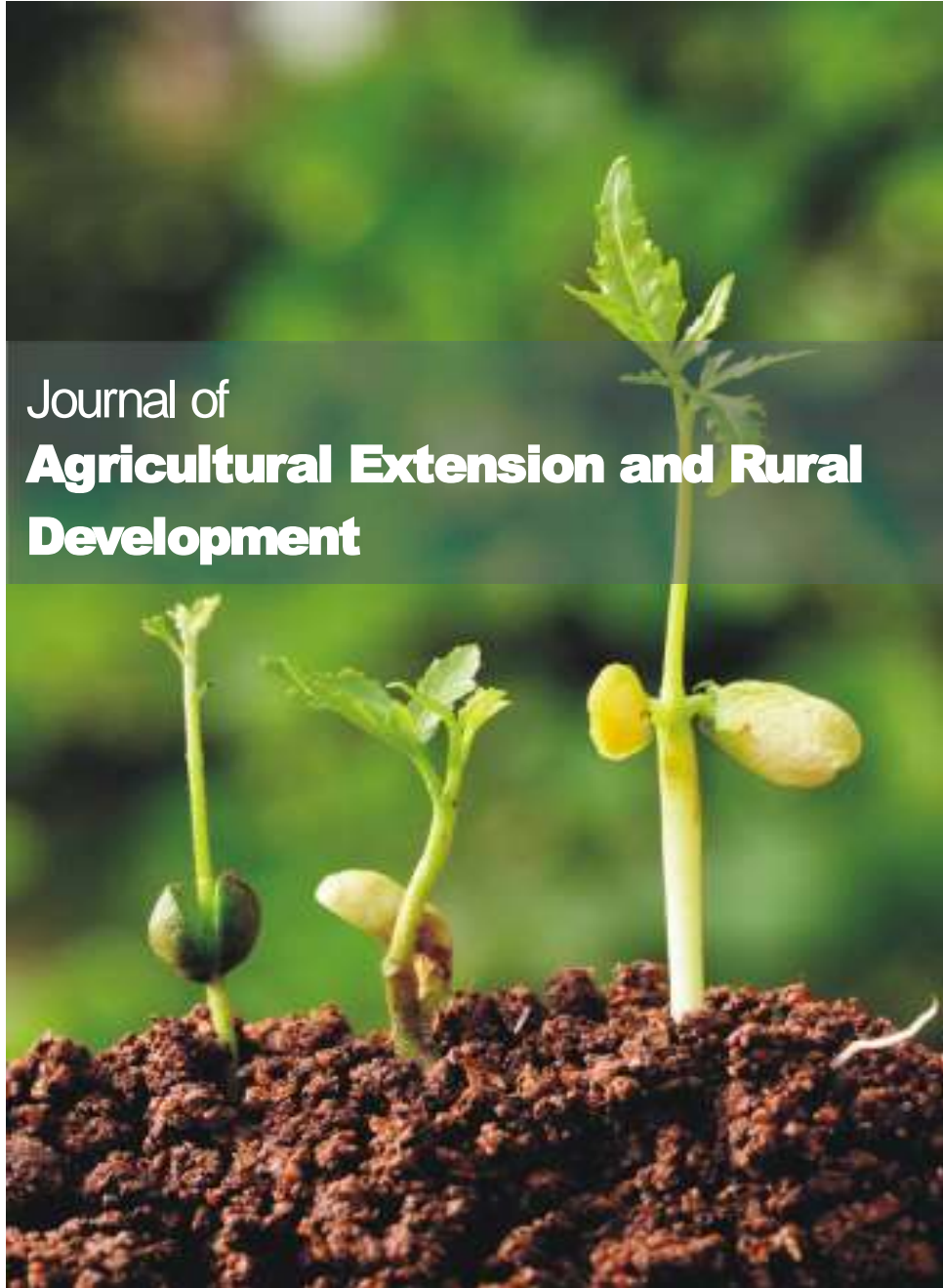


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Full Length Research Paper

Gender and youth challenges and opportunities in rural community: The case of Goregora, West Dembia district of North West Ethiopia

Wondim Awoke Kassa* and Kefale Eniyew

Department of Rural Development and Agricultural Extension, College of Agriculture and Rural Transformation, University of Gondar, Gondar, Ethiopia.

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The study was conducted in Goregora, North West Ethiopia. The main objective of the study was to analyze gender role, gender and youth challenges and opportunities in the study area. Two stage sampling technique was employed. Male (32) and female (28), in total 60 sample respondents were interviewed. The sample size for this study was a function of the variability of the population characteristics, time and resource availability. Data were collected through focus group discussion, key informant interview, sample household interview and observation. Quantitative and qualitative data were analyzed in the form of description and narration respectively. According to the study, 45% of the sample respondents said that there was gender based discriminatory practice. Challenges related to youth and genders were also found. Besides, the research result indicated that the contribution of men and women in the division of labor was unequal. Therefore, concerned body should organize experience-sharing event among household and best practice should be scale out. In addition, governmental and nongovernmental organization should provide awareness creation training for both sexes.

Key words: Challenges, community, gender, rural.

INTRODUCTION

Gender is about a socially constructed set of norms and values that govern social relations, behaviors, opportunities and accesses, risks and vulnerabilities for men and women. It became developmental concern more than three decades (Jerneck, 2018). According to the

global and local evidences show heavy bias against women and girls in case of division of labor, access to and control over resources, decision making power and equal beneficiaries from any development endeavors (Lal and Khurana, 2011). To address inequalities between

*Corresponding author. E-mail: wondimawoke@gmail.com. Tel: +251 916352952.

men and women in every aspects of human life gender mainstreaming approach was introduced in Beijing conference (1995) (Bekhouche et al., 2013). Gender mainstreaming incorporates series steps of actions that begin from gender analysis. Gender analysis is a fundamental step toward identifying, assessing and informing actions that are essential to address gender inequality in programs and institutions and to benefit men and women equitably (Akpan, 2015).

Gender roles are socially defined tasks, responsibilities, and behaviors, which are appropriate for men and women. They vary from society to society and can change over time (Manfre et al., 2013). Hence, both men and women perform different activities in the study areas. Women farmers perform different paid and unpaid activities, but their work remains undervalued and not considered as work (Baden, 2013; Bekhouche et al., 2013). In Ethiopia, gender inequality is a serious concern. The country stands 129th out of 136 countries in the gender related development index (UNDP, 2011) and 116th in the global gender gap index (World Economic Forum, 2011). Ethiopian women and girls are subordinate to their husbands, families as well as vulnerable to various forms of gender based violence such as early marriage, female genital mutilation (FGM) and domestic violence. Furthermore, the physical hardship they face or undergo in their everyday lives has not yet been given emphasis (UN, 2014).

The agricultural sector in Ethiopia, which employs more than 80% of the population, shows disproportionate exertion of labor and imbalanced control over products between men and women. Gender related norms and values gives high value for men as heads of the household with more privileges to control key resources and decision-making power over women. Even if the contribution of women to agricultural production and maintenance of the household is immense, their role is unrecognized or undervalued in the eyes of the community and local administrations. As a result, most rural women were left out from agricultural support programs/extension services, introduction of new farming technologies and income diversification interventions (Oxfam, 2015).

Currently, regional governments have established women's affairs bureaus and departments, employed them, and afforded them with recurrent significant budgets (Spadacini and Nichols, 1998). The government also set up a micro enterprise scheme whereby a group of entrepreneurs can develop business plan, access credit and obtain support from the government. This scheme designed to benefit women more by facilitating their economic empowerment. A review made by the investigators on challenges and opportunities of gender and youth shows that no study was conducted in the study area. Therefore this paper provides details of information on gender and youth challenges and opportunities in rural community in North West Ethiopia to

attain the following objectives: (1) Identifying and analyzing gender role; (2) Identifying gender based discriminatory practice and their methods used to avoid discriminatory practice, and (3) Assessing the gender and youth challenges and opportunities in rural community.

METHODOLOGY

Sampling techniques and sample size

The study was conducted in Gorgora, West Dembia District of North West Ethiopia. The study employed two stage sampling technique such as purposive and simple random sampling. The study area was selected using non-random purposive sampling due to time and resource availability to collect data.

Meanwhile, simple random sampling was employed to select sample respondents. Smallholder farmers were the target group for the study. The sample size for this study was a function of the variability of the population characteristics (either homogenous or heterogeneous), time and resource availability. Based on these criteria, male (32) and female (28) totally 60 sample respondents were selected and interviewed from target area. The sampling covers from young (who has not married) up to the elders to collect information for meeting stated objective. Data collected through sample household interview were triangulated by using different data collection tools such as focus group discussion, key informant interview and observation.

Data analysis

After the collection of data to achieve stated objectives, gender analysis was used to analyze data gathered on gender differences and social relations to identify and understand the different roles, challenges and opportunities in the community. Both qualitative and quantitative tools were used to carry out data analysis of the gender issue in the community. Under the quantitative tools, descriptive analysis such as range, chart and percentage was utilized, whereas qualitative data were analyzed through narration. Statistical Package for Social Sciences software (SPSS) version 20 was utilized to carry out analysis for quantitative data.

RESULTS AND DISCUSSION

Socio economic characteristics of the sample respondents

Among the sample respondents, 53.3% of the respondents were male, whereas 46.7% of them were female. The minimum and maximum age of the respondent was 18 and 82, respectively having the mean age of 42.82 years old. Number of family members was ranged from 1 to 10 and mean of 5.38. The marital status of sample respondent was single (8.3%), married (88.3%) and divorced (3.3%). From the total sample of the respondents, 73.3% of them were illiterate and the rest of them were literate. The sample respondents reported that they were engaged in different income generating activities in their community such as farming (86.7%), private employment (6.7%) and other like petty trade and private guard (6.7%).

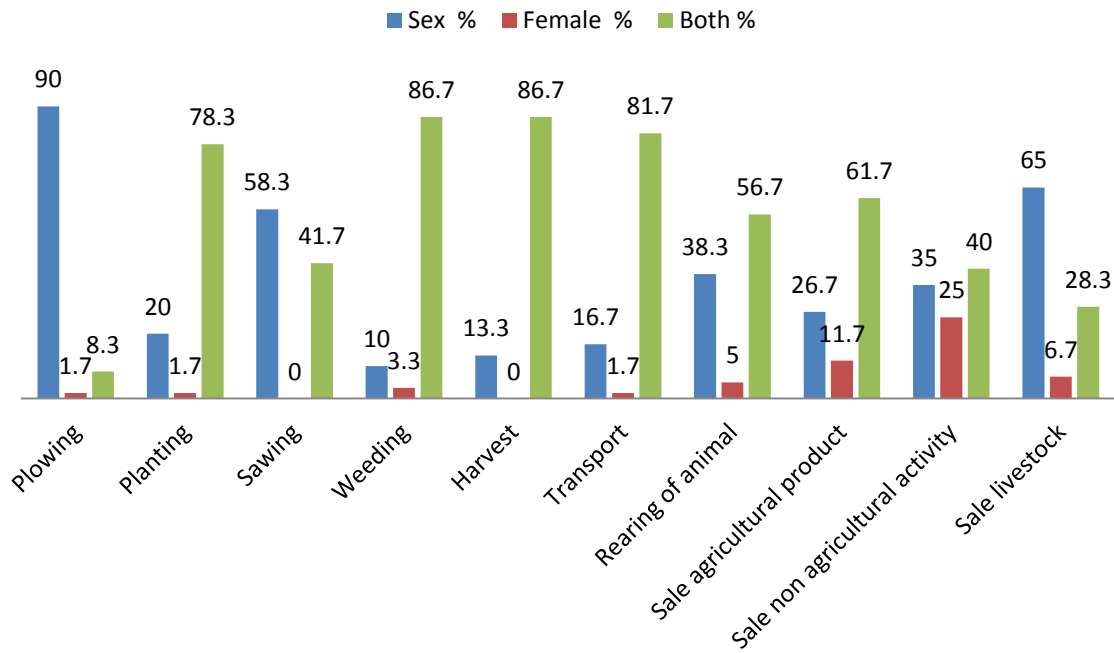


Figure 1. Productive activity performed by both sex.

Gender role (division of labor)

Productive role

The productive activities were considered as income generating activities in the community. The different studies revealed that, it was considered as the men activity/role (Baden, 2013; Bekhouche et al., 2013). In the study area, sample respondents were engaging in different income generating activities to improve their livelihood. In the household, men and women have different roles with different degree of participation. Activities or role performed by men and women in the study area were plowing, planting, sawing, weeding, harvesting, transporting, rearing of animal, selling agricultural products like crops and non-agricultural product like fire woods and livestock. The result of the study indicates that men mostly did activities such as plowing, sawing and selling of livestock (65%) compared to women. Meanwhile, activities such as planting (78.3%), weeding (86.7%), harvesting (86.7%), transporting (81.7%), rearing of animals (56.7%), selling of agricultural and non-agricultural products were major activities done by both men and women in the study area. The sample respondents said that activities such as planting (78.3%), weeding (86.7%), harvesting (86.7%), transporting (81.7%), rearing of animals (56.7%), selling of agricultural product (61.7%) and non-agricultural product (40.0%) were done by both men and women.

According to Bassazenew (2008), the rigidity of

gender division of labour was seen in productive activities like plowing, sowing and applying fertilizer and there were some activities, which were done minimal involvement of women in farm activities due to domestic workload, cultural norm and beliefs and their perception. According to (Care, n.d), men in Ethiopia, did alone plowing only from the agricultural activities. In the study area, there was rigidity in productive activities like sowing and harvesting activities, that is, women participation on these activities was minimal (Figure 1).

Reproductive role

The activities, which were done mostly in home and time consuming, were so called reproductive activities. Most scholars argue that it was considered women activities (Baden, 2013; Bekhouche et al., 2013; Cohen, 2004; Ferrant, Pesando and Nowacka, 2014; Sikod, 2007; Standing, 2008). These include washing cloth, brining water, preparing food, clothing, medication and schooling, cooking, cleaning and nursing activity. The study revealed that women performed most activities such as washing cloth (76.7%), brining water (68.3%), preparing food (75%), cooking (78.3%) and cleaning activity (78.3%). However, the participation of men in reproductive activities was below average. The sample respondents said that activities like clothing (46.7%), medication (63.3%), schooling (76.7%) and nursing (48.3%) were done by both sex (Figure 2).

The domestic gender division of labor varies based on geographic regions, household income and societies.

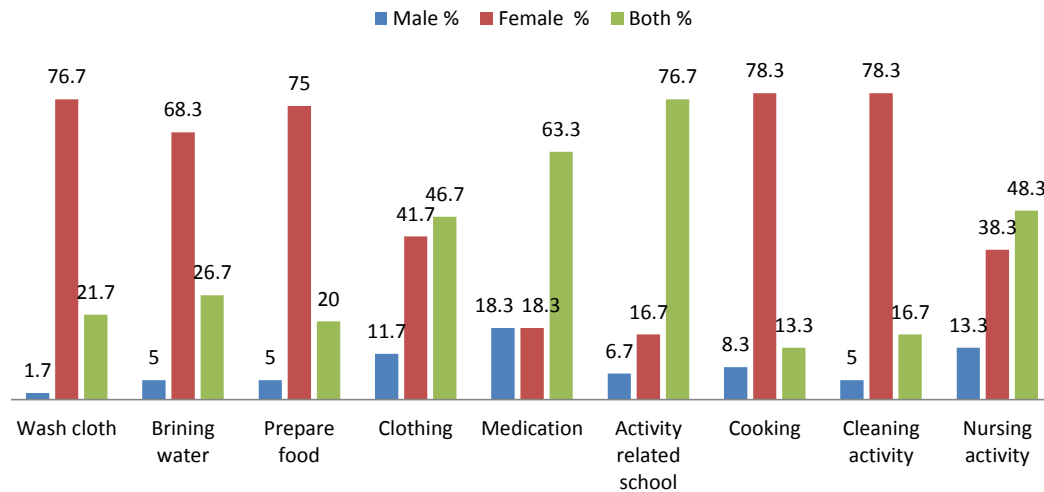


Figure 2. Reproductive activities performed by both sex.

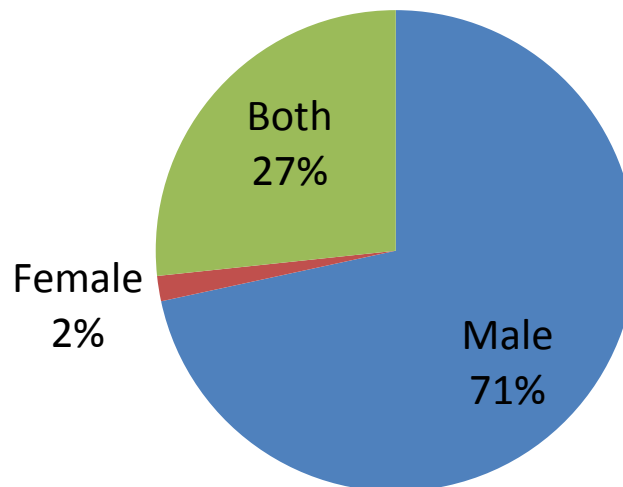


Figure 3. Community management activities performed by both sex in percentage.

Nevertheless, around the world, unpaid work/domestic works were mostly considered as female responsibility. They also spend more time on domestic work compared to the male (Ferrant et al., 2014). In line with these in the study area, reproductive role was assumed the task of women and the participation of men were minimal but not rigid. In contrast to these, study conducted by Bassazene (2008) revealed that the household division of labor in domestic task was mostly rigid.

Community management

In the study area activities such as *Idir*, *Ekub*, *Debo*, wedding, funeral and security were considered as community management activities. Such activities were

the most crucial for the social developments of the community. Being member of institution has paramount role in building human capacity in management and administration but women have no chance to join institution compared to men (Coles and Mitchell, 2011). The study also revealed that sample respondents said that male (71%), both male and female (27%) and female (2%), did the community management activities. This shows that the participation of women in social development aspect was low (Figure 3).

Gender based discriminatory practice

Both men and women are victims of gender-based violence's as result of socio cultural factors. However,

women are the primary victims at household and societal level. For a long period women were faced with unconstructive effect through customary practices like dominance of men (Baden, 2013). In this study, 45% of the sample respondents said that there was gender based discriminatory practice in the study area. Some of the gender based discriminatory practices in the area were patriarchal system, low payment with same activity, and design of the technologies. According to the study, 31.75% of the sample respondents said that there was patriarchal system in the study area. However, 68.3% of the sample respondents said that there was no practice of patriarchal system. Many individuals argued that patriarchal system was manifested by paying fewer amounts of birr by same work. The study found no consensus about payment. For example, 71.7% of the sample respondents said that there were individuals that receive low payment. On the other hand, 28.3% of the respondents said that there was no individual that receive low payment. Meanwhile, more than half, that is, 55.8% of respondents said that females were receiving low payment. The sample respondents said that male (18.6%) and both male and female (25.6%) received low payment. In the study area, the designed technologies were not suited to physical condition of male and female. Among the sample respondents, 95% of them said that technology did not suit physical condition of males and females. Especially, technologies did not suit with the physical condition of the female farmers. During the focus group discussion and key informant interviews, participants mentioned some of the gender based discriminatory practice such as men perceive themselves as superior to women, have more land ownership authority, low participation women in meetings, work discrimination, cultural belief such as women should not go outside and female genital mutilation. However, communities with government have used some methods to avoid unethical and immoral activities through government punishment, applying affirmative action and consultation. In most cases, women were faced with problems in the community during their live with their male counterpart.

As discussed previously in Africa particularly Ethiopia there were different gender based problems like stereotyped perception of society towards women which impedes social and economic development (Bayeh, 2016). Besides, deep-rooted patriarchal social norms, religious practices, biased attitudes and traditional practices such as female genital mutilation (FGM) were different challenges that encountered women in the rural community of Ethiopia (Care, n.d).

Gender and rural youth challenges and opportunities in the community

Challenges were problems face by smallholder farmers to

improve their livelihood. The major common challenges that faced both men and women farmers in study area include shortage of land, shortage of access to credit, shortage of technology, low literacy, less cash to pay for transport and religious reasons. According to the study result, shortage of land (90%) and religious reasons (26.7%) were the most and least challenges in the study area, respectively.

Women play a significant role in different agricultural and non-agricultural activities (Harun, 2014). Even though, women participated in different activities, they were faced with challenge to access and control of resources such as land, financial credit and skills training (Care, n.d). Like other world, women in the study area were faced with different challenges while they were engaging in life improving activities. The study revealed that 68.3% of the sample respondents believed that rural women were exposed to various problems in the community. These include challenges such as shortage of time (53.3%) and lack of freedom to move out side community (45%). In addition to these, lack of access to education, workload related to household activities, unsustainable support from women's association/group, lack of access to get training services, mobility problem/fear of movement alone, feeling of inferiority and shortage of women empowerment training were common problems, which women encountered in the community.

Lack of land access and unemployment were the challenges that faced youths. Particularly, lack of land access made them away from an agricultural livelihood and outmigration (Bezu and Holden, 2014). Rural youth in the study area faced different challenges in their life. For instance, 81.7% of the sample respondents' revealed that rural youth was victims of different challenges. Among which lack of employment, shortage of land, low opportunity for job, lack of initial budget, lack of empowerment by government, lack of coordination among youth, lack of credit and diseases like HIV AIDS were the common challenges for both male and female youth. Besides, lack of participation in training, small land size, lack of productive land, shortage of enough money for more production, lack of technical training and less payment were the common problems that faced rural youth. However, mostly usage of drug, alcoholic drinks and addiction to alcohol were the major challenges for male youths. During the key informant interview, particularly for female youth attending school due to farness and work burden by family were the major challenges.

Even if there are several challenges, there also some favourable conditions that help farmer to improve their livelihood. These include the existence of formal and informal group, good loan repayment rate, meeting place, skills and indigenous knowledge. According to the study result, these opportunities varied based on the respondent response, that is, existence of formal group (51.7%), good loan repayment rate (38.3%), informal

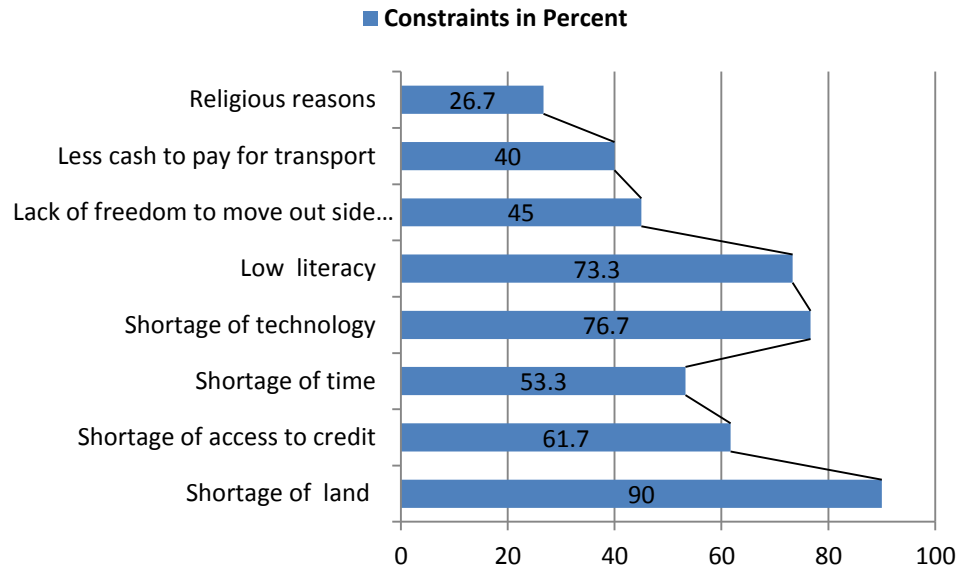


Figure 4. Gender challenges (in percentage).

group (85%), meeting place (80%), existing skills (73.3%) and indigenous knowledge (63.3). Hence the existence of the informal group (85%) and good loan repayment rate (38.3%) were the most and least opportunity in the study area, respectively (Figure 4).

CONCLUSION AND RECOMMENDATION

According to the result of the study, in most households the division of labor between men and women was not equal. Men predominantly did some activities and women performed most of them, and only a few of the tasks were done by both sexes. Mostly productive activities were done by both sexes. However, role played by women alone compared with men was small. Some productive activities like sawing were done by men alone. Mostly, the reproductive activities were under the shoulder of women. Men did community management activities and this may be because women were so busy with reproductive activities and this is due to cultural barriers. According to the study, some of the sample respondents reported that there was no gender based discriminatory practice, though some of them mentioned gender based discriminatory practice such as patriarchal system, low payment with same activity, and design of technologies. Respondents also reported the existence of different challenges that inhibit them from improving their livelihood. Among which shortage of land was the major one. Lacks of access to education, workload, shortage of women empowerment training were also the challenges that women face. In the study area, rural youth were faced with challenges such as lack of employment, shortage of land, disease like HIV AIDs, lack of technical

training, work burden and alcoholic addiction. The existence of formal and informal group and indigenous knowledge were opportunities that existed in the community. Based on the conclusions drawn, the following recommendations were given:

1. The research result indicated that the contribution of men and women in the division of labor was unequal. Hence, governmental and nongovernmental organization should provide awareness creation training for both sexes of the community.
2. Gender discriminatory practice and challenges that face community vary from individual to individual. Therefore, concerned bodies should organize experience-sharing event among households and best practice should be scale out.
3. Shortage of land was the most severe challenge for the community especially rural youths. Hence, the government should reform the land to benefit landless youth.
4. Government should also formulate policy related to usage of drug by youth to reduce addiction.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Participatory evaluation of the adaptability of released maize varieties to moisture stress areas of Dugda Dawa, southern Oromia

Natol Bakala*, Tolasa Taye, Dirriba Mangistu, Belda Idao and Ahmed Mohamed

Yabello Pastoral and Dryland Agricultural Research Center, Oromia Agricultural Research Institute, P. O. Box 85, Yabello Ethiopia.

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Maize is an essential food crop in Ethiopia. The experiment was conducted to establish and select adaptable maize variety/ies with better agronomic performance and to familiarize farmers with improved agronomic practices for moisture stress within the study area. The experiment was conducted on agro-pastoralists' land by the researcher together with some selected members of agro-pastoralists. Three maize varieties that included (MH140, MHQ138, and MH130) were used for the experiment on selected pieces of land. A total of twenty-five farmers were selected from the following Peasant Association for this experiment for both years based on their interest. Five groups were formed based on their closer areas. Each group planted all maize varieties on 10 × 10 m plot size for each variety with a gross area of 100 m² after the land was prepared in good manner with the help of expert. Recommended spacing of 75 and 25 cm between rows and plant, respectively was used. Analysis of variance showed significant difference among varieties in days to physiological maturity, plant height, biomass, grain yield, and harvest index. The highest grain yield was obtained from MH130 (6.55 ton/ha) followed by MHQ138 (5.88 ton/ha), while the lowest grain yield was recorded for MH140 (5.02 ton/ha). Based on agro pastoralists perception and selection criteria, MH130 was the first followed by MHQ138. This study states how the pastoralist perceptions were obtained. Therefore, since MH130 is relatively a high yielder and early maturing variety, it is recommended for adoption in Dugda Dawa district and other areas with the same agroecology.

Key words: Participatory, agro-pastoralist, Dugda Dawa, maize variety, perception.

INTRODUCTION

Maize (*Zea mays* L) is one of the most important cereal crops grown world-wide with a global leader in total cereal production and is ranked third most important food

crop after wheat and rice (FAOSTAT, 2012). Maize is also an important staple cereal crop sub-Saharan Africa. The crop fits well in farming systems across agro-

*Corresponding author. E-mail: natymartyko@gmail.com. Tel: +251464460198. Fax: +2510464460261.

ecological zones in the region, meeting the nutritional needs of people with varying socio-economic circumstances (Macauley and Ramadjita, 2015). It is a versatile crop grown over a range of agro climatic zones. In fact, the adaptability of maize to diverse environments is unmatched by any other crops. It is grown from 58°N to 40°S, within latitudinal ranges of 0 to 3000 masl and in areas with 250 mm to more than 5000 mm of rainfall per annum (Dowswell et al., 1996). Maize is one of the most important cereal crops in Ethiopia, ranking second in area coverage following tef and first in total grain production followed by tef, wheat and sorghum and first in area coverage (FAO, 2015). The popularity of maize in Ethiopia is partly because of its high value as a food, feed and source of fuel for rural families. Approximately 88% of maize produced in Ethiopia is consumed as food, both as green and dry grain (CSA, 2015).

Maize growing areas in Ethiopia are mostly classified into four agro-ecological zones based on altitude and annual rainfall. These are the high altitude moist zone, which lied between altitudes of 1700 to 2400 masl, and receive 1200 to 2000 mm annual rainfall. The mid altitude moist zones lies between an altitude of 1000 and 1700 masl and receives 1200 to 2000 mm annual rainfall. The low altitude moist zone lays an altitude less than 1000 masl and receives 1200 to 1500 mm annual rainfall. The moisture stress zones lie between an altitude ranging from 500 to 1800 masl and receives rainfall amount of less than 800 mm per year (Kebede et al., 1993). About 40% of the total maize growing area is located in lowland (moisture stress areas) and contributes less than 20% of the total annual production (CSA, 2015). This is because rainfall in this region is unpredictable both in terms of distribution and amount (may start early or very late in the season), quantity (sometimes less than 600 mm/annum) and in its distribution.

Annual maize yield loss of about 15% has been attributed to drought in sub-Saharan Africa and biomass production generally decreases with decreasing moisture availability (Blackwell et al., 1985). The yield reduction of 70 to 90% has also been reported under mild to severe water stress condition (Vicente, 1999). Drought stress at silking, tasseling and grain filling has been reported to be more drastic on grain yield in maize than stress during vegetative phase (Westgate and Grant, 1989). Poor stand establishment results in reduced yield and/or complete crop failure if drought occurred at the seedling, flowering or grain filling stages, which coincide with the beginning and end of the growing season (Sacks et al., 2010). Therefore, the low yield in these areas is mainly attributed to recurrent drought, low levels of fertilizer use and low adoption of improved varieties. To combat this problem, varied maize varieties have been released from Melkassa Agricultural Research Center for moisture stress areas which are tolerant to drought. However, most of the varieties were not evaluated for moisture stress areas of western Guji zone especially on farmers

land. Participatory evaluation of technology under farmers' condition is an important approach in technology dissemination process. Above all, it is a systematic dialogue between farmers and scientists to solve problems related to agriculture and ultimately increase the impact of agricultural research. Since, participation of farmers in varietal choice has considerable value in technology evaluation, dissemination and production improvement for a given crop. Therefore, this study was designed to demonstrate and select adaptable maize variety/ies with better agronomic performance integrating farmer's criteria and to familiarize farmers with improved agronomic practices for moisture stress areas of the study area.

MATERIALS AND METHODS

Description of the study area

The experiment was conducted at Dugda Dawa district, Mokonisa Magada PA for two consecutive years. Dugda Dawa district is found in western Guji zone at 498 km from Addis Ababa to southern direction. Dugda Dawa had midaltitude (30%) and lowland (70%) environmental conditions. The district is found in lowland area which receives an average annual rainfall of 750 mm that is erratic and not evenly distributed. The altitude of the study area ranged from 300 to 1750 masl. The length of the growing season is between 60 and 100 days (March to June) "Gana" season and late August to late October "Hagaya" season. The types of soil found with the study area are mainly sandy loam to sandy clay with low moisture holding capacity. The temperature in the region ranges from 25 to 33°C. The dominant crops grown in this area are maize (*Z. mays* L), inset (*Ensete ventricosum* (Welw)), tef (*Eragrostis tef*) and haricot bean (*Phaseolus vulgaris* L).

Experimental setup and management

Selection of participants (agro-pastoralists) was done in a participatory manner with the district pastoral office experts working on crop production. The selection of participants was based on the interest they had on technology, model farmers and managing the field as required. Accordingly, a total of twenty-five farmers were selected from the following PA for this experiment for both years. After the farmers undergoing training, they were grouped into five participatory research (PRG) groups according to their proximity to the experimental sites. After the sites were selected for all groups, land was cleared, ploughed and harrowed by using an oxen-drawn plough at the end of the second rain season. Three improved maize varieties (MH-140, MHQ-138, and MH-130) released from Melkassa Agricultural Research Center were demonstrated on agro-pastoralist land. Each group planted all maize varieties on 10 × 10 m plot size for each variety with a gross area of 100 m² after the land was prepared in good manner with the help of expert. Recommended spacing of 75 and 25 cm between rows and plants, respectively was used. Planting was done immediately following the first rain shower. Two seeds per hill were sown, which were thinned to one plant per hill after three weeks. Sowing was done by hand drilling at a seeding rate of 25 kg ha⁻¹. The maize crops were sown at 2 seeds per hole (justify). Fertilizer was applied in the form of Urea and DAP in the rate of 200 and 150 kg ha⁻¹, respectively. DAP was used all once during planting, while half of the urea was applied during planting, one fourth at knee stage and one fourth at

silking stage. All agronomic practices including weeding were done for all varieties equally as required.

Collected data

Days to physiological maturity (DM)

It is the number of days from date of emergence to the date when 90% of the plants in each plot are physiologically matured determined by the formation of black layer at the base of each kernel.

Plant height (PH)

A height of five randomly taken plants from each plot was measured from the ground level to the base of tassels and the average was recorded in centimeter.

Ear height (EH)

The height of five randomly taken plants from each plot was measured from the ground level of the node bearing upper ear and the average was recorded in centimeter.

Ear length (EL)

Length of five randomly taken ears from each plot was measured from the base to the tip of the ears and the average was recorded in centimeter.

Grain yield per plot (Yld)

Measuring the amount of grain yield obtained from a plot in kilogram.

Biomass (BM)

Total above ground yield (Grain yield and other morphological part) harvested from each plot was weighted after being dried under sun and converted to hectare base.

Harvest index

This was calculated for all varieties by using the following formula:

$$HI = \frac{\text{grain yield}}{\text{total yield}}$$

Finally, pastoral perception was collected to enhance the farmer's demands in technology recommendation across various criteria of socio-economics criteria.

Data analysis

The collected agronomic and phenological data were subjected to SAS computer software (SAS Institute, 2002). Means separation was done using least significant difference (LSD) at $p < 0.05$. Farmer's perceptions were analyzed by descriptive statistics. Collected farmers preferences were analyzed by using formula

described by De Boef and Thijssen (2007). The formula of ranking method used was:

$$\text{Rank} = \sum \left(\frac{N}{n} \right)$$

where N is the value given by group of farmers for each variety based on the selection criteria and n is the number of selection criteria used by farmers.

RESULTS AND DISCUSSION

Agronomic performances

Analysis of variance showed significant difference among varieties in days to physiological maturity, plant height, biomass, grain yield, and harvest index. The significant difference observed among varieties showed the genetic difference of the varieties.

Days to maturity

In days to maturity, analysis of variance showed significant repetition difference among varieties ($p < 0.05$). The highest days to maturity was recorded for MH140 (149 days) while the lowest days to maturity was recorded for MH130 which took 127.33 days to mature.

Plant height

Analysis of variance showed significant difference among varieties ($p < 0.05$). The highest plant height was registered for MH140 (196.67 cm) followed by MHQ138 (187.23 cm), while the lowest plant height was registered for MH130 (166.67 cm) (Table 1). Different researchers reported significant difference in plant height for maize genotypes (Tadesse et al., 2014; Taye et al., 2016; Bakala et al., 2017).

Biomass

Analysis of variance showed significant difference among varieties in biomass yield ($p < 0.01$). The highest biomass yield was recorded for MH140 (8.51 ton/ha) while the lowest was recorded for MH130 (7.87 ton/ha) (Table 1). In line with the aforementioned finding, Tadesse et al. (2014), reported significant difference in total biomass yield for different maize genotypes.

Grain yield

Analysis of the data revealed significant variations among the tested varieties ($p < 0.01$). The variety MH130 (6.55 ton/ha) had higher grain yield than all other varieties



Figure 1. Pictorial presentation of MH130 maize variety 2017 main cropping season at grain filling stage (Natol, September, 2017).

Table 1. Mean performance of different maize variety at moisture stress areas of Western Guji Zone, Dugda-dawa district in 2017 main cropping season (pooled mean).

Variety	DM (days)	PH (cm)	EH (cm)	BM (tone/ha)	GY (tone/ha)	HI
MH130	127.33 ^b	166.67 ^b	86.27 ^a	7.87 ^c	6.55 ^a	0.45 ^a
MHQ138	147.33 ^a	187.23 ^{ab}	82.47 ^a	8.29 ^b	5.80 ^b	0.41 ^b
MH140	149.00 ^a	196.67 ^a	96.67 ^a	8.51 ^a	5.02 ^c	0.37 ^c
Mean	141.22	183.53	88.46	8.22	5.79	0.41
CV	5.14	9.59	7.36	5.64	6.98	5.62
LSD	16.47*	21.76*	14.76ns	0.15**	0.54**	0.03**

Means with the same letter are not significantly different. DM: Days to maturity, PH: plant height, EH: ear length, BM: biomass, GY: grain yield, HI: harvest index, ns: non-significant, **Significant at ($p < 0.01$), *Significant at ($p < 0.05$), LSD: least significant difference, CV: coefficient of variation.

under study while the variety MH140 (5.02 ton/ha) yielded the lowest grain than other varieties (Table 1). In the same way, Bassa and Goa (2016) reported significant difference among maize genotypes in grain yield in their study of maize performance evaluation at Southern Ethiopia Hadiya zone. Similar, Taye et al. (2016) reported significant difference in grain yield for high land maize genotypes evaluated at Bule Hora in Ethiopia. In contrast to the current finding, Tadesse et al. (2014), reported non-significant difference for different maize genotypes evaluated on farm at Chilga district of North Western Ethiopia.

Harvest index

Analysis of the data revealed significant variations among

the tested varieties ($p < 0.01$). The variety MH130 (45%) (Figure 1) had the highest harvest index while the variety MH140 (0.37) had the lowest harvest index (Table 1). This is in agreement with Worku and Zelleke (2007), who reported that mean harvest index varied from 31.1 to 45.0%. Tadesse et al. (2014) also reported harvest index ranging from 43.5 to 32.70% for different maize genotypes on farm evaluation.

Preference comparison

The producers were asked to list the main criteria to be considered in the selection of improved seed in their local condition. Responses given included variables such as: yield, early maturity, drought tolerant, disease, tolerance, seed size, seed color, plant height, less susceptibility for

Table 2. Variety ranking against various criteria.

Maize variety	Yield	Early maturity	Drought tolerant	Disease tolerance	Seed size	Seed color	Plant height	Less wildlife attack	Score (100%)
	23.5	17.6	23.5	11.8	5.9	5.9	5.9	5.9	100
MH130	94	70.4	94	47.2	23.6	23.6	23.6	5.9	38.2
MH140	47	35.2	23.5	23.6	17.7	11.8	17.7	17.7	19.4
MHQ138	70.5	52.8	70.5	35.4	11.8	5.9	5.9	11.8	22.0

wildlife attack, market demand and consumption. From these criteria, crop yield, drought tolerant, early maturity and disease tolerance were given a due attention by pastoral households. Although the aspect of the market demand and taste were not evaluated, at the current condition the producers preferred MH130, MHQ138 and MH140 (Table 2) as the most suitable maize varieties for the moisture stress regions of Dugda Dawa.

However, the preference was highly susceptible to rainfall condition. In good rainy season, MH140 can relatively provide higher yield than the other two varieties (MH130 and MHQ138), while MH130 and MHQ138 are highly preferable, respectively due to both drought resistant and early maturity. As compared to the local breed, however, MH130 and MHQ138 can highly withstand the moisture stress season that provides reasonable yield to ensure the food security of the households. Finally, MH130 and MHQ138 were selected as the first and second selected crop on average across various criteria (Table 2). Though the market demands were not yet evaluated, the higher yield and resistant to moisture stress could be an indication to improve the income of the community as compared to the local seed.

CONCLUSION AND RECOMMENDATIONS

Maize (*Z. mays* L.) is one of the most important cereal grains grown worldwide in a wider range of environments because of its greater adaptability. Analysis of variance showed significant difference among varieties in days to physiological maturity, plant height, biomass, grain yield and harvest index. The significant difference observed among varieties showed the genetic difference of the varieties. In addition to its yield advantage over other varieties, MH130 variety was selected by PRG members and field day participants including district and zonal level experts as first and productive variety. MHQ138 was ranked second in grain yield and preference criteria's. Based on the stated findings, the following recommendations were suggested for end users and researchers.

Since maize is one of the most important food crop of the society, it needs further attention to increase the production and productivity than the currently obtained one.

(1) Variety MHQ138 has very valuable quality protein very important for human consumption, so it is recommended to be produced for food purpose.

(2) Participatory varietal selection has significant role in rapid technology adaptation and dissemination than conventional approach.

(3) Highbred varieties need seed from its source (first line). Yet, the supply of these seeds to the demand of these producers need further attentions due to economy of scale for individual producers to collect the seed from its sources. Thus, it needs strong linkage of producers, agriculture and natural resource office of both district and zonal level office, seed supplier and seed enterprises.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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