

Enhancing Chickpea Seed Production through Irrigation Production System at Lowlands of North Wollo

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Abstract: The seed multiplication activity conducted at Kobo districts, which was selected based on its irrigation potential and experience to produce chickpea seed during 2018 cropping season to increase production and productivity of chickpea in the major producing areas of the region and to improve livelihood of farmers. Totally 189 (52 F) farmers were participated by this activity with 54ha of their land covered by 7.56 tones seed. The seed source was directly purchased from seed grower farmers association. Training was also given for participating farmers and development agents on production packages of chickpea. Field days were organized for further promotion to farmers. The variety was acceptable after field days by farmers due to its yield performance and disease tolerant response. Participant farmers area major seed source for others chickpea producing areas. Totally, 86 tons of habru variety seed produced. Thus, this variety has potential to increase chickpea production and productivity for high producing areas of north and south Wollo zones. Further seed multiplication of this variety will be continued to addressing other potential areas and increase production and productivity of chickpea in regional level.

Keywords: Chickpea Seed, Irrigation Production, North Wollo .

INTRODUCTION

Chickpea (*Cicerarietinum* L.) is self-pollinated diploid ($2n=2X=16$) annual leguminous plant in the family Fabacea, with a genome size of 738.09 Mbp (Varshney, *et al.*, 2013). It is considered as one of the first grain legumes to be domesticated in the World. Southwest Asia and the Mediterranean region particularly Southeast Turkey and Syria are considered as the two primary centers of origin of chickpea (Singh, *et al.*, 1997). Ethiopia is considered as one of the centers of secondary diversity for chickpea (van der Maesen, 1987). In Ethiopia, chickpea is the second largest food legume crop in area and production next to faba bean (CSA, 2017).

Chickpea is produced in more than 60 countries. India is the largest chickpea producing country accounting for 72% of the global chickpea production. The other major chickpea producing countries include Pakistan 5%, Iran 2%, Australia 6%, Turkey 4%, Myanmar 4%, Ethiopia 3.5%, Tanzania 1%, Mexico 2% and Malawi 0.5% (Ojiewo, 2016). In Africa, chickpea is widely grown in Ethiopia, Tanzania, Malawi, Algeria, Morocco, Sudan, Tunisia and Uganda (FAOSTAT, 2014). Ethiopia is the largest producer, consumer and exporter of chickpea in Africa and shares some 4.5% of global chickpea market and more than 60% of Africa's global chickpea market (Tebkew and Ojiewo, 2016).

In Ethiopia, chickpea is grown by subsistence farmers in several regions of the country under rain fed conditions with residual moisture on black *Vertisol* soils and through irrigation production system. Although chickpea is widely grown in

Ethiopia, the major producing areas are concentrated in the two regional states, Amhara and Oromia. These two regions cover more than 90% of the whole chickpea area and constitute about 92% of the total chickpea production in the country (CSA, 2017). The top chickpea producing zones (East Gojjam, North Gonder, North Shewa, North Wollo, South Gonder, South Wollo, and West Gojjam) belong to the Amhara region and account for about 80% of the country's chickpea production. From the Oromia region, the major producing zones are East Shewa, North Shewa and West Shewa (Minale *et al.*, 2009).

Chickpea is very important due to its good nutritional value as it contain an average of 4.5% fat, 8% crude fiber, 22% protein, 63% carbohydrate and 2.7% ash (Shafique. *et al.*, 2016). Besides being an important source of human food and animal feed, it is also an important contributor to soil fertility as it provides nitrogen to soil through fixation of atmospheric nitrogen (Gul, *et al.*, 2011).

Ethiopia is one of the few African countries endowed with relatively abundant water resources, favorable climate and potentially huge irrigable land (Tilahun, *et al.*, 2008). Irrigation production system is one means for a better land utilization and stable with higher crop production. Continued growth and dynamism in agriculture is an important necessity to meet the increasing demand for food and other products in view of the growing population (Tilahun, *et al.*, 2008).

Chickpea production under rain-fed conditions is low and subject to substantial year-to-year fluctuation due to erratic rainfall and its poor distribution (Pasandi, *et al.*, 2014). On the other direction, irrigated agriculture can play a major role in reaching the broader development vision of the country in achieving food security, poverty alleviation and improvement in livelihood of end users (Tilahun, *et al.*, 2008). Based on this, Kobo district has a high irrigation potential for crop production especially chickpea. According to Kobo Girana Valley Programme, in this district there is more than 1200ha of land cultivated by farmers with well-organized irrigation scheme to produce triple crop per season. Farmers in this area produce three different crops per season, tef or maize or sorghum-chickpea-onion. Almost all of farmers produce desi type local chickpea variety which is low yielder (0.7 – 1 ton per hectare) and very susceptible to biotic (especially the most popular disease which name is *Aschocyta* blight) and abiotic factors. Due to these farmers not much benefiting from this cropping system especially from chickpea. However there is a possibility to improve the situation using improved varieties seed, which can give a better yield and stress tolerant than the local one. To increase production and productivity of chickpea in this area there is a need to use improved chickpea variety's seed

which passed through adaptation trial in the area. Therefore, the objective of improved chickpea varieties' seed multiplication for irrigation potential areas was to increase production and productivity of chickpea in the major producing areas of the region and to improve livelihood of farmers.

APPROACHES

Description of the Sites

The seed production was conducted at Kobo district which is found northeast part of Amhara region with large irrigation scheme. At Kobo, the major crops under rain fed are sorghum, tef, and chickpea whereas onion, chickpea and tef are the major crops under irrigation sequentially as triple crop production per season. According to Kobo Girana Valley Programme, in this district there is more than 1200ha of land cultivated by farmers with well-organized irrigation to produce triple crop per season. The water source is deep well which is managed and programmed by Kobo Girana Valley Program which is governed by regional Agricultural office. Totally, grouped under 57 project sites 30 of them were covered by chickpea. This location represents the major chickpea growing areas of north Wollo, especially by irrigating crop production system. The site was located at 429km northeast of the main city of the region, Bahir Dar.

Table 1: Geographical description of seed production site

Locations	Altitude	Temperature		Average Annual Rainfall (mm)	Soil Type	Latitude	Longitude
		Min.	Max.				
Kobo	1450	15.8 °C	29.1°C	637	Eutricfluvisol	11°08'21"	39°18'21"



Figure 1: Seed multiplication farm at Kobo during early pod filling period, 2017

Description of the Variety

Habru is kabuli type of chickpea variety which was released by Debre Zeyt Agricultural Research Centers. Sirinka Agricultural Research Centers

evaluated its adaptability during 2010 through participatory variety selection (PVS) process and recommended based on its performance and farmers’ preference.

Table 2: description of the variety, according to Debre Zeyt Agricultural Research Centers

Varieties	Year of release	Released centre	Maturity dates	Growth Altitude range	Productivity tone per ha	
					On research field	On farmers field
Habru	2004	Debrezeyt ARC	91 – 150	1450 - 2600	1.4 - 5	2 – 4

After this, the variety was scaling out in high producing areas of this district in the last three cropping seasons under rain fed conditions. Because of early maturing, Habru variety can fit lowland areas which are mostly suffered by drought stress conditions. This variety also bold seeded its hundred seed weight is more than export standard size (100 seed weight > 35gm). In addition to this, it is resistant to chickpea popular disease, Aschochyta blight.

Area Coverage and Participants

The seed producing activities conducted at Kobo districts, which was selected based on its irrigation potential and experience to produce chickpea seed. This activity covered 54ha of irrigated land covered by 7.56 tons seed. Totally, 189 (52 females) farmers were directly participated by this activity. These farmers have big experience to produce triple crop per season tef - chickpea – onion at the area.



Figure 2: Seed multiplication farm at Kobo during final stage of pod filling period, 2017

METHODOLOGY AND CROP MANAGEMENT

The site selection was done by Kobo Girana Valley Programme based on irrigational schedule in the districts. Most of farm activities were implemented by farmers on selected sites by supervising Kobo Girana Valley Programme and Sirinka Agricultural Research centers' researcher. The duration between sowing up to harvesting was from mid-November up to end of February. Total amount of seed was 7.56 tons which were directly purchased from seed grower farmers association, around Debre Zeyt. Farmers not used any fertilizer during this activity. All agronomic practices such as row planting, irrigation frequency, weeding and

others were well applied by the farmers under the supervision of programs coordinator and. After harvesting each farmers took agreement to give seed for five farmers for the next irrigation cropping season.

Training and Field day

Training was given for 152 (31 females) farmers; 12 (4 females) BoA development agents; 2 Kobo's district BoA leaders, 2 Kobo Girana Valley Program leaders and 6 Sirinka Agricultural Research Center's researchers on production packages of chickpea, including irrigation production system. In general, 174 (35 females) trainers took training.



Figure 3: Participant farmers during training at Kobo, 2017

The training also included about different food type which can prepare from chickpea, especially kabuli type. Before training most of farmers had negative attitude for kabuli type chickpea's food compare to local variety. This comes due to unpopular of kabuli type chickpea in the districts especially through irrigation. Before this activity farmers produced only local variety which is low

yielder, susceptible to biotic and abiotic factors, has small seeded (100 seed weight 10 – 15gm) and serve only for local market with less value. But after training, they can understand about multiplied this improved variety important and they change to positive attitude. Kobo Girana Valley Program professionals and leaders also took the training for two days.



Figure 4: Different type of food which prepared from kabuli type chickpea

Field days were organized for further promotion to 251 (4 females) farmers, 3 researchers, 15 (3 females) development agents, 2 Kobo’s district BoA leaders and 2 Kobo Girana Valley Program professionals and leaders. During field days, farmers asked about market problem of this type of chickpea because before this the variety not much popular as their variety (local variety) in local

market. But after giving orientation, training and advertising about this variety seed to other farmers, BoA and NGOs we could increase the demand of this varieties’ seed to use for the next cropping season. In addition to this; based on the varieties’ yield performance and disease tolerant response, farmers promised to popularize this variety for non-participant farmers.



Figure 5: Participant farmers during field day at Kobo, 2017

During field day farmers gave their comments about popularization of this type of chickpea in local market especially for youth min-market groups in the town by preparing and advertising different type of foods for example; *kolo* (roasting and packed), *nifro* (boiled), *engirgib* (Soft boiled), *shiro wet* (Sauce), *dabo* (blended in bread),

shimbira Asa (delicious sauce), *eshet* (green pod), *bekolt* (germination grain) and *kita* (backing of chickpea flour) to increase population demand. Based on this, Sirinka Agricultural research center and Kobo Girana Valley Program took assignments to popularize for consumers and minimize farmers fear for market problem.



Figure 6: Participant farmers during field day discussion at Kobo, 2017

This activity also covered by Amhara Mass Media on Television and radio program at flowering stage of the variety. In both case covered as news with

3.29 and 3.20 minutes on Television and Radio, respectively. This also important to advertize chickpea can produce under irrigation.



Figure 7: the activity on Amara Television, picture from video, 2017

ACHIEVEMENTS

Availability improved varieties’ seed multiplication is a vital to increase production and

productivity of a crop. The seed production activity was increased not only chickpea production and productivity in the areas but also

improve farmers production system and exchange their experience through training, field day and seed revolving system. Totally, 108 tons of improved variety seed produced. Due to this activity, participant farmers can serve as source of seed for neighbors’ farmers, BoA, NGOs and investors by selling with better cost (1kg seed=25birr) than the local variety (1kg seed=12birr). In addition to selling of seed, farmers could also exchange their produced seed with other crops like tef. This cropping season (2018) of environmental condition especially lowland of north Wollo zone is favored to sorghum pest, stock borer, due to this most of

farmers decided to change their sorghum farm to chickpea. This situation was one of the opportunities for farmers who participate in this seed multiplication activity to sell their produced seed. Training and field day supported popularization of improved chickpea variety under irrigation production system. Media also gave attention for this activity, this also important to advertize chickpea suitable to irrigated lowland areas of the region. After harvesting each farmers took agreement to give seed for five farmers for the next irrigation cropping season. Based on this, 945 farmers can use by this variety seed in the district.

Table 3: Summary of Activities

Activities/Items	Amount/area in no./ha/k/t	Participant farmers		Remarks
		Male	Female	
Area coverage of planted farm	54ha	137	52	These farmers participated directly on implementing activity on their land.
Total planted seed	7.56tons			Planted mid November as component of triple crop production per season
Seed source	7.56tons			Purchased
Training	174			Total participants
Farmers	152	121	31	Took training about kabuli type chickpea seed production under irrigation and its food preparation.
Experts and extension agents	16	12	4	Took training to facilitate and increase awareness about the activity.
Researchers	6	6	0	Participated as trainer and organizer.
Field day	273			Total participants
Farmers	251	247	4	During field days, farmers exchange their experience and increase the demand to produce this improved variety under irrigation.
Experts and extension agents	19	16	3	Took responsibility to popularize this improved varieties seed to others irrigated area.
Researchers	3	3	0	Participated as organizer.
Seed yield	108 tons			The sum of all 189 farmers’ seed yield.
Minimum number of farmers who gave seed for others farmers	945			Based on their agreement each seed producer farmers gave for five other farmers who missed in this activity.
Media coverage as news	3.29 on TV and 3.20 on Radio			Amara Mass Media gave attention and covered as news on TV and Radio.

CONCLUSION AND RECOMMENDATION

The seed multiplication of chickpea in north Wollo was conducted in high irrigation potential and chickpea producing areas of Kobo district to

increase the production and productivity of chickpea in the region. Chickpea is one of a potential crop in the lowlands of irrigated and rainfed production system in this district. Training and field day capitalized farmers’ attitude on

production and utilization of kabuli type chickpea. Habru variety was best performed and accepted, with irrigation and rain fed improved production system, by farmers at this location. This activity is a major seed source for other chickpea producing areas. Thus, this variety has potential to increase chickpea production and productivity for high producing areas of north and south Wollo zones. Further seed multiplication of this variety will be continued to address other potential areas and increase production and productivity of chickpea in regional level.

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