NAMIBIAN AGRONOMIC BOARD

UNAM UNIVERSITY OF NAMIBIA

NAB-UNAM SEED PROJECT

RESEARCH REPORT

SCREENING WHITE MAIZE VARIETIES UNDER IRRIGATED CONDITIONS IN NAMIBIA

Trial Season - 2024

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1. INTRODUCTION AND BACKGROUND

The Namibian Agronomic Board (NAB) is mandated to promote the agronomic industry and facilitate the production, processing, storage, and marketing of controlled crops. The NAB's Strategic Plan for 2019-2024 emphasises that seed research and production is one of its key priority areas. White maize and pearl millet are the most important cereal crops cultivated in Namibia, whose yields are partially hampered by the limited availability of high-yielding and adapted varieties. The certified seed sector in Namibia is underdeveloped, thus resulting in dependence on seed and food imports. To widen the range of access to seeds of locally adapted high-yielding crop varieties, the University of Namibia (UNAM) and the Namibian Agronomic Board (NAB) are implementing a 5-year MOU on Seed Research and Seed Production of selected agronomic and horticulture crops, including maize. The overall aim is to develop high-yielding and adapted varieties of food security crops that feed into the mainstream seed and food production systems. Thus, field trials of about 33 white maize SeedCo hybrid varieties and three (3) CIMMYT varieties licensed to UNAM were planted at different ecological zones within two (2) research production sites of Ogongo in the Omusati region and Mashare in the Kavango East region for the second trial cropping season. The SeedCo varieties were also paired with three (3) other local commercial varieties commonly used by local farmers to be referenced as controls or checks.

All the SeedCo and the UNAM licensed varieties were first planted in 2022 for the first evaluation. The current season (second cropping season) is, therefore, being conducted to ensure data reliability and thorough screening of the varieties' performance. The hybrids were planted at Ogongo and Mashare in 2024 to subject the varieties to a second trial season for a reliable conclusion on their performance. A total of 39 varieties (including 3 local checks and 3 CIMMYT varieties licensed to UNAM) were planted on 25/01/2024 at Mashare and on 04/03/2024 at Ogongo sites, respectively. Crop management practices were applied, and data were collected throughout the crop development stages. This report, therefore, highlights the performance of the planted white maize hybrid varieties during the second cropping season (2024).

2. RESEARCH OBJECTIVE

The objective was:

- ✓ To screen and evaluate the selected maize (Zea mays) varieties for high yields and adaptation in different agro-ecological zones in Namibia, and to select the best performers under Namibian soil and climatic conditions.

3. MATERIALS AND METHODS

3.1 Experimental sites

The trials were carried out at 2 locations in 2 production zones with 1 site in the North Central (Ogongo UNAM campus) and another site in the Kavango production zone (Mashare), respectively (Figure 1).

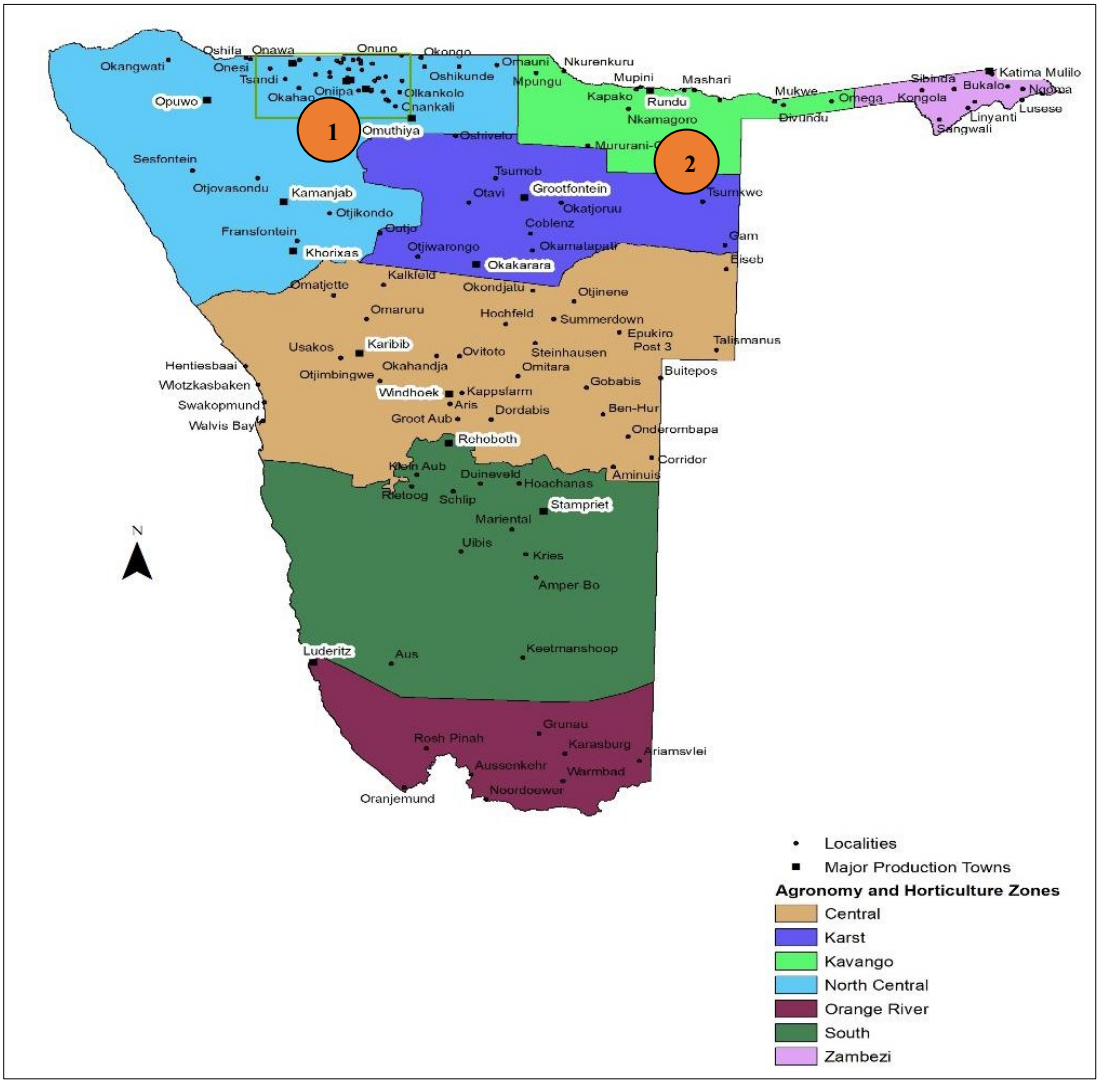

Figure 1: Overview of the trial/experimental sites on the Namibian map over the various production zones

NB: 1=Mashare; 2=Ogongo

Table 1 shows the planting dates and management practices applied at each research trial site

Table 1: *Research trial sites and crop management practices*

Production zone	Site	Planting date	No. of varieties planted	Area planted	Crop management
Kavango	Mashare Irrigation (Pty) Ltd.	25/02/2024	33 SeedCo 3 Local checks (Kalahari Early Pearl, Stark Ayres- white and yellow)	2,490 m2 (SeedCo & Local checks) 425.25 (UNAM licensed)	Irrigation was done through the sprinkler system. Other activities such as weeding & harvesting were done manually
North Central	UNAM Ogongo	04/03/2024	3 UNAM licensed		Irrigation was done through the sprinkler system and partly drip irrigation. Other activities done manually.

3.2 Experimental design

The 36 SeedCo together with the 3 local checks (depending on the site) were laid out in a Randomised Complete Block Design (RCBD) in 3 replications in the 2 research trial sites. For Mashare, the layout was divided into 3 blocks, whilst for Ogongo it was divided into 6 blocks to suit the field layout on the ground. The same RCBD design was used for the UNAM licensed varieties at both sites (Table 2).

Table 2: *Variety group and spacing protocols*

Variety group	Spacing protocols used
33 SeedCo + 3 local checks (Kalahari Early Pearl, Stark Ayres- white and yellow)	• Plot sizes 9m by 2.25m • 3 lines per plot • Inter-row space 0.75m • Inter-row space 0.30m • 108 plots
UNAM licensed	• Plot sizes 10.5m by 4.5m • 6 lines per plot • Inter-row space 0.75m • Inter-row space 0.30m • 9 plots

3.3 Data collection and analysis

Data collected included grain yield, days to 50% flowering, and plant height. Other important information, such as planting dates and scouting of pests and diseases, was recorded. Descriptive statistics were used to summarise the results in Excel. Parameters analysed included days to 50% flowering, plant height, and grain yields.

4. RESULTS AND DISCUSSIONS

The 2024 cropping season performed very poorly due to challenges of limited rainfall and high heat waves experienced during March and April 2024. Additionally, the fact that the trial crops were planted in late February, towards early March 2024, contributed to the poor performance as the crops did not establish themselves well within their required growing season. Other challenges, like fall armyworm experienced at Ogongo and frost at Mashare, also negatively affected the crop performance. The variety performance, therefore, may not be a true reflection of such varieties, and the results may not be reliable.

4.1. SEEDCO VARIETIES

4.1.1. Days to 50% flowering - SeedCo

According to SeedCo Zambia (2025), the 300 series is extra early, followed by the 400 series and then the 500 series, which are early maturing. The 600 series is intermediate maturing, and the 700 series is late maturing.

The average number of days to 50% flowering of SeedCo varieties planted at the Mashare site ranged between 52 and 77 days (Figure 2). Varieties like SC301 and SC303 flowered the earliest, taking only 52 and 54 days, whilst other varieties such as SC735, SC729, SC727, and SC553 took the longest to flower (74 - 79 days) (Figure 2).

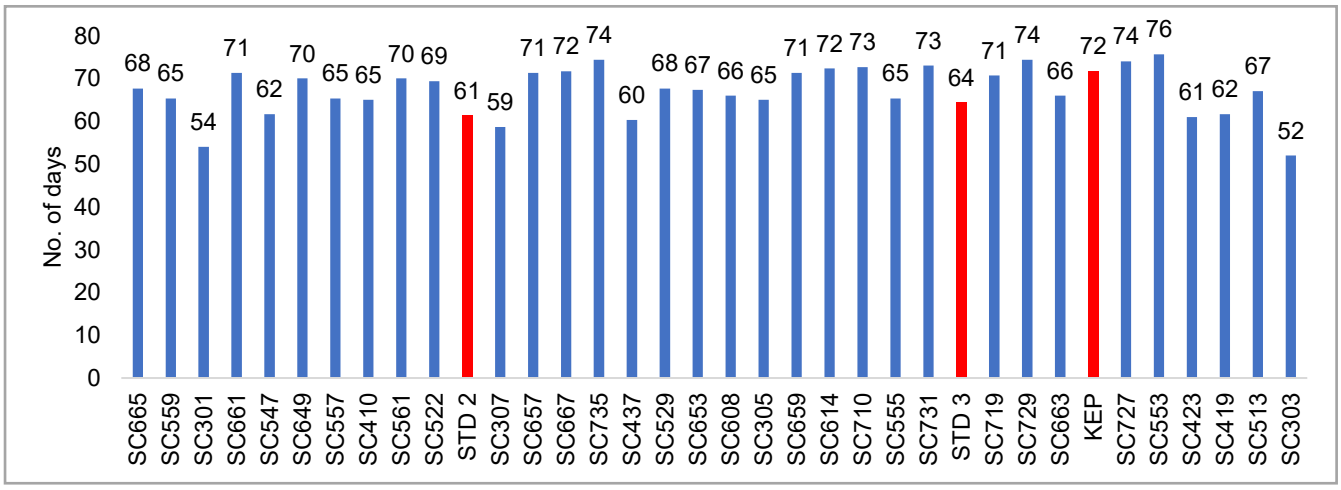

Figure 2: Average number of days to 50% flowering for SeedCo maize, Mashare 2024
NB: Local check varieties in red

For the Ogongo site, the number of days to 50% maturity for the SeedCo varieties ranged between 48 and 68 days. Varieties such as SC419 and SC303 only took 48 or 49 days, whereas other varieties like SC731, SC710, SC557, SC735, and SC727 took 65 days or more to reach 50% flowering (Figure **3**).

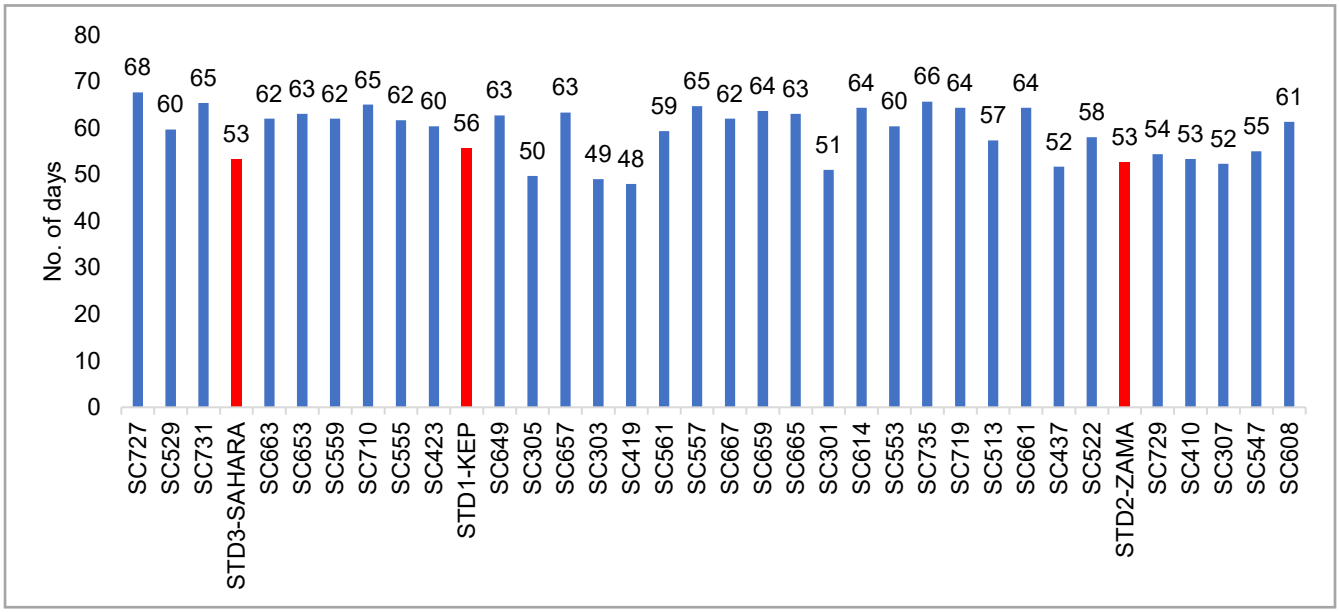

Figure 3: Average number of days to 50% flowering for SeedCo maize, Ogongo 2024
NB: Local checks varieties in red

4.1.2. Plant Height (m) - SeedCo

During the 2024 cropping season, and as illustrated in Figure 4, the plant height ranged between 1.6m (local check variety STD 2) to 3m (SC653). The majority of the varieties, like SC301, SC557, SC731, SC719, etc., fell between the height range of 2m and 2.7m. Other varieties like SC659 and SC653 had a height of more than 2.8m.

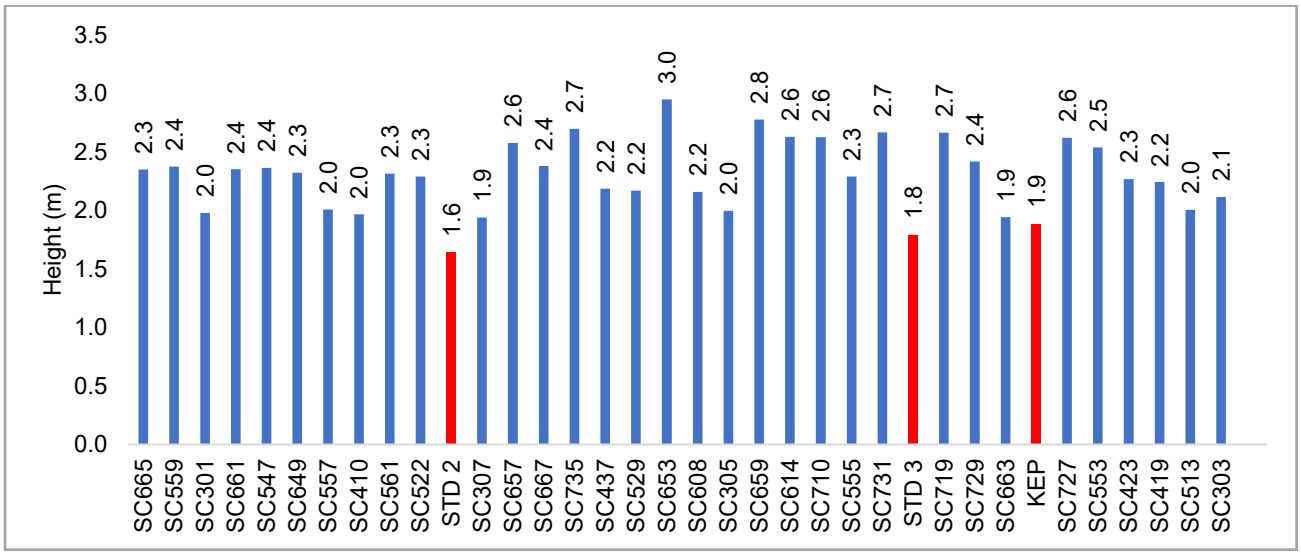

Figure 4: Average plant height (m) for Seedco maize - Mashare 2024
NB: Local checks varieties in red

Figure 5 indicates how the Ogongo site reported a plant height range between 1.5m and 2.2m. At least two local varieties (STD 2 & STD 3) planted for benchmark checks recorded a height of 1.5. The SeedCo varieties all recorded equal or slightly taller heights than the local checks, from the shortest varieties of SC663 and others with a height of 1.5m to a series of other tall varieties such as SC657 (2.2m).

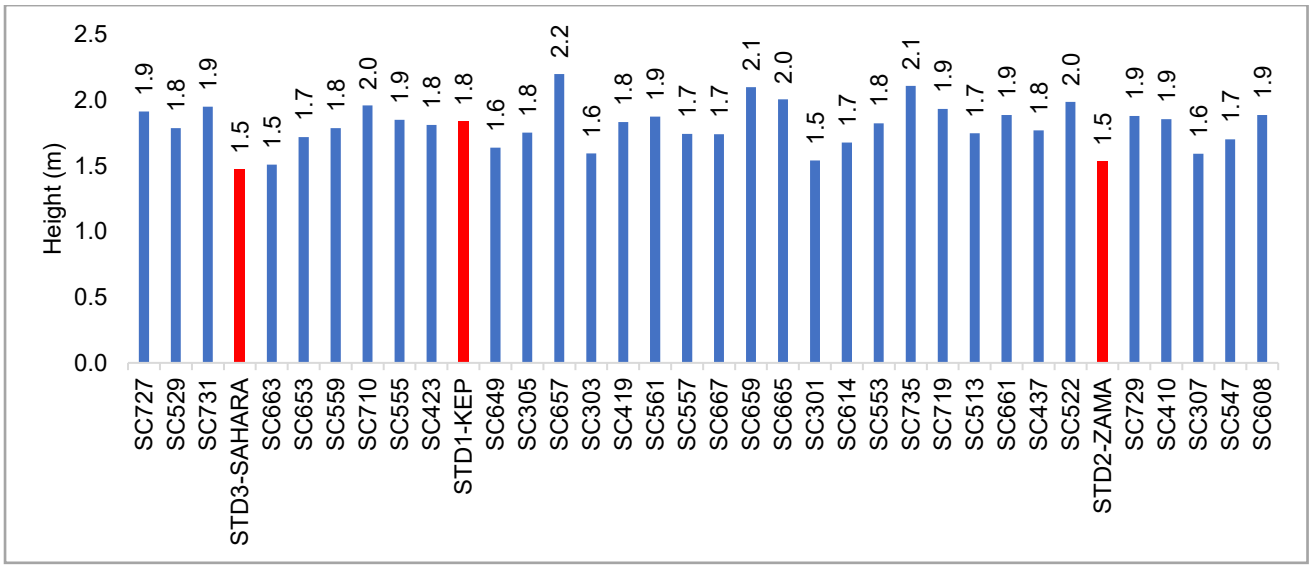

Figure 5: Average plant height (m) for Seedco maize - Ogongo 2024
NB: Local checks varieties in red

4.1.3. Grain yield (t/ha) – SeedCo - 2024

Whilst varieties with shorter growing seasons, which are early maturity, are generally desired, especially in the hot climate conditions of Namibia, grain yield is also of vital importance. There was a generally poor grain yield of all maize varieties planted during the 2024 season, with a below-average grain yield ranging from 1.4 t/ha to 3.9 t/ha. The highest-yielding varieties include SC555 (3.9 t/ha), SC559 (3.8 t/ha), SC547 (3.8 t/ha), SC665 (3.7 t/ha), and SC727 (3.7 t/ha), whilst the lowest yielding varieties were STD 3 (1.8 t/ha), STD 2 (2.2 t/ha), and SC561 (2.2 t/ha) (Figure 6).

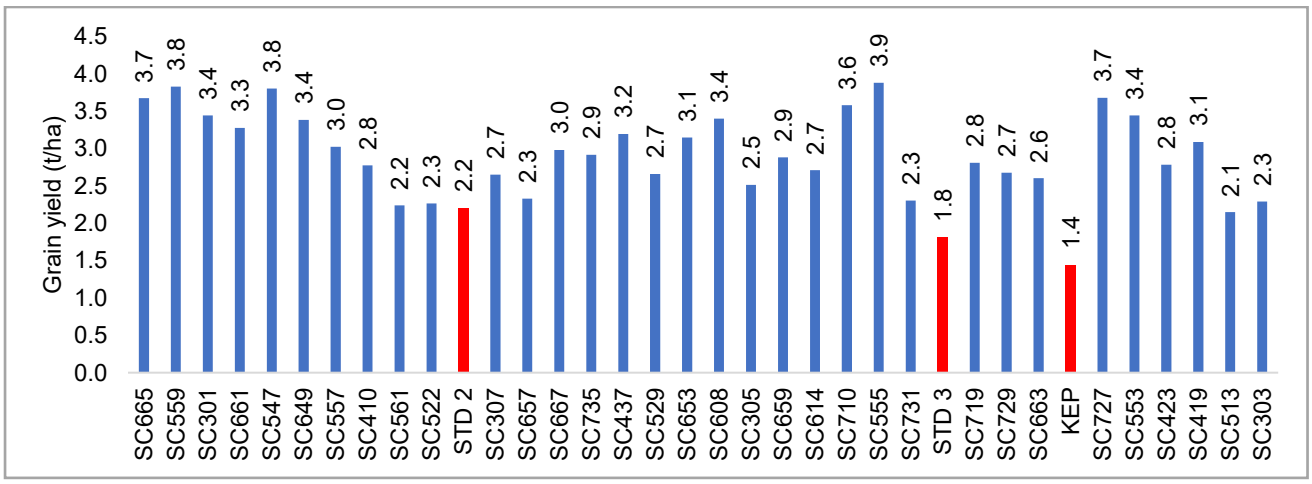

Figure 6: Average grain yield (t/ha) for Seedco maize - Mashare 2024
NB: Local checks varieties in red

Grain yield performance of the varieties planted at Ogongo as indicated in Figure 7, was worse than those planted at Mashare, with an average yield ranging between 0.6 t/ha and 1.7 t/ha. At least three varieties, STD3-SAHARA (local check), SC667, and SC307, recorded the lowest grain yield of 0.6 t/ha. Other varieties, SC547 and SC437, recorded the highest yield of 1.6 t/ha and 1.7 t/ha, respectively.

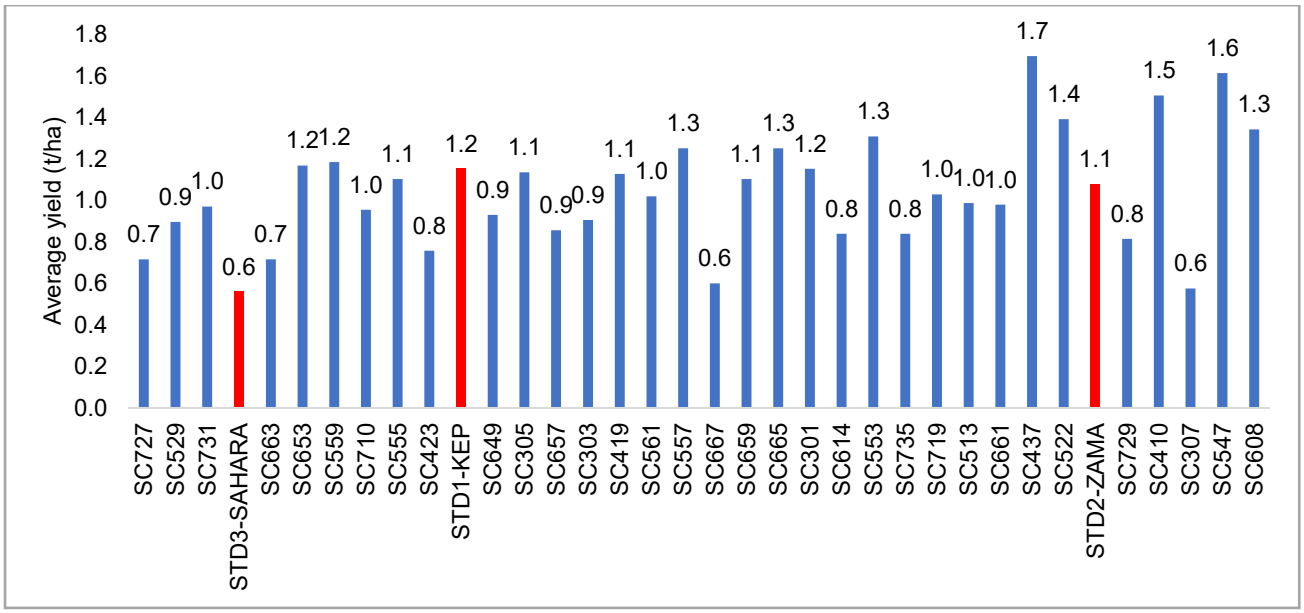

Figure 7: Average grain yield (t/ha) for Seedco maize - Ogongo 2024
NB: Local checks varieties in red

4.1.4. Grain yield (t/ha) comparisons Mashare site – SeedCo 2023 vs 2024

The data presented in Figure 8 indicates a significant decline in grain yield from 2023 to 2024 across all the varieties. This is due to the extreme challenges experienced during the 2024 trial season, such as extreme water stress due to drought and irrigation failure, late planting, and pest (fall armyworm) outbreak. In 2023, several varieties produced yields above 10 t/ha, such as SC710 (19.2 t/ha), SC419 (16.0 t/ha), and SC522 (15.0 t/ha), with the highest yields. Yields, however, drastically dropped in 2024 with most varieties producing between 1.4 t/ha and 3.9 t/ha, even way below the lowest yielding variety in 2023, which was SC423 with 9.2 t/ha. Some of the varieties planted in 2023 were not planted in 2024, hence no comparison is reflected in the graph.

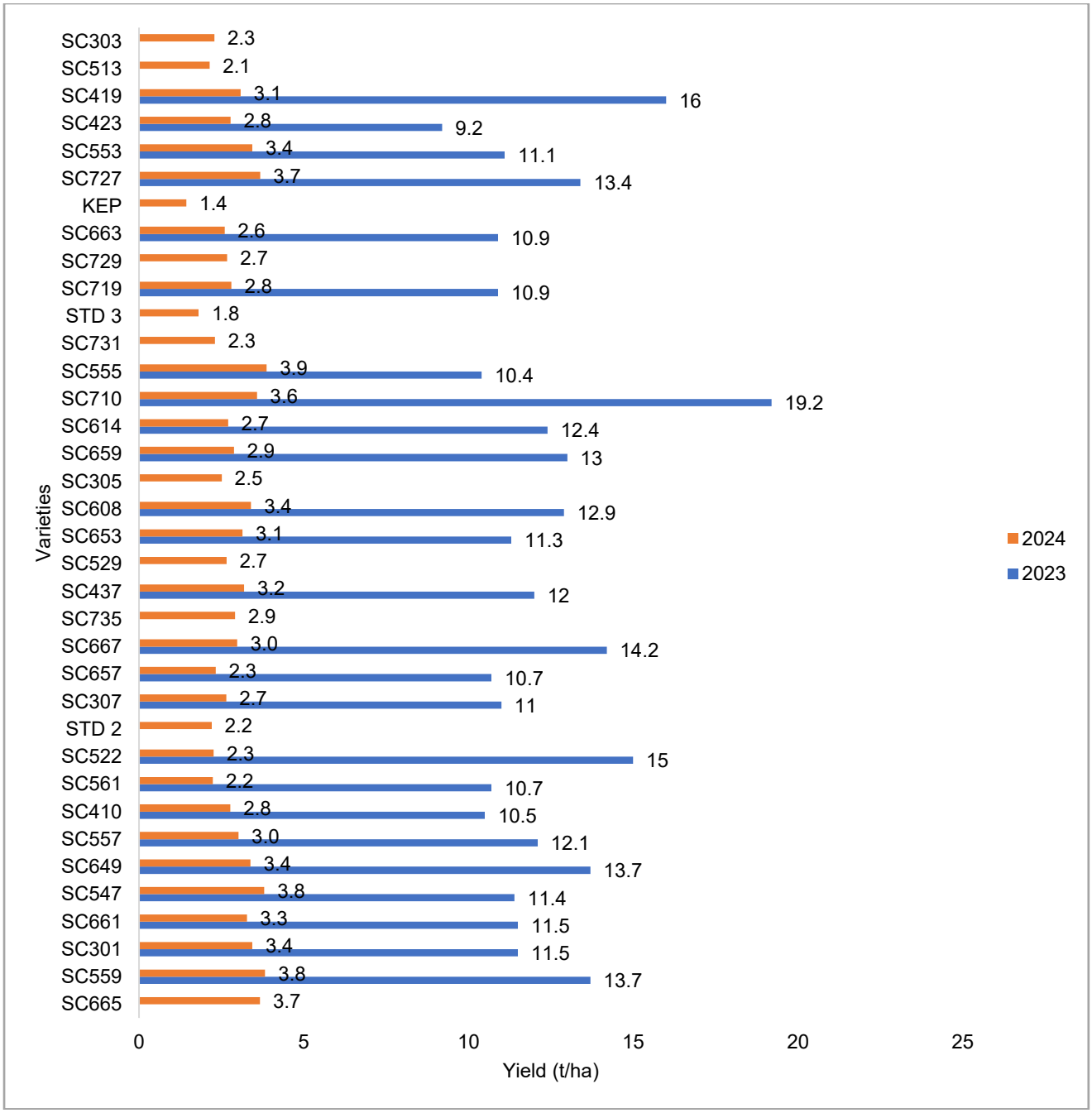

Figure 8: Mashare: SeedCo Varieties grain yields comparison for 2 cropping seasons -2023 & 2024

4.1.5. Grain yield (t/ha) comparisons Ogongo site – SeedCo 2023 vs 2024

As it is the same for the Mashare site, the Ogongo site also experienced a significant decline in grain yield from 2023 to 2024. This indicates a complete failure of the trial, and results from the 2024 trial season cannot be used. In 2023, yields from the Ogongo trial site ranged between 3.7 t/ha and 8.1 t/ha, whereas in 2024, the yields drastically dropped to a range of 0.6 t/ha to 1.7 t/ha. The highest yielding variety in 2024 was SC437 with 1.7 t/ha, which is significantly lower than the 2023 yield of 7.2 t/ha (Figure 9). The highest-yielding variety in 2024 was SC437 (1.7 t/ha), but even this is significantly lower than 2023 levels.

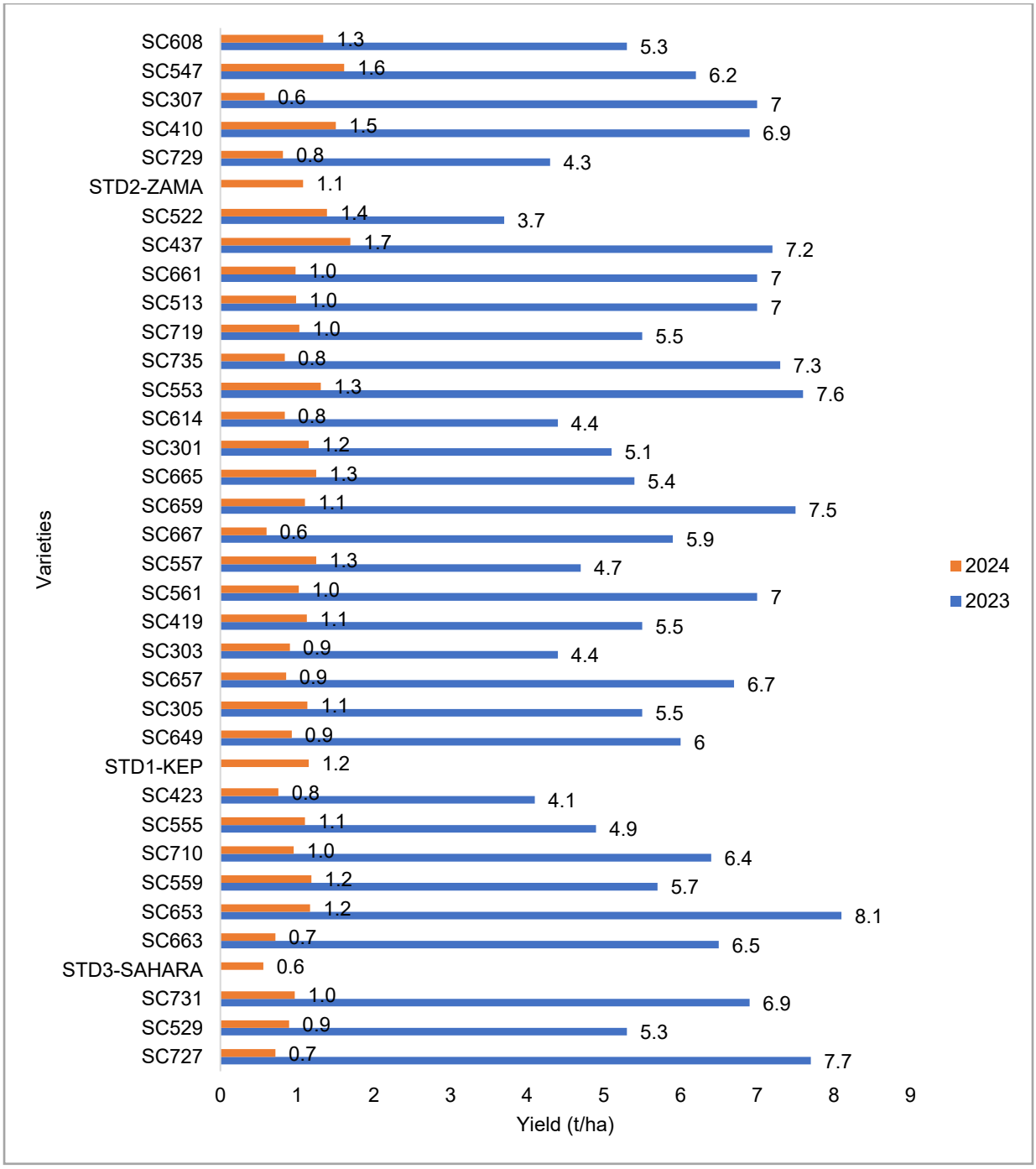

Figure 9: Ogongo: SeedCo Varieties grain yields comparison for 2 cropping seasons -2023 & 2024

4.2. UNAM LICENCED VARIETIES

4.2.1. Days to 50% flowers – UNAM licensed

The UNAM licensed varieties planted at the Mashare site, variety CZH16413-CIM35, flower or reach 50% flowering the earliest at 62 days. Varieties CZH16277-CIM23 and CZH16278-CIM24 take slightly longer at 64 days (Figure 10). Although there is a small variation, the results indicate that these varieties may have a similar maturity period.

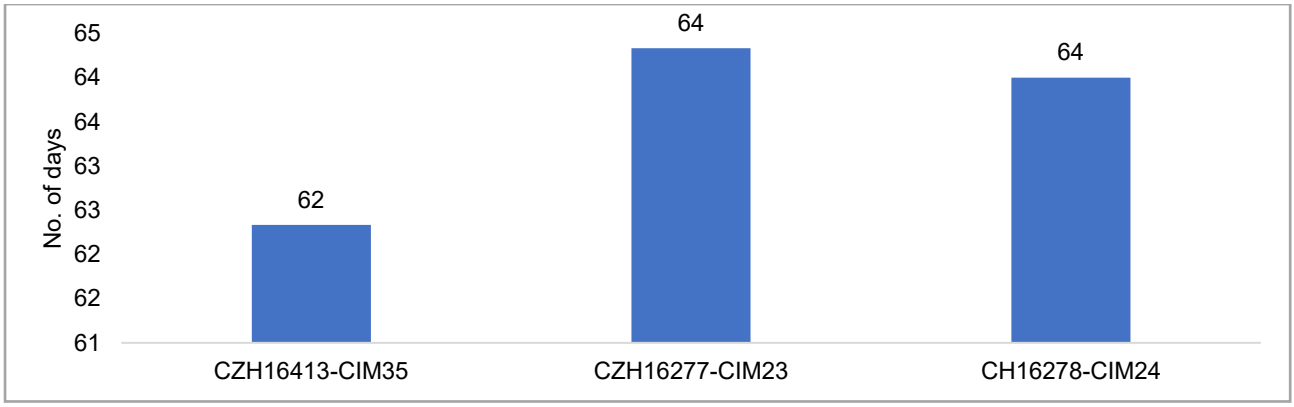

Figure 10: Average number of days to 50% flowering for UNAM Licensed maize, Mashare 2024

Of the UNAM licensed maize varieties planted at Ogongo site, variety CZH16277-CIM23 took slightly longer to reach 50% flowering at 39 days. Varieties CZH16413-CIM35 and CZH16278-CIM24 reached 50% flowering in 38 days (Figure 1111).

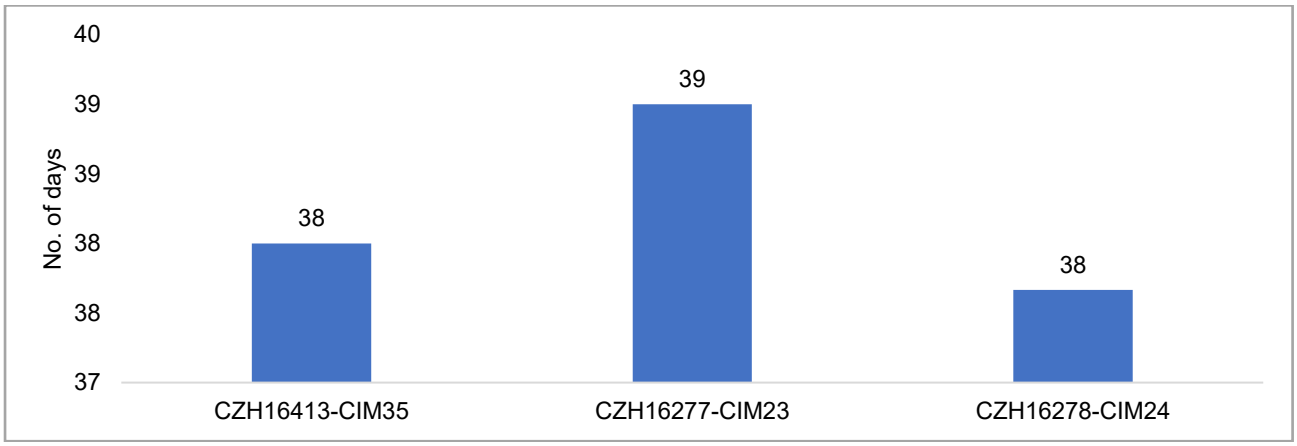

Figure 11: Average number of days to 50% flowering for UNAM Licensed maize, Ogongo 2024

4.2.2. Plant height (m) – UNAM licensed

The plant height of the UNAM licensed maize planted at Mashare in 2024 ranged from 2.0m (CZH16413-CIM35) to 2.5m (CZH16277-CIM23), with CH16278-CIM24 at 2.1m. Variety CZH16278-CIM24 falls in the mid-range with a height of 2.1m (Figure 12).

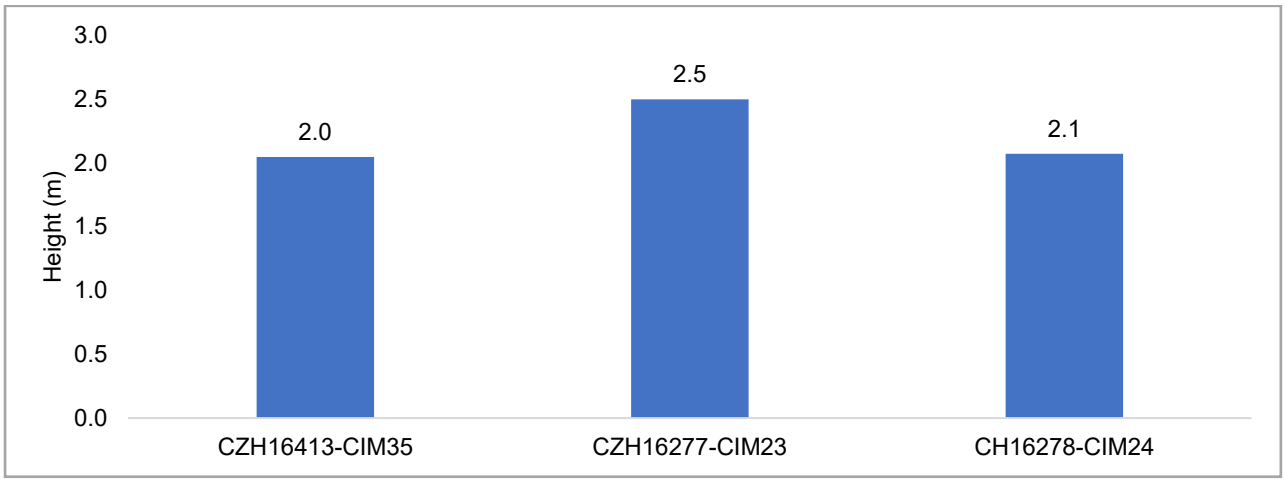

Figure 12: Average plant height (m) for UNAM Licensed maize - Mashare 2024

The plant height range for the UNAM licensed maize varieties planted at Ogongo was between 1.9m for CZH16278-CIM24, which is the shortest, and 2.2m for CZH16277-CIM23, which is the tallest. Variety CZH16278-CIM24 recorded a height of 1.9m, therefore, falling in the middle range (Figure 13).

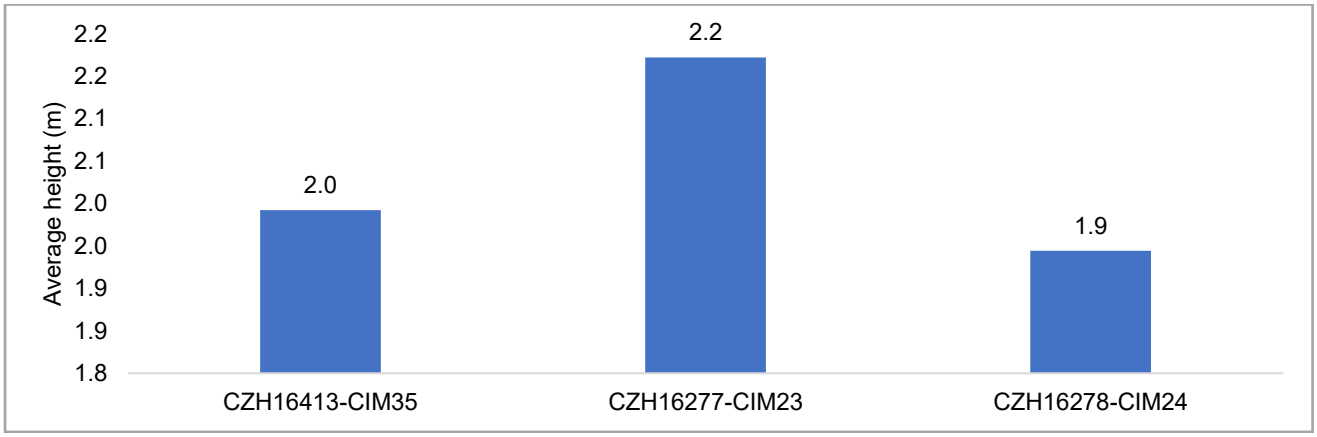

Figure 13: Average plant height (m) for UNAM Licensed maize - Ogongo 2024

4.2.3. Grain yield (t/ha) – UNAM licensed

The grain yield of the UNAM-licensed maize planted at Mashare ranged between 3.0 t/ha and 4.0 t/ha. Variety CZH16413-CIM35 recorded the highest yield of 4.0 t/ha, followed by variety CZH16277-CIM23 with 3.1 t/ha and lastly CZH16278-CIM24 with 3.0 t/ha, respectively (Figure 14).

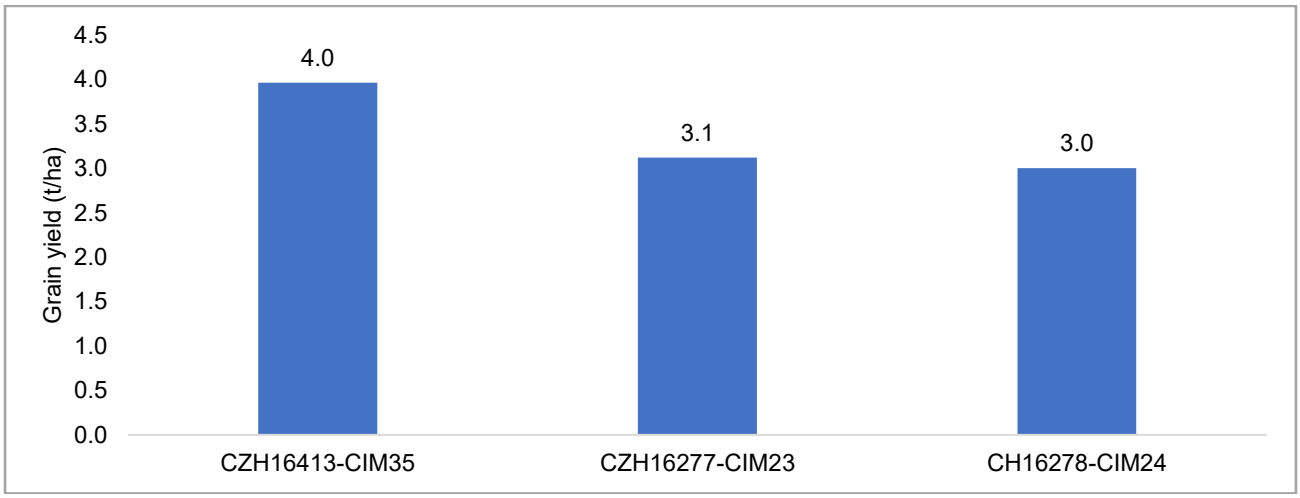

Figure 14: Average grain yield (t/ha) for UNAM licensed maize - Mashare 2024

The Ogongo site recorded a lower yield on the UNAM licensed maize compared to Mashare, with variety CZH16277-CIM23 recording the lowest yield of 0.057 t/ha, followed by CZH16278-CIM24 with a grain yield of 0.62 t/ha and the highest CZH16413-CIM35 with a yield of 0.068 t/ha (Figure 15). The issue of late planting, water challenges, and the fall armyworm pests greatly impacted the crop performance.

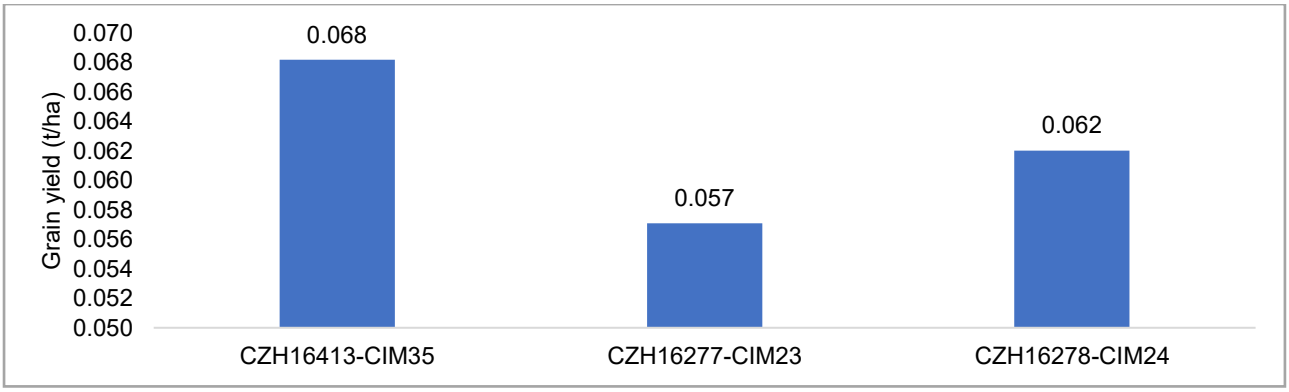

Figure 15: Average grain yield (t/ha) for UNAM Licensed maize - Ogongo 2024

4.2.4. Grain yield (t/ha) comparisons Mashare site – UNAM Licensed varieties 2023 vs 2024

A decline in yield is observed in 2024 compared to 2023 for all the varieties at the Mashare trial site. In 2023, yields ranged from 9.2 t/ha to 10.3 t/ha, while in 2024, they dropped to between 3.0 t/ha and 4.0 t/ha. This yield variation was mainly caused by late planting, which was conducted in late February to early March 2024, while in 2023, planting was done in late December 2022 to early January 2023, and frost occurred in June 2024, immediately before harvesting, while the maize cobs were not yet dry. CZH16413-CIM35 maintained the highest yield in both years but still recorded a huge reduction from 10.2 t/ha to 4.0 t/ha (Figure 16).

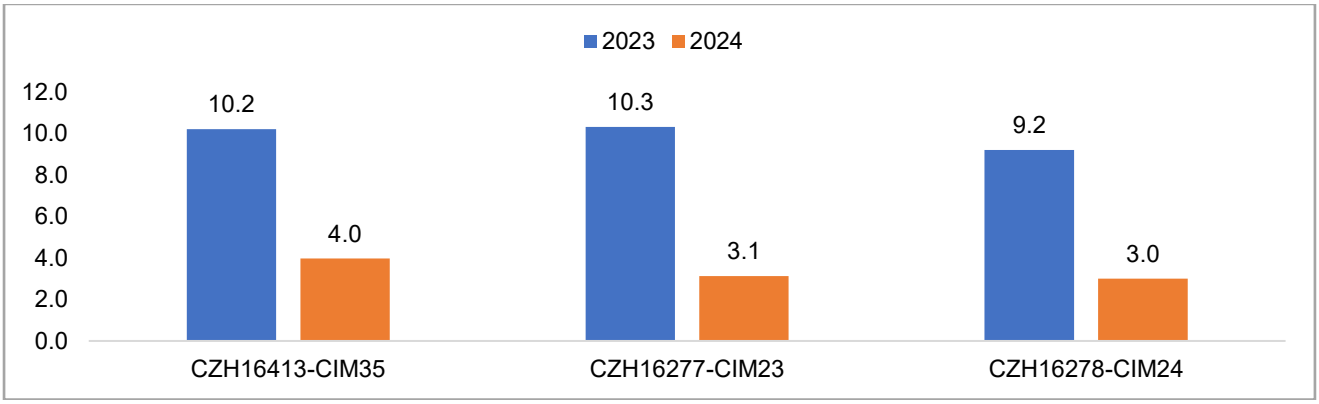

Figure 16: Mashare: UNAM Licensed Varieties grain yields comparison for 2 cropping seasons - 2023 & 2024

4.2.5. Grain Yield (t/ha) Comparisons Ogongo site – UNAM Licensed varieties 2023 vs 2024

As indicated in **Figure 17**, the 2024 yield drastically declined compared to 2023. In 2023, the yields were relatively high, ranging between 11.0 t/ha (CZH164-CIM35) and 13.5 t/ha (CZH16278-CIM24). In 2024, the yields drastically dropped to extremely low levels, with CZH16413-CIM35 yielding only 0.068 t/ha, CZH16277-CIM23 yielding 0.057 t/ha, and CZH16278-CIM24 yielding 0.062 t/ha.

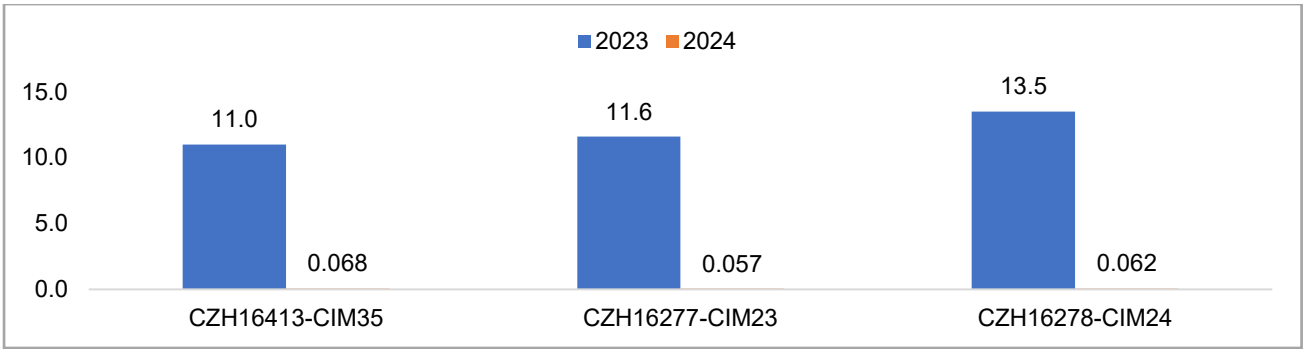

Figure 17: Ogongo: UNAM Licensed Varieties grain yields comparison for 2 cropping seasons (2023 & 2024)

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The grain yield data results from the 2024 trial season significantly decreased; therefore, this is not a true representation of the varieties' performance, given how they performed during the 2023 trial season. The issues of late planting, which resulted in extreme water stress for the crops, poor rainfall, extreme heat waves, and pest outbreaks (fall armyworm), drastically affected the crop performance during the 2024 trial season. All the SeedCo varieties planted in 2024 recorded a highest grain yield of 3.9 t/ha at Mashare and 1.7 t/ha at Ogongo, whilst the lowest yield for 2023 was 9.2 t/ha at Mashare and 7.2 t/ha at Ogongo, respectively. For the UNAM licensed varieties, the highest grain yield attained in 2024 at Mashare was 4.0 t/ha and 0.068 t/ha at Ogongo, in comparison to the lowest yield attained in 2023 of 10.3 t/ha at Mashare and 13.5 t/ha at Ogongo. The results from the 2024 trial season are, therefore, not reliable and cannot be used for evaluation.

5.2 Recommendations

- Given the poor performance of the 2024 cropping season trials, it is recommended that the results for 2024 be disregarded, and another trial season be conducted with consideration of early planting date, irrigation, and fertilisation.
- Some new varieties were planted in 2023 and were not planted in 2024, and vice versa. From the onset, the design should ensure uniformity and ensure that the same varieties are planted across all sites at the same time to avoid having some varieties left behind, discarded from the list or having to require another trial season.

6. REFERENCES

SeedCo Zambia. (2025). *White maize.*
https://seedcogroup.com/zm/fieldcrops/product_category/maize/