

Improving farmers income from improved Kabuli chickpea production through linking farmers to a sustainable market

Reducing Land Degradation and Farmers' Vulnerability to Climate
Change in the Highland Dry Areas of North-Western Ethiopia



TECHNICAL REPORT OF EXPERIMENTAL ACTIVITIES JUNE 2016

Implemented by



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Funded by



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RESEARCH
PROGRAM ON
Dryland Systems

About the Project

Implemented By

International Center for Agricultural Research in the Dry Areas (ICARDA)

Project Agreement No. 100202

Funded by

Austrian Development Agency (ADA)

Project Reference No. 2012/04

Duration

01 April 2013 to 30 June 2016

Project coordinator

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*Cover photo: Field performance of chickpea under scaling up | November 2015 |
Yonas Worku*

About ICARDA

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Synthesis

Activity type: Technology generation

Report submitted by: Yonas Worku

Summary report

In Gumara-Maksegnit watershed, chickpea is major crops for goat keepers. Chickpea residue is a highly nutritious livestock feed widely used by farmers in the area. Farmers have grown the local chickpea variety with traditional system. In addition, majority of farmers mainly get their seeds from informal channels. As a result, the productivity of chickpea was very low. However, Gondar agricultural research Center has tested the adaptability of improved chickpea variety in the watershed and found high yielder chickpea varieties. Improved chickpea the productivity of chickpea through research is not enough to improve the livelihood of goat keepers sustainably, there has to be some mechanisms that convert the research results into business which can fetch income that goes to farmers' income. Therefore, this research intervention was designed to improve farmer's income through improved chickpea seed production by targeting and creating sustainable market in the area. Research to business (R2B) model was used to link farmers in to a sustainable market. The research to business model was implemented in such a way that partnerships, which include private sector, smallholder farmers and government, are key to gaining greater access to markets for small farmers so that they can increase their incomes. To convert research outputs to business sustainably, community based goat breeding participants used as an entry point for chickpea community based seed production. The technology package used was improved Kabuli chickpea varieties (Arerti) with improved agronomic packages (row planting, proper weeding, bollworm control) etc. The activity has been conducted for two years (2014-2016). In the two year about 141 farmers with a total farm size of 57.5 ha were reached and covered by improved varieties.

A number of steps were followed to link the seed growers to sustainable market. Tsehay union through primary cooperative was used as a channel to sell the produced grain as a seed. Seed production procedures followed and field inspections were made to select qualified fields. Out of 99 participant farmers in the second year about 77 farmers field met the seed inspection criteria and linked with the market. Regarding the productivity of the variety compared to the local variety, the improved chickpea variety had more than double yield advantage and had 601% marginal rate of return (MRR). Therefore, it was recommended to further scale out the chickpea technology package and to use R2B as an approach to link famers into sustainable market.

Schematic summary of information

Location:	Degola-chinchaye Village. Gumara Maksegnit watershed, Gondar
Easting:	0346190
Northing:	1373265
Elevation	1976m a.s.l.
Period of implementation:	January, 2014 to December, 2015
Duration of trials:	2years
Activity leader(s):	Yonas Worku
Other researchers involved:	Simachew Yedeme; Biyadige Wubu and Eshetu Melesse

1 Background and rationale

In Gumara-Maksegnit watershed, community based goat breeding program has been introduced to improve phenotypic as well as genetic potential of the local goat breeds. Chickpea is major crops for the farmers and have grown the local chickpea variety with traditional system (Yonas et al., 2010). In addition, majority of farmers mainly get their seeds from informal channels which include farm saved seeds, seed exchanges among farmers or/and local grain/seed market. As a result of this the yield as well as the income generated from chickpea production are very low than what is expected. The Ethiopian chickpea production is predominated by desi chickpea (about 95%). However, in recent years, there has been an increase in the interest of farmers in growing large-seeded kabuli varieties due to their higher price in the market. The market price for one ton kabuli chickpea currently varies from 3000 to 4000 Birr (US\$344 to 459) depending on the seed size, while the desi chickpea is sold at about 2000 Birr (US\$230) (Ketema et al., 2005).

By considering this fact, in 2011/12 cropping season Gondar Agricultural Research Center (GARC) has conducted participatory adaptation trial to test the adaptability of different Kabuli chickpea varieties to improve the productivity of chickpea. Two Kabuli chickpea varieties (Shasho and Arerti) were selected by farmers and researchers. The result of the trials showed that by growing Shasho and Arerti varieties, farmers could able to gain 20% and 64% more income over growing the local variety as well as improve feed availability in the area, respectively (Tewodros et al., 2012).

Through introducing the two Kabuli chickpea varieties with their agronomic packages farmers' productivity could be increased, farmland soil fertility could be maintained and feed availability and quality could be improved. Improved soil management through crop diversification and improved cropping systems (intercropping, crop rotation and double

cropping) with legumes have led to increased soil fertility and pulse productivity since legumes can fix atmospheric N biologically (Egamberdieva et al., 2015). Integrating goat production with chickpea production farmers could also fatten their goats and sell goats at better prices. Chickpea is a highly nutritious livestock feed widely used by farmers in the area. It has greater advantage over other protein rich grains (Cordesse, 1990)

In previous research efforts increase in productivity from improved chickpea varieties with agronomic practices, improved livestock feed varieties and community-based bred improvement technologies have been registered. Nevertheless, these achievements have never been changed into cash that goes to farmers' pockets. Thus, the current project considers research results in improved chickpea production, improved livestock feed production and community-based goat bred improvement to raise small holder farmers' productivity and to link them to market through partnering between smallholder farmers and private sector. Therefore, this activity is aimed at to increase farmer's income through improved chickpea seed production by targeting and creating sustainable market in the area

2 Objective

The main objective of this research activity was to increase farmer's income through improved chickpea seed production by targeting and creating sustainable market in the area.

3 Experimental Methods and results

Agricultural research results have been often reported to have immense impacts on productivity. However, agricultural research needs to think beyond increasing productivity-transforming research results to business to enable smallholder farmers to fetch more cash from the research results. This could be realized by establishing a research to business model (R2B) where businesses are taken as part of the solution to poverty reduction. The research to business model should work in such a way that partnerships, which include private sector, smallholder farmers and government, are key to gaining greater access to markets for small farmers so that they can increase their incomes.

Research-to-business (R2B) model/approach is used to develop the organizational structure of the already organized community breeding program. R2B model facilitated linking up small- and medium-sized enterprises and smallholder farmers, in a mutually beneficial relationship between smallholder farmers and the private sector.

The technology package used was improved Kabuli chickpea varieties (Arerti) with improved agronomic packages (row planting, proper weeding, bollworm control). The activity has been conducted for two years (2014-2016). In year one (2014), 42 farmers planted Arerti chickpea variety on a total plot of 20 hectares. Each participating farmer allocated at least 0.25 ha of land to improved varieties. There were two clusters one at each village of Das Dinzaz and Degola Chinichaye villages. Clusters were created by considering adjacent fields. Selecting participating farmers and clustering were carried out in collaboration with the district office of agriculture and development agents. In year two (2015), in addition to the 42 farmers of 2014 the technology package further implemented on about 99 more farmers with a total farm size of 37.5 ha. In total, in the two years about 141 farmers with a total farm size of 57.5 ha were reached and covered by improved varieties.

A series of workshops were being held with farmers and business platform actors to have common ground and understanding on the research objectives and processes. Roles and responsibilities of actors and detailed activities jointly planned in the workshop. Then after, training on the production and management of chickpea was given to participant farmers.

Field days at different growth stage in both years were organized to assess farmers and local administrators' views and reactions. Data on farmers (participating and non-participating) reaction were collected. Sample yield from the Kabuli fields and from farmers' field who grow the local variety was also collected using quadrant. Production costs (seed cost, fertilizer cost, labour cost etc.) and product prices have been collected and analysed using simple descriptive statistics and CIMMYT's partial budget and sensitivity analysis tool to compare the economic impact of improved chickpea technologies with farmers practice.

I. Research to Business model (R2B)

To convert research outputs to business sustainably, community based goat breeding participants used as an entry point for chickpea community based seed production. Community based goat producers were organized in a cooperative as goat husbandry and marketing cooperative at Dinizaz kebele. The main purpose of organizing farmers in goat market association is to generate better income for farmers who are organized in community breeding program. This cooperative can serve the bases for goat keepers to create horizontal coordination to goat keepers in a scalable structure and the vertical coordination with key buyers of their produces.

The business platform actors were Gondar Agricultural Research Center (GARC), Zone and District extension departments, Tsehay Farmers' Union, Amhara Seed inspection and regulatory office, Kabuli chickpea producing farmers. GARC in collaboration with district office of agriculture selected and trained participant farmers and extension workers, delivered seeds of Kabuli chickpea variety, organized field days, implemented and monitored activities, facilitated and monitored the functioning of the business model. North Gondar zone and Gondar Zuria district Cooperatives Offices have linked farmers to market. Gondar Seed Laboratory office were certified the seed after they have done field visit. Tsehay Farmers' Union purchased the produced seed through primary cooperative by giving 15% premium price.

Partnership meeting/discussion was held at Gondar among potential partners (GARC/IFAD, N2Africa, SNV and Tsehay union). During the meeting an agreements were reached to create synergy and Common activities like training, field day and etc. were identified and planned together. Roles and responsibilities of each partner were identified and thus Memorandum of understanding (MOE) was signed among these partners.

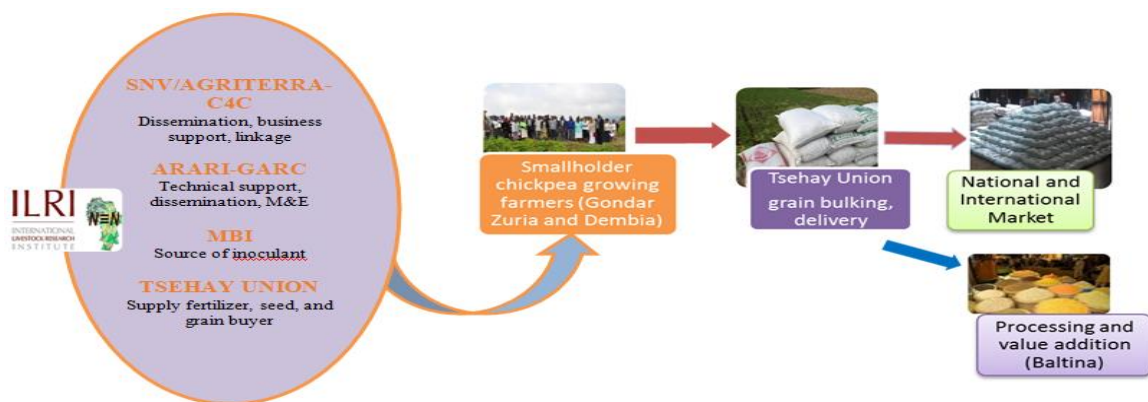


Figure 1: The Research-to-Business Model of North Gondar

For sustainably to convert research outputs to business, goat husbandry and marketing cooperative was established at Dinizaz. The main purpose of organizing farmers in goat market association is to generate better income for farmers who are organized in community breeding program. In the breeding program in every six months, there is bucks selection based on farmers and breeders criteria. Only few bucks will which met the criteria will be selected and the others will be culled and supplied to the market. In addition, old bucks and does in the stock should be either consumed at home or sold to the market. If these farmers organized and linked to the market they can fetch better price collectively.

This cooperative can serve the goat keepers to create horizontal coordination of goat keepers in a scalable structure (allowing community-based breeding as well as the marketing of agricultural commodities) and the vertical coordination with key buyers of their produces. Goat husbandry and marketing cooperative plays a key role to establish research-to-business model sustainably by following the value chain of a given commodity. To meet this assumption through the collaboration of the district office of cooperative, goat husbandry and marketing cooperative was established at Dinizaz. Of the 62 community goat breeding members 42 members were pay the registration fee and buy share. The members decided to contribute 300 birr each to be the initial capital. (250 birr for share+50 registration fee). They have opened bank account in the name of the cooperatives and elected executive, auditing, marketing, credit committee. The cooperative is now under the process to get legal certificate from the district cooperative office.

II. Participant selection and area clustering

Participant selection criteria were developed by GARC and Gondar Zuria office of agriculture. Participant farmers' selection and area (farmers' field) clustering were carried out by Gondar Zuria office of agriculture experts and DA's. Two clusters (Das Dinaz and Degola Chinichaye villages) were selected. In 2014, A total of 20 hectares on 42 farmers' adjacent field (at least 0.25 ha on each) was selected and covered with improved variety. In 2015, scale 37.5ha of land on 99 farmers' selected. In the two year about 57.5 ha of land from 141 farmers covered with improved chickpea technologies. Basic seed was purchased from Tsehay union (partner) and distributed to participant farmers through in kind loan.

Table 1: Chickpea participants and input distribution for community seed production

Location (Kebele)	Year	Area(ha)	Amount of seed (qt)	Inoculant sacts)	No of participant farmers		
					Male	Female	total
Das Denzaz	2014	10	10	-	21	1	22
Degola Chinchaye		10	10	-	20	0	20
Das Denzaz	2015	18	18	25	54	0	54
Degola Chinchaye		19.5	19.5	25	45	2	47
Total		57.5	57.5	50	138	3	141

III. Capacity development

The main purpose of training was to build farmers and extension workers skills and knowledge on chickpea technology packages. In the two implementing years different training sessions were organized. The topics covered during the training included improved legume production agronomic practices and disease and pest management given by legume breeder and pathologist, inoculation given by soil agronomist, quality seed production(chickpea) by socio-economist & zone seed inspection expert, marketing (district cooperative expert), post-harvest handling and market linkage/market chain. As shown in the following Table training was given for a total of 255 farmers (7 women) and 38 experts who are from zone and district office of agriculture and Das.



Figure 2: Training on how agronomic management of chickpea production| July 2014
Photo by Yonas Worku

Table 2: Participants of the training at different time

Technology	year	Kebele	No of participant farmers			No of Experts /DAs		
			Male	Female	Total	Male	Female	Total
Chickpea community seed prodn Chickpea post harvest & marketing Total	2014	Degola	24	0	24	4	2	5
		Dinizaz	26	3	29	3	3	6
		Degola	54	0	54	8	2	10
	2015	Dinizaz	45	2	47	1	2	3
		Degola	54	0	54	8	2	10
	2015	Dinizaz	45	2	49	1	2	3
Total			248	7	255	25	13	38

IV. Field day for technology popularization and Demand creation

The main purpose of undertaking the field days was to create demand on chickpea technologies, create and strengthen linkage among stakeholders(enablers) who work on to improve chickpea value chain and finally to enhance technology multiplication and dissemination system. The field days were done on both kebele's. In each year, at Degoal kebele 3 clusters were visited by participants while at Denizaz, of the 2 clusters were visited by participants



Figure 3: Field day held for farmers and stakeholders | July 2014 | Photo by Yonas Worku

As shown in the following tables about 255 farmers and stakeholders from different levels were participated in the field day. At regional level: ARARI senior researchers of crop and socio-economics research directorates, public communication participated. At Zonal Level: Zonal Office of Agriculture, Zonal of cooperative promotion, Tsehay Union, Zonal office of Seed inspection, North Gondar - livelihood improvement and sustainable resource management program, GARC, Ethiopian television were participated. At Districts level: - District office of Agriculture, cooperative, World vision and DA's of both kebeles were participated in the field day.

At Both kebeles, Arerti Variety with its technology packages compared with local ones were demonstrated to the participants. Briefing and explanation were given to the field day participants about chickpea technology packages, how the by-products can be utilized for goat producers as feed to their goats and the participatory process and how this scaling up activities will be continued sustainably. During each field days' farmer's reactions on Ararti technology package were collected. They have suggested that the main advantage Ararti variety and the technology packages compared to local variety and practices were

- Arerti variety is resistant to drought and disease
- Row planting has brought vigorous growth but it demands high labor
- 2-3 times plowing reduces weed and diseases infestation
- Arerti variety has good branching ability and its biomass is will be good source feed goat and other livestock
- Arerti variety has large number of pods per plant
- Arerti variety large seed size preferred by market

Finally, at the end of each field day the participants had intensive discussion about how to sustain the system for long time without any other external support. Furthermore, the seed production and marketing procedure, criteria on quality seed production, the roles and responsibilities of the local institutions were briefly discussed.

Table 3: Chickpea field day participants

Kebele	year	Participant farmers			Stakeholders from Districts			Stakeholders from Zonal office			Stakeholders from Regional offices		
		M	F	Tot	M	F	Tot	M	F	Tot	M	F	Tot
Degola	2014	56	21	77	13	5	18	4	1	5	3	1	4
Dinzaz		43	4	47	-	-	-	-	-	-	-	-	-
Degola	2015	42	6	48	7	4	11	3	-	3	3	-	3
Dinzaz		75	17	93	8	3	11	2	-	2	-	-	-
Total		216	48	265	28	12	40	9	1	10	6	1	7

V. Seed quality control and market linkage

Market linkage was created for community seed producer participants. A number of steps were followed to link the seed growers to sustainable market. First the plan was discussion with key stakeholders (office of seed inspection and regulation, district office of agriculture, district office of cooperative and Tsehay union). During the discussion it was reached in agreement that GARC has to develop some selection criteria to select participant farmers. The criteria used to select the participant were the participant must be a member of goat community-based breeding program, must have willingness to participate for seed production, the participant field must be clustered, there should not be any other chickpea field in the nearby to keep isolation distance etc. Based on the stated criteria GARC with the collaboration of district office of agriculture about three clusters and participant farmers were identified.

Then after one day training was given as how to produce quality seed which met inspection criteria for the participants. At this stage, farmers were agreed to produce the seed and each stakeholder took their roles and responsibilities. The other important and challenging work was to get certified basic seed. This assignment was given to Tsehay union. Certified seed was purchased from Tsehay union and distributed to the participant farmers. To collect the produced seed, it was agreed that Tsehay union would collect through primary cooperative than an agreement paper was signed between Tsehay union and the two primary farmers' cooperative found at Dinzaa and Degola. The two primaries have got 20birr margin per quintal. Finally, GARC with the collaboration of district office of Agriculture has put the technology on the ground based on the recommended chickpea technology packages.

Regarding field seed inspection, it was jointly done by a team composed of zonal seed inspection office, Tsehay Union, GARC and Office of Agriculture. During the field inspection all farmers field was visited by team. The main purpose of seed quality control is to identify those fields which can qualify quality seed production. Farmers' field which met the inspection criteria were selected and used as seed for next year and linked with market. About 72 farmers' field out of 99 participant farmers field passed the seed criteria. The estimated amount of seed that can be collected and used as seed for next year was about 333qt of seed. Here after, a one-day workshop was held with key market actors and stakeholders, Tsehay union agreed to purchase the seed by giving 15% premium price from the market. Currently, Tsehay union is on the process of collecting the chickpea seed produced by farmers through multipurpose primary cooperatives found in the two kebeles.

III. Yield advantage and financial analysis

Sample grain yield were collected from host farmers' field and neighbouring farmers field. Since kabuli chickpea was introduced for the first time, there is no local kabuli chickpea in the area. However, the comparison was done with the dessi type. Farmers widely grow dessi type for many years. The highest yield recorded from the Ararti variety was 1645kg/ha and the lowest was 1263kg/ha while the highest and the lowest yield of sampled local variety were 920 and 628kg/ha, respectively. The improved kabuli type variety (Arerti) gave a mean seed yield of 1488 kg/ha while the local dessi type gave 814kg/ha. This means that kabuli chickpea variety had a yield advantage of 674 kg/ha over the local one. The yield of chickpea in this production year was low due to high ball worm infestation.

The partial budget analysis was carried out for the improved variety against the local check using CIMMYT (1988). Based on the input and out price illustrated on table 4, the marginal rate of return for Arerti variety over local is 601.37%. This means that farmers who grow Arerti kabuli chickpea variety with its improved production packages earned a higher margin than those who produce local variety. The figure obtained is greater than the generally accepted minimum rate of return i.e. 100%. The heist earning is a result of higher productivity of the variety in one side and the market linkage created for chickpea seed producers using R2B approaches. This implies that for one birr additional cost on the use of Ararti variety over local have a return of birr 6.01, over the local variety.

Table 4: Partial budget analysis

Items	Local	Improved
Mean GY (kg/ha)	814	1488
Adjusted yield (kg/ha)	732.60	1339.20
Gross Field Benefit (ETB/ha)	6512.00	12052.80
Labor cost (ETB/ha)	0.00	240.00
Seed cost(ETB/ha)	770.00	1320.00
Total Cost that Vary (ETB/ha)	770.00	1560.00
Net Benefit (ETB/ha)	5742.00	10492.80
Marginal Cost (ETB/ha)		790.00
Marginal Net Benefit (ETB/ha)		4750.80
Magrginal Rate of Return (%)		601.37

4 Conclusions and the way forward

It was found that Arerti kabuli chickpea variety is high yielder, financially feasible and socially preferred by the farmers. Therefore, the Arerti variety should be scale out to boost production and productivity in similar area. Though the seed business is challenging and need some special care, it was highly profitable and has high market demand. The R2B approach on the other hand found to be a good approach that converts the research output in to income generating option for the poor famers. The local institution should further follow up closely the seed production and strengthen the cooperative and the union to make them competent in the market and to sustain the system.

It was observed that introduction of new variety and creating seed business need some lag time between them. It would be good first to have sufficient time in order to create demand on the technology before converting it into business. During the first year it was observed that farmers prefer to check the well working of the technology than producing quality seed and selling to the market. Therefore, in the begging more focuses should be given on demand creation/ introducing the variety to the area than seed production. Seed production needs special attention like (keeping isolation distance and other seed production parameters). At the same time producers need to be certified to sell the produce as a seed. In addition, there must be legalized entity to run the financial system smoothly (Degola and Dinizaz multipurpose cooperative is still at infant stage). The established cooperative need close follows up to strengthen and be competitive in the market

Challenges encountered to implement R2B:

During the implementation of R2B model the following challenges were encountered

- It was difficult to get certified seeds at the beginning
- At the first year, farmers are more interested on the technology than seed production
- Area clustering was challenging unless all the neighbouring farmers included
- Farmers had no experience and willingness to rogg out /remove the off-type and other weeds in the first year
- Bollworm was difficult to control
- Getting legal entity for community based goat husbandry and marketing cooperative took lengthy time
- At the first year, the primary cooperative had not enough capital to purchase the produced seed. To solve the problem Tsehay union agreed to transfer the seed money for Primary cooperative. However, the process took some time (opening an account for the primary cooperative and arranging their facilities, cleaning store etc.) in the meantime farmers was not sold the produce as a seed.

Lesson learnt:

- Seed production needs field clustering

There should not be other variety in the nearby

- Seed inspection

Knowing seed production standards ahead and involving the inspectors starting from the beginning is crucial

- Institutional arrangement

Certifying the established Goat husbandry and production cooperative to use as a node to sell the seed

- Market linkage

Involving Tsehay union starting from the beginning and signing a memorandum of understanding played a key role

Participant farmers should sign contractual agreement with the established cooperative.

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NOTE: *The data presented in this report are currently being elaborated for scientific publication, thus some of them are not final. The aim of this report is to summarize the nature and quality of the activities conducted and of the dataset generated, and to illustrate the main results obtained.*

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