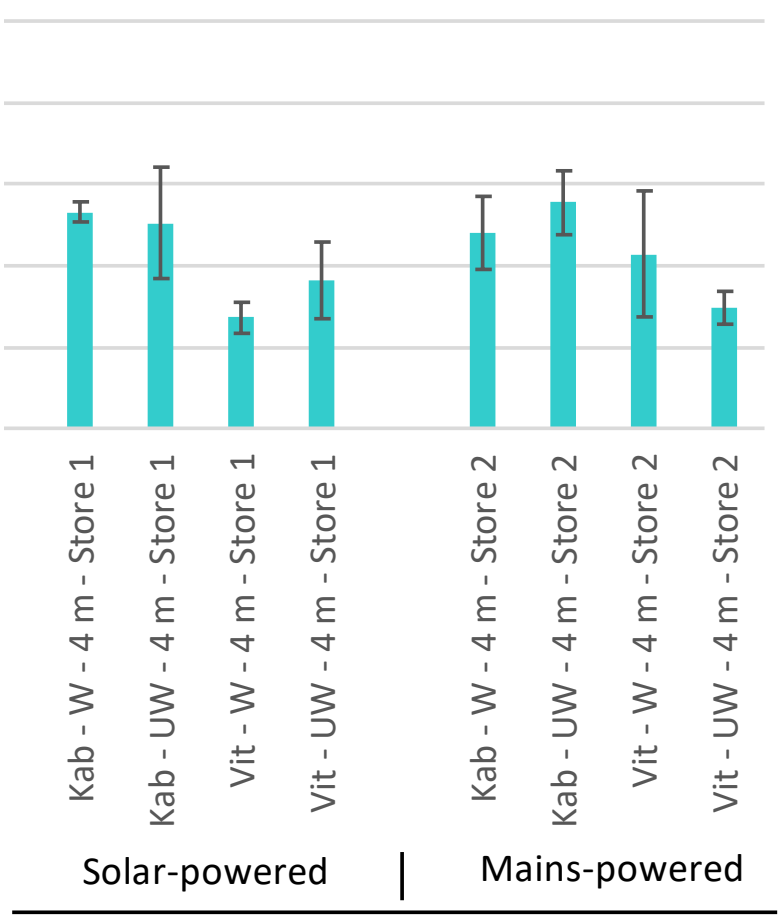


W-NH = Normal Harvest then Washed, UW-NH = Normal Harvest UnWashed, W-DH = De-Haulmed then Washed, UW-DH = DeHaulmed UnWashed

Figure 6. Comparison of percentage root weight loss since set-up between storage trials



LTS 6: Solar-powered container store



LTS 4: Evaporative cooling converted room stores

W-NH = Normal Harvest then Washed, UW-NH = Normal Harvest UnWashed, W-DH = De-Haulmed then Washed, UW-DH = DeHaulmed UnWashed


4 months storage


Freshly harvested


UW
W
Marketable quality of roots stored for 4 months which did not rot

Beta-carotene retention

Figure 7a. Trans β-carotene content - sweetpotato raw roots from harvest through curing to 4 months storage - LTS 6 roots (FWB)

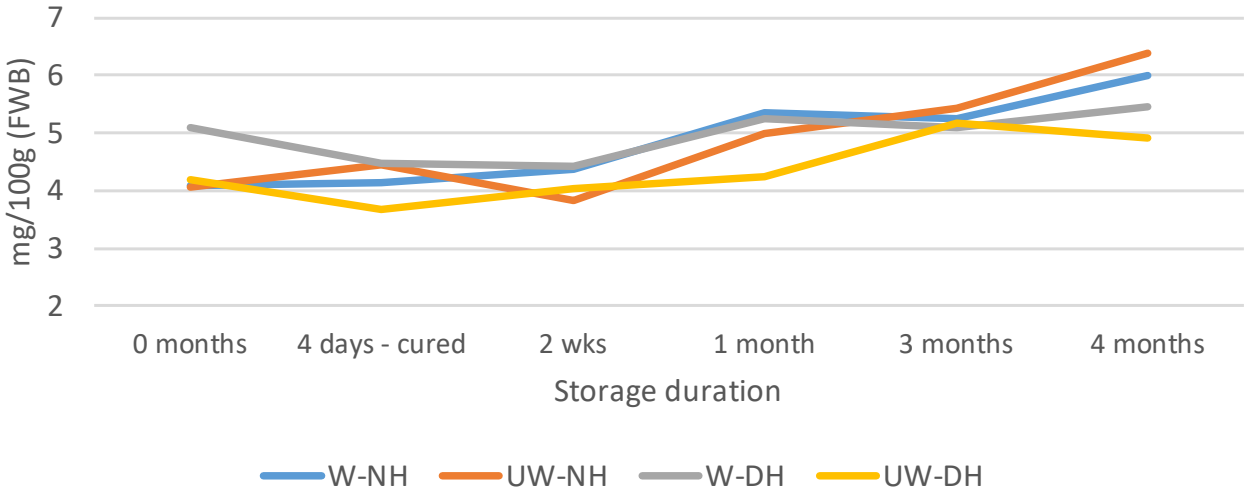
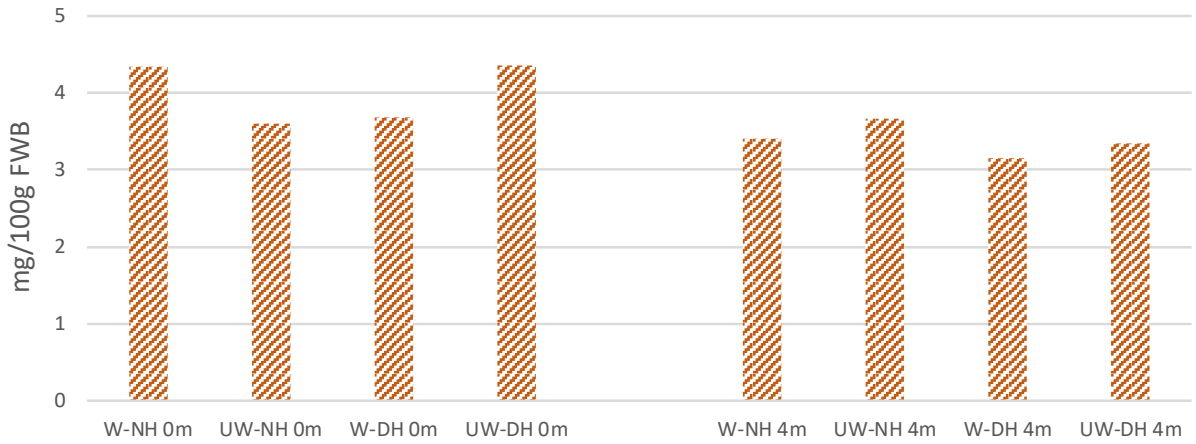


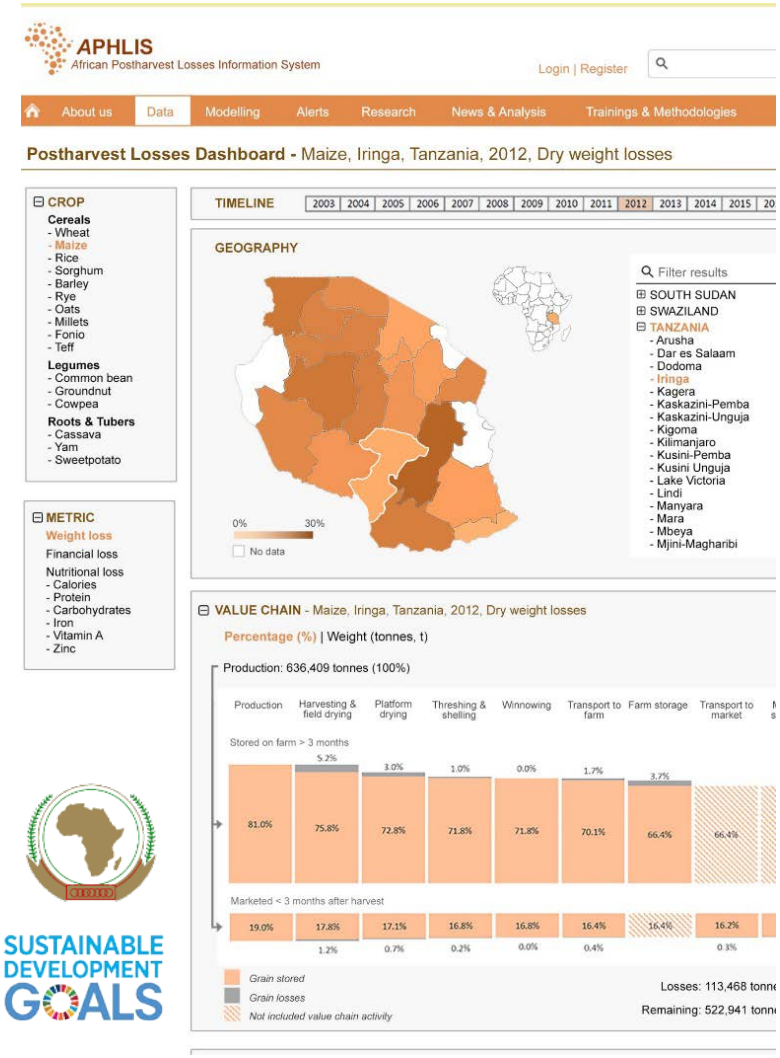
Figure 7b. Trans β-carotene: puree LTS6

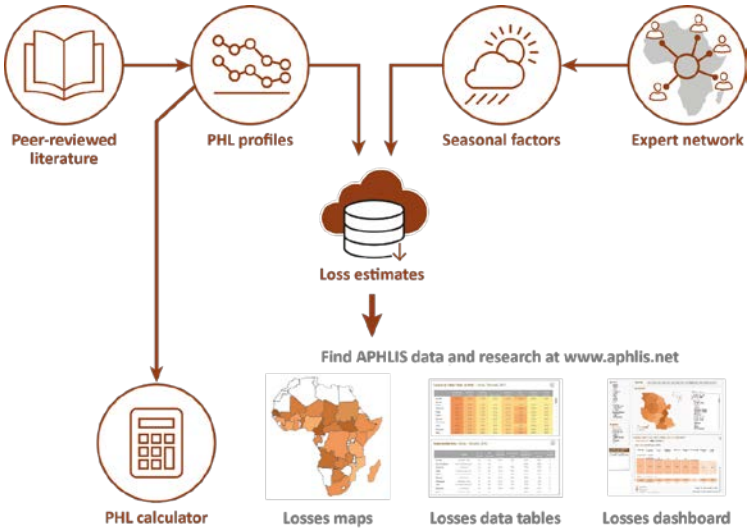


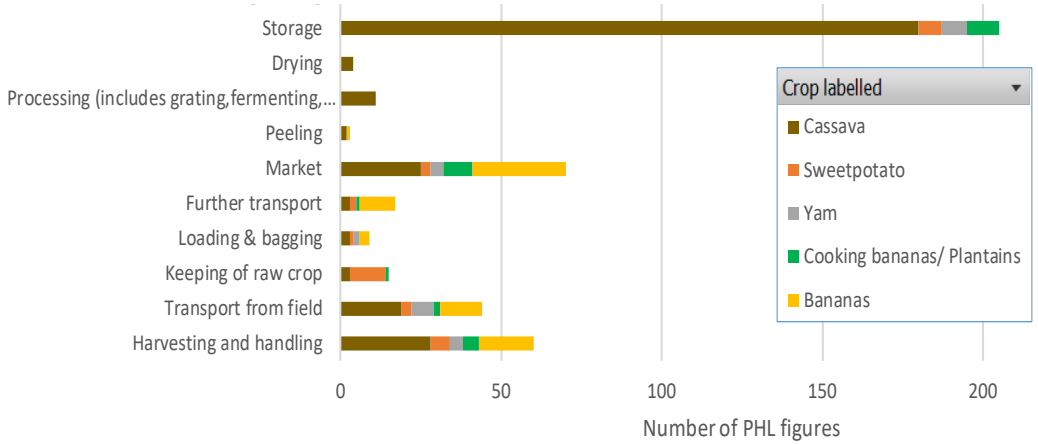
Storage trial 6 – conclusions

- The unacceptably high incidence of **rotting** which occurred was unexpected
- High **CO_2** levels during the trial, indicate high root respiration, which results in high weight loss and indicates roots were stressed. High CO_2 and rots cause root stress
- High **surface mould** incidence on washed roots at 1 month, would have increased the fungal spore load in the store
- Trials to test the impact of **curing and storing conditions and duration** on rot development are being planned
- Increased **ventilation** is being installed in the store to prevent CO_2 build-up
- Our previous trial found Vita stored better than Kabode, if storage becomes important, the storability of new **varieties** will also need to be studied
- Despite the disappointing results, there were indications that **de-haulming** 4 days prior to harvest reduces storage weight loss of roots, while **washing** appeared in this trial to increase it
- An **economic analysis** is investigating strategies to reduce capital investment and running costs to help widen the applicability of the storage approach

APHLIS+ – expanding to include postharvest loss estimates of root and tuber crops







SUSTAINABLE DEVELOPMENT GOALS

APHLIS+ is funded by the BILL & MELINDA GATES foundation

Awareness, demand and packaging of vitamin A-rich orange-fleshed sweetpotato roots for different markets in urban Nairobi

Informal markets

High-end grocery stores

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