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36 J. Agric. Econs. Extens. Rural Dev

Pre Extension Demonstration of Onion Varieties in Chiro and Gemechis Districts of West Hararghe, Oromia Regional State, Ethiopia

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Abstract

The West Hararghe Zone in the Oromia Regional State is an important onion-producing area in Ethiopia, thanks to its favorable climate. However, farmers in this region face several challenges, including limited access to improved onion varieties, insufficient knowledge of modern farming techniques, and weak agricultural extension services. These issues have led to lower productivity compared to yields obtained at research stations. To address these challenges, a pre-extension demonstration of improved onion varieties and their production practices was conducted in the Chiro and Gemechis districts in 2023 and 2024. The main objective of the study was to showcase a newly released onion variety called Nafis, alongside a standard check variety known as Red Bombay. Twelve volunteer growers demonstrated the two onion varieties on 100 m² plots. The Nafis variety produced an average yield of 275.51 quintals per hectare, while the Red Bombay variety yielded 249.63 quintals per hectare. Statistical analysis revealed significant yield differences among all tested treatments, except Nafis grown under farmer conditions and Red Bombay on the demonstration plot, with a probability level of less than 1%. The Nafis variety is preferred for its higher yield, good bulb size, disease tolerance, and better storability. It is recommended that the Nafis variety be promoted through the Ministry of Agriculture in the study area and disseminated in similar agro ecological zones.

Keywords: Demonstration, Technologies and Pair wise comparison

1. INTRODUCTION

Onion (Allium cepa L.) is one of the most important vegetables grown in Ethiopia. As a bulb crop, it is primarily produced by smallholder farmers to generate cash income (Desalegne, L., & Aklilu, S. 2003).

Onion bulbs are also becoming an important commercial crop for smallholder farmers in Ethiopia The onion production in Ethiopia during the 2020/2021 growing season covered approximately 38,952.58 hectares, yielding about 3,460,480.88 tons, which translates to an average yield of roughly 8.8 tons per hectare. This yield is influenced by various factors including irrigation practices, variety selection, agronomic practices, and post-harvest management (Fekadu M and Dandena G., 2006).

Different onion varieties exhibit varying yields. For instance, the Nasik red variety showed the highest bulb yield in Basketo special district, with 13.23 tons per hectare under supplementary irrigation (Ergicho, G. F., & Hogago, T. W. 2023). Similarly, the Bombay red and Nasik red varieties performed well in Northwest Ethiopia, with marketable yields of up to 32.03 tons per hectare when seedlings were 60 days old (Aragie, E., Alemayehu, M., & Abate, A. 2023).

In West Hararghe during the 2020/2021 season, approximately 6,235 hectares were under onion production, with an average yield of about 2.3 tons per hectare (WHAO, 2021). The lack of improved onion varieties and production practices suitable for the region

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contributes to this low productivity, forcing farmers to rely on local onion varieties, which yield significantly less.

As the population grows, the demand for high-quality onions increases, both for domestic consumption and export (Ministry for Primary Industries; New Zealand 2021). However, many farmers in the region struggle with low yields due to poor seed varieties and inadequate farming practices. Onion farming in the region is often hindered by factors such as poor seed quality, limited access to disease-resistant varieties, inadequate irrigation systems, and high susceptibility to pests and diseases (Yeshiwas, Y., Alemayehu, M., & Adgo, E. 2023). These challenges significantly reduce the overall productivity of onion farms.

The potential yield for improved onion varieties is reported to be 40 tons per hectare (EARI, 2002, as cited by Alemu et al., 2004). In contrast, the average yield achieved by farmers typically ranges from 17 to 20 tons per hectare. This indicates a substantial yield gap of approximately 50% between potential and actual productivity.

Farmers in West Hararghe face several challenges in their farming activities, including poor farming practices, inadequate use of inputs, and a lack of adoption of appropriate farming technologies. These issues have resulted in low crop yields, food insecurity, and reduced incomes.

To address these challenges, it is essential to demonstrate new varieties and production methods. The pre-extension demonstration of onion varieties is a crucial step in supporting onion farmers in West Hararghe. Therefore, this study aims to provide farmers with practical knowledge about the most suitable onion varieties for their specific farming conditions. Such knowledge can lead to higher yields, enhanced resistance to pests and diseases, and increased profitability. Additionally, this demonstration serves as a testing phase to evaluate the performance of these varieties before they are widely introduced to more farmers in the region.

2. MATERIALS AND METHODS

The study was conducted over two years, 2023 and 2024, at the pre-extension demonstration level, which included eight demonstration plots on selected farmers' fields in the Chiro and Gemechis districts. The aim was to demonstrate the yield potential of various technologies and stimulate demand. Specifically, the demonstrations sought to identify yield gaps and compare the yields from the demonstration plots with those achieved through farmers' practices, as well as between the Nafis and Bombay red onion varieties.

Table: 1 Standards of demonstration plot

Parameters	**Demonstration Plot**
Seedling rate	32cm between row and 12 cm between plant
Sowing method	Line planting
Fertilizer doses	Top-dress using Urea (100kg /ha in 2 splits • 1stTop-dressing: 15-20 days after transplanting • 2ndTop-dressing: 30-40 days after transplanting
Plant protection measures	Need-based spray of insecticide and fungicides

During the study period, several extension activities were carried out, including orientation sessions, field visits, and field days, all designed to enhance the likelihood of farmer adoption. Each demonstration plot measured 10 m x 10 m, and a recommended package of practices was provided, which included Nafis and Bombay red onion varieties, integrated weed management, fertilizers, and plant protection measures. The spacing employed was 12cm between plants and 35cm between rows.

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The seeds were sown in a well-prepared bed for seedling production, with transplanting occurring two months later, from mid-July to the last week of July, and harvesting took place in November's first week. The demonstrations were regularly monitored from transplanting to harvesting, and yield data was collected from the entire plot. Statistical analysis software Stata was employed for pairwise comparisons. Additional analytical tools, including minimum, maximum, standard deviation, coefficients of variation, and yield advantage analysis, were used to assess the performance of the demonstrations.

$$\text{Yield advantage } \% = \frac{\text{Yield of BH549} - \text{Yield of BH546}}{\text{Yield of BH546}} \text{X } 100$$

3. RESULT AND DISCUSSION

3.1. Demonstration and comment toward onion varieties.

The pre-extension demonstration activity offers a valuable opportunity for local extension workers to learn about new onion varieties and share this knowledge with stakeholders to enhance agricultural practices. Various stakeholders participated in the onion showcase held in the villages, including farmers, development agents, district experts, researchers, and cooperative officials (Table 2). During the event, both farmers and stakeholders expressed their opinions on the demonstrated onion varieties. Extension workers, alongside farmers, benefited from the training provided during the demonstration. They gained practical experience with the new varieties and techniques, leading to increased awareness about the importance of using high-quality seeds, effective pest control, and other management practices.

This event also helped identify which onion varieties perform best in the specific soil and climatic conditions of the Chiro and Gemechis districts. The demonstration was well-received by local farmers, many of whom showed interest in adopting the new varieties. Farmers reported that the improved varieties are easier to manage, and they appreciate the higher yields, good bulb size, disease tolerance, and relatively better storability (Table 3).

Table 2: Field Day participants

		Chiro		
No	**Field Day Participant**	**Male**	**Female**	**Total**
1	Farmers	75	54	129
2	DAs	4	2	6
3	District Experts	6	1	7
4	Researchers	4	0	4
5	Cooperatives	1	0	1
	Total	**90**	**58**	**148**

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Table 3: Farmers' feedback on the demonstrated varieties**.**

Variety	Strengths	Weakness
Nafis	-Production capabilities are good	-Diseases become more prevalent when there is an increase in rainfall and colder conditions.
	-good bulb size,	
	-strong resistance to moisture stress	
	-good storability.	
Red Bombay	-Good in bulb color	- Diseases become more prevalent when there is an increase in rainfall and colder conditions
	-Good in moisture stress resistance	
	-Good in bulb size	

3.2. Performances of Demonstrations

By demonstrating high-yielding and disease-tolerant onion varieties, farmers can adopt practices that improve both productivity and sustainability in onion farming. The Nafis variety outperformed the red Bombay variety, with a mean yield of 275.51 quintals per hectare (qt/ha) in the demonstration plot, compared to 240 qt/ha under conventional farmers' conditions. This indicates that improved technologies can enhance harvests (see Table 4). Conversely, the red Bombay variety had a mean yield of 249.63 qt/ha in the demonstration plot versus 206.63 qt/ha under farmers' practices (see Table 4). The farmers' methods involved an unclear seed rate, lacked line planting, and did not specify the date or amount of fertilizer application. This finding further supports that modern practices can significantly increase onion production.

Table 4: Dependency of yield on variety and agricultural practices

	Yield Qt/ha			
Districts	**DPofN**	**FPofN**	**DPofRb**	**FPofRb**
Gemechis	287.5	240	256	184
	245.7	221	227	205
	211.4	198	200	189
	287.5	255	245	195
Chiro	276.5	243	252	215
	297	275	287	220
	298	217	245	215
	300.5	271	285	230
Min	**211.4**	**198**	**200**	**184**
Max	**300.5**	**275**	**287**	**230**
Mean	**275.5125**	**240**	**249.625**	**206.625**
Std. Dev.	**31.34907**	**26.92317**	**28.5654**	**16.15052**
CV%	**11.37846**	**11.21799**	**11.44332**	**7.816344**

Note: - DPofN= Nafis (demonstration plots), Bombay rad (demonstration plots), Nafis (Farmer practice) and Bombay rad (Farmer practice)

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Overall, Nafis shows a 10.4% yield advantage over red Bombay and a 14.79 % advantage over farmers' plots. Statistical analyses indicate that, except for Nafis under farmers' conditions and red Bombay in the demonstration plot, other treatments showed significant yield differences at a probability level of less than 1%. This result is supported by (Miruts, F., Beshir, B., & Ejersa, G. 2021). Moreover, Nafis yields 275.51 qt/ha, surpassing red Bombay's 249.63 qt/ha. Its favorable traits higher yield, bulb size, disease tolerance, and better storability make it also the preferred choice for onion farmers (Table 3).

Table 5: Pair-wise compactions of varieties and agricultural practices

		Tukey	
Variety	**Contrast**	**t**	**P> | t |**
DPofN vs. FPofN	-67.525	-7.71	0.000
DPofN vs. DPofRb	-55.025	-6.28	0.000
DPofN vs. FPofRb	-111.4	-12.71	0.000
FPofN vs. DPofRb	-12.5	1.43	0.494
FPofN vs. FPofRb	43.875	-5.01	0.000
DPofRb vs. FPofRb	56.375	-6.43	0.000

Note: - DPofN= Nafis (demonstration plots), Bombay rad (demonstration plots), Nafis (Farmer practice) and Bombay rad (Farmer practice)

4. CONCLUSION AND RECOMMENDATION

This research in the Chiro and Gemechis districts of the West Hararghe Zone in Oromia demonstrated the potential of improved onion varieties to enhance production. Among the two evaluated varieties, Nafis consistently outperformed Red Bombay. Farmers preferred Nafis for its higher yields, better disease tolerance, improved quality, and marketability, leading to increased income and better livelihoods. It is recommended that Nafis be promoted for cluster farming in this region and similar areas. The findings suggest that with proper support, adopting improved onion varieties can enhance food security and agricultural development. However, success will depend on addressing challenges like limited access to improved seeds and providing additional training for farmers.

Conflict of interest

The author has declared no conflict of interest. The author thanks the Ethiopian Institute of Agricultural Research (EIAR) for funding this project. The author also sincerely appreciates the Chiro National Sorghum Research and Training Center for providing all necessary input facilities.

5. REFERENCE

Aragie, E., Alemayehu, M., & Abate, A. (2023). Influences of seedling age and variety on the growth and bulb yield of onion in northwest Ethiopia. International Journal of Agronomy, 2023(1), 9132446.

Alemu, D., Deressa, A., Desalegne, L., & Anchala, C. (2004). Domestic vegetable seed production and marketing. *Research Report (Ethiopia)*, (57).

Desalegne, L., & Aklilu, S. (2003). Research experiences in onion production. West Hararghe office of Agriculture and Natural resource Annual Report (WHAO, 2021).

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Economic Intelligence Unit, (2021) Onion Market Opportunities- Market Dynamics. Ministry for Primary Industries; New Zealand

Ergicho, G. F., & Hogago, T. W. (2023). Participatory variety evaluation and selection of improved onion (Allium cepa L.) varieties for bulb yield under supplementary irrigation condition at Basketo Special District, Southern

Ethiopia. *International Journal of Science and Research Archive*, *9*(1), 186-193.

Fekadu, M., & Dandena, G. (2006). Review of the status of vegetable crops production and marketing in Ethiopia. *Uganda Journal of agricultural sciences*, *12*(2), 26-30.

Miruts, F., Beshir, B., & Ejersa, G. (2021). Farmer preferred and financially feasible onion varieties for scaling: evidence from the central rift valley in Ethiopia. *Ethiopian Journal of Agricultural Sciences*, *31*(4), 45-56.

Yeshiwas, Y., Alemayehu, M., & Adgo, E. (2023). The rise and fall of onion production; its multiple constraints on pre-harvest and post-harvest management issues along the supply chain in northwest Ethiopia. *Heliyon*, *9*(5).