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# Assessing the Yield Performance of Improved and Local Potato (solanum tuberosum l.) Cultivars Grown in Eastern Ethiopia

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**Abstract**
Potato is an important cash and food security crop in Eastern Ethiopia. However, the yield of the crop is very low due to a number of constraints. Cultivation of low yielding local cultivars is one of the constraints. Therefore, field experiments were conducted at Haramaya and Hirna with the objective of assessing the yield performances of local (farmers') and improved potato cultivars during the main cropping season of 2011. The treatments consisted of five released cultivars (Badhasa, Chala, Chiro, Gabbisa, Zemen) and four local (farmers') potato cultivars (Batte, Daddafa, Jarso, Mashenadima). The experiment was laid out as a Randomized Complete Block Design with three replications. The highest total tuber yield was produced by cultivar Badhasa (37.39 t/ha) while the lowest by Mashenadima (19.46 t/ha) at Hirna. In case of tuber number, Jarso produced (24.37) highest tubers per hill and Mashenadima (7.04) least tubers per hill. Minimum average tuber weight was produced by cultivar Jarso (31.37 g) and maximum by Mashenadima (88.93 g). Zemen at Haramaya had higher (86.60%) harvest index and least was obtained from Daddafa (70.10%) at Hirna.
**Keywords:** potato (*solanum tuberosum* l.), yield Performance, Improved, local, Ethiopia

## Introduction

Potato (*Solanum tuberosum* L.) is one of the most important food crops in many countries of the world. In volume of production, it is the fourth most important crop after wheat, maize and rice with annual production of 314.1 million tonnes cultivated on about 18.1 million hectares of land (FAOSTAT, 2010). It is a major part of the diet of half a billion consumers in the developing countries (Mondal, 2003). Potato is an important food and cash crop in Eastern and Central Africa, playing a major role in national food security and nutrition, poverty alleviation and income generation, and; provides employment in the production, processing and marketing sub-sectors (Lung'aho *et al*., 2007).

The low acreage and productivity of potato in Ethiopia are attributed to many factors. The major ones are lack of well adapted and high-yielding cultivars, unavailability and high cost of seed tubers, inappropriate agronomic practices, and lack of marketing and suitable post-harvest management facilities, pests and disease (Berga *et al*., 1994; Tekalign, 2005; Endale *et al*., 2008; Gildemacher *et al*., 2009).

In Eastern Ethiopia, improving and maintaining potato cultivars with high yield and market values is limited by lack of knowledge on the diversity of the local as well as the improved cultivars. This is because; the local cultivars are not well studied as that of the improved ones, which need studying both cultivars for better documentation. Moreover, considerable variations exist in local naming or identification of the cultivars. There is information that each agro-ecological zone has its own unique set of names for different cultivars and duplicate or different names may have been given for the same cultivar. This diverse system of naming cultivars not only limits the proper identity of the cultivar but also hinders monitoring and follow-up of the released improved cultivars. Therefore, documented information on the cultivated potato cultivars is vital for advancing improvement work on the crops.

However, to date, no systematic studies have been done to investigate and document the similarities and differences yield performances among the local and improved potato cultivars grown in the Eastern Ethiopia. Therefore, this study was initiated with the objective of assessing the yield performances of the major local and improved cultivars of potato grown in Eastern Ethiopia.

## Materials and Methods

### *Description of the study area*

The study were carried out at Rare, Horticulture section's research field, Haramaya University and Hirna research site of the University under rainfed condition during the 2011 main growing season. Rare research site is located at 9 o26' N latitude, 42 o3' E longitudes at an altitude of 1980 m.a.s.l. The mean annual rainfall is 760 mm (Belay *et al*., 1998). Mean annual temprature16 °C (Mishra *et al*., 2004). The mean relative humidity is 50%, varying from 20 to 81%. The soil of the experimental site is alluvial type with organic carbon content of 1.15%, total Nitrogen content of 0.11%, available Phosphorus content of 18.2 mg kg soil$^{-1}$, exchangeable Potassium content of 0.65 cmol$_c$ kg soil$^{-1}$, pH of 8.0 and per cent sand, silt and clay content of 62.92, 19.64 and 17.44, respectively (Simret, 2010).

Hirna sub-station is located at 9 $^{o}$12’ N latitude, 41 $^{o}$4’ E longitudes at an altitude of 1870 m. a.s.l. The area receives mean annual rainfall of 990 to 1010 mm with an average temperature of 24 $^{o}$C (HURC, 1996). The soil of Hirna is vertisol with organic carbon content of 1.75%, total Nitrogen content of 0.18%, available Phosphorus content of 32 mg kg soil$^{-1}$, exchangeable Potassium content of 0.68 cmol$_c$ kg soil$^{-1}$, pH of 7.09 and percent sand, silt and clay contents of 27, 28 and 45, respectively (Nebret, 2011).

***Description of Experimental Material***

Five potato cultivars, which were released by Haramaya University at different times and four locally available potato cultivars were used for the experiment (Table 1).

Table 1. Potato cultivars used in the study, year of release and their sources.

| **Variety** | **Year of release** | **Source of planting material** |
|---|---|---|
| Chiro | 1998 | HUPIP |
| Zemen | 2001 | HUPIP |
| Badhasa | 2001 | HUPIP |
| Gabbisa | 2005 | HUPIP |
| Chala | 2005 | HUPIP |
| Source (MoARD, 2010) | | |
| Batte | Local | RHSPC |
| Mashenadima | Local | RHSPC |
| Jarso | Local | RHSPC |
| Daddafa | Local | RHSPC |

Key: HUPIP = Haramaya University Potato Improvement Programme
RHSPC = Rare Hora Seed Producers’ Cooperative

***Treatments and Experimental Design***

The treatments are nine consisting of five improved cultivars (Chala, Chiro, Badhasa, Gabbisa and Zemen) and four local cultivars (Batte, Mashenadima, Jarso and Daddafa). The experiment was laid out as a Randomized Complete Block Design (RCBD) and replicated three times. Each plot was 3.60 m x 4.50 m = 16.2 m$^2$ wide consisting of six rows, which accommodated twelve plants per row and thus 72 plants per plot. The spacing between plots and adjacent replication were 1 m and 1.5 m, respectively. There was a total of 669.3 m$^2$ area for experimental site.

***Experimental Procedures***

The experimental field was cultivated by a tractor to a depth of 25-30 cm and levelled and ridges were made by hand. Medium sized (39-75 g) Lung’aho *et al*., (2007) and well sprouted tubers were planted at the sides of ridges at the spacing of 75 cm between ridges and 30 cm between tubers. Planting depth was maintained at 5 cm (Mahmood *et al.,* 2001). Phosphorus fertilizer at the rate of 92 kg $P_2O_5$ ha$^{-1}$ in the form of Diammonium Phosphate (200 kg ha$^{-1}$) was used and the whole rate was applied at planting. 75 kg Nitrogen ha$^{-1}$ was applied in the form of urea in two splits, half rate after full emergence (two weeks after planting) and half rate at the initiation of tubers (start of flowering). Potato plants were treated with Mancozeb 80% WP at the rate of 1.5 kg ha$^{-1}$diluted at the rate of 40 g per 20 litre water once a week to control late blight disease.

**Plant Data Collection and Analysis**

Post harvest observations and measurement were taken from randomly selected plants from each plot for all characters studied. Data were subjected to analysis of variance (ANOVA) using the General Linear Model of the SAS statistical package (SAS, 2007) version 9.1. All significant pairs of treatment means were compared using the Least Significant Difference Test (LSD) at 5% and 1% level of significance.

**Results and Discussion**

**Total tuber yields**

Yield is a prime trait which helps in selection of any new cultivars because farmers are more concerned with this trait more than the quality traits. The main effects of both cultivar and location highly significantly ($P < 0.01$) influenced both marketable and total tuber yields. The main effect of location did not significantly influence unmarketable tuber yield. However, cultivar and location interacted to highly significantly ($P < 0.01$) influence marketable, unmarketable and total tuber yields.

The cultivars significantly differed in the ability to produce tuber yields at both locations. Thus, the highest total tuber yields were obtained for Chiro (32.81 t ha$^{-1}$) and Daddafa (31.53 t ha$^{-1}$) at Haramaya, which were in statistical parity. The lowest total tuber yield was obtained for Mashenadima (19.46 t $ha^{-1}$) at Haramaya. Thus, at Haramaya, the total tuber yield obtained from Chiro significantly exceeded the total tuber yields obtained from Mashenadima, Jarso, Chala, Batte, Gabbisa, Zemen, Badhasa and Daddafa by additional increments of about 69,51,43,41,15,10,8 and 4%, respectively (Table 2).

At Hirna, the highest total tuber yields were recorded for Badhasa (37.39 t $ha^{-1}$), Chiro (36.57 t $ha^{-1}$), Zemen (34.19 t $ha^{-1}$) and Batte (33.13 t $ha^{-1}$). The four cultivars produced total tuber yields that were in statistical parity with each other as well as with the total tuber yields obtained for Chiro at Haramaya. At this location, Badhasa produced total tuber yields that significantly exceeded the total tuber yields recorded for Jarso, Daddafa, Chala, Mashenadima and Gabbisa by about 50, 46, 35, 28, and 20%, respectively (Table 2).

The results revealed that most of the cultivars differed in yielding ability across the two locations. However, Chiro produced significantly higher total tuber yields at both locations, indicating its high yielding potential as well as yield stability at both locations. The total tuber yields obtained from Gabbisa, Chala and Zemen, although being significantly lower than those obtained from Chiro, remained stable across the two locations. Mashenadima and Badhasa yielded significantly better at Hirna than at Haramaya, with extra total tuber yield advantages of about 50 and 24%, respectively. However, only one cultivar, namely, Daddafa yielded significantly better at Haramaya than at Hirna, with a relative yield advantage amounting to about 34% (Table 2). The results of this study are in accord with those of Wiersema and Cabello (2002) and Tekalign and Hammes (2005) who reported that different potato cultivars varied with respect to total tuber yields.

**Marketable tuber yields**

Similar to the differences observed in total tuber yields, the cultivars also differed in marketable tuber yields across the two locations (Table 2). The highest marketable tuber yields were recorded for Chiro (30.95 t $ha^{-1}$), Zemen (30.49 t $ha^{-1}$), Badhasa (28.49 t ha-1) and Batte (26.49 t $ha^{-1}$) at Hirna, closely followed by the marketable tuber yields of Chiro, Daddafa, Zemen and Badhasa cultivars at Haramaya. The proportion of marketable tuber yields of the four cultivars viz., Chiro, Daddafa, Zemen and Badhasa to their total tuber yields at Hirna amounted to as high as 85, 89, 76 and 80 %, respectively. This shows that the four cultivars produced more healthy and unblemished tubers than the others. The lowest marketable tuber yields were recorded for Chala, Mashenadima, Batte and Jarso at Haramaya and for Chala at both locations, which amounted to only 51, 62, 45, 74 and 43% of their corresponding total tuber yields, respectively. The higher marketable yields of the other cultivars were indicator of freedom of the tubers from diseases and physical blemishes.

**Unmarketable tuber yields**

The cultivars significantly differed also in the unmarketable tuber yields. The highest unmarketable tuber yields were recorded for the cultivar Chala at both Hirna (15.77 t $ha^{-1}$) and Haramaya (11.38 t $ha^{-1}$) (Table 2) whereas the lowest was recorded for the cultivars Zemen, Daddafa, Jarso and Chiro at Hirna, and Jarso at Haramaya. Chala produced the highest amount of unmarketable tuber yield. The highest unmarketable tuber weight of Chala could be attributed to the bacterial wilt disease (*Ralstonia solanacearum*), which infected the cultivar at both locations. The disease led to rotting of tubers thereby drastically reducing their yield. These bacterial wilt is a devastating disease of potato infecting and reducing tuber marketability drastically was described also by (Lung'aho *et al*, 2007).

The cultivars that produced low yields such as Mashenadima, Jarso and Batte at Haramaya and Jarso, Daddafa and Mashenadima at Hirna were because these local cultivars were vulnerable to biotic environmental stresses particularly the late blight disease. However, Daddafa at Haramaya and Batte at Hirna performed relatively well. Corroborating this suggestion, Kidane-Mariam (1980) stated that local potato are generally low yielders and are susceptible to diseases and pests. Bekele and Hailu (2001) also stated that late blight caused by *Phytophthora infestans* is the most serious fungal disease of potato causing huge losses in yield. Therefore, application of proper management practices to enhance vigorous early growth is very important to achieve higher tuber yield from potato under these types of environment al conditions (Fotiveark, 1999; Caliskan *et al*., 2004).

 

Table 2. The interaction effect of cultivars and location on marketable, unmarketable and total tuber yield of potato cultivars.

| Location | Cultivar | Marketable | Unmarketable | Total Tuber yield (t/ha) |
|---|---|---|---|---|
| Haramaya | Badhasa | 20.65$^{c-f}$ | 9.60$^{bcd}$ | 30.25$^{cde}$ |
| | Batte | 14.80$^{fg}$ | 8.49$^{def}$ | 23.29$^{f-i}$ |
| | Chala | 11.61$^{g}$ | 11.38$^{bc}$ | 22.99$^{ghi}$ |
| | Jarso | 16.19$^{efg}$ | 5.59$^{gh}$ | 21.78$^{hi}$ |
| | Chiro | 24.76$^{bcd}$ | 8.05$^{def}$ | 32.81$^{a-d}$ |
| | Mashenadima | 12.13$^{g}$ | 7.33$^{efg}$ | 19.46$^{i}$ |
| | Zemen | 21.34$^{cde}$ | 8.61$^{def}$ | 29.95$^{cde}$ |
| | Daddafa | 22.34$^{cd}$ | 9.19$^{cde}$ | 31.53$^{bcd}$ |
| | Gabbisa | 20.58$^{c-f}$ | 8.03$^{def}$ | 28.61$^{def}$ |
| Hirna | Badhasa | 28.49$^{ab}$ | 8.90$^{cde}$ | 37.39$^{a}$ |
| | Batte | 26.49$^{abc}$ | 6.64$^{fg}$ | 33.13$^{a-d}$ |
| | Chala | 11.91$^{g}$ | 15.77$^{a}$ | 27.68$^{d-g}$ |
| | Jarso | 19.31$^{def}$ | 5.62$^{gh}$ | 24.93$^{e-i}$ |
| | Chiro | 30.95$^{a}$ | 5.62$^{gh}$ | 36.57$^{ab}$ |
| | Mashenadima | 19.75$^{def}$ | 9.46$^{bcd}$ | 29.21$^{cde}$ |
| | Zemen | 30.49$^{ab}$ | 3.70$^{h}$ | 34.19$^{abc}$ |
| | Daddafa | 20.22 $^{def}$ | 5.32$^{gh}$ | 25.54$^{e-h}$ |
| | Gabbisa | 20.30$^{def}$ | 10.84$^{bc}$ | 31.14$^{bcd}$ |
| LSD (0.05) | | 6.07 | 2.08 | 5.49 |
| F-test | | ** | ** | ** |
| CV (%) | | 17.67 | 15.25 | 11.44 |

Treatment means followed by the same letter within a column are not significantly different. ** = significant at 1% probability level.

**Tuber number**
Marketable and total tuber numbers per hill were highly significantly influenced by the main effects of cultivar and location as well as by the interaction of the two factors. However, unmarketable tuber number per hill was influenced only by the main effect of cultivar and the interaction effect of cultivar and location.

**Total tuber number**
The cultivar Jarso (24.37) produced the highest total tuber number per hill at closely followed by Daddafa, Badhasa, Batte at Hirna and Jarso itself at Haramaya. The total tuber number produced by Jarso at Hirna significantly exceeded the total tuber numbers produced by Badhasa and Daddafa at the same location by about 37 and 36%, respectively. Mashenadima (7.04) at Haramaya produced the least tuber number and was exceeded the total tuber number produced by Jarso by about 187%. This shows that the cultivars markedly differ in the number of tubers they produce. The total tuber numbers produced by each of the cultivars at the two locations were in statistical parity. However, Batte, Gabbisa and Jarso produced significantly higher tuber number per hill at Hirna than at Haramaya (Table 3). This shows that the environment in which cultivar grow may also influence the number of tuber produced per hill. The results of this study are corroborated by the observation of Subarta and Upadhya (1997) that genetic and environmental factors play a vital role in stolon development and tuberization process. Yibekal (1998) also observed a significant difference in total tuber numbers produced between the improved cultivar Al-624 and the local check. Similarly, Allen (1978) also reported that the number of tubers set by plants was determined by stem density, variety, crop management and season.

**Marketable tuber number**
The cultivars significantly differed in marketable tuber numbers produced per hill. The highest marketable tuber numbers were recorded for Jarso (13.88), Chiro (13.18), Batte (11.91), Badhasa (11.43), Zemen (10.99) and Daddafa (9.88) at Hirna, closely followed by the marketable tuber numbers of Jarso and Daddafa at Haramaya. The lowest marketable tuber number was recorded for Chala (3.47) and Mashenadima (3.73) at Haramaya (Table 3). This shows that cultivars Jarso, Chiro, Batte, Badhasa, Zemen and Daddafa at Hirna were prolific and produced significantly higher, healthier and unblemished tuber numbers than the rest of the cultivars. Except Chala and Mashenadima, which produced marketable tuber numbers, which were in statistical parity at both locations, all other cultivars produced significantly higher marketable tuber numbers at Hirna than at Haramaya. This shows that Hirna is a more conducive environment for profitable potato production during the meher season.

**Unmarketable tuber number**

Similar to the differences observed in total tuber number and marketable tuber number, the cultivars also differed in unmarketable tuber numbers at both locations (Table 3).The highest unmarketable tuber number were recorded for cultivar Jarso(10.49) at Hirna and Badhasa (9.42) at Haramaya. However, the lowest unmarketable tuber number was recorded for cultivar Zemen (2.92) and Chiro (3.71) at Hirna closely followed by Mashenadima (farmers' cultivar) at Haramaya and Hirna, respectively.

Across the two locations, some cultivars produced significantly higher unmarketable tubers at Hirna than at Haramaya (Batte and Jarso). Others produced higher unmarketable tubers at Haramaya than at Hirna (Badhasa, Chiro and Zemen). The remaining cultivars all produced tuber numbers that were in statistical parity at both locations (Table 3).

This result indicates that number of tubers initiated by a particular cultivar could be influenced by the growing condition as well as the cultivars' inherent traits. Consistent with this suggestion, Subarta and Upadhya (1997) reported that genetic and environmental factors play a vital role in stolon development and tuberization process. The highest unmarketable and total tuber number of Jarso could be related to late blight disease because of the inherent vulnerability of the cultivar to the disease. Consistent with this suggestion, Bekele and Hailu (2001) stated that Late blight is the major destructive and the most serious fungal disease of potato that affects tuber production

Table 3. The interaction effect of cultivar and location on marketable, unmarketable, total tuber number and Harvest index of potato cultivars.

| | | Tuber number per hill | | | |
|---|---|---|---|---|---|
| Location | Cultivar | Marketable | Unmarketable | Total | Harvest index(% |
| Haramaya | Badhasa | $6.37^{ij}$ | $9.42^{ab}$ | $15.79^{b-e}$ | $75.86^{hig}$ |
| | Batte | $7.03^{ghi}$ | $3.35^{gh}$ | $10.38^{hi}$ | $73.34^{hij}$ |
| | Chala | $3.47^{k}$ | $7.13^{cd}$ | $10.60^{hi}$ | $76.84^{f-i}$ |
| | Jarso | $9.74^{def}$ | $7.10^{cd}$ | $16.84^{bcd}$ | $77.63^{e-h}$ |
| | Chiro | $8.60^{fgh}$ | $5.93^{de}$ | $14.53^{def}$ | $81.35^{b-f}$ |
| | Mashenadima | $3.73^{k}$ | $3.31^{fgh}$ | $7.04^{j}$ | $72.54^{ij}$ |
| | Zemen | $6.70^{hij}$ | 7.06cd | $13.76^{efg}$ | $86.60^{a}$ |
| | Daddafa | $8.87^{efg}$ | $7.03^{cd}$ | $15.90^{b-e}$ | $75.97^{hij}$ |
| | Gabbisa | $6.75^{g-j}$ | $4.88^{efg}$ | $11.63^{gh}$ | $83.32^{a-d}$ |
| Hirna | Badhasa | $11.43^{bcd}$ | $6.31^{cde}$ | $17.74^{bc}$ | $82.06^{a-e}$ |
| | Batte | $11.91^{abc}$ | $5.27^{def}$ | $17.18^{bcd}$ | $79.55^{c-g}$ |
| | Chala | $4.79^{kj}$ | $8.06^{bc}$ | $12.85^{fgh}$ | $78.44^{d-g}$ |
| | Jarso | $13.88^{a}$ | $10.49^{a}$ | $24.37^{a}$ | $84.57^{ab}$ |
| | Chiro | $13.18^{ab}$ | $3.71^{fgh}$ | $16.89^{bcd}$ | $84.34^{abc}$ |
| | Mashenadima | $3.75^{k}$ | $4.50^{e-h}$ | $8.25^{ij}$ | $78.37^{efg}$ |
| | Zemen | $10.99^{cde}$ | $2.92^{h}$ | $13.91^{efg}$ | $79.48^{c-g}$ |
| | Daddafa | $9.88^{c-f}$ | $8.09^{bc}$ | $17.97^{b}$ | $70.10^{j}$ |
| | Gabbisa | $8.84^{fg}$ | $6.16^{de}$ | $15.00^{c-f}$ | $85.72^{ab}$ |
| LSD(0.05) | | 2.14 | 1.87 | 2.85 | 4.90 |
| F-test | | ** | ** | ** | ** |
| CV (%) | | 15.46 | 18.31 | 11.87 | 3.73 |

Treatment means followed by the same letter within a column are not significantly different. ** = significant at 1% probability level.

**Harvest index**

The main as well as the interaction effects of location and cultivars significantly ($P < 0.01$) influenced harvest index. Zemen (86.60%) at Haramaya followed by Gabbisa, Jarso, Chiro and Badhasa at Hirna produced higher harvest indices that were similar and in statistical parity. The lowest harvest index was recorded for Daddafa (70.10%) at Hirna. On average, cultivar Zemen at Haramaya exceeded cultivar Daddafa by about 24%(table 3). As Radford, (1967) suggested this characterizes the allocation of dry matter to the economic part of the plant. The variations observed among the cultivars in harvest index may be attributed to their inherent genetic differences as well as the growing locations, which is evident from the significant interaction effect.

Table 4.The main effect of cultivars and location on average tuber mass.

| | Average tuber mass (g/tuber) |
|---|---|
| Location | |
| Haramaya | 69.53[a] |
| Hirna | 47.97[b] |
| LSD(0.05) | 6.28 |
| F-test | ** |
| Cultivars | |
| Badhasa | 55.43[b] |
| Batte | 58.87[b] |
| Chala | 63.40[b] |
| Jarso | 31.37[c] |
| Chiro | 57.95[b] |
| Mashenadima | 88.93[a] |
| Zemen | 60.85[b] |
| Daddafa | 50.67[b] |
| Gabbisa | 61.32[b] |
| LSD(0.05) | 13.29 |
| F-test | ** |
| CV (%) | 19.3 |

**Average tuber weight**

The average tuber weight was highly significantly ($P < 0.01$) influenced by cultivar and location. However, this parameter was not significantly influenced by the interaction effect of cultivar and location. The cultivar Mashenadima (88.93g/tuber) had significantly higher average tuber weight than the average tuber weights of all other cultivars. On the other hand, Jarso (31.37 g/tuber) produced the least average tuber weight. The remaining cultivars had average tubers weights that were in statistical parity with each other (Table 4). The average tuber weight of Mashenadima exceeded the average tuber weights of Chala, Gabbisa, Zemen, Batte, Chiro, Badhasa, Daddafa and Jarso by additional increment of about 40, 44, 46, 51, 53, 60, 75 and 183%, in the order listed here (Table 4). The tuber weight of most of the cultivars was in the medium category. The results of this study are in accord with those of Berga *et al.* (1994) and Bereke (1994) who observed significant differences between varieties for average tuber weight.

The results also revealed that heavier tubers were generally produced at Haramaya whereas larger numbers were produced at Hirna, indicating that tuber weight and numbers are inversely related and also influenced by environmental factors. In line with this result, Boyd *et al.* (2002); Struik (2007); Eremeev *et al.* (2008) also stated that the greater the number of tubers per plant, the smaller the average tuber mass, and vice versa.

**Conclusion**

The highest mean total and marketable tuber yields of about 30 t $ha^{-1}$ and 25 t $ha^{-1}$ ,respectively over both locations were recorded for the improved cultivars released by the Haramaya University, namely, Badhasa, Chiro, Zemen and Gabbisa. Among the farmers' cultivars, it was only Daddafa that competed with the cultivars released by the Haramaya University in terms of yielding ability by producing about 27 t $ha^{-1}$ of total and about 21 t $ha^{-1}$ of marketable mean tuber yields at both locations. However, cultivar Batte performed comparatively well like Daddafa, but only at Hirna and not at Haramaya. These results clearly indicate that the cultivars released by Haramaya University performed far better than the majority of farmers' cultivars.

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