# Participatory Selection of Potato (Solanum tuberosum L.) Varieties in the Midland Areas of Guji zone, Southern Ethiopia

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**Abstract**

Irish Potato (Solanum tuberosum L.) is one of the most important food security and cash crop produced at different agro-ecologies of Guji Zone, Southern Ethiopia. However, in the midland areas of Guji zone an access of improved potato variety is highly limited. Due to this reason and other bottle neck factors, the potential of the area to potato crop is not exploited. So, there is an urgent need to develop and promote technologies that suit for the area. As a result, an experiment was conducted in the midland areas of Guji Zone (Dibayu, Kiltu sorsa, Gobicha and Dole) at four farmers' fields during 2019/20 cropping season to evaluate potato varieties with active participation of farmers and to identify and select adaptable, high yielding, and late blight tolerant potato variety (ies) for midland areas of Guji zone. Seven (7) improved potato varieties Gudanie, Chiro, Zemen, Bubu, Chala, Bedasa, and Gebisa were used as testing crop. The treatments were arranged in randomized completed block design (RCBD) with three replications for mother trial and farmers were used as replication for baby trials. Both agronomic and farmers data were collected based on the recommended standards. Data collected from mother trail were subjected to analysis of variance where as matrix ranking was used for data collected from baby trial. The analysis of variance indicated that significant differences observed at (P≤ 0.05) among the tested Irish potato varieties for stem number per hill, tuber number per hill, marketable and total tuber yield. However, non-significant difference was observed at (P> 0.05) among the varieties for days to 50% emergence and flowering, days to 90% maturity, plant height, tuber weight and unmarketable tuber yield. The highest marketable tuber yield was (41.32t/ha) was recorded for Zemen followed by Gudanie and Bubu (36.81 and 36.78 t/ha) respectively. But, the lowest marketable tuber yield 21.85t/ha was obtained from improved Gebisa variety. In other cases, farmers were allowed to evaluate the varieties using their own criteria. Accordingly, variety Zemen, Bubu and Gudanie were selected by farmers due to their best performance, high yielder, resistance to disease, number of tubers and marketability. Therefore, these three improved Irish potato varieties are selected based on agronomic data result and farmers preference and recommended for production to the midland areas of Guji zone.

**Keywords:** Improved variety, Irish Potato, participatory variety selection

## 1. INTRODUCTION

Potato (Solanum tuberosum L.) belonging to the family Solanaceae, is an important food and cash crop as an income sources globally (Fekadu et al., 2013).  It is an important tuber crop grown widely in humid tropics and used as source of carbohydrates for many people in tropical and sub-tropical areas of the world (Crissman et al., 1993). Potatoes are among the most widely-grown crop plants in the world, giving good yield under various soil and weather conditions (Lisinska and Leszcynski, 1989). It is the third most important food security crop in the world after rice and wheat (Haverkort et al., 2009).

The potential for high yield, early maturity, and excellent food value give the potato great potential for improving food security, increasing household income, and reducing poverty (Devauxe et al., 2014). Yields are typically three to five times higher in developed nations (Struik and Wiersema, 1999). Many factors contribute to the low yield, including drought (FAO, 2010), frost, hail, pests, diseases (Bekele and Eshetu, 2008), poor production practices and limited access to high quality seed (Hirpa et al., 2010).

So far, different potato varieties have been released and /or registered to satisfy the growing production demands of the farmers in the country. The crop particularly has potential for fertile and waste land where other crops could not survive, to help overcome food shortage (Gebremedhin et al., 2013).  In Ethiopia, potato production could fill the gap in food supply during the hunger months of July to August before the grain crops are being harvested.

Therefore, assessment of genotype × environment (including end use) interactions answers the adaptation to the environment and end users because, it is unlikely that one of many potential new cultivars would be best in all environments and for all uses Bradshaw et al. (2007). Although (Allard, 1960) described the biological complexity underlying genotype and environment. The entire variable encountered in producing a crop can be collectively called an environment, while every factor that is a part of the environment, has the potential to cause differential performance that is associated with genotype, genotype to environment interaction in potatoes

(Bradshaw et al., 2007).

The low productivity is attributed due to lack of well adapted varieties which is accepted by the farmers, unavailability and high cost of seed tubers, diseases and insect (Bereke, 1994; Gebremedhin et al., 2008 and Adane et al., 2010). This implies that the country has suitable environmental condition; the average national yield (14.176tha$^{-1}$) productivity of potato during 2018/19 season (CSA, 2019) is very low as compared with world average of 20tha-$^1$(FAOSTAT, 2019). The reason is  primarily  due  to lack  of  adaptable varieties for marginal  ecology  and  use  of  low  quality seed tubers for planting (Gildemacher et al., 2009). There are also many factors that can contribute directly or indirectly for low yield in Ethiopia, lack of improved technology, low attention to the crop, varieties that were released by different research centers for different agro-ecologies in the country and farmer's potato varieties in the country level is still unidentified.

In midland areas of Guji zone, an access of improved potato variety is highly limited to the available cultivars. In addition, potato yields varied depending on season, weather conditions, cultivar, and location in the study area. Farmers as well as Seed Producer Cooperative are highly demanding better yielding and late blight resistance varieties to maximize their product, and improve the livelihood of their families. Participatory varietal selection has been proposed as an option to the problem of fitting the crop to a multitude of both target environments and users 'preferences (Ceccarelli et al., 1996). Identifying farmers' needs; searching for suitable material to test with farmers; and experimentation on farmers' fields (Meaza, 2015).   In midland areas of Guji zone, there are no varieties under production still know. Adaptability of crops can vary from location to location depending on the agro-ecology of a particular area. Hence, it is essential to conduct location specific adaptation trial to identify suitable potato variety/varieties (Addis et al., 2017). Therefore, to evaluate different varieties of potato crop with active involvement of farmers' is important to increase the production and productivity of potato in study area. This research was conducted with the following objectives:-

- To evaluate potato varieties with active participation of farmers
- To increase farmers' awareness and their access to improved potato varieties that suit them better than existing cultivar and,
- To identify and select adaptable, high yielding, and late blight tolerant potato variety (ies) for mid-land agro ecologies of Guji zone.

## 2. MATERIALS AND METHODS

### 2.1. Description of the Experimental Site

The experiment was conducted in the midland areas of Guji Zone (Dibayu, Kiltu sorsa, Gobicha and Dole) at four farmers' field during 2019/20 cropping season to select and to evaluate potato varieties with active participation of farmers and to identify and select adaptable, high yielding, and late blight tolerant potato variety (ies) for midland agro-ecologies of Guji zone Adola district is located at about 470 to the south from Addis Abeba. Adola district is characterized by three agro-climatic zones, namely Dega (high land), Weina-dega (mid land) and Kola (low land) with different coverage. The mean annual rain fall and temperature of the district is about 900 mm and 12-34 0c respectively. Based on this condition two time cropping season was commonly practiced i.e Arfasa (main cropping season) which start from March to April especially for maize, haricot bean, Sweet potato and Irish potato. The second cropping season is called Gana (short cropping season) which was practiced as double cropping  using small size cereal crops like tef, potato and barley after harvesting the main cropping season crops. This study was also conducted during short cropping season in midland areas of Guji zone.

### 2.2. Treatments and Experimental design

About seven improved Irish potato varieties (Gudanie, Chiro, Zemen, Bubu, Chala, Bedasa and Gebisa) were used as testing crop. The varieties were brought from Holeta Agricultural Research Center and Haramaya University. The treatments were arranged in randomized completed block design with three replications for mother trial (planted at Dibayu on- farmer field) and three farmers were used as replication for baby trials. For this purpose, one farmer field was used as replication for baby trials in which selected farmer's plant materials in one replication and the other host farmers were planted the two non-replicated trials. At both trial sites, the materials were planted on a plot size of, 3 m length and 2.4 m width =7.2 m2 having 4 rows with 75 and 30 cm between rows and plants. In puts (seeds, fertilizers) and management practices were applied as recommended for Irish potato production. Data were collected in two ways: agronomic data and farmer's data. For agronomic data phenological, Growth, yield and its component were collected following their own principles and at vegetative and harvest stage of potato the training were given for the farmers, experts, and developmental agents.

Table 1. Description of experimental materials improved potato varieties for midland agro-ecologies of Guji zone

| No. | Variety | Breeder | Released year | Recommended Altitude (masl) |
|---|---|---|---|---|
| 1. | Gudanie | Holeta Research Centre | 2006 | 1600-2800 |
| 2. | Bubu | Haramaya University | 2011 | 1700-2000 |
| 3. | Bedasa | Haramaya University | 2001 | 1700-2000 |
| 4. | Chala | Haramaya University | 2004 | 1700-2000 |
| 5. | Zemen | Haramaya University | 2001 | 1700-2000 |
| 6. | Gabbisa | Haramaya University | 2005 | 1700-2000 |
| 7. | Chiro | Haramaya University | 1998 | 1700-2000 |

Source: MoANR (2017)

## 2.3. Field management

The experimental field was cultivated by using oxen to fine the soil before planting. Uniform and medium-sized (39-75g) tubers of the test variety with sprout lengths of 1.5 to 2.5 cm (Lung'aho et al., 2007) was planted on ridges with inter-and intra-row spacing of 75 cm and 30 cm, respectively. The recommend blended NPS and potassium fertilizer rates were applied at planting at the specified rates and placed in banded application methods and urea rates were split applied at planting the rate of (1/4 kg N ha$^{-1}$) and half (1/2 kg N ha$^{-1}$) at 15 days after emergence and one forth (1/4 kg Nha$^{-1}$) at mid-stage (at about and 30days) after emergence respectively. On the other hand, weed control were done timely by hoeing. The first, second and third earthling-up were done 15, 30, and 45 days after planting to prevent exposure of the tubers to direct sunlight, promote tuber bulking and ease of harvesting. Haulms were mowed two weeks before harvesting at physiological maturity for reducing skinning and bruising during harvesting and post-harvest handling.

## 2.4. Agronomic Data Collection

Agronomic data were collected from a net plot of two rows and selected plants of the plots. Collected agronomic data includes; Days to 50% emergence, Days to 90% maturity, stem number per hill, Plant height (cm), tuber number per hill, Marketable, Unmarketable and Total tuber yield were based on the recommended recording stage and methods.

## 2.5. Farmers Data Collection

Farmers' evaluation and selection criteria data were collected on plot basis from the three baby trials i.e., farmers were grouped around each host farmer of the trials. Farmer's evaluation criteria were employed viz. Resistant to disease, Stem number, Tuber size, Tuber color, Tuber number per hill, Tuber eye depth, Marketability, and high yielder. A rating scale of 1-5 was used for farmer's criteria. Rating of the performance of variety for a given criteria: 5= very good, 4= good, 3= average, 2= poor and 1= very poor.

## 2.6. Data Analysis

Field data were analyzed by using Genstat 18th edition software for the data following the standard procedures outlined by Gomez and Gomez (1984). Comparisons among the treatment means were done using Fisher's protected least significant difference (LSD) test at 5% level of significant. Farmers' data were subjected to analysis using simple ranking method and then ranked in accordance with the given value Walter et al. (2007).

## 3. RESULTS AND DISCUSSION

The analysis of variance (ANOVA) for tuber yield and other agronomic characters of seven (7) Irish potato varieties planted at Dibayu on-farm as mother trail is presented in (Table 2). The analysis of variance (ANOVA) indicated presence of significant differences at (P≤0.05 respectively among the evaluated Irish potato varieties for stem number per hill, tuber number per hill, marketable and total tuber yield. However, non-significant difference was observed among the varieties for days to 50% emergence and flowering, days to 90% maturity, plant height, tuber weight and unmarketable tuber yield.

### 3.1. Mean square

Table 2. Analysis of Variance for different agronomic parameters of different midland areas of potato Varieties from mother trial

| Source of variation | Mean square of potato variables | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | DE (days) | DF (days) | DM (days) | STN (no.) | PH (cm) | TN (no.) | Twt (g) | Myld (t ha-1) | Umyld (t ha-1) | Tyld (t ha-1) |
| Rep(2) | 12.19ns | 28.05ns | 15.48ns | 2.72** | 64.9ns | 7.69** | 98.7ns | 11.67* | 0.58ns | 7.88* |
| Varieties(5) | 4.83ns | 13ns | 24.19ns | 6.4** | 93.8ns | 18.13** | 239.6ns | 162.89* | 1.01ns | 152.67* |
| Error(10) | 5.47 | 9.88 | 14.48 | 0.52 | 263.6 | 3.43 | 139.4 | 53.26 | 1.43 | 44.81 |

** = highly significant at P ≤ 0.001; *= significant at P ≤ 0.05; ns = not significant at P> 0.05; a Numbers in parentheses are degrees of freedom associated with the corresponding source of variation; DE: Days to Emergence, DF: Days to Flowering, DM: Days to maturity, SN: Stem Number per hill, PH: plant height, TN: Tuber Number per hill, Tw: Tuber Weight, Myld: Marketable yield, Umyld: Unmarketable Yield, Tyld:  Total yield

### 3.2. Phenology and growth

The mean values for the seven (7) varieties are shown (Table 3). The variation with respect to days to flowering and days to maturity was ranged from 40 to 45.33 and 75.67 to 84 days respectively. Based on the study result, the longest days to flowering was revealed by Zemen and Bedasa (45.33days) followed by Gudanie (43 days). However, early flowering was recorded for varieties Chiro (40 days) followed by Bubu (41 days). In other cases, variety Chiro was early maturing variety (75.67days) followed by Gebisa (76.33days). Among the tested varieties, Zemen was late maturing with 84 days followed by Bedasa (79.33 days).

The mean values revealed that the highest stem number per hill was recorded by Gudanie variety (6.2) followed by variety Zemen (5.79) respectively. However, the lowest stem number per hill Chala variety (2.58) followed Chiro variety (3.37) respectively. This result is in line with De la Morena et al. (1994) who reported that the difference in number of number main stem among the varieties might be due to the inherent genotypic variation in the number of buds per tuber which is in turn influenced by the size of the tubers, physiological age of the seed, storage condition, and number of viable sprouts at planting, sprout damage at the time of planting and growing conditions. This result is consistent also with that of Zelalem et al., 2009) who reported that stem density, which is influenced by genetic makeup, increase tuber yield as stem density increases numbers of tubers, or size of tubers, or both. The longest plant height was exhibited by Gudanie variety (130.3cm) followed by Zemen variety (123.6cm).However, the shortest plant height was revealed by Chiro variety (114.4cm) followed by Bubu, Chala and Gebisa varieties (116.7) respectively (Table 3). These differences in plant height among the varieties may be caused by plant genetics and the quality of the plant material (Eaton et al., 2017).

Table 3. Mean Value of DE, DF, DM, PH and STN of potato PVS from mother trial in midland areas of Guji zone, during 2019

| Varieties | Phenology and growth variables | | | | |
|---|---|---|---|---|---|
| | DE(days) | DF(days) | DM(days) | STN(no.) | PH(cm) |
| Zemen | 15 | 45.33 | 84a | 5.79a | 123.6 |
| Bubu | 15 | 41 | 77.33ab | 5.06a | 116.7 |
| Gudanie | 15 | 43 | 77ab | 6.2a | 130.3 |
| Bedasa | 15.33 | 45.33 | 79.33ab | 2.86b | 120.3 |
| Chala | 17.33 | 42.67 | 77ab | 2.58b | 116.7 |
| Chiro | 18 | 40 | 75.67b | 3.37b | 114.4 |
| Gebisa | 16.67 | 41.33 | 76.33b | 5.08a | 116.7 |
| Lsd (0.05) | 4.16 | 5.59 | 6.77 | 1.28 | 28.88 |
| Cv% | 14.6 | 7.4 | 4.9 | 16.3 | 13.4 |
| P-Value | 0.54 | 0.32 | 0.21 | 0.001 | 0.89 |

Mean values sharing the same letter in each column for each factor have no-significant difference at 5% probability according to Fisher's protected test at 5% level of significance; CV (%) = Coefficient of variation, LSD (5%) = Least significant difference at 5% probability.

### 3.3. Yield and yield components

Based on agronomic data result indicate that the highest tuber number per hill was recorded from Zemen variety (14.5) followed Chala variety (13.94) where as the lowest tuber number per hill from Gebisa variety (7.91). The highest tuber weight was recorded from Bubu variety (77.72g) followed Zemen variety (74.84g) where as the lowest tuber weight from Chiro variety (53.10g) and followed Chala variety (57.79g) respectively. Variation among different varieties in the weight of tubers per plant may be due to the genetics, management practices, the

seed quality, or the agro-ecological conditions of the experimental sites (Eaton et al. 2017). Significant variations were revealed among potato varieties number and weight of tubers per plant (Addis et al., 2017).

The highest marketable tuber yield were obtained from Zemen (41.31 tha-1) followed by Gudanie (36.81tha-1) and Bubu (36.78 tha-1) respectively whereas the lowest marketable tuber yield Gebisa (21.85t/ha) and Chiro (22.52 t/ha) varieties were recorded respectively. The marketable yield is some very important criteria to select potato clones for high yield (De Haan et al., 2014).The highest unmarketable tuber yield were obtained from Badesa variety (4.09 tha-1) followed by Chiro variety (3.56 tha-1) respectively whereas the lowest unmarketable tuber yield Gudanie variety (2.44tha-1) followed by Zemen variety (2.63 tha-1) was recorded respectively. In other cases, the highest total tuber yield were obtained from Zemen variety (43.95 tha _1) followed by Bubu variety (39.64 tha ) respectively whereas the lowest total tuber yield Gebisa variety (24.69tha-1) followed by Chiro variety (26.1 tha-1) was recorded respectively (Table 4). Thus, the yield differences between these varieties may be related to their genetic makeup in the efficient utilization of inputs like nutrient as reported by (Tisdale et al., 1995). Similar tuber yield variation results were reported on potato by Seifu and Betewulign( 2017). Significant variations were revealed among potato varieties for no marketable and marketable tuber yields (Addis et al., 2017). Tapiwa (2016) reported a significant difference in the yields due to genetic makeup of potato varieties.

Table 4. Mean Value of TN, TW, Myld, UMyld and Tyld of potato PVS from mother trial in midland areas of Guji zone, during 2019

| Varieties | Yield and yield components variables | | | | |
|---|---|---|---|---|---|
| | TN(no.) | Twt (g) | Myld (t ha-1) | Umyld (t ha-1) | Tyld (t ha-1) |
| Zemen | 14.5a | 74.84ab | 41.32a | 2.63a | 43.95a |
| Bubu | 11.39ab | 77.72a | 36.78a | 2.86a | 39.64a |
| Gudanie | 12.61a | 70.46ab | 36.81a | 2.44a | 39.25 |
| Bedasa | 12.39ab | 64.83ab | 31.38ab | 4.09a | 35.47ab |
| Chala | 13.94a | 57.79ab | 31.88ab | 3.31a | 35.19ab |
| Chiro | 8.94bc | 53.10b | 22.52b | 3.56a | 26.1bc |
| Gebisa | 7.91c | 63.06ab | 21.85b | 2.84a | 24.69c |
| Lsd (0.05) | 3.29 | 21.01 | 12.98 | 2.13 | 11.91 |
| Cv% | 11.94 | 17.9 | 23.0 | 38.6 | 19.2 |
| P-Value | 0.007 | 0.2 | 0.047 | 0.66 | 0.034 |

Mean values sharing the same letter in each column for each factor have no-significant difference at 5% probability according to Fisher's protected test at 5% level of significance; CV (%) = Coefficient of variation, LSD (5%) = Least significant difference at 5% probability.

### 3.4. Farmer's variety selection criteria's

In variety selection farmers have a broad knowledge based on their environments, crops and cropping systems built up over many years and do experiments by their own and generate innovations, even though they lack control treatment for comparison and statistical tools to test the hypothesis. Based on this concept, farmers were informed to set criteria for selecting best Irish potato variety according to their area before undertaking varietal selection. This was done by making group discussion among the farmers which comprises elders, women and men. After setting the criteria they were informed to prioritize the criteria according to their interest. By doing this, farmers were allowed to select varieties by giving their own value.

Accordingly, resistant to disease, stem number per hill, tuber size, tuber color, tuber number per hill, tuber eye depth, marketability, and high yielder. Based on set criteria, the evaluated varieties were revealed various values by the evaluators (farmers). With this regard, farmers selected/ranked the varieties Zemen (1st), Bubu (2nd) and Gudanie (3rd) were showed better performance resistant to disease, highest stem number per hill, marketable tuber size, attractive tuber color, highest tuber number per hill, low tuber eye depth, good for marketability, and highest yielder. However, farmers ranked least Chiro (7th) and Chala (6th) potato varieties respectively (Table 5). This suggestion is in agreement with that of Witcombe et al. (1996) who report participatory variety selection can effectively be used to identify farmer-acceptable varieties and thereby overcome the constraints that cause farmers to grow old or obsolete varieties. This suggestion is consistent also with that of Chambers (1989) who reported that identification of suitable improved, released cultivars to provide a large 'basket of choices' to farmers. On the other hand, Witcombe et al. (2008) reported that PVS is a more rapid and cost-effective way of identifying farmer-preferred cultivars if a suitable choice of cultivars exists.

Hence, Research costs can be reduced and adoption rates increased since farmers participate in variety testing and selection. Moreover, Graham et al. (2001) who reported that farmers were actively involved in plant breeding at various levels of the breeding process, the new varieties were successfully adopted. Furthermore, Ortiz et al. (2008) who reported that participatory methods consider the value of farmers' knowledge, their

preferences, ability and innovation, and their active exchange of information and technologies as it was demonstrated during farmer field school approach.

Table 5. Farmers' preference scores and ranking for baby trial in midland areas of Guji zone, during 2019/20 cropping season

| Varieties | Locations | Farmers selection criteria/traits and ranks | | | | | | | | | Total | Average | Ranks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Resistant to disease | Stem Number | Maturity | Number of tubers | Tuber size | Tuber color | Tuber eye depth | Marketability | High yielder | | | |
| Zemen | Gobicha | 24 | 24 | 24 | 40 | 34 | 23 | 20 | 33 | 50 | 831 | 30.78 | 1 |
| | Dole | 31 | 32 | 32 | 55 | 55 | 55 | 36 | 38 | 50 | | | |
| | Kiltu | 26 | 26 | 26 | 20 | 12 | 16 | 13 | 16 | 20 | | | |
| Bubu | Gobicha | 40 | 40 | 40 | 40 | 23 | 32 | 32 | 33 | 23 | 663 | 24.55 | 2 |
| | Dole | 22 | 27 | 27 | 14 | 21 | 7 | 16 | 15 | 10 | | | |
| | Kiltu | 16 | 16 | 16 | 13 | 20 | 20 | 50 | 20 | 30 | | | |
| Gudanie | Gobicha | 19 | 19 | 19 | 22 | 16 | 12 | 20 | 24 | 33 | 661 | 24.48 | 3 |
| | Dole | 32 | 20 | 20 | 14 | 15 | 24 | 17 | 21 | 25 | | | |
| | Kiltu | 24 | 24 | 24 | 27 | 40 | 30 | 40 | 40 | 40 | | | |
| Bedasa | Gobicha | 15 | 15 | 15 | 14 | 14 | 9 | 25 | 11 | 4 | 642 | 23.77 | 4 |
| | Dole | 21 | 22 | 22 | 25 | 34 | 25 | 48 | 27 | 41 | | | |
| | Kiltu | 26 | 26 | 26 | 27 | 30 | 50 | 20 | 30 | 20 | | | |
| Chala | Gobicha | 8 | 8 | 8 | 37 | 50 | 45 | 21 | 50 | 10 | 566 | 20.96 | 6 |
| | Dole | 6 | 8 | 8 | 33 | 26 | 37 | 25 | 38 | 28 | | | |
| | Kiltu | 14 | 18 | 22 | 16 | 10 | 10 | 10 | 10 | 10 | | | |
| Chiro | Gobicha | 26 | 26 | 26 | 9 | 5 | 15 | 12 | 10 | 18 | 342 | 12.66 | 7 |
| | Dole | 13 | 11 | 11 | 14 | 5 | 14 | 11 | 23 | 29 | | | |
| | Kiltu | 16 | 16 | 16 | 16 | 0 | 0 | 0 | 0 | 0 | | | |
| Gebisa | Gobicha | 14 | 14 | 14 | 11 | 10 | 8 | 31 | 19 | 7 | 583 | 21.59 | 5 |
| | Dole | 44 | 33 | 33 | 21 | 16 | 13 | 14 | 11 | 13 | | | |
| | Kiltu | 32 | 32 | 30 | 27 | 24 | 22 | 25 | 35 | 30 | | | |

## 4. CONCLUSION AND RECOMMENDATION

In midland areas of Guji zone where improved technologies are not widely addressed, it's vital to catch immediate action towards setting appropriate way of addressing new technologies and methods. In such case, Participatory variety selection is an effective tool in facilitating the adoption, extension and selection of the improved technologies. Furthermore, participatory variety selection is a more rapid and cost-effective way of identifying farmer-preferred cultivars if a suitable choice of cultivars exists. The farmers are allowed to participate in selecting appropriate technologies by employing their own indigenous knowledge. As the result, the current study was also verified that farmers were able to participate in selecting improved Irish potato varieties through employing their own selection criteria. The farmers need varieties that show high performance for yield and other essential agronomic traits. Improved potato varieties through employing their own selection criteria in order to verified technologies and solve the potato grower problems in short period of time. Therefore, three improved potato varieties i.e., Zemen, Bubu and Gudanie are selected based on agronomic data results, farmer's preference and recommended for midland areas of Guji zone and similar agro-ecologies.

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