Gender mainstreamed participatory varietal selection of potato clones in Amhara region in Ethiopia: Adet experimental station

Netsayi N Mudege, Britta Kowalski, Tesfaye A Desta
Yeshitila Mikias, Betaw Hirut

2017

Correct citation: Mudege, N.N., Kowalski, B., Tesfaye, A.D., Yeshitila, M., Betaw, H. 2017. Gender-mainstreamed participatory varietal selection of potato clones in Amhara region in Ethiopia: Adet experimental station. Lima (Peru). International Potato Center. Technical report. Available online at: XXXXXXX

Contact:
xxxxxxxxx
International Potato Center (CIP)
Apartado 1558, Lima 12, Peru
xxxxxx@cgiar.org • wwwxxxxxx.cgiar.org

ISBN:
DOI:

Contents

Acronyms

AUDPC	area under the disease progress curve
CIP	International Potato Center
DAP	days after planting
PVS	participatory varietal selection

Abstract

This paper is based on data collected during a participatory varietal selection activity carried out at Adet Agricultural Research Center experimental station in Amhara in Ethiopia. A gender-mainstreamed participatory varietal selection method was used to evaluate potato clones cultivated on the station. This method was selected in order to understand the male and the female farmers' trait preferences so that they could be incorporated into the potato breeding program in Ethiopia, as well as to ensure that the genotypes promoted for official release were accepted by male and female farmers. A total of 15 genotypes that had been tested for drought tolerance under sufficient and suboptimal moisture conditions were selected for evaluation. The results show that the male and the female farmers had different trait preferences. For example, out of five important clones, the male and female farmers' preferences matched for only the top two selected by the breeders, and although both men and women were interested in marketable traits, women had additional requirements, particularly relating to processing.

The need for panels made up of trained farmers for evaluation of varieties should be taken into consideration in future, so that variety decisions are based on a wider diversity of knowledge. For example, CIP-301024.14, the clone selected as number one by both the female and the male farmers at harvest time, was rejected by breeders because more than three of its tubers had been cracked, which showed that it possibly lacked tolerance to dry spells. The farmers did not have such knowledge, although women expressed the worry that clones with many cracked tubers may not be good for cooking. Trained male and female farmers' panels would be able to spot potential issues with the different clones, especially relating to pest and disease susceptibility and drought tolerance, while also ensuring that the selected clones met other farmer criteria.

The fact that four out of the five clones that were selected by the male and the female farmers combined were rejected by the breeders and that the breeders selected two clones that the farmers did not select may mean that farmers and breeders had different objectives. For example, while both the breeders and the farmers were concerned about yield, disease resistance and drought tolerance, the farmers had other preferred traits such as tuber size, eye depth, potential for long storage, cooking quality (especially in making a good stew) and so on. This calls for change in scientists' breeding criteria in order to satisfy some of the farmers' preferred traits. Farmers do not cultivate potatoes for only their high yields and markets but also for their fit in their culinary culture. Hence, in some cases women overlooked a clone's poor disease resistance for its culinary performance. This calls for the breeding pipelines to work to provide farmers with a basket of choices to meet their needs.

Acknowledgments

This research was undertaken as part of the CGIAR Research Program on Roots, Tubers and Bananas, which also was its funder, and it was supported by CGIAR Fund donors (http://www.cgiar.org/about-us/our-funders/). We would like to thank the male and the female farmers who evaluated the clones and the researchers and Adet experimental station, who participated in the data collection and managed the experimental plots.

1. Introduction

Participatory research involving both men and women is increasingly being used as a way to promote the adoption and upscaling of technologies. Excluding farmers from decision-making regarding crop varieties is blamed for the low adoption rates of released varieties. This is because researchers' or breeders' criteria may overlook certain growers, market and end-users' preferences. Adoption of varieties may increase if farmer and consumer preferences are known and taken care of during breeding. For example, in a research undertaken by the International Center for Tropical Agriculture in Rwanda to evaluate bean genetic material in a participatory manner, the bean varieties 'selected by the female farmers had production increases of up to 38 percent over breeder-selected varieties' (Quisumbing & Pandolfelli, 2009:10). In addition, it has been noted that gender analysis and participatory breeding and varietal selection can reduce the length of time to full adoption of a seed variety, improving productivity for male and female beneficiaries (Klawitter et al., 2009). As a result of their different roles and different access to resources, men and women may have different trait preferences. Thus, it is important to understand the similarities and differences between such preferences and take them into account during breeding, to ensure that both groups benefit. As noted by Paris et al. (2001:191), while it may be difficult to combine all their preferred traits into one unique variety because of genetic correlations, it is important that both men and women have a 'basket of choices of varieties suited to their needs and agro-systems'.

To understand the male and female farmers' trait preferences and incorporate them into the potato breeding program to ensure that the selected genotypes addressed men and women's needs and trait preferences, the International Potato Center (CIP), in collaboration with the Adet Agricultural Research Center's Experimental Station in Amhara, Ethiopia, rolled out a participatory varietal selection (PVS) activity for evaluating advanced potato genotypes by male and female potato growers. This was important to do because involving farmers in researcher-managed trials eliminates 'the possibility of putting forward genotypes for official variety release that are not accepted by farmers' (Grüneberg et al., 2009).

2. Materials and methods

2.1 Treatments

A total of 15 prominent genotypes were selected from the 52 tested in a morpho-physiologic evaluation of potato (*Solanum tuberosum* L.) clones for drought tolerance under sufficient and suboptimal moisture environments. The clones maintained under sufficient moisture had been put on drip irrigation until maturity, which was the time of the treatments. The clones maintained in the suboptimal moisture environment were provided with moisture until flowering time. As a local check, the widely grown farmer's variety, named Ater Abeba or Suquare, was included in the treatment. The Adet Agricultural Research Center's main experimental station, where the potato genotypes for evaluation were planted, is located 11°17' N and 37°47' E and 2240 meters above sea level.

2.2 Trial design

The trials evaluated in this PVS activity were researcher-managed mother trials set up at the experimental station. A mother trial contains a full set of treatments that are arranged in two blocks with random assignment to each experimental plot (Fig. 1). A mother trial is developed within the study area (experimental field station) following a randomized complete block design with two replications and is managed by the researcher or a local partner.

Each clone was represented by a plot consisting of 40 plants established in a plot of 9 m^2. Each plot had four rows and each row was 3 m long, with 0.75 m inter-row and 0.3 m intra-row spacing. All the other cultural practices were carried out as per the recommendations. At harvest time, 16 plants in the middle rows, excluding borders, were considered for yield and yield component measurements.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
12	4	9	15	1	13	10	3	14	6	16	7	8	2	11	5

Key

1	CIP398180.612
2	CIP393077.54
3	CIP391533.1
4	CIP381379.12
5	CIP380011.12
6	CIP304371.67
7	CIP397069.5
8	CIP395077.12
9	CIP397014.2
10	CIP301024.14
11	CIP304345.47
12	CIP396285.1
13	CIP302499.30
14	CIP393227.66
15	CIP397029.21
16	Ater Abeba

Figure 1: Field map of the trial

2.3 Study method

The study used a gender-mainstreamed PVS method to evaluate the potato clones cultivated on the station at the Adet Agricultural Research Center. The method adopted for the study comprised evaluation of the potato clones at three key stages: (1) at the time of flowering, (2) at the time of harvest, which also included standard yield and organoleptic evaluations, and (3) organoleptic testing at 45 days and 90 days after harvesting to assess how well the clones behaved in storage. However, the first, or vegetative stage, evaluation was a trial evaluation to ensure that the facilitators and the participants were familiar with the method, and so its results are not reported. The organoleptic assessment included for this study were taste, texture and appearance. According to the female and male farmers panelists, taste and appearance were ranked as “Excellent = 5”, “Fair =3” “and poor=1”, whereas texture was ranked as “flowery =5”, “intermediate=3” and “watery=1”.

At the beginning of each stage of the evaluation the facilitators explained the objectives of the evaluation to the farmers. The farmers were then separated into sex-disaggregated groups to ensure that men and women’s views and trait preferences were captured. The first activity in the groups in each evaluation stage involved collecting ranking criteria of the characteristics that the farmers considered when evaluating the clones. This was followed by the ranking of the selection criteria in order of importance by the farmers in their two groups.

The farmers were then asked to use their selection criteria to rank their most preferred clones from the mother trial. They were instructed to choose their three most preferred clones using a participatory weighting method. To differentiate men and women’s choices during stages 1 and 2 evaluations, men were each given six corn kernels and women six bean seeds each. A covered container was placed at the end of each plot (per clone) and the male and female farmers were to select the preferred clones by placing three corn kernels or three bean seeds in the container for

their most preferred clone, two corn kernels or bean seeds for the second most preferred clone and one corn kernel or bean seed for the third choice.

Women selecting clones during the vegetative stage stage

Men selecting clones during the vegetative

Members of farmers' groups or associations working with Adet Agricultural Research Center had been invited to participate in the participatory varietal section activity but it was noted during stage 1 evaluation that a large proportion of them were men, who dominated membership in those groups. In subsequent evaluation the team made an effort to ensure the involvement of almost equal numbers of men and women by asking the farmer group members to invite additional women participants even if they did not belong to their group. While stage 1 evaluation had only 12 women participants compared with 23 men, 22 men and 22 women participated during the harvest time and the post-harvest organoleptic evaluations.

2.4 Statistical tests

The statistical tests used to analyze the data were the independent sample t-test, paired sample t-test and Kruskal-Wallis H test. P-values are used as a reference for significance. For P-values greater than 0.1000, we considered the difference between the test variables to be not significant. For P-values of less than 0.100, we considered the relationship between the test variables as significant.

3. Results

3.1 Selection of potato clones by replication

T-test comparisons by the different replications did not show any significant differences in the selection criteria (p-values = 0.8757). This was consistent with the Kruskal-Wallis H test, which showed that there was no statistically significant difference in the selection criteria between the two replications: $\chi^2(2) = 0.756$, $p = 0.3847$ (Table 1). This means that generally what farmers choose as their best clones in one replication is not statistically different from what they chose as their best clone in the second replication.

Table 1: Kruskal-Wallis H test for differences between clones selected in first and second replication

	Chi squared between the two groups	p-value	Significance
Replication no. 1	0.037	0.8481	Not significant
Replication no. 2	1.042	0.3073	Not significant
All plots combined	0.756	0.3847	Not significant

Whereas in general there were no differences between the plots, for male farmers, clone CIP-380011.12 had a very high score in replication 1 and a zero score in replication 2. The possible reason could be in the difference in the raw data of >30 g average marketable tuber weight (a parameter that indicates tuber size) between the two replications for this clone. The first replication's higher tuber weight of 89 gram could make the clone attractive to male farmers, as tuber size was one of the criteria specific to male farmers. However, when the mean scores were calculated for the total in the two replications, the clone came second in preference. Similarly, CIP-304345.47 had a very high score for female farmers in the first replication and a zero score in the second replication. The possible reason could be in the difference in the number of potatoes harvested for this clone in replications 1 and 2, which were 12 and 5, respectively. This may give the impression that the clone in replication 2 was low yielding. When the overall mean scores were calculated from the two replications this clone came third for female farmers. While it is not quite clear what caused the differences in the CIP-380011.12 and CIP-304345.47 plots in particular, the analysis of the clone selection data for the harvest time combined replications 1 and 2, because overall there was no significant difference between the replications.

3.2 Farmer and breeders' choices of potato clones at harvest time

While there was no significant difference between the men and women's selection criteria (p-value 0.265), women had much a wider range of selection criteria, especially in relation to processing qualities (Fig. 2).

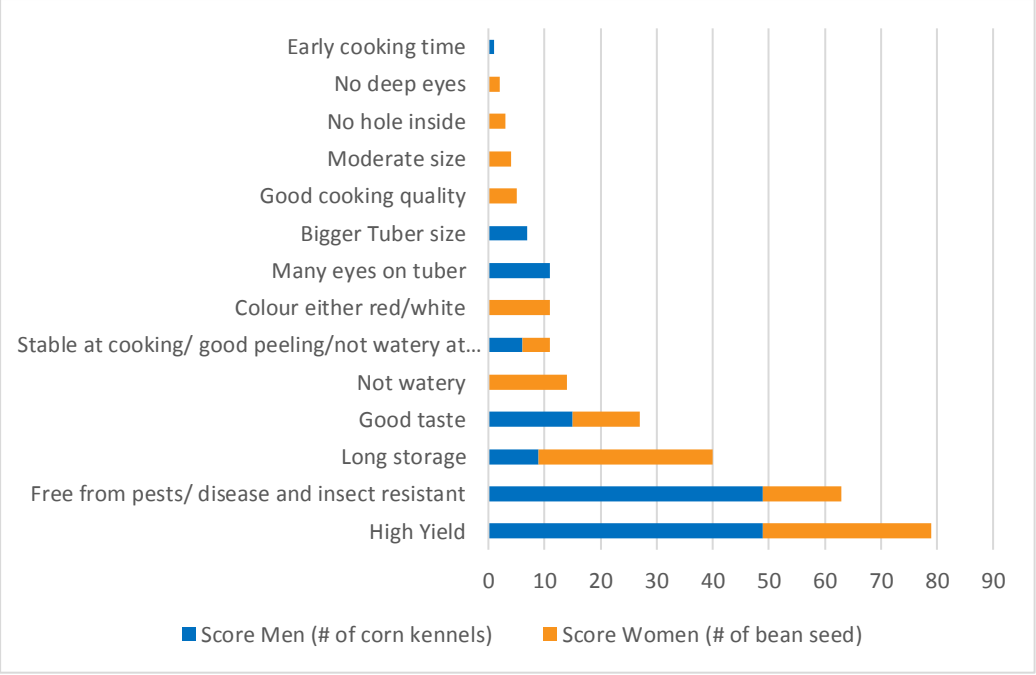

Figure 2: Men and women's free listed selection harvest time criteria

Both the men and women agreed on the criteria for not selecting a potato clone, such as the small size of the tuber and attack by pests and diseases. The men mentioned that they sometimes kept their potato longer than needed in the field before harvesting it. If potato clones were already attacked by insects at the time of the first harvest, this was seen as evidence of the fact that they could not be stored for long underground. Some clones were not selected because of that reason.

3.2.1 Top-ranked clones

The clones that emerged as the top six among those selected at harvest time by the breeders and the male and female farmers from the 16 that were evaluated are shown in Fig. 3 (see Annex 1 for the evaluation scores for all clones).

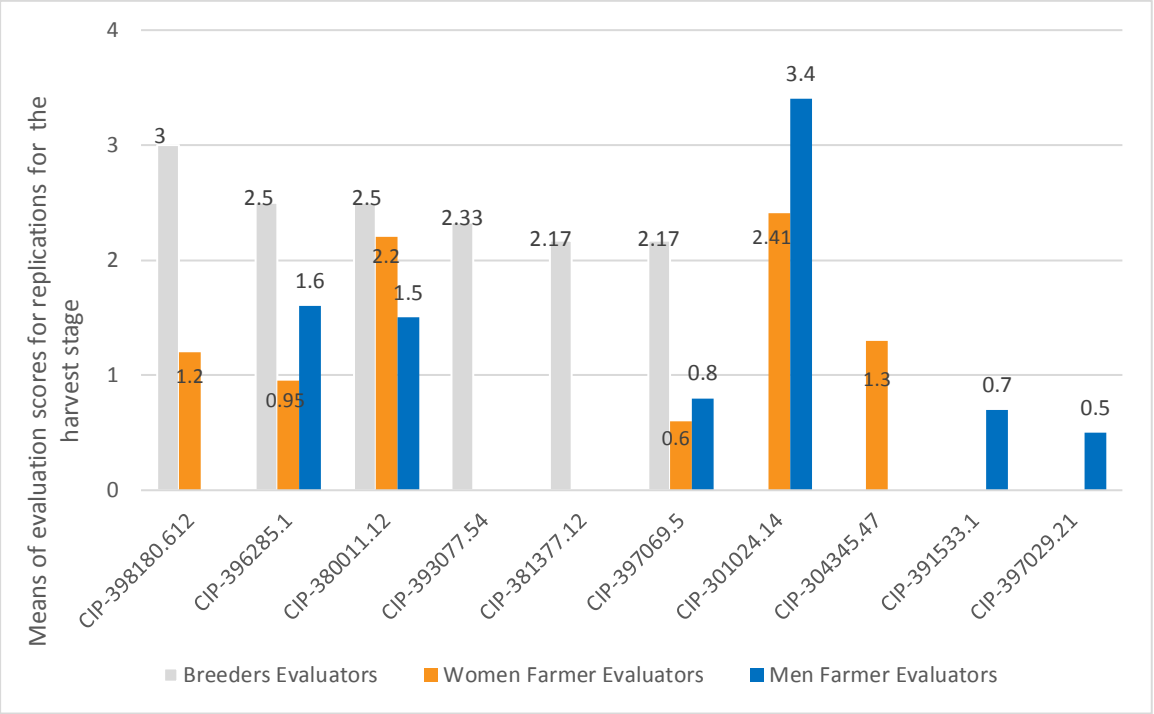

Figure 3: The top six selected clones for the breeders and male and female farmers at harvest time

There was variation in the farmer's and the breeders' selection of clones. Some of the clones selected by the breeders were not among the farmers' top six, while some of those selected by the farmers were rejected by the breeders. The breeders' selection matched only once with the women's and once with the men's selection. The clone selected by both the men and the women as their top clone, CIP-301024.14, was rejected by the breeders for the reason that more than three of its tubers were cracked, which they took to show its possible lack of tolerance to dry spells and susceptibility to tuber blight. This discrepancy between the farmers and the breeders in the evaluation of the clones may indicate the need to use trained farmer panels in the evaluation of clones, since untrained farmers may not know what to look for during evaluations. Farmer criteria may be limited in some cases.

CIP-304345.47 and CIP-391533.1,[1] which were selected among the top six by the women and the men, respectively, were rejected by the breeders. CIP-391533.1 was rejected because it produces small tubers, and CIP-304345.47 because it lacks uniformity,[2] for example some of the white tubers it produces have no pink eye. The lack of congruence between breeder and farmer criteria may mean that breeders and farmers should work closely to exchange knowledge and insights on trait preferences.

3.2.2 Selection of the potato clones at harvest time by the farmers

Out of the 16 clones evaluated, 10 had none or negligible selection from female farmers. For male farmers these were 6 clones. Fig. 4 shows that overall the clones ranked high by the men were also ranked high by the women.

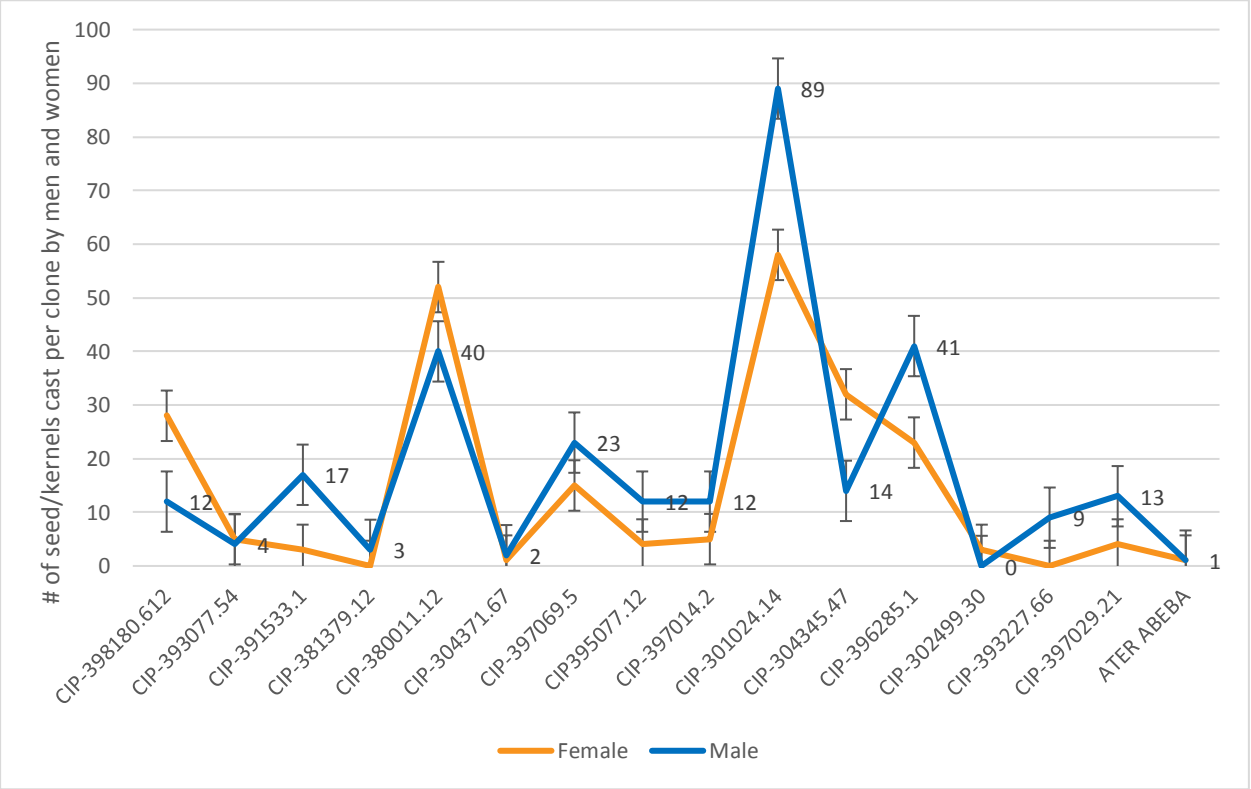

Figure 4: Varietal scoring by sex

The five clones ranked highly overall were CIP-301024.14, CIP-380011.12, CIP-396285.1, CIP-304345.47 and CIP-398180.612. This misses out CIP-304345.47 and CIP-391533.1, which were ranked among the top five clones by women and men (see Table A1.2).

Men and women's preferences matched for their top two clones. The criteria used by both men and women to selection the top three clones were tolerance to disease and pest attack, high yield and tuber sizes that matched market preferences. However, while men selected clones only for their perceived tolerance to pests and diseases, for their second and third choices women selected some

[1] This clone yields only 13 t/ha, which is lower than the yield of the farmers' variety, Ater Abeba. With the type of data collected we cannot explain why the male farmers chose it.

[2] This was the result of a technical mistake not of the application of the selection criteria, because it shows the clone not to be true to type or to have been mixed with an unknown variety. In a case like this the usual practice is to consider clone as a missing plot.

potato clones that had some insect or pest damage because they were of the size that was preferred by the market, their shape was considered favorable or they had shallow eyes that made them easy to process or peel. For the clone that they selected as their second choice, the women were concerned about its cracking, which they said could result in wastage during processing or affect the quality of the potato stew if it was used for that as it would disintegrate upon boiling. This study shows that although men and women were interested in marketable traits, women had additional requirements, particularly relating to processing.

3.2.3 Yield of the different potato clones as a selection trait

Table 2 shows that for all the yield measurements there was no statistical difference between the replications.

Table 2: Statistical values (p-values) of yield differences between the two replications

Yield measure	P-value
Proportion of marketable and non-marketable tubers	0.3259
Total number of tubers per plant	0.9830
Average tuber weight	0.8538
Average marketable tuber weight	0.8496
Average tuber yield (t/ha)	0.8538

Because there was no statistical difference between the replications, the yield indicators were computed by taking the average of the two replications. Table 3 shows the top five clones that scored highly for the different yield indicators and whether they were selected by breeders as well as male and females farmers.

Table 3: Selection of clones by yield

Variety	High proportion of marketable to non-marketable tubers	High average yield (t/ha)	Highest average tuber weight (g)	Highest average marketable tuber weight (g)	Breeders' choice	Female farmers' choice	Male farmers' choice
CIP-380011.12	✓	✓	✓	✓	✓	✓	✓
CIP-398180.612		✓	✓	✓	✓	✓	
CIP-301024.14		✓	✓	✓		✓	✓
CIP-393227.66		✓	✓	✓			
CIP-304345.47			✓	✓		✓	

Out of the six clones selected by the female farmers at least four performed well under the different yield indicators. Yield was an important indicator for both men and women. However out of six clones selected by men, four did not perform well across the different yield indicators except on the average marketable tuber weight (see Annex 2). This may indicate that men were slightly more concerned about marketing of the potatoes than were women.

3.3 Growth, disease tolerance and quality of the clones

Both the male and the female farmers were able to select clones with the lowest AUDPC (area under the disease progress curve) (see Table 4 and Annex 3 for more details). AUDPC is a disease resistance parameter calculated from the percentages of the leaf area affected, which are estimated at different sequential times during the epidemic. Late blight disease severity was assessed visually recorded as a percentage of the foliage affected on the 46th and the 68th day after planting. The

lower the AUDPC the higher the resistance of the clone. For all plots and assessment dates, the area under AUDPC (Campbell & Madden, 1990) was calculated using the following formula:

$$AUDPC = \sum_{i=1}^{n-1} [(t_{i+1} - t_i)][(y_{i+1} + y_i)/2]$$

Where *t* is the time of each reading, *y* is the percentage of the foliage affected by the disease at each reading and *n* is the number of readings.

Table 4: The most important clones that did well in early emergence, early flowering and late blight resistance

Clones with the least days to 50% emergence after planting	**Clones with the least days to 50% flowering after planting**	**Clones with the least late blight score 58 DAP (% of leaf area affected)**	**Clones with the lowest AUDPC**	**Clones with the highest specific gravity**
Ater Abeba CIP-393077.54 CIP-393227.66 CIP-397014.2 CIP-397069.5	CIP-393227.66 Ater Abeba CIP-396285.1 CIP-398180.612 CIP-381379.12	CIP-301024.14 CIP-304345.47 CIP-398180.612 Ater Abeba CIP-393077.54	CIP-393077.54 CIP-301024.14 CIP-304345.47 Ater Abeba CIP-380011.12 CIP-396285.1	CIP-397014.2 CIP-397069.5 CIP-304345.47 CIP-301024.14 CIP-395077.12 CIP-381379.12 CIP-380011.12
Clones with strong quality characteristics that also were the breeders' choice				
CIP-393227.66 CIP-397069.5	CIP-393227.66 CIP-396285.1 CIP-398180.612 CIP- 381379.12	CIP-301024.14 CIP-398180.612	CIP-301024.14 CIP-380011.12 CIP-396285.1	CIP-397069.5 CIP-301024.14 CIP-395077.12 CIP-381379.12 CIP-380011.12
Clones with strong quality characteristics that also were female farmers' choice				
CIP-397069.5	CIP-396285.1 CIP-398180.612	CIP-398180.612 CIP-301024.14 CIP-304345.47	CIP-301024.14 CIP-304345.47 CIP-380011.12 CIP-396285.1	CIP-397069.5 CIP-304345.47 CIP-301024.14 CIP-380011.12
Clones with strong quality characteristics that also were male farmers' choice				
CIP-397069.5	CIP-396285.1	CIP-301024.14	CIP-301024.14 CIP-380011.12 CIP-396285.1	CIP-397069.5 CIP-301024.14 CIP-380011.12

Note:
*DAP = days after planting

The days to 50% flowering ranged from 44.5 days to 49.5. In terms of days to 50% emergence, the range in days considered as the least days was from 17.5 days to 18.5 days. The clones regarded to have the least late blight score had 0–5% leaf area with the infection.

The specific gravity of potato tubers is an important quality criterion for their processing. It is used as an estimate of their solids, or dry matter content, and the higher the dry matter content, the lower the water content and the higher the specific gravity. The formula used to calculate specific gravity is:

$$Specific\ gravity = \frac{Weight\ in\ air}{weight\ in\ air - weight\ in\ water}$$

Both the farmers and the breeders selected the clones with highest specific gravity. Among the traits preferred by both men and women was low water content in potatoes. Women were concerned that watery potatoes would not taste good or make a good stew. The findings here suggest that high

dry matter was important for both male and female farmers, since potatoes were processed mostly for home use. The farmers also preferred potatoes that could store for a long period. Although it is reasonable to assume that the farmers could tell whether clones had high dry matter content only by organoleptic testing, some women said that could tell that by looking at the potato skin and feeling its texture. However, they were not able to explain exactly what that meant in practical terms.

3.4 Organoleptic properties and preferences for potato clones

3.4.1 Organoleptic characteristics in relation to days after harvesting

The general analysis of the scores on organoleptic testing, regardless of the variety, showed that the female farmers gave higher scores than male farmers (Table 5). The scores were highest for texture followed by appearance. The lowest scores were for taste. In all cases the scores were significantly different from each other (See Annex 4 on the organoleptic properties after harvest). This implies that the most important constraint to the adoption of the clones was taste, and texture was the least important constraint in that respect. Table 5 shows the ranking scores by the male and the female farmers of the different appearance, taste and texture of different clones at harvest and 45 and 90 days after harvest.

Table 5: Comparison of average organoleptic characteristic scores of female and male consumers of potatoes consumed after harvest*

SEX	Appearance	Taste			Texture		
		At harvest	45 days	90 days	At harvest	45 days	90 days
Female	2.19	2.19	2.13	2.30	2.38	2.08	2.20
Male	2.02	1.85	2.06	2.07	2.26	1.95	2.07
Average	2.11	2.02	2.10	2.19	2.32	2.01	2.14
P-value	*0.002*	*0.000*	0.308	*<0.001*	*0.041*	0.0204	*0.017*

*The scores for the organoleptic properties were changed to a continuous scale of 1, 2 and 3 for ease of analysis as 1=poor, 2=fair, 3=Excellent for taste and appearance and 1=watery,2=intermediate, 3=floweryfor texture

There were significant differences between the male and the female farmers, with a p-value of at least < 0.05 for the all the parameters except taste on the 45th day (Table 5). The female farmers gave high scores for organoleptic properties more often than men did. This may be related to women's roles in processing and preparing food.

The female farmers generally gave the clones higher scores for appearance than male farmers did (See Annex 4). A comparison of the breeders' and farmers' ranking of the clones for appearance shows that only one of the breeders' varieties, that was CIP-397069.5, was among the five varieties farmers ranked top (see Table 6). That variety was also in the preferred top five for the male and female farmers at harvest time. Generally, the clones ranked the highest in terms of appearance were similar for the male and the female farmers.

Table 6: Clones that were highly rated on appearance at harvest time

Variety	**Score**	**Categorical ranking**
CIP-397014.2	2.82	Excellent

CIP-397069.5	2.73	Excellent
CIP-397029.21	2.73	Excellent
Ater Abeba	2.48	Fair
CIP-391533.1	2.30	Fair
CIP-393227.66	2.30	Fair

The clones selected by breeders at harvest time through observation in the field after harvest (see figure 3) were also ranked highly for taste by both the male and the female farmers compared to farmer selected clones (Table 7).

Table 7: Best scored clones with regard to taste

Clones with the highest taste scores	**Score**	**Categorical scale**	**Breeders' choice**	**Female farmers' choice**	**Male farmers' choice**
Choice of clones at harvest					
CIP-381379.12	2.34*	Fair	✓		
CIP-380011.12	2.30	Fair	✓	✓	✓
CIP-395077.12	2.64	Excellent	✓		
CIP-396285.1	2.38	Fair	✓	✓	✓
Ater Abeba	2.45	Fair			
Choice of clones after 45 days					
CIP-396285.1	2.64	Excellent	✓	✓	✓
CIP-393227.66	2.66	Excellent			
CIP-395077.12	2.68	Excellent	✓		
CIP-397069.5	2.59	Excellent	✓	✓	✓
CIP-380011.12	2.52	Excellent	✓	✓	✓
Choice of clones after 90 days					
CIP395077.12	2.88	Excellent	✓		
Ater Abeba	2.64	Excellent			
CIP381379.12	2.64	Excellent	✓		
CIP391533.1	2.58	Excellent			✓
CIP396285.1	2.48	Fair	✓	✓	✓

*1=poor, 2=fair, 3=Excellent for taste and appearance and 1=watery,2=intermediate, 3=flowery for texture

There was not much difference in the varieties ranked highly by the men and the women in terms of taste; however, the women rated Ater Abeba, the control clone, higher than men did. Additionally, the scores for taste for women were significantly higher than those given by men (See annexes 4 and 5).

Most of the clones with good texture were breeders' selected clones. All the five clones most preferred in general by the male and the female farmers in terms of texture were also among the breeders' most preferred clones (Table 8).

Reflections on organoleptic testing

In terms of organoleptic evaluation, irrespective of gender, Ater Abeba, the control variety, seemed to be among the best in performance. CIP-380011.12, CIP-395077.12 and CIP-396285.1 were ranked

highly for taste and texture. They were thus the most preferred clones for the farmers in terms of organoleptics, but they were also preferred by the breeders. The second best were CIP-397069.5, CIP-381379.12 and 301024.14.

The female farmers gave higher scores than the male farmers in all the organoleptic tests, and the difference was significant. This may be because women are responsible for cooking and local processing of potatoes, which makes them more attuned than are men to potatoes' organoleptic properties. Taste scores for the male farmers were very low compared to those of the female farmers. In fact, for 14 out of the 16 clones, the scores of the female farmers were significantly different from those of the male farmers. Lower differences in scores were observed in appearance evaluation, where it was in only three clones that the female farmers' scores were significantly higher than those of the male farmers. The least score was for taste. Texture had better scores than taste. For texture scores, seven clones were categorized as flowery, seven as intermediary and one as watery. For taste, one clone was categorized as excellent, five as poor and ten as intermediary. As for appearance, three clones were considered as excellent, eleven as fair and two as poor. This may mean that texture may not be as limiting a factor as taste across the clones as regards adoption. However, most of the clones that were ranked high by the female farmers were also ranked high by the male farmers, although the female farmers generally gave higher scores.

Table 8: Clones that scored the best for texture

	Score	**Categorical ranking**	**Breeders' choice**	**Female farmers' choice**	**Male farmers' choice**
Clones with the highest score for texture on day of harvest					
CIP-393227.66	2.91	Flowery			
CIP-396285.1	2.86	Flowery	✓	✓	✓
Ater Abeba	2.75	Flowery			
CIP-301024.14	2.73	Flowery		✓	✓
CIP-395077.12	2.77	Flowery	✓		
CIP-380011.12	2.64	Flowery	✓	✓	✓
Clones with the highest score for texture after 45 days					
CIP-393227.66	2.91	Flowery			
CIP-396285.1	2.86	Flowery	✓	✓	✓
Ater Abeba	2.75	Flowery			
CIP-301024.14	2.73	Flowery		✓	✓
CIP-395077.12	2.77	Flowery	✓		
CIP-380011.12	2.64	Flowery	✓	✓	✓
Clones with the highest score for texture after 90 days					
CIP398180.612	2.76	Flowery	✓	✓	
CIP395077.12	2.72	Flowery	✓		
CIP393227.66	2.64	Flowery			
Ater Abeba	2.56	Flowery			
CIP393077.54	2.4	Fair	✓		

3.4.2 Organoleptic properties at harvest time and 45 and 95 days after harvesting

The score for taste 45 days after harvesting was higher than that for texture at the same period (Table 9).

Table 9: Comparison test of organoleptic properties between harvest, after 45 and 90 days of harvest

	Taste			P-values				Texture			P-value			
	Harvest	45	90	Harvest & 45	45 & 90	Harvest & 90	Harvest 45 & 90	Harvest	45	90	Harvest & 45	45 & 90	Harvest & 90	Harvest 45 & 90
Score	2.02	2.10	2.20	0.035	0.002	<0.001	<0.001	2.32	2.01	2.14	0.000	0.005	<0.001	<0.001

The results show that clone taste had improved through time. CIP-393227.66 and CIP-397069.5 both had higher scores for taste 45 days after harvesting than at harvest time or at 90 days after harvesting. CIP-398180.612's taste and floury texture improved steadily after harvesting for the clone to be among the top five at 45 and 90 days after harvesting, which was not the case at harvest time, when it was ranked low. This may mean that CIP-398180.612 has good storage qualities.

Clones CIP395077.12, CIP396285.1 and CIP304345.47 were among the top five for taste at both 45 and 90 days after harvesting, with CIP395077.12 performing the best and being ranked second in taste and texture over the whole evaluation period.

Conclusion and discussion

Clones CIP-397029.21, CIP-391533.1, CIP-304371.67, CIP-304345.47, CIP-302499.30 were not highly ranked at all in yield, disease tolerance and other key quality criteria including organoleptic tests (See Table 10). In the absence of qualitative data, it is not possible to determine why CIP-397029.21 and CIP-304371.67 were selected by the male farmers, and CIP-304345.47 was selected by the female farmers as among of their top six clones at harvest time. It is, however, important to note that although clones CIP-397029.21 and CIP-304371.67 appeared in the top six for men they also had the lowest mean scores at selection. This may indicate that they can be dropped from the breeding program.

This gender-mainstreamed PVS research in Ethiopia showed that male and female farmers' perspectives need to be integrated into breeding programs to ensure that the clones released meet their needs. The male and the female farmers had different preferences in their selection of potato clones. For example, out of the five most important clones selected, the male and female farmers' preferences matched in the top two clones. In the selection of their top three clones, the male and the female farmers used freedom from disease and pest attack, high yield and market-preferred tuber sizes as their criteria. However, while men selected only the clones that they perceived to be free from pests and diseases, for their second and third best clones women selected some potato clones that had some insect or pest damage because they were of a size that was preferred by the market, had a shape that was considered favorable or had shallow eyes that made them easy to process or peel. For the clone selected as their second choice, the women were concerned about its cracking, which they said could result in wastage during processing or affect the quality of the potato stew if it was used for that as it would disintegrate upon boiling. This study shows that although men and women are interested in marketable traits, women had additional requirements particularly related to processing that men did not have.

Both the men and the women agreed on criteria for not selecting a potato clone, such as the small size of the tuber and attack by pests and diseases. The men mentioned that they sometimes kept

their potato longer than needed in the field before harvesting. If the potato clone was already attacked by insects by the time of the first harvest, this was seen as evidence of the fact that it could not stay long underground without causing farmers some loss. That was the reason some clones in the breeders' managed plots at the station were not selected during farmer evaluation.

The breeders' ranking of the clones differed from farmers' ranking and their selection matched only once with the women's and once with the men's selection. The top two of the men's selected clones, CIP-391533.1 and CIP-304345.47, were rejected by the breeders. This was because CIP-391533.1 produces small tubers and CIP-304345.47 lacks uniformity, e.g. some white tubers it produces have no pink eye. CIP-304345.47 was also one of the top clones selected by women.

Evidence from this evaluation suggests the need to have trained farmer panels for the evaluation. For example, the clone selected by both the men and the women as their first choice at harvest time, CIP-301024.14, was rejected by breeders because more than three of its tubers were cracked, which they took as an indication of its lack of tolerance to dry spells. The farmers did not have such knowledge, although the women expressed the worry that clones with many cracked tubers may not make a good stew. Such knowledge is important, especially considering that pest and disease resistance was an important trait for farmers. Panels of trained male and female farmers would spot potential issues with the clones, especially relating to pest and disease susceptibility and drought tolerance, while also ensuring that the selected clones also meet other farmer criteria.

The fact that the combined male and female farmers selected four clones that were rejected by the breeders while the breeders selected two clones that farmers did not select may illustrate that farmers and breeders may have different objectives. For example, while both breeders and farmers were concerned about yields, disease resistance and drought tolerance, farmers also had other preferred traits such as the size of the tubers, eye depth, perception that the potato could store for long, cooking quality, especially the ability to make a good stew, and so on. This calls for changes in scientists' breeding criteria in order to meet some of farmers' preferred traits. Farmers cultivate potatoes not just for their high yields and markets, but also they need potatoes that can fit into their culinary culture. That is why in some cases women overlooked a clone's poor disease resistance for its culinary uses. This requires breeding pipelines to be able to provide farmers with a basket of choices to meet their needs.

The organoleptic scores for taste, appearance and texture were different also between the male and the female farmers, with the female farmers giving higher scores than men in general. The female farmers were more attuned to the clones' organoleptic properties. This could be related to women's domestic chores and roles in cooking and processing of potato and it shows that gender considerations are important factors for breeding programs to incorporate to ensure that the clones they select respond to men and women's needs and roles.

Table 10: Selection of clones and evaluation of the best properties of each clone

	Days to 50% emergence	Days to 50% flowering	Yield indicators above 3	Marketable tubers	Disease and quality	Organoleptic properties					Choice of clones at Harvest		
						Appearance	Test at harvest	Taste 45 days post-harvest	Texture at harvest	Texture 45 days post-harvest	Breeders	Women farmers	Men farmers
CIP-398180.612		✓	✓	✓	✓						✓	✓	
CIP-393227.66	✓	✓	✓	✓		✓		✓	✓	✓			
CIP-380011.12			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
CIP-301024.14			✓	✓	✓				✓	✓		✓	✓
Ater Abeba	✓	✓			✓	✓	✓		✓	✓			
CIP-396285.1		✓					✓	✓	✓	✓	✓	✓	✓
CIP-395077.12								✓	✓	✓			
CIP-397069.5	✓					✓		✓			✓	✓	✓
CIP-393077.54	✓										✓		
CIP-381379.12		✓				✓					✓		
CIP-397014.2	✓					✓							
CIP-397029.21						✓							✓
CIP-391533.1													
CIP-304371.67													✓
CIP-304345.47												✓	
CIP-302499.30													

References

Campbell, C.L. & Madden, L.V. 1990. Introduction to plant disease epidemiology. New York, USA: John Wiley & Sons.

Grüneberg, W.J., Mwanga, R., Andrade, M. & Espinoza, J. 2009. Selection methods. Part 5: Breeding clonally propagated crops, p. 275–322. In: Ceccarelli, S., Guimarães, E.P. & Weltzien, E. (eds.). Plant breeding and farmer participation. Rome, Italy: FAO.

Klawitter, M., Henson Cagley, J., Yorgey, G., Gugerty, M.K. & Anderson, L. 2009. Gender cropping series: wheat in sub-Saharan Africa. Evans School Policy Analysis and Research, University of Washington.

Paris, T., Singh, A., Luis, J. with Singh, H.N., Singh, O.N., Singh, S., Singh R.K. & Sakarung, S. 2001. Listening to farmers' perceptions through participatory rice varietal selection: a case study in villages in eastern Uttar Pradesh, India. Paper presented at the Systemwide Program on Participatory Research and Gender Analysis for Technology and Institutional Innovation Workshop, 1–5 May 2000, Pokhara, Nepal.

Quisumbing, A.R. & Pandolfelli, L. 2009. Promising approaches to address the needs of poor female farmers. IFPRI Discussion Paper 00882. Washington, D.C.: International Food Policy Research Institute.

Annexes

Annex 1: Selection of clones by the breeders and the farmers at harvest

Table A1.1: Clones scored as the best by the breeders

	Clones	**Mean score (from the 3 evaluators, and for the 2 replications**
Clones scored as the best by the breeders		
1	CIP-398180.612	3
2	CIP-396285.1	2.50
3	CIP-380011.12	2.50
4	CIP-393077.54	2.33
5	CIP-381379.12	2.17
6	CIP-397069.5	2.17
Scores for other clones		
7	CIP-395077.12	1.67
8	CIP-301024.14	1.67
9	CIP-397014.2	1.17
10	CIP-393227.66	0.67
11	CIP-397029.21	0.5
12	Ater Abeba	0.5
13	CIP-304371.67	0.33
14	CIP-304345.47	1
15	CIP-391533.1	0
16	CIP-302499.30	0

Table A1.2: Ranking of the clones by male and female farmers

Clones	Female rep 1	Female rep 2	All female reps	Rank	Male rep 1	Male rep 2	All male reps	Rank	Overall score	Rank
CIP-398180.612	19	9	28	4	5	7	12	8	40	5
CIP-393077.54	0	5	5	7	0	4	4	12	9	11
CIP-391533.1	3	0	3	11	0	17	17	5	20	7
CIP-381379.12	0	0	0	15	0	3	3	13	3	13
CIP-380011.12	17	35	52	2	40	0	40	2	92	2
CIP-304371.67	1	0	1	14	1	1	2	14	3	13
CIP-397069.5	15	0	15	6	22	1	23	4	38	6
CIP395077.12	4	0	4	9	11	1	12	8	16	10
CIP-397014.2	0	5	5	7	7	5	12	8	17	8
CIP-301024.14	20	38	58	1	26	63	89	1	147	1
CIP-304345.47	32	0	32	3	14	0	14	7	46	4
CIP-396285.1	4	19	23	5	8	33	41	3	64	3
CIP-302499.30	0	3	3	11	0	0	0	16	3	13
CIP-393227.66	0	0	0	16	1	8	9	11	9	11
CIP-397029.21	2	2	4	9	2	11	13	6	17	8
Ater Abeba	1	0	1	14	0	1	1	15	2	16

Annex 2: Yield performance of the clones

Table A2.1: Performance of the clones on different yield indicators

Clone	Proportion of marketable to non-marketable tubers	Total tubers per plant	Average tuber weight (g)	Average marketable tuber weight (g)	Tuber yield (t/ha)
CIP-398180.612	0.64	8.95	55.27	58.3	21.97
CIP-393077.54	0.66	8.95	40.78	48.6	18.84
CIP-391533.1	0.73	10.35	19.04	23.5	13.82
CIP-381379.12	0.57	16.30	43.44	49.2	19.68
CIP-380011.12	0.70	10.25	70.88	74.05	24.73
CIP-304371.67	0.80	8.20	34.10	38.45	12.65
CIP-397069.5	0.60	8.50	38.37	43.35	17.02
CIP-395077.12	0.63	9.90	38.82	46.20	18.05
CIP-397014.2	0.59	10.90	48.48	54.85	17.99
CIP-301024.14	0.54	8.60	64.20	67.85	25.24
CIP-304345.47	0.61	9.25	49.30	57.80	17.04
CIP-396285.1	0.78	7.95	46.93	52.95	21.11
CIP-302499.30	0.64	10.10	19.38	23.85	9.32
CIP-393227.66	0.61	10.95	47.54	56.10	19.09
CIP-397029.21	0.51	9.15	36.23	45.60	19.73
Ater Abeba	0.53	12.15	35.11	43.20	18.88

Table A2.2: The five clones with highest scores for the different yield properties

Highest proportion of marketable to non-marketable tubers	Highest total tubers per plant	Highest average tuber weight	Highest average marketable tuber weight (g)	Highest tuber yield (t/ha)
CIP-304371.67	CIP-381379.12	CIP-380011.12	CIP-380011.12	CIP-301024.14
CIP-396285.1	Ater Abeba	CIP-301024.14	CIP-301024.14	CIP-380011.12
CIP-391533.1	CIP-393227.66	CIP-398180.612	CIP-398180.612	CIP-398180.612
CIP-380011.12	CIP-397014.2	CIP-304345.47	CIP-304345.47	CIP-396285.1
CIP-393077.54	CIP-391533.1	CIP-393227.66	CIP-393227.66	CIP-397029.21

Annex 3: Growth, disease tolerance and quality of the potato clones at harvest

Table A3.1: Scores for growth rapidity, disease tolerance and mass of the potato clones

	Days to 50% emergence (DAP)	Days to 50% flowering (DAP)	Late blight score* 46 DAP	Late blight score* 54 DAP	AUDPC	Weight in air (kg)	Weight in water (kg)	Specific gravity
CIP-398180.612	19.5	48	0	2.5	46.25	5	0.31	1.07
CIP-393077.54	18	50	0	5	0	5	0.25	1.05
CIP-391533.1	20	52	0	15	120	4.30	0.21	1.05
CIP-381379.12	19.5	49.5	0	2.5	50	5	0.36	1.08
CIP-380011.12	19	50	0	12.5	6.25	5	0.37	1.08
CIP-304371.67	20	55	12.5	57.5	325	3.80	0.20	1.06
CIP-397069.5	18.5	55	12.5	37.5	1415	4.80	0.37	1.09
CIP-395077.12	21	51	0	44.5	222.5	4.80	0.34	1.08
CIP-397014.2	18.5		0	25	120	4.50	0.41	1.10
CIP-301024.14	21.5	51	0	0	0	5	0.36	1.08
CIP-304345.47	20	51	0	0	0	3.30	0.28	1.09
CIP-396285.1	19	48	0	7.6	6.25	5	0.27	1.06
CIP-302499.30	20		25	66	212.5	2.80	0.15	1.06
CIP-393227.66	18.5	44.5	0	8	220	5	0.32	1.07
CIP-397029.21	19.5	55.5	0	6	15	4.90	0.26	1.06
Ater Abeba	17.5	47.5	0	2.5	0	4	0.24	1.07

Note:
* Percentage of leaf area affected

Annex 4: Organoleptic properties of the potato clones at harvesting

Table A4.1: Scores for the appearance of the potato tubers at harvesting[§]

	Female farmers	Male farmers	Overall	P-value
CIP-398180.612	1.05	1.00	1.02	0.323
CIP-393077.54	2.05	2.00	2.02	0.713
CIP-391533.1	2.32	2.27	2.30	0.789
CIP-381379.12	2.28	2.09	2.16	0.396
CIP-380011.12	1.82	1.55	1.68	0.273
CIP-304371.67*	2.09	1.68	1.89	0.059
CIP-397069.5	2.82	2.64	2.73	0.184
CIP-395077.12*	2.14	1.86	2.00	0.060
CIP-397014.2	2.82	2.82	2.82	1.000
CIP-301024.14	2.09	2.23	2.16	0.463
CIP-304345.47*	2.00	1.68	1.84	0.063
CIP-396285.1	1.50	1.36	1.43	0.447
CIP-302499.30*	2.45	2.00	2.23	0.041
CIP-393227.66*	2.50	2.09	2.30	0.012
CIP-397029.21	2.73	2.73	2.73	1.000
Ater Abeba	2.50	2.45	2.48	0.769

Note:
[§]1 = poor, 2 = fair, 3 = excellent
*For these clones there was a significant difference between the scores of male and female farmers. Generally, female farmers gave the clones a higher score on appearance than male farmers did.

Table A4.2: Scores for taste for the potato clones immediately at harvesting

	Female farmers score	Male farmers score	Overall score	P-value
CIP-398180.612	1.27	1.73	1.50	0.029
CIP-393077.54	2.18	2.05	2.11	0.555*
CIP-391533.1	2.77	2.22	0.55	0.003
CIP-381379.12	2.68	2.00	2.34	0.000
CIP-380011.12	2.18	2.41	2.30	0.288*
CIP-304371.67	1.18	1.00	1.09	0.037
CIP-397069.5	2.64	1.82	2.23	0.000
CIP-395077.12	2.77	2.50	2.64	0.089
CIP-397014.2	1.59	1.27	1.43	0.052
CIP-301024.14	1.68	2.45	2.07	0.000
CIP-304345.47	2.50	1.41	1.95	0.000
CIP-396285.1	2.68	2.10	2.38	0.002
CIP-302499.30	2.32	1.68	2.00	0.007
CIP-393227.66	2.55	1.55	2.04	0.000
CIP-397029.21	1.14	1.32	1.23	0.209*
Ater Abeba	2.86	2.05	2.45	0.000

Note:
[§]1 = poor, 2 = fair, 3= excellent
Female farmers gave higher scores for taste than did male farmers. However, the differences were significantly different in almost all the clones, except in only 3 clones highlighted in asterisks

Table A4.3: Scores for texture for the potato clones at harvesting

	Female farmers	Male farmers	Overall	P-value
CIP-398180.612	1.68	2.18	1.93	0.049*
CIP-393077.54	2.18	2.86	2.52	0.001*
CIP-391533.1	2.27	1.95	2.11	0.108
CIP-381379.12	2.27	2.00	2.14	0.201
CIP-380011.12	2.50	2.77	2.64	0.089*
CIP-304371.67	1.05	1.00	1.02	0.323
CIP-397069.5	2.41	2.18	2.29	0.208
CIP-395077.12	2.68	2.86	2.77	0.209
CIP-397014.2	2.00	1.32	1.66	0.001*
CIP-301024.14	2.55	2.91	2.73	0.014*
CIP-304345.47	2.68	1.95	2.32	0.001*
CIP-396285.1	3.00	2.73	2.86	0.049*
CIP-302499.30	2.55	1.77	2.16	0.001*
CIP-393227.66	2.86	2.95	2.91	0.305
CIP-397029.21	2.50	2.14	2.32	0.104
Ater Abeba	2.91	2.59	2.75	0.047*

§1 = watery, 2 = intermediate, 3 = flowery
* indicate that there is significant difference in the scores between male and female farmers.

Table A4.4: Clones given the highest scores for texture by female and male farmers

Varieties scored highly by female farmers	Score		Varieties scored highly by male farmers	Score
CIP-393227.66	2.55		CIP-395077.12	2.61
CIP-304345.47	2.50		CIP-396285.1	2.55
CIP-396285.1	2.64		CIP-393227.66	2.75
CIP-395077.12	2.55		CIP-380011.12	2.30
CIP-380011.12	2.63		CIP-301024.14	2.30
CIP-398180.612	2.50		CIP-398180.612	2.50

Annex 5: Organoleptic properties of the clones 45 days after harvesting

Table A5.1: Scores for taste for the potato clones 45 days after harvesting

Potato variety	Female farmers	Male farmers	Overall	P-value
CIP-398180.612	2.41	1.41	1.91	0.000
CIP-393077.54	2.09	2.05	2.06	0.786
CIP-391533.1	2.05	2.05	2.05	1.000
CIP-381379.12	2.00	1.64	1.82	0.168
CIP-380011.12	2.50	2.55	2.52	0.832
CIP-304371.67	1.23	1.45	1.34	0.188
CIP-397069.5	2.45	2.73	2.59	0.148
CIP-395077.12	2.55	2.82	2.68	0.054
CIP-397014.2	1.59	1.45	1.52	0.450
CIP-301024.14	2.23	1.64	1.93	0.006
CIP-304345.47	2.41	2.36	2.39	0.798
CIP-396285.1	2.73	2.55	2.64	0.299
CIP-302499.30	2.00	2.00	2.00	1.000
CIP-393227.66	2.45	2.86	2.66	0.015
CIP-397029.21	1.09	1.14	1.11	0.701
Ater Abeba	2.23	2.36	2.30	0.420

Note:

At 45 days after harvesting the differences between the male and female farmers' scores were significant only for 4 clones. Note that the differences in scores between females and males at harvest were in 14 out of the 16 varieties.

Table A5.2: Clones with the highest taste scores 45 days after harvesting

Variety with the highest score	Score	Category scale
CIP-396285.1[§]	2.64	Excellent
CIP-393227.66	2.66	Excellent
CIP-395077.12[§]	2.68	Excellent
CIP-397069.5[§]	2.59	Excellent
CIP-380011.12[§]	2.52	Excellent

Note:

[§]These clones were also on the breeders' preferred list.

Table A5.3: The five clones the farmers gave the highest scores for taste 45 days after harvesting

Clones scored highly by female farmers on taste	Score	Clones scored highly by male farmers on taste	Score
CIP-393227.66	2.45	CIP-380011.12	2.52
CIP-396285.1	2.73	CIP-396285.1	2.64
CIP-395077.12	2.55	CIP-395077.12	2.68
CIP-380011.12	2.50	CIP-397069.5	2.59
CIP-397069.5	2.45	CIP-393227.66	2.66

Note:

The five most popular varieties were the same clones for female and male farmers.

Table A5.4: Scores for texture for the potato clones 45 days after harvesting

Variety	Female farmers	Male farmers	Overall	P-value
CIP-398180.612	2.50	2.50	2.50	1.000
CIP-393077.54	1.32	1.36	1.34	0.807
CIP-391533.1	2.00	1.41	1.70	0.002
CIP-381379.12	1.95	2.45	2.20	0.043
CIP-380011.12	2.63	1.95	2.30	0.001
CIP-304371.67	1.14	1.00	1.07	0.076
CIP-397069.5	2.23	1.73	1.98	0.004
CIP-395077.12	2.55	2.68	2.61	0.442
CIP-397014.2	1.77	1.68	1.73	0.634
CIP-301024.14	2.27	2.32	2.30	0.815
CIP-304345.47	2.50	1.82	2.16	0.001
CIP-396285.1	2.64	2.45	2.55	0.236
CIP-302499.30	1.54	1.14	1.34	0.008
CIP-393227.66	2.55	2.95	2.75	0.001
CIP-397029.21	1.59	1.32	1.45	0.099
Ater Abeba	2.09	2.36	2.23	0.083

Note:

At 45 days after harvesting, there were more differences in the clone scores between male and female farmers than at harvest time. For example, at harvest time only seven clones had scores that were significantly different between the genders but this increased to 10 clones 45 days after harvesting.

Table A5.5: Clones with the highest texture scores 45 days after harvesting

Variety with the highest texture score	Score	Categorical ranking
CIP-395077.12	2.61	Flowery
CIP-398180.612	2.50	Flowery
CIP-396285.1	2.55	Flowery
CIP-393227.66	2.75	Flowery
CIP-380011.12	2.30	Intermediate

Annex 6: Organoleptic properties of the clones 90 days after harvesting

Table A6.1: Scores for taste for the potato clones 90 days after harvesting

Potato clone	Female farmers	Male farmers	Combined	P-value
CIP395077.12	2.931	2.8095	2.88	0.233
Ater Abeba	2.6552	2.619	2.64	0.825
CIP381379.12	2.4828	2.8571	2.64	0.006
CIP391533.1	2.9655	2.0476	2.58	< 0.001
CIP396285.1	2.3448	2.6667	2.48	0.037
CIP304345.47	2.5862	2.1905	2.42	0.022
CIP393227.66	2.4138	2.2857	2.36	0.454
CIP398180.612	2.4828	2	2.28	0.018
CIP397069.5	2.3103	2.1905	2.26	0.514
CIP380011.12	2.3793	2	2.22	0.061
CIP393077.54	2.2414	1.8095	2.06	0.008
CIP397014.2	2.1379	1.9048	2.04	0.07
CIP304371.67	2.1724	1.6667	1.96	0.006
CIP302499.30	1.8966	1.5714	1.76	0.114
CIP301024.14	1.6552	1.4762	1.58	0.336
CIP397029.21	1.1724	1	1.099	0.107

Note:

At 90 days after harvesting the differences between the male and female farmers' scores for taste were significant for half of the clones. Note that the differences in scores between female and male farmers were for 14 clones at harvest and 4 clones on the forty-fifth day.

Table A6.2: Clones with the highest taste scores 90 days after harvesting

Clones with the highest score	Score	Category scale
CIP391533.1	2.88	Excellent
CIP395077.12	2.64	Excellent
Ater Abeba	2.64	Excellent
CIP304345.47	2.58	Excellent
CIP381379.12	2.48	Fair

Note:

Three out of the five clones preferred for taste at 90 days after harvesting were also on the breeders' preferred list. These are: CIP395077.12, CIP381379.12 and CIP396285.1. Clone CIP396285.1 was also selected by both male and female farmers.

Table A6.3: The five clones given the highest taste scores by the farmers

Clones scored highly by female farmers	Score	Clones scored highly by male farmers	Score
CIP391533.1	2.9655	CIP381379.12	2.8571
CIP395077.12	2.931	CIP395077.12	2.8095
Ater Abeba	2.6552	CIP396285.1	2.6667
CIP304345.47	2.5862	Ater Abeba	2.619
CIP381379.12	2.4828	CIP393227.66	2.2857

Note:

Three out of the five clones preferred by the farmers for taste were common between the male and female farmers.

Table A6.4: Scores for texture for the potato clones 90 days after harvesting

Clone	Female farmers	Male farmers	Combined	P-value
CIP398180.612	2.6897	2.8571	2.76	0.223
CIP395077.12	2.6897	2.7619	2.72	0.643
CIP393227.66	2.5862	2.7143	2.64	0.4
Ater Abeba	2.5172	2.619	2.56	0.517
CIP393077.54	2.5172	2.2381	2.4	0.129
CIP380011.12	2.4828	2.1905	2.36	0.107
CIP396285.1	2.3793	2.2857	2.34	0.607
CIP304345.47	2.4138	2.0952	2.28	0.082
CIP391533.1	2.3793	1.7143	2.1	< 0.001
CIP301024.14	2.1379	1.9048	2.04	0.205
CIP302499.30	2.0345	1.9048	1.98	0.574
CIP381379.12	1.931	2	1.96	0.656
CIP397069.5	1.931	1.8095	1.88	0.575
CIP397029.21	1.6552	1.6	1.6327	0.811
CIP397014.2	1.4828	1.381	1.44	0.567
CIP304371.67	1.3448	1	1.2	0.006

Note:

At 90 days after harvesting, male and female farmers' scores for texture were similar except for two clones unlike in the two previous evaluation periods. For example, at harvest time 7 clones had scores that were significantly different between the genders, but that increased to 10 clones at 45 days after harvesting.

Table A6.5: Clones that farmers gave the highest texture scores at 90 days after harvesting

Variety with the highest score	Score	Categorical ranking
CIP398180.612	2.76	Flowery
CIP395077.12	2.72	Flowery
CIP393227.66	2.64	Flowery
Ater Abeba	2.56	Flowery
CIP393077.54	2.4	Intermediate