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Evaluating the Performance of Recently Released Onion (Allium Cepa L.) Varieties at Highland Areas of West Hararghe, Ethiopia

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Onion (Allium cepa L.) is widely produced by farmers and commercial growers throughout the year for local use and local markets as income generation by farmers and for export market by commercial growers in Ethiopia. Field experiment was conducted during 2018 to 2020 cropping season at highland areas of the west Hararghe aimed at evaluating the performance of recently released onion varieties. Treatments were composed of three released onion (Allium cepa L.) varieties such as Nafs; Nasik-Red & Bombay-Red arranged in a randomized complete block design (RCBD). Onion parameter data were analyzed using R software (R 3.4.1). Accordd u analusc y p D p p א RCBD ' a bulb yield (tha-1) and signifcant (P≤0.01) difference for total bulb yield (tha-1) but non-signifcant (P≥ 0.05) difference for unmarketable bulb yield. Hence, the highest leaf numbers per plant (16), leaf length (45.55cm), plant height (59.80cm) were recorded from variety Nafs whereas highest days to physiological maturity (127.25days) obtained from variety Nasik-Red. In addition, the highest average bulb weight (99.31gm bulb--1), marketable bulb yield (20.05tha-1) &total bulb yield (22.58tha-1) were recorded from variety Nafs. Thus, the result of this study revealed that variety Nafs was superior over rest varieties tested in relation to leaf number, leaf length, plant height, average bulb weight, marketable bulb yield and total bulb yield. Hence, variety Nafs caused additional leaf number (28%), leaf length (33.8%), plant

of West Africa, leaves still green at bulb harvest are propounded, and then used to make sun-dried and fermented balls, which are used later for seasoning dishes. Sliced raw onions have antibiotic properties, which can reduce contamination by bacteria, protozoa or helminthes in salads . It is grown primarily for its bulb which is used for avoring the local stew'/wet which is considerably important in the daily diet, mostly used as seasonings or as vegetables in stews. In addition, it serves as sources of work opportunity and income generation: example; in 2013 Ethiopia exported 220,213 tons of vegetables and generated USD 438 million . Onion is one of the richest sources of avonoid in the human diet and avonoid consumption has been associated with a reduced risk of cancer, heart disease and diabetes. In addition it is known for anti-bacterial, antiviral, anti-allergenic and anti-in ammatory potential **10** .

In Ethiopia, onion can be produced twice per year both under the

experimental plot and then average values per plant were used for analysis.

Leaf length was measured in centimeter using meter tape from 10 randomly selected representative plants from middle rows of each experimental plots and average leaves length was taken for analysis. Plant height was determined from 10 randomly selected sample plants from middle rows of each experimental plot and measured the plant height from the base of the plant to tip of the plant using meter tape and the average values were used for analysis. Days to physiological maturity was determined by counting the actual number of days from date of sowing until 90% of the leaves of the plant senesced and attained harvest maturity from middle rows of each experimental plot and it was agreed with the procedure given by **13** .

(*alli m ce a* .)

is parameter encompassed onion traits like average bulb weight (gm bulb^{-1}), marketable bulb yield (tha^{-1}), unmarketable bulb yield(tha^{-1}) and total bulb yield(tha^{-1}) were collected and determined using di erent techniques and procedure. Hence, average bulb weight was determined using 10 randomly selected representative plant bulbs from middle rows of each experimental plot and weighed using sensitive balance and then the average values per bulb were taken for analysis.

Marketable bulb yield (tha^{-1})was determined by taking those bulbs which were free from split, dense necked and unpleasant bulbs which harvested from the middle rows of each experimental plot, weighed using sensitive balance and it was calculated in ton basis per hectare and the average values used for analysis. Unmarketable bulb yields (tha^{-1}) were determined by considering under sized, contaminated, rotten, disordered, physiologically thick-necked and divided bulbs which were harvested from middle rows of each experimental plot as unmarketable bulb yields, weighed, computed in ton basis per hectare and the average values were used for analysis. Likewise, the total bulb yield (tha^{-1}) was determined by taking the summation of marketable and unmarketable bulb yields harvested from net area of each experimental plot were weighed using sensitive balance and computed in ton basis per hectare and the average values were used for analysis.

All collected onion (*Allium cepa* L.) data were analyzed using R so ware (R 3.4.1) and least signi cant di erence (LSD) at 5% probability level was used for mean separation when analysis of variance indicates the presence of signi cant di erence among treatments **14** .

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e combined analysis of variance over the three years showed that

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of 20.05tha^{-1}, variety Bombay-Red (17.64tha^{-1}) and variety Nasik-Red (15.87tha^{-1}) respectively. Hence, the highest (20.05tha^{-1}) marketable bulb yield was produced by variety Na s whereas the lowest (15.87tha^{-1}) marketable bulb yield obtained from variety Nasik-Red (**3).** is result is in agreement with the nding who reported that the highest mean bulb yield was recorded from Na s with a 45 percent yield increment over Bombay-Red. However, marketable bulb yield obtained from Nasik-Red was on the contrary with the report of **4** who mentioned that bulb yield increment was caused by variety Nasik-Red as compared to Bombay-Red. It was also in disagreement with the ndings who explained that the highest bulb yield was obtained from variety Bombay red followed by the varieties Melkam.

Variety Nasik-Red and Bombay-Red were not statistically di erent from each other in relation to marketable bulb yield (Table 3). e range between maximum and minimum marketable bulb yield was about4.18tha^{-1}. is is to show that variety Na s was produced the highest marketable bulb yield with 20.85% increase over variety Nasik-Red. e observable di erences among onion varieties in marketable bulb yield could be due to genetic variability among them. In line with the idea who reported that the di erences in marketable bulb yield might be due to genetic variation among onion varieties. e reason for variability among onion varieties in relation to marketable bulb yield might be because of genetic potential di erences among them.

Furthermore, onion variety with highest marketable bulb yield is an indication of best performance and yielding potential and also these characteristics could be because of genotypic variability among varieties and then could be the main criteria for the variety selection.

($^{-1}$)

Total bulb yield is summation of marketable and unmarketable bulb yield. e combined total bulb yield results were signi cantly (P≤.01) a ected by onion varieties (Table 3). In disagreement with the nding who expressed that analysis of variance showed that improved onion varieties were non-signi cantly di erent in total bulb yield in tha^{-1}. Similarly, in disagreement with the report of **1** who revealed that improved onion varieties were showed non-signi cant di erence for total bulb yield [26].

With this, analyzed total bulb yield results (17.84tha^{-1}, 21.62tha^{-1}& 22.58tha^{-1}) were statistically di erent from one another and ranged from 17.84-22.58tha^{-1}. e analysis of variance showed that onion varieties were caused di erent average bulb weight results as variety Na s (22.58tha^{-1}), variety Bombay-Red (21.62tha^{-1}) and Nasik-Red (17.84tha^{-1}) respectively.

Hence, leading highest (22.58tha^{-1}) total bulb yield was recorded from variety Na s followed by variety Bombay-Red (21.62tha^{-1}) whereas the lowest (17.84tha^{-1}) total bulb yield was obtained from variety Nasik-Red. However, variety Na s and Bombay-Red were statistically at par in total bulb yield. e di erence between leading highest and lowest total bulb yield was 4.74tha^{-1}. Which is indicating that variety Na s was produced21% additional total bulb yieldover variety Nasik- Red. e reason for variability among onion varieties in relation to total bulb yield might be because of genetic potential variations among them?

Field experiment was conducted during 2018 to 2020 cropping season at onion potential areas of west Hararge highlands using three recently released onion varieties (Na s, Nasik-Red & Bombay-Red) under supplementary irrigation conditions. A West Hararghe highland of study site is potential area for onion production. At west

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