Research Article

Participatory Variety Selection of Rice (*Oryza Sativa* L) at Tepi South West Ethiopia

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Abstract

Participatory variety choice changed into finished in Tepi Southwestern Ethiopia in 2019 and 2020. The objectives were to perceive farmers' selection standards, to growth farmers' attention and their get admission to to improved rice types, to allow farmers to evaluate the performances of stepped forward rice varieties of their preference and to boost up seed dissemination of farmers' chosen varieties thru farmer-to-farmer alternate mechanisms. The analysis of variance showed that significant differences ($p \leq 0.05$ or $p \leq 0.01$) among varieties for all of the studied traits, except for thousand seed weight. High grain yield was obtained from NERICA-4 and shaga with yield potential of 3855.2 kg/ha, 3468.9 kg/ha respectively. Farmers listed the selection criteria to select varieties for production *viz.*, grain yield, maturity date, disease resistance, tillering ability, seed size, panicle length and plant height. The result of direct matrix ranking revealed that varieties ediget ranked first followed by NERICA-4 and Fogra-1based on the criteria listed by the participants. Therefore, three varieties were recommended for the study area for production with their production packages.

Keywords: Direct matrix ranking, Participatory variety selection, Grain yield, Maturity date, Disease resistance

INTRODUCTION

In Ethiopia, the cultivation of rice is of a latest history, however, its use as meals crop, income source, employment opportunity and animal feed has been well recognized (Kassa H, et al., 2017). The government of Ethiopia taken into consideration rice because the maximum strategic meals safety crop that has acquired unique attention in promoting of agricultural manufacturing and as such it is known as the "millennium crop" anticipated to make contributions in ensuring meals safety in Ethiopia (Aristya VE, et al., 2021).

The total cultivated place at national stage has extended from 48, 418.09 in 2016/2017 to 53, 106.79 hectares in 2017/2018 (Loko YL, et al., 2021). The cultivated area has increased in 2017/18 in comparison to 2016/2017 by using about 9.68% nationally with substantial difference across areas. for that reason, rice production has increased from a complete of 1, 36000.726 heaps, in 2016/17 to at least one, 51018.330 heaps in 2017/18. Similarly, productiveness in ton in keeping with hectare has expanded from 2.8 in 2016/17

to 2.84 in 2017/18 (Hossain M, et al., 2022).

There are many improved varieties of rice in the country, but the adoption rate is very low. This is because evaluation criteria were mainly centralized by researcher's interest (De Santis G, et al., 2022).

This is due to the fact researchers can also forget a number of very vital tendencies wanted through farmers, this will occur as a result variety evaluation and selection in Ethiopia is specifically under the manager of the researchers on my own (Nanfumba D, et al., 2013). Therefore, at last dissemination and acceptance of generation may be very negative and recognize a very few stepped forward varieties among many are adopted by means of farmers (Joshi KD, et al., 2002). To avoid the problems troubles inside the range assessment process and adoption, variety evaluation with the fingers of farmers have an amazing significance (Dorward P, et al., 2007). The use of participatory variety choice will don't forget the view and preference of various stake holders (Kanbar A, et al., 2011). Participatory range choice can be used to recognize the farmer's standards to pick out types for adoption (Witcombe JR, et al., 1999). It additionally reduces

studies price and increase adoption costs if farmers are allowed to participate in range checking out and choice (Yacouba AS, et al., 2013).

Consequently, this research changed into carried out the subsequent goals:

- To test performance of promising rice sorts underneath farmers growing conditions and researcher farmer control.

- To gain comments on farmers preferred tendencies for destiny breeding programs.

MATERIALS AND METHODS

Site and farmer selection

The trial was carried out during the main cropping season of 2019 and 2020 at yeki woreda sheka zone. From the district Tepi on station and Bechi kebeles were selected on the basis of their representation of the target ecology for rice production. Twenty farmers from each kebele were selected, based on familiarity with rice production (Joshi KD, et al., 1997).

Experimental design and participatory variety selection

In this trial RCBD design with three replication used. Eight improved rice varieties (Shaga, Fogra-1, Ediget, Adet, Wanzaye, NERICA-4, Gumara and X-jigna were used. The plot was made up with 5 m length and 4 m width (with the total area of 20 m^2). Each plot consisted of sixteen rows at 0.25 m interval, out of which data were taken from the middle fourteen rows. 80 kg/ha seed rate were used as national recommendation. Fertilizer was applied as per the national recommendation.

Participatory variety selection

The district agricultural worker together with researchers selects farmers from each kebele. Participants were given a chance to select a set of traits which they are considered important. At physiological maturity variety selection by farmers were done. Direct matrix ranking methods were used to rank varieties, in matrix ranking farmers are ordered to rate the performance of each varieties with respect to each selection criteria as: (1=Excellent, 2=very good, 3=good, 4=poor, 5=very poor).

Data collections

Data collection was done according to the Standard Evaluation System for rice (SES).

Plant peak (PH, cm): Height of the plant in centimeter from the bottom of the main stem to the top of the panicle was recorded because the average of five randomly taken flowers within the middle 5 rows of each plot.

Panicle duration (PL, cm): Duration of the panicle in centimeter changed into measured from the node,

where the first panicle department starts off evolved, to the end of the panicle as the common of 5 randomly taken vegetation in the middle five rows of every plot.

Wide variety of fertile grains consistent with panicle (FGPP, No.): Taken by using counting the quantity of fertile grains from the primary panicle at harvest maturity from five randomly taken flowers and averaged.

Number of fertile tillers in step with plant (FTTP, No.): The common number of fertile tillers from five randomly taken pattern flowers in the center 5 rows of each plot was recorded.

Days to heading (HD, days): Number of days from days to sowing to the date whilst the guidelines of the panicles first emerged from the principle shoots on 50% of the plant in a plot.

Days to maturity (MD, days): Variety of days from the date of sowing to the date when 85% of grain on panicle are matured.

Thousand Grain Weight (TGW, g): The weight of 1000 grains in gram from bulked grains, which were amassed from five vital rows of each plot were measured and changed at 14% moisture content material.

Grain Yield in keeping with hectare (GY, kg): Grain yield in gram received from each plot of the middle fourteen rows at physiological adulthood become transformed into kilogram per hectare, after cleaned and adjusted to 14% moisture content material level.

RESULTS AND DISCUSSION

Analysis of variance: The analysis of variance showed that significant differences (p ≤ 0.05 or p ≤ 0.01) among varieties for all of the studied traits, except for thousand seed weight (Table 1). This may be due to the existence of different genetic composition among varieties and environmental effect, which brings different response among the studied trait. In this study flowering date ranges from 80 to 92 days for the studied eight varieties. Maturity date ranges from 110 to 118 days after sowing for the studied eight varieties (Table 2). Plant height varied significantly among varieties with a range of 98 to 118 cm and most of the verities have height >90 cm. According to IRRI, rice height is classified as semi-dwarf (<90 cm), intermediate (90 cm-125 cm), and tall (>125 cm). This indicated that the height of studied verities is grouped under the class of intermediate. Sabouri, et al., reported the importance of wide range of variation in plant height for better selection in rice improvement program.

Panicle length

In this study, grain yield also differed significantly among varieties. High grain yield was obtained from NERICA-4 and shaga with yield potential of 3855.2 kg/ha, 3468.9 kg/ha respectively and minimum yield obtained from x-jigna variety.

Farmers' participatory evaluation and selection for the tested rice varieties

Participatory variety selection in this study showed that which varieties by which criteria are preferred by farmers (Table 3). Farmers give rank based on the following criteria for production *viz.,* grain yield,

maturity date, disease resistance, tillering ability, seed size, panicle length and plant height.

The result of direct matrix ranking (Table 3) revealed that varieties ediget ranked first followed by NERICA-4 and Fogra-1 based on the criteria listed by the participants. Farmers had question for the negative and positive side of each variety so that it gives good opportunities for breeder to make improvement **(Tables 1-3)**.

Table 1. Analysis of variance among rice varieties for the studied traits.

Traits	Mean	MSV (7)	MSL (1)	MSY (1)	MSVL (7)	MSVY (7)	MSVYL (8)	MSE (62)	CV (%)
FD	83.8	181.7***	894.3***	14.3ns	3.8ns	22.9***	115.1***	3.8	2.33
MD	114.5	73.3***	682.7***	0.7ns	12.4ns	20.4*	96.2***	7.5	2.38
PH	105.2	1155.8***	126.0ns	2328.5***	146.2*	90.6ns	143.7*	55.2	7.06
PL	19.8	6.8**	14.7*	1.5ns	3.9ns	4.3ns	5.3*	2.2	7.52
FT	31.4	139.3*	315.4*	1239.9***	27.7ns	75.2ns	63.7ns	58.2	24.3
FG	97.6	1106.3***	8832.0***	43947.04***	534.4*	288.8ns	1571.6***	203.5	14.62
TSW	33.3	35.2ns	302.1***	89.74*	5.6ns	31.6ns	10.6ns	16.51	12.21
GY	3084.3	5406302.3***	14073683.2***	12872036.6***	2327468.4***	508963.8ns	3795745.3***	551645.6	24.1

Table 2. Mean performance of rice varieties for eight traits.

Varieties	FD	MD	PH	PL	FT	FG	TSW	GY
Shaga	83.3^c	115^{bc}	118.6^a	19.98^{abc}	26.25^d	101.8^{abc}	31.8^b	3468.9^a
Fogera-1	83.4^{bc}	115^{bc}	97.95^{cd}	20.15^{abc}	31^{abcd}	108.9^a	34.04^{ab}	3380^{ab}
Ediget	82.3^c	110.9^e	103.28^{bc}	18.5^d	30.5^{abcd}	103.9^{abc}	35.8^a	2808.2^{bc}
Adet	80.3^d	113.2^{cd}	91.5^e	19.13^{cd}	30.35^{bcd}	96.7^{bcd}	32.14^b	3352.1^{ab}
Wanzaye	83.1^c	116.1^b	112.7^a	20.43^{ab}	36.7^a	88.7^{de}	35.5^a	3406.5^{ab}
NERICA-4	80.1^d	111.7^{de}	96.98^{de}	19.4^{bcd}	33.7^{abc}	106.23^{ab}	33.5^{ab}	3855.2^a
Gumara	92.5^a	118.4^b	116.35^a	20.83^a	34.5^{ab}	80.43^e	31.31^b	2708.4^c
X-Jigna	85^b	116^b	104.2^b	20.03^{abc}	28.25^{cd}	94.1^{cd}	32.03^b	1694.7^d
LSD	1.6	2.2	6.1	1.21	6.22	11.64	3.31	606.12

Table 3. Ranking of selection criteria for each variety.

Relative weight / Variety	Grain yield	Maturity Date	Disease Resistance	Seed Size	Plant Height	Tillering Ability	Panicle Length	Total Score	Rank
Shaga	3	3	3	3	4	4	3	23	4
Fogera-1	3	3	3	3	3	3	3	21	3
Ediget	1	2	2	2	2	2	2	13	1
Adet	3	3	3	3	3	4	4	23	4
Wanzaye	4	3	3	4	4	4	4	26	6
NERICA-4	3	3	3	3	3	3	3	19	2
Gumera	5	4	5	5	4	3	4	29	7
X-jigna	5	5	5	5	5	5	5	34	8

Note: 1=excellent, 2=very good, 3=good,4=fair and 5=poor

CONCLUSION

Varieties selected by researchers not likely selected and preferred by farmers because farmers have their own interest for selection criteria, therefore farmer's participation in selecting technologies is very important. In this study Ediget, NERICA-4 and Fogera-1 were preferred by farmers for the next production based on their selection criteria grain yield, maturity date, disease resistance, tillering ability, seed size, panicle length and plant height. Therefore, for the study area three varieties were recommended for the production packages.

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