Reports
2023; 3(4): 41-46
http://www.sciencepublishinggroup.com/j/reports
doi: 10.11648/j.reports.20230304.11
ISSN: 2994-7146 (Online)

Seed Dissemination Path-Way of Major Improved Crop Varieties and Its Related Constraints in West Hararghe Zone, Oromia National Regional State, Ethiopia

Gosa Alemu*, Birhanu Angasu, Jima Degaga, Nimona Sime

Mechara Agricultural Research Center, Mechara, Ethiopia

Email address:

gosa.alex@gmail.com (Gosa Alemu)

*Corresponding author

To cite this article:

Gosa Alemu, Birhanu Angasu, Jima Degaga, Nimona Sime. (2023). Seed Dissemination Path-Way of Major Improved Crop Varieties and Its Related Constraints in West Hararghe Zone, Oromia National Regional State, Ethiopia. *Reports*, *3*(4), 41-46.
https://doi.org/10.11648/j.reports.20230304.11

Received: October 28, 2023; **Accepted**: November 14, 2023; **Published**: December 11, 2023

Abstract: Although agriculture remains the most contributing sector for the Ethiopian economy, its performance has been unsatisfactory and unable to meet the ever increasing demand of the increasing population due to the poor use of modern inputs such as fertilizers, improved seeds and extension services which partly explain the less productivity of the sector. The study aimed to assess and map the seed dissemination pathway of major improved crop varieties and to identify the constraints in the seed dissemination pathway of major improved crops seed in west Hararghe zone. Data were collected from a total of 144 sample farmers using semi-structured questionnaires. Secondary data was also collected from relevant sources from published and unpublished documents of district and zone bureau of agriculture. One FGD consisting of model farmers, agriculture experts, DAs and elders with adequate knowledge of the farming system of the area was also used to improve the accurateness of the data. The survey result showed that among the released major improved crops maize, teff, finger millet, sorghum from cereal crops; chickpea, haricot bean and faba bean from pulse crops and irish potato from horticultural crops were generated, introduced and disseminated to smallholder farmers through different stakeholders in the study area. The result of the study also indicated that insufficient quantity of seed unavailability of inputs on time, land shortage, hybrid nature of the crop, subsequent drought, lack of transportation, lack of storage space, seed quality problem, high seed price and lack of budget are the major constraints in the seed dissemination pathway. So, responsible government organizations need to give attention to the capacity building of local seed enterprises and multipurpose agricultural cooperatives, improving the extension service delivery and seed quality control and certification system.

Keywords: Seed, Improved Variety, Dissemination, Stakeholders, Pathway

1. Introduction

Ethiopia is mainly an agrarian country. The agricultural sector accounts for roughly 43 percent of GDP, and 90 percent of exports. Nevertheless, food security remains a critical issue for many households and for the country as a whole [1]. Moreover, expansion of the cropped area to more marginal lands has led to severe land degradation in some areas [2]. With a total area of about 1.13 million km2 and about 51.3 million hectares of arable land, Ethiopia has tremendous potential for agricultural development. Only about 11.7 million hectares of land, however, are currently being cultivated; just around 20 percent of the total arable area. Nearly 55 percent of all smallholder farmers operate on one hectare or less [9].

Although agriculture remains the most contributing sector for the Ethiopian economy, its performance has been unsatisfactory and unable to meet the ever increasing demand of the increasing population. This is mainly attributed to the poor use of modern inputs such as fertilizers, improved seeds and extension services which partly explain the less productivity of the sector [5].

Diffusion of improved technologies among small-scale farmers, especially where formal methods and market mechanisms are inefficient, can be enhanced through the

participation of farmers [8]. In the diffusion process, traditional dissemination methods have been found to be vital in technology transfer to farmers, especially for seed varieties, and improved livestock breeds that are usually introduced by the public or private sector [7]. In addition, formal methods of disseminating seed in most African countries have not taken advantage of the farmers' traditional transfer methods [5].

In west Hararghe zone, both annual crops and perennial crops are produced simultaneously. The major annual crops grown in the area include sorghum, maize, teff, haricot bean, barely, chickpea and finger millet. Farmers in the zone use both a variety of local crop seeds and improved seed as well.

Even if different improved crop varieties are promoted and distributed for small-scale farmers by different agents in the zone, no research work was done to identify and map the seed dissemination path-way existing in the study area.

Therefore, this activity aimed to assess the seed dissemination path-way of improved crops varieties and identify the constraints in the dissemination path-way in the study area.

2. Objectives

The main objectives of this study were:

1) To assess and map the seed dissemination pathway of major improved crop varieties in west Hararghe zone
2) To identify the constraints in the seed dissemination pathway of major improved crops seed in the zone

3. Research Methodology

3.1. Description of the Study Areas

The study was conducted in Tullo, Gemmechis and Habro districts of West Hararghe Zone which have potential in using major improved crop varieties.

3.1.1. Habro District Description

Habro district is one of the fifteen districts of West Hararghe administrative zone of the Oromia National Regional State. It is located 404 km to East of Addis Ababa, which is capital city of Ethiopia and 75 km to South of Chiro. The district is boarded by Guba Koricha district in West, Boke district in East, Daro Lebu in South and Oda Bultum in North. Gelamso town is the administrative seat of the district. According to [10], the population of the district is estimated to be 244,444 of which women account for 118,268 (48.4%) and men account for 126,176 (51.6%) of the population. The altitude of the district ranges from 1600 to 2400 masl. The annual average rainfall the district is 1010 mm & the mean temperature ranges between 16 and 32°C [4]. There are two cropping seasons in the area, Belg (short rainy season) from March to June and Meher (main rainy season) from June to September. Belg rains are mainly used for land preparation and planting long cycle crops such as maize. The Meher rains are used for planting of cereal crops like barley, teff, wheat and vegetable crops. Meher rains are also the major source of moisture for the growth and development of perennial crops such as mango, coffee and chat. Haricot bean is grown in both of the cropping seasons.

3.1.2. Tullo District Description

Tullo is located at 370km southeast of Addis Ababa and about 40 km South of Chiro, which is capital town of the Zone. Hirna town is the administrative seat of the district. Tullo district has a total population of 178,245 out of which 90,746 and 87,499 are male and female, respectively. The district is found at an average altitude of 1750 meters above sea level with mean annual rainfall of 1850ml and mean annual temperature of 23°C. Agro-ecologically, the district has three sub-climatic zone highland, midland and lowland. The production system is mixed type in which extensive husbandry management of livestock have been practiced [6].

3.1.3. Gemmechis District Description

Gemmechis is located at 343km East of Addis Ababa and about 17 km South of Chiro, which is capital town of the Zone. The district is bordered with Chiro district in West and North, Oda bultum district in South, and Mesela district in East. Kuni town is the administrative seat of the district. Gemmechis district has a total population of 220,006 out of which 111,658 are male and 108,348 are female. The district is found at altitude ranges from 1300 to 2400msal. Agro-ecologically, the district has three sub-climatic zone highland (15%), midland (45%) and lowland (40%). The district is mainly characterized as steep slopes and mountains with rugged topography. It receives annual rainfall of 850mm and average temperature of 20°C.

3.2. Sampling Techniques and Sample Size

The study was conducted in Tullo, Gemmechis and Habro districts of west hararghe zone which are purposively selected due to their large extent of using improved seed varieties. Out of improved crop varieties using districts found in the zone, 3 districts were selected randomly out of which 2 (two) *kebeles* were used from each district which sum up to a total of six (6) *kebeles*. Finally, a total of 144 respondent farmers were selected to collect primary data. One FGD consisting of model farmers, agriculture experts, DAs and elders with adequate knowledge of the farming system of the area was also used.

Table 1. *Total number of sample households.*

Districts	Kebeles	Number of sample households
Gemmechis	Welargi	29
	Kuni-segeriya	16
Habro	Bereda	28
	Ifajiru	19
Tullo	Reketafura	21
	Kirakufis	31
Total		144

3.3. Sources of Data and Methods of Data Collection

For this research, both primary and secondary data sources were used. Secondary data were collected from formal and informal documents of District Office of Agriculture to support the primary data. Both qualitative and quantitative primary data were collected from the selected sample

representative households through focused group discussions (FGDs), key informants interview (KII) and direct interviewing by using semi-structured questionnaires in order to meet the objectives of the study. A total of five (5) researchers/enumerators/ from the two research processes (Socio-economic and Agricultural Extension Research Process and Crop Research Process) were included during data collection to conduct the survey. Prior to the administration of the questionnaires, enumerators were thoroughly oriented on the contents of the questionnaire and trained about the intention of the study.

3.4. Method of Data Analysis

SPSS software version 20 was used for data management and analysis. Descriptive statistics such as measures of central tendency (mean and standard deviation), frequency and percentages were employed to meet the specific objectives of the study. An index ranking method was also employed to rank constraints of improved major crop varieties seed dissemination in the study area.

4. Results and Discussion

4.1. Demographic Characteristics of Sample Households

The average age of households in the study area was 39.30 years ranging from 18 to 70 years, while the average family size was 5.72. Averagely, experience of the sample households in improved crop production was 6.17 years. Average land holding size of households in the study area was 4.54 ± 2.420.

Table 2. *Age, experience in improved crops production, land holding and family size.*

Variable	Min	Max	Mean	St.dev
Age	18	70	39.30	12.074
Experience in improved varieties production	1	30	6.17	5.194
Land holding size	0.5	16	4.54	2.420
Family size	1	14	5.72	2.097

Source: Own survey, 2021

The result of the study indicated that out of the total sample households, 116 (80.6%) of them were male household heads, while the rest 28 (19.4%) of them were female household heads. Education is assumed to be important to increase farmers' ability to obtain, process, and use information and improved agricultural technologies relevant to improve agricultural production. The result of the study indicated that about 27.8% of sample households were illiterate, about 13.2% can read and write and 59% of them have taken formal education.

Table 3. *Education status and sex of the household head.*

Variable	Category	N	Percentage
Educational status	Illiterate	40	27.8
	Read and write	19	13.2
	Formal education	85	59.0
Total		144	100
Sex	Female	28	19.4
	Male	116	80.6
Total		144	100

Source: Own survey, 2021

4.2. Seed Dissemination Pathway of Major Improved Crop Varieties in the Study Area

4.2.1. Formal Seed Dissemination

Formal seed systems usually consist of public and private sector research (plant breeding) institutions, public and private sector agencies bulking up seed, mostly private sector companies distributing and marketing seed, and mostly public sector organizations responsible for seed certification and quality control. In formal seed systems, all parts of the seed production, processing and marketing chain are subject to regulation, inspection and certification. Within formal seed systems, the seed produced by plant breeders is referred to as breeder seed (or pre-basic seed), which usually exists only in small amounts. When the breeder seed is first bulked up the result is known as foundation seed (or basic seed). When foundation seed is bulked up further, to provide seed that can be sold to farmers, the resulting seed is known as certified seed, standard seed or quality declared seed (QDS).

A lot of efforts have been made by different organizations in developing, adapting and disseminating different types of improved varieties with appropriate agronomic practices to improve production and productivity of different major crops. Among the released major improved crops maize, teff, finger millet, sorghum from cereal crops; chickpea, haricot bean and faba bean from pulse crops and Irish potato from horticultural crops were generated, introduced and disseminated to smallholder farmers through different stakeholders such as Mechara Agricultural Research Center, District Office of Agriculture, Melkassa Agricultural Research Center, Haramaya University, Oda bultum University, Chercher Oda-bultum Union, and different NGOs such as World Vision Ethiopia, Plan International and Pioneer Plc in the study area.

Table 4. *Improved varieties of major cereal crops mostly used in the study area.*

Crop type	Variety(ies)	Seed sources
Maize	Shone, BH-661, BH-660, Javi, BH-140, Pioneer, BH-540, BH-160, Jibat, Dangote, Limu, Sarto, Melkassa 1 &2	Union, cooperatives, DOA, McARC, Plan international, Pioneer PLC.
Teff	Kuncho, DZ-01-1821, DZ-cr-77	McARC, MARC, DOA, OBU, World vision Ethiopia
Finger millet	Tadesse	McARC, MARC
Sorghum	Abshir, Gubiye, Chiro, Girana-1	DOA, McARC, MARC

Source: Survey result, 2021

Table 5. *Improved varieties of major horticultural and pulse crops mostly used in the study area.*

Crop type	Variety(ies)	Seed sources
Chickpea	Minjar, Natoli, Arerti, 'dubbee'	McARC, MARC, DOA, World vision Ethiopia
Haricot bean	Nasir, Awash melka, Awash-1	DOA, McARC, MARC, World vision Ethiopia
Faba bean	Tumsa	McARC
Irish potato	Muger, Samune	McARC, World vision Ethiopia, DOA

Source: survey result

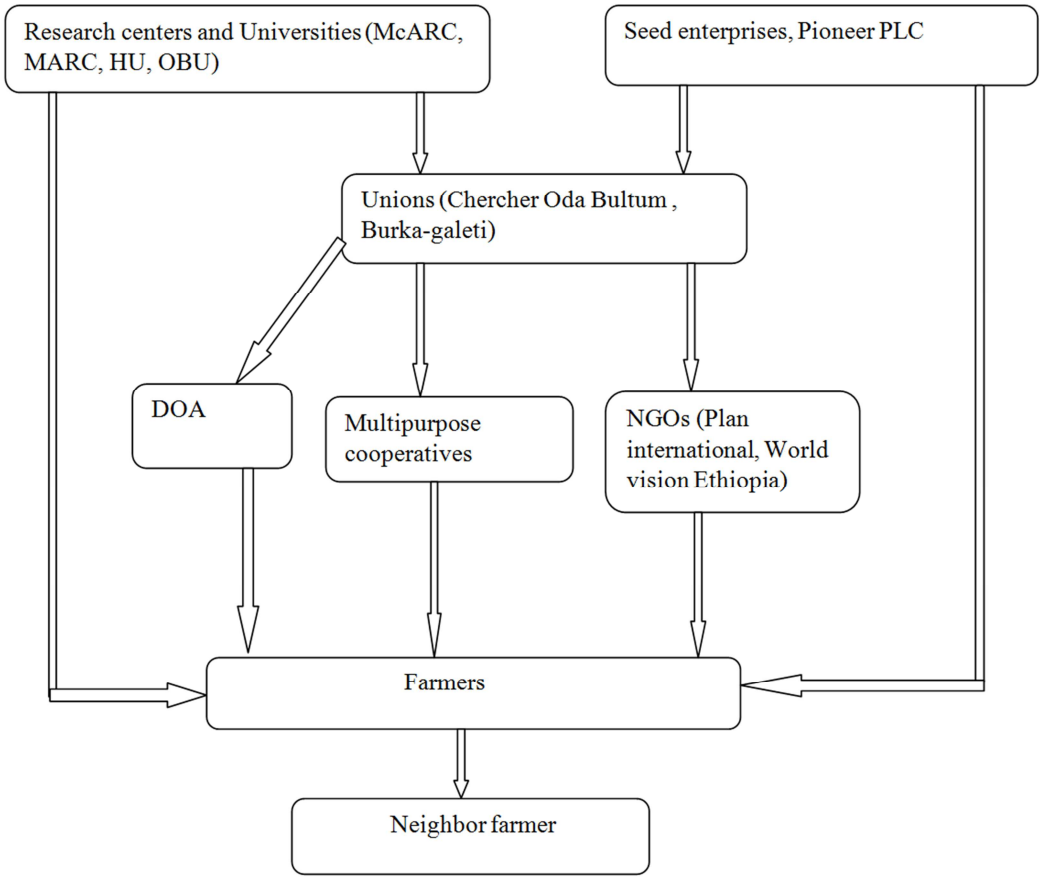

Figure 1. *Map of seed dissemination pathway of improved major crop varieties in the study area.*

4.2.2. Informal Seed Dissemination

Informal seed systems comprise large numbers of farmers who produce both traditional (landrace) and modern (improved) varieties with no regulatory oversight. They save, process and store seed for their own use as well as sharing it with their relations, neighbors and other local community members through exchange, barter, gifts and sales. Tied up with these practices may be complex socio-cultural practices and obligations which, even in today's rapidly changing world, many farmers still observe and respect. As a consequence, for some farmers paying for seed is an alien concept, which makes shifting from informal, traditional seed systems to more formal, commercial systems even more challenging. The advantages of traditional seed systems are that they support the management and conservation of local agro biodiversity and make seeds of locally valued landraces and varieties available close by and when needed. Disadvantages are that seed will not be available after droughts and other causes of crop failure; storage facilities can be lacking; and seed quality can be very variable, often poor. Informal systems are best suited to remote areas where seed distributors find access difficult and farmers cannot easily reach seed and output markets; narrow agro-ecological zones where the seed market is limited and widely marketed varieties may not be suitable; and areas where there are high transport costs.

Table 6. *Current status of informal seed dissemination existing in the study area.*

Variable	Category	Frequency	Percentage
Informal seed dissemination	Strong	47	32.6
	Weak	97	67.4
Total		144	100

Source: survey result, 2021

The result of the study showed that among the interviewed sample representative households, 97 (67.4%) said farmer to farmer seed dissemination in the area is weak due to lack of quality seed obtained from neighbor farmer, decreasing yield

of the crops, increasing demand to produce new improved varieties etc., while only 47 (32.6%) of them said that the current farmer to farmer seed dissemination is strong in the area.

4.3. Institutional Services

Agricultural extension is of paramount importance to introduce better agricultural practices and improved technologies to smallholder farmers in a country like Ethiopia where the traditional practices are dominating.

Extension visits will help to reinforce the message and enhance the accuracy of implementation of the technology packages [3]. More frequent DA visits, using different extension teaching methods like attending demonstrations and field day can help the farmers to adopt a new technology. If the farmers get better extension services, they are expected to adopt seed production technologies than others. Mechara Agricultural Research center along with other stakeholders has been carrying out different researches that increase the production and productivity of farmers in the study area.

Table 7. *Frequency distribution and percentage of institutional services in the study area.*

Category	Type of institutional services			
	Training		Credit service	
	N	%	N	%
Yes	92	63.9	41	28.5
No	52	36.1	103	71.5

Source: survey result, 2021

The study revealed that 92 (63.9%) of sample farmers were trained regarding improved major crop varieties, while 51 (36.1%) of them were not given any training during the cropping year. The result of the study also shows that only 28.5% of the sample households have access to credit.

4.4. Constraints Related to Seed Dissemination of Major Improved Crop Varieties

In the study area, the constraints related improved major crops dissemination were identified and prioritized by farmers in order of their importance. The survey result showed that insufficient quantity of seed is the major constraint followed by unavailability of inputs on time, land shortage, hybrid nature of the crop and subsequent drought, etc.

Table 8. *Constraints related to seed dissemination of major improved crop varieties in the area.*

Constraints	Index score	Rank
Insufficient quantity of seed	0.129	1st
Unavailability of inputs on time	0.118	2nd
Land shortage	0.114	3rd
Hybrid nature of the crop	0.110	4th
Subsequent drought	0.098	5th
Lack of transportation	0.086	6th
Lack of storage space	0.069	7th
Seed quality problem	0.064	8th
High seed price	0.048	9th
Lack of budget	0.047	10th

Source: Survey result, 2021

5. Conclusion and Recommendation

This study was conducted in order to identify and map seed dissemination pathway of major improved crop varieties in the study area. The study also tried to investigate the related constraints to the dissemination pathway and perception of farmers on the availability and quality of major improved crop varieties mostly used in the zone.

In recent years, a number of research and development institutions, universities, cooperative unions, NGOs, district and zonal agriculture offices are working together to improve and establish successful and sustainable seed dissemination of improved varieties in west Hararghe zone.

A number of research and development institutions, universities, cooperative unions, NGOs, district and zonal agriculture and natural resources offices are working together to improve and establish successful and sustainable seed dissemination of improved varieties in west Hararghe zone. Despite the effort made so far supply and availability of improved crop seed with fair price is still not sufficient.

In the study area, there are different major improved crop varieties introduced and disseminated to the small holder farmers. Among the released major improved crops maize, teff, finger millet, sorghum, wheat and barley from cereal crops; chickpea, haricot bean and faba bean from pulse crops and Irish potato from horticultural crops were generated, introduced and disseminated to smallholder farmers.

There is high demand for improved crops seed in West Hararghe zone. Although there is high demand of farmers for improved varieties, Unavailability of inputs on time, lack of storage space, subsequent drought, insufficient quantity of seed, lack of budget, hybrid nature of the crop, seed quality problem, high seed price, lack of transportation the major challenges which hinder the rapid dissemination of the technologies in the area.

On the basis of the analysis from the study, the following recommendations are proffered.

1) Responsible government organizations need to give attention to the capacity building of unions, government as well as private seed enterprises and multipurpose agricultural cooperatives.
2) Supporting informal seed dissemination system, and the on-going up scaling of technologies for enhancing the availability of improved crop varieties seeds and farmers' access to them in the study area.
3) Improving the extension service delivery and seed quality control and certification system in important.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Daniel, O., A. Gideon, M. John, and N. Wilson, 2010. Technical efficiency in resources uses: Evidence from smallholder Irish potato farmers in Nyandarua North District Kenya. African Journal of Agricultural Research, 5: 1179-1186.

[2] Dawit A, Deressa A, Dessalegne L, Anchala C (2004). Domestic vegetable seed production and marketing. Research Report No. 57. Ethiopian Agricultural Research Organization.

[3] Gezahegn, W. (2008). Determinants and Role of Farmers' Seed and Seedling Multiplication in the SNNP Region Seed System.

[4] HDOA (Habro District Office of Agriculture), (2016). Annual Report of 2016 of Habro District Office of Agriculture. Habro district, West Hararghe Zone, Oromia National Regional State, Ethiopia.

[5] Ike, P. C. and O. Inoni, 2006. Determinants of Yam Production Among Smallholder Farmers in South Eastern Nigeria. Journal of Central European Agriculture, 7(2): 337-342.

[6] Tulu, D., & Lelisa, K. (2016). A study on Major gastrointestinal helminth parasites of cattle in Tulo District, West Hararghe Zone, South-Eastern Ethiopia. Austin Journal of Veterinary Science and Animal Husbandry, 3(2), 3-6.

[7] Mbanasor, J. and K. C. Kalu, 2008. Economic Efficiency of Commercial Vegetable Production System in Akwa Ibom state, Nigeria. Journal of Tropical and Subtropical Agroecosystems, 8(3): 313-318.

[8] Tewodros Aragie, 2001. Farm Household Technical Efficiency: A Stochastic Frontier Analysis. A Study of Rice Producers in Mardi Watershed in the Western Development Region of Nepal. M.Sc. Thesis Presented to the Department of Economics and Social Science, Agricultural University of Norway.

[9] MoARD (Ministry of Agriculture and Rural Development), 2010. Ethiopia's Agricultural Sector Policy and Investment Framework 2010-2020. Draft Final Report, 15 September 2010.

[10] CSA (Central Statistical Agency), 2013. Agricultural Sample Survey (2012/2013), Report on Area and Production for Major Crops (private peasant holdings, main season), Addis Ababa, Ethiopia.