Recent Development in Water Harvesting Practices in Ethiopia

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Foreword

This report briefly summarizes the recent on-going practices in water harvesting technologies adopted by smallholder farmers in Ethiopia. It is a follow-up of the previous study conducted at EDRI on “water harvesting and irrigation outcome” in 2005. Using a rapid assessment appraisal (PRA), this study takes a stock of water harvesting technologies currently used by farmers and analyses the current development and economic gains from adopting the technologies in various agro ecologies and farming systems. The report includes pictures from various sites for different agro ecological set up. It is hoped that this report would provide an insight to the development of efforts of smallholder’s commercialization of agriculture in Ethiopia.

Newai Gebreab
Director, EDRI
Acknowledgment

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Recent development in water harvesting

Introduction

A major issue in productivity and associated food security of rural households is perceived to be water scarcity and reliability. To this end, Water harvesting has been widely promoted as an important instrument in overcoming moisture-associated production constraints and pervasive household welfare problems. Understanding the nature of challenges facing Ethiopian agriculture, varieties of water harvesting technologies and practices have been adopted in Ethiopia during the last five years. To document best practices on water harvesting experiences in Ethiopia the EDRI has conducted Water Harvesting Agriculture Survey in 2005 and published its report on EDRI Research Report VI “Water Harvesting Practices and Impacts on Livelihood Outcomes in Ethiopia.”

As the findings of the study depicted, there are numerous success stories and best practices, which can be scaled-up to be used throughout the country. It was felt that building on the existing good experiences learnt, as a learning process provide a pathway for learning. It planned to have a second round Preliminary Assessment as a follow-up on the status of the technology in the third year after the survey, i.e., 2007. To this end, a rapid assessment was carried out using the PRA, which covers the previous survey sites and the respective institutions. Accordingly, this assessment covered the weredas located in central Oromiya and east Oromiya and SNNPR. The visit includes photographic documentation of best practices. This report presents a brief outcome of the study conducted on the field level on the following locations.

1. Oromiya Region

1.1. Modjo area

The assessment program for best practice water harvesting techniques was undertaken from 26 to 28 February 2007. The areas surveyed
included Modjo and Adama. One typical exemplary case visited around Modjo was a farmer’s practice on integrated water harvesting, which was proved to provide diverse benefits to the farmer. The practice is integrated with milk production from crossbred cows, forage, vegetable, and fruit production using drip irrigation. The farmer has made significant investment supported by SG2000 and this has helped him to generate significant income on a plot of less than a ha. The farmer harvest includes horticultural crops such as papaya and onion that are produced and distributed throughout the seasons. Labor is one of the major constraints as a result the farmer has less leisure time. The farmer learned and uses compost, thus, reduced the amount of inorganic fertilizer, which otherwise cost him a significant proportion of his income. Poultry is another diversification in the integrated farming practices around Modjo. Pond construction was covered with iron sheet (Fig 1). These ponds are mostly protected unlike the practices in Eastern Harraghe and other parts of the country. Farmers are using Treadle pumps to irrigate the land.

1.2. Chiro
In areas nearby Chiro, in the West Harraghe Zone of Oromiya Region, a number of farmers use ponds. However, there are many exit and entry for adopting in the practices of water in the past two years. Seepage and
hence wastage of water is one of the major problems, and as a consequence some ponds were seen empty and abandoned.

Some farmers noted that because it was not fenced, due to wild animals entering the ponds, the plastic sheet lining is often torn and they do not have the means and knowledge to repair it. However, in other localities there are specialized and innovative, farmers able to repair plastic lining of their ponds easily. In some localities, they cannot get enough supply of the plastic. As a result, some farmers abandoned the ponds, filled it with soil, and used it for cropping. This clearly demonstrates the fact that, one can observe the inadequate supply of input and knowledge of managing pond sites and lining the ponds with plastic to prevent seepage.

Similar observation was made in Mieso areas, which is moisture stress area. Most of the farmers are using ponds to irrigate chat and vegetables, which are very lucrative activities. Many others use it for growing vegetables intercropped with chat. They do not apply drip irrigation for chat because of the amount of water requirement for chat. They use furrow irrigation. They only apply drip irrigation for vegetables to optimize the use of scarce water.

In Western Harraghe, where under ground water is available, farmers are shifting to use hand-dug wells (Fig 2) where water is abundant and use motorized pump for abstracting the water from wells.
During the survey, about 500 farm households were found using the water harvesting under the a watershed using hand-dug wells. There were, however, some competition and conflicts in the use of underground water in the area, between upstream and downstream farmers. There was also a growing demand for use of drip irrigation and motorized pumps. Farmers were organized in a group of 10-13 and purchase-motorized pumps. It was also noted that some farmers are demanding inputs such as plastic and seed for horticulture production. We observed that supply of improved input such as improved vegetable seed is a critical element for a successful water harvesting to impact on farmers livelihood.

The average income obtained various from 40,000 to 50000 birr per household by using irrigation. However, economic use of underground water should be in order so that the water may not deplete in a short period. It should also be noted that farmers be able to use a well in-group located in strategic distances. Catchment approach should also be practiced to keep the water source sustainable.

Like in the central highlands of Ethiopia, production is diversified into vegetables and pulses in the locality. Garlic is dominating in farmers’ fields. To the farmers the major constraint is cost of transportation. For instance, there is a gravel road built by the farmers to get the transport services of light trucks. Farmers built the hilly 3 km road to reach and connect the asphalt road. This effort may require technical support, to the farmers, by an institution most concerned about water harvesting impact.

1.3. Gursum

This area is amongst moisture stressed ones, and used to be classified as one of food insecure weredas. Water is a critical input. Unlike the other parts of the country, the water harvesting practice is increasingly becoming a very lucrative activity; as a result, there is more entry every year than exit. It could safely concluded that WHT is expanding rapidly
in Gursum than any parts of the country so far observed. There are more than 6000 ponds all functioning in this Wereda. Here of course one could note of the proximity to domestic and external market.

The peculiar features, which make water harvesting interesting in this area include:

- Farmers are innovative, they have modified the standard ponds that they have constructed two years back in order to maximize and save the land; and to maximize the amount of water in the ponds. They combine two or three standard ponds into one use two plastic sheets for three of the ponds. By doing so, perhaps they economize resource such as plastic sheet. They also grow algae to reduce the level of evaporation, which helps them to optimize water use in an innovative way.

- Farmers have mutual collaboration to dig ponds and the social capital is an asset by itself in this society so that they can overcome labor requirements. Actually, a farmer in Gursum is working almost day and night. Nearly all the farmers are food secured at this moment and accumulate wealth. A typical farmer has grain stock which normally takes him for a year. A farmer is normally rejected by the society if he does not dig and own at least one pond. He cannot qualify for a marriage unless he owns a minimum of one pond since owning a pond is considered as a sign of wealth and security. Women are also active participants in the WH activities. Farmers in the area accumulating assets such as furniture, television, better conditioned house both in urban and rural areas. They are sending their children to schools. An average household has five or more children seen all better fed and sent to school.

- Market is linkage is also a decisive factor and markets have been opened up both from the neighboring Somali Region and Dire Dawa, as far as Djibouti. Access to markets act as both a push and pull factor to develop an integrated and intensified agriculture. In this type of activity, farmers use their own social network.
Chat intercropped with vegetables such as sweet potatoes and cabbages and coffee. Many farmers now converted their land to vegetable farming as well as sorghum. They sell vegetables and chat, and purchase food items from the market. Agriculture has become commercial and farmers are competing for a better market. To go along with such competition, some farmers are using motorized irrigation pumps, which is expensive in most part of the country. Some use mobile phones to get spot market information. Farmers' wives are decorated with golden jewelries. Moreover, the pond construction in Gursum is integrated with watershed management, which has a meaningful impact on the development of the environment and future agriculture.

However, it was noted that inputs are in a severe shortages and getting expensive from time to time. The availability inputs such as seed and plastic are limited and become one of the major concerns for future development of irrigation in the area. Using motorized pumps is becoming expensive due to escalating fuel prices. Although market connectivity is relatively well developed, it is yet constrained by bad road access to Dire Dawa and Harraghe as well as Jijiga markets. This makes it dominantly difficult to expand commercialization of agriculture. Trucks can only cover limited areas and there are far away kebeles that cannot be accessed by a vehicle. The experiences gained and the practice has to be scale-up and out to other similar pats of the country where water is scarce or moisture limiting is a major concern of development of agriculture. In summary, the following can be concluded:

- Water harvesting and use of ponds is a successful factor of commercialization of agriculture and a means to get out of poverty in drought prone areas, with high population density and market as observed in eastern Ethiopia;
- Government support in providing and delivering of inputs on time is a necessary conditions; and
- Market access through road construction is a very important aspect of a successful water harvesting and commercialization of agriculture; which need to be integrated with WH.
2. SNNPR

Evaluation of the Water Harvesting practices was conducted from 19 to 24 March 2007. From the outset, the survey team met the Regional Bureau of Agriculture (RBA) and discussed on water harvesting issues in the Region. According to RBA despite the reduction in the number of water harvesting activity, at this time it is revising. Particularly previous projects in Hosanna, Kembata and Hadiya, Damot Gale, Omo Sheleko, Gurage and Silte Weredas are well functioning. Moreover, he explained that, initially, the procedure of introducing the technology was wrong; it was simply a campaign and some farmers feel that they were forced. Nevertheless, at this time, all weredas are supporting these activities. Farmers understand the importance of water harvesting, the way it is functioning, and decided to go about it on their own.

During the survey, we noted that pond lining plastics provided by Wereda Agriculture Bureaus to farmers. The constraints in these weredas as pointed out by the bureau head were:

- some farmers feel that WH has dropped due to the lack of orientation from the responsible bodies;
- in some areas there is a problem of perception on the technology;
- land constraint;
- the change in leadership and experts at local and bureau level plus the rearrangement of administration at wereda level, etc; and
- the reshuffling of institutions and tasks and mandates in relation to water.

Because of this and other factors, there is insufficient report to comment on the program. In some areas, activities are not executed as planned.

Despite these problems in the process of using WHT, the regional program fully encourages the technology. WHT was not planned in such a way that we have to move to pond digging after using all possible sources of water. Therefore, the consequence has brought failures in some
weredas and the negative consequences rather than the positive one prevailed and persisted in many weredas. The problem is of approach and implementation, not of policy on water and cheap rural labor use in agriculture.

In the evaluation at regional level in 2004/05, the lives of the farmers in weredas such as Miskane and Mareko changed due to water harvesting. Recently, there are areas, which drop WHT; while in other areas, there is remarkable outcome: up to four ponds and hand-dug wells are used by some farmers. With regard to the support from the Bureau, there are applications for plastic from Alaba, Sankora, Shashoko, Meskan, etc. These weredas were highly food insecure and received food aid. In the highlands of Gurage such as Gumer, Alecho, and Andonceh, there are good visible practices. In the Miskane wereda, the land allocated to WH cropping grew from 200 ha in some PAs to 1500-2000 ha in many PAs. Therefore, the Region recommended the need for observation/filed visit, the need for irrigation projects currently at work, and the need for media coverage; etc; this issue need not be a one-time issue. It was also recommended that both the positive and the negative aspects have to be discussed through media.

The weredas covered in the field visit of WHT in SNNPR are Boricho (separately established from Shebedino) in Sidama Zone, Alaba Special Wereda, Damot Gale in Wolayita Zone, Arbaminch Zuria, Mirab Abaya and Gamo Wereda (Chencha).

2.1 Boricho

Moricha is very green area, but considered as food insecure wereda. It is suitable to grow coffee, maize, and inset. To date, there is less concern on ponds (person communication, 2008). The number of ponds is scaled down with the level it can be utilized. However, there are irrigation and stream development projects in some localities. It was noted that some mistakes have been committed when introducing WHT using ponds.
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Based on his suggestions the team visited the WH activities around Boricho. We began our visit by discussing the reports at Wereda Water Resource Office. In our discussion with experts, they remarked that at this time, the WHT ponds are not as extensive, and farmers use the water from the ponds for feeding livestock and home use.

The statistics at wereda level shows that there is an increasing trend in the number of ponds used in the wereda (Table 1).

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<th>Table 1: Number of Ponds in Boricho over the period 1995-1998</th>
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<tr>
<td>Cements</td>
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<td>Plastics</td>
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<td>Total</td>
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In 1999, there were no newly constructed ponds or structures reported. This could be due to the exhaustion of potential new entrants, the lack of incentive to build, the lack of plastics, etc. The most important factor that constrained the number of ponds is land size.

The PAs observed in this Wereda is Fasasa Aldada, an immediate PA around Boricho and Loko Abaya-Dale. There is high water shortage in the PA in particular and the Wereda as a whole. The ponds are constructed in good shape. Particularly, the mouth of the ponds is built by cement to keep the plastic tight against sliding and removal. This is an improved version mouth structure compared to the case of Harraghe ponds. It is 8x8 trapezoids. A local NGO, Goal Ethiopia, supported the farmers to purchase cover materials. The roofs are covered by horizontal woods and covered by the Goal-plastics to protect evaporation (Fig. 4).
According to agriculture bureau experts, in some Pas WH is well functioning. It is changing the life of the farmers particularly in moisture stress areas, although we were unable to observe any significant irrigation activity at the time of our visit. However, pond owners in the locality produced and harvested vegetables, sorghum and inset last year. There are also livestock production activities by farmers.

The PAs nearer to Morcho town are well doing in marketing their vegetables- carrot, cabbage, onion, etc. The agriculture bureau supports the farmers in finding and connecting markets. The experts also said that in the water stress areas water selling is a normal activity and there are farmers in the nearby PA of Wolayita and Oromiya, who sold drinking water up to 12,000.00 birr in 1998. There is an increasing demand for plastics from many farmers in the wereda. Another important development in the water harvesting practice in the wereda is the catchments approach with an integrated watershed management. This
Recent development in water harvesting approach is seen as top-priority in the rehabilitation of the land, through watershed development. Nearly, the catchment area is well treated.

However, there are major constraints observed in the adoption of the technology. These include:

- Land shortage;
- Site selection problems particularly training capacity building constraints;
- Weak management by farmers despite some of them has sufficient land and water;
- Farmers lack the initiative to sustain the technology independently unless supported by the bureau;
- Lack of plastics;
- Plastics are stolen from some farmers during night times and there is little enforcement to protect such unlawful activities; and
- Lack of credit to purchase inputs is also important.

2.2. Alaba

Compared to the previous survey in 2005, Alaba area has shown a change in the use of water harvesting techniques. Farmers specialized mainly on vegetables production in the entire homestead, because of WH activities.

Farmers are carrying out and pushing the WH practice at their own choice (personal communication deputy head of BOARD, 2006). In 1999, in a PA alone the farmers dug 70 ponds without any further motivation from the bureau. There were about 160 ponds in a typical PA in Alaba. Farmers were motivated by what they observed from WHT users. They were also requesting plastics to buy at their own expenses without any subsidies.

The use of WH is twofold. First, in Alaba, a farmer has to dig about 310 meters deep well to extract water, which is beyond the capacity of an individual farmer for the public that costs about 700,000.00 birr. The wells encountered with many challenges. Within the 80 PAs in Alaba, there were only 28 deep wells and of these only 22 were functioning. This
shows the extent of the problem. Alternatively, farmers dig ponds to collect water to overcome the problem. Second, farmers use it for growing vegetables, thus they have now cash crop for the market. There is a clear tendency as a result Alaba food insecurity has declined due to the use of WHT. The visiting team also observed the trend. Some farmers from the area were supported in the construction of ponds by the development agent. One of the three farmers has two ponds—one is for cropping while the other is for drinking—and the other two have one pond each. The ponds are full of water. The farmers are using algae to protect evaporation similar to Haraghe farmers and that is partly why the ponds are kept full. Most of the ponds are lined with plastic, unlike at the initial stage where they adopt cement ponds. The technique of construction of cement ponds is also relatively difficult because of knowledge of construction. The farmers use manual labor rather than treadle pump, because they think that using treadle pump creates abuse of water. The ponds in Alaba are full of water even during the driest season of January.

All the farmers diversified their crops often intercropping cabbage, sugarcane, inset, green paper, coffee, sweet potato, papaya, chat, tomato, in their compound. Some farmers earned birr 800 from the sale of cabbage in a season of 1998 for instance. Alaba farmers own relatively larger size plot, with an average 1.0-1.5 ha. One of the farmers has a beehive around his house and this is an activity integrated with WH after the adoption.

The success of WH use in Alaba, is mainly associated with the following factors:

- Alaba is known for conventionally producing pepper and vegetables before WH and the emergence of WHT further qualifies the activity. But during the 2005 visit, the vegetable gardens were as such not widespread:
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- DAs and the Wereda Bureau of Agriculture are serious in supporting. However, recently it appears that there is some loose handling of the issue;
- Land is relatively abundant;
- Farmers are intelligent;
- There is availability of market;
- There is a scarcity of water and the best alternative is WH as an opportunity.

On the other hand, there were a number of challenges and constraints observed during the visit. The major ones include the following

- The loose linkage with the Bureau and insufficient attention given to sustain the WH activity;
- The lack of seedlings and selected seed material from the Wereda Bureau of Agriculture; and
- Shortage of plastics including its maintenance as basic input in all the cases

In general, there are best practices in WH in the area, which can be scaled-out to the other regions with similar agro-ecology coverage.

2.3. Damot Gale

Damot Gale Wereda in Wolayita Zone, like Shebedino and Alaba, is one of the weredas included in the 2005 survey. There were 42 farm households taken from 12 PAs. The case of Damot Gale is different from other areas. This is because the soil is exceptionally very fertile and moisture is relatively better. Water harvesting is mostly used as supplementary to the rain fed agriculture. Largely, the farmers cultivate root crops vegetables- Sweet potato, cassava are dominating. Other horticultural crops include inset, cabbage, tomato, onion and garlic, papaya, and lemon.
The Bureau Head indicated that at the earlier stage of the WHT practice they followed an arbitrary approach, mentioning site selection and the technical problem brought about flaws in its implementation. There was mass expansion on WH activity in that particular time which resulted in, around 400 ponds constructed; of which only 110 of them hold water; 50 of them use it for cropping (within 20 PAs), and in all were covered with plastic sheets.

In those PAs visited there were some farmers who received award at national level as best farmers supported by WH best practices and accumulated wealth. The Ade Damot PA was also awarded in a ceremony held in Bahir Dar. However, one of the constraints is land shortage, as the Wereda is densely populated; due to WH however, farmers produce two and three times mainly high value horticultural crop. There are many tubes and plastics piled up in the compound of the bureau. There is uneven delivery of plastics. Most of the farmers produce both for market and own consumption using WHT. Farmers produce vegetables like carrot, cabbage, tubers, onion, garlic and tomato, papaya, enset, etc. with intercropping. There is also integrated livestock rearing activity. It is clearly seen that the WH has brought a discernible impact on the food security of the farmers.

In this Wereda, we visited two farmers WH activity. The first farmer uses plastic pond holding 60 m$^3$ of water. The pond is fully fenced. The experts remarked that now the farmer is busy due to the availability of water. According to this farmer, his major problem is shortage of land. He planted inset, coffee in addition to sweet potato. He uses compost as well as a fertilizer. Compost making has substantially reduced the cost of fertilizer.

The second case farmer has an integrated crop and livestock farming. His farm is well managed. This household has many extended family and he spend the whole day working in his farm. He has roof thatched with grass pond (fig 1). There is an impressive innovation by this farmer. The farmer
Recent development in water harvesting has invented new technology for drip irrigation using a pots buried beneath the soil to serve like a tube for drip water.¹

![Fig 5. A pond thatched roof with grass in Damot Gale (a farmers' innovation)](image)

The farmer planted enset, tomato, cabbage, carrot, sunflower, apple, banana, elephant grass, and Godere. He is watering the seedling from the water using tube-container linked water-holding instrument. The farmer also has modern beehives. His wife and other family members engage in the farm in his garden intensively. The farmer constructed a recreation center in front of his house. Interestingly, both farmers visited have a document for receiving the comments of visitors, and such new ways of doing things.

The other impressive activity in the PA is the catchment development efforts (Fig 6). This practice proves to provide more sustainable ways of using the water and conserving the soil. This activity is supported by the Wereda Bureau of Agriculture.

¹ As replacing drip irrigation saves soils and easily management by the farmers.
It is also interesting to observe that water harvesting changed the life of many farmers. They have acquired and diversified assets. It has to be supported in a sustainable manner.

2.4. Mirab Abaya and Arbaminch Zuria

Similar to the other areas, our assessment showed that site selection and pond structures had faults. The bureau has realized that the technology has no problem by itself; rather the approach had a problem. In some PAs of this Wereda, there was good performance of the technology. Currently, there is high demand to adopt WH. The best practices are found in Laka PA, Kala Shala, and PAs in the lowlands, which are far from Arbaminch. Apparently, in the lowlands it has become tradition after the bureau once triggered it.

There are farmers who practice irrigation through stream diversions and farmers have received awards at the national level for their outstanding performance. From Laka, the dega farmers we found 3-4 of them performing very well awarded for that. There are frontline regular suppliers of apple, cabbage, etc to consumers and traders.
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With respect to the structure of the technologies, in the lowlands the stream diversion/small-scale irrigation is common, while in the *dega* areas the shallow wells are used. Again, the highland farmers focus more on ponds than the lowlands.

In this wereda since 1996 EC, pond lining was done using cement concerts, not plastic. Plastic lining has arrived in 1999 EC. The Bureau has been persistently convincing farmers in many areas. During our visit, the bureau was distributing input and supporting/encouraging the farmers, with a priority to ponds.

It has become apparent that shortage of land in the *dega* areas is the most constraining factor of production. In the lowlands, also there is this problem but relatively less pressing. The land shortage in the lowlands restricts cotton production as required.

The situation in Mirab Abaya Wereda is more or less similar. We observed there are traditional banana cultivation in both Arbaminch Zuria and the Mirab Abaya areas; the advantage of the two weredas is that both are in the locality of large lakes, which keep the moisture of the ground and the water supply for irrigation or WH.

In Mirab Abaya, the visiting team had 84 sample households in the 2005 survey, while we had no sample from Arbaminch Zuria. Owe observation in West Abaya was limited to roadside. We discussed the Arbaminch Zuria case, as we could not arrange discussion with Mirab Abaya Agriculture Bureau. In both weredas, we observed that water harvesting has continued to be important farming practice. In Arbaminch Zuria Wereda, after an initial exit, now there is increasing entry in adopting the technology.
2.5. Chencha

Chencha Wereda is the second PRA site found under the Gamo Gofa Zone of the SNNPR. The wereda is classified predominantly as highland, above 1600 masl. The cropping pattern is also different in this case with integrated farming system of cropping highland fruits such as apples, apiculture, poultry and fattening rather than only grain production. Similar to other location is land constraint is a problem, with an average of 0.5 ha for the wereda.

From our discussion with the bureau head, the types of the WH activities undertaken are shallow wells, stream development, diversion, and ponds. Nevertheless, the number of ponds is limited. The Bureau confirmed that the WH activity is sustained in this wereda, with out much interruption after May 2005. Entry and sustained activities are more than exits in the wereda WH farming.

There are new entrants and exit as well, but overall entry are sustained in WH. Farmers are supported by the bureau for WH. Basically the farmers collect the local materials and the bureau purchases construction materials. The bureau supports are:

- Technical support - from the DA to the experts;
- Constructing a cover for shallow-well-cement, sand;
- Supporting the stream development technically and materially;
- Orienting on how to use workforce; and
- Supporting market promotion and market development.

We visited the Kele Stream Diversion, which is supported by an NGO, and Dembo WH sites. The Kele site included both stream diversions, which is used by large number of farmers. In the same area, the team observed shallow wells, too.
The major crops at the stream diversion are cabbage, enset, pepper, onion, and garlic. Many farm households are linked by the constructed stream diversion structure.

In Chencha, the major constraint is market for apple. Farmers sell 8-10 birr/kg, while the traders, in Addis Ababa, sell it for 22-25 birr/kg. The lack of road infrastructure is one constraint. Despite there is a road, there are limited number of vehicles.

2.6. Conclusion

From the PRA assessment, the following issues are identified:

- Water Harvesting has positive impacts on the food security of the farmers and there are many households become well off who come to be rich after adopting the technology through asset creation. Farmers are entering to the activity even when there is little support from the agriculture and rural development Bureau at Wereda level;

- The evidences show that there is flawed approach in the beginning of introducing the technology. All the Agriculture and Rural Development Bureau heads of the visited weredas agree that the failures that occurred are partly the misperception of the farmers emerging from the weak approach. There is nothing wrong with the technology, as explained at each level of our visit;

- The institutional supports in different weredas are at different level and there is no common understanding for disseminating the technology. Gursum, Chencha, Alaba (best practices), Damot Gale (innovation and best practices), Boricho (low level of the activity in the locality and low level of support by the wereda ARDB);

- There has to be sufficient awareness creation through media coverage particularly in Gursum, Alaba, Chencha, and Damot Gale. At national level, there are many best practices but we guess that probably they are not sufficiently disclosed;
- In these best practice weredas there is low level of exit than entry;
- Some of the constraining factors pertinent to each wereda are market, land, institutional support, farmers weakness/management, farm level security, and infrastructure; and
- Water harvesting helps to maximize scarce resources like land and capital, and water particularly in moisture stress areas.

The team suggested that the best practices in Amhara, Tigray, central Oromiya, and part of SNNP Regions have to be similarly visited. Institutional support of the technology is very important to sustain the technology. Moreover, the area requires in depth analysis to well understand it and sustain the technology.

Sources of Information

1. A farmer around Modjo
2. A farmer around Mieso
3. Gursum Wereda Administrator, Ato Zeinu Mohammed
4. Gursum Wereda Agriculture Bureau Head Ato Abdurahman Mohammed
5. Workers and the Muyedin PA DAs.
7. Deputy Bureau Head of Damot Gale, Ato Teshome.
8. Arbaminch Zuria Agriculture and RD Bureau Head, Ato Andegna Shinale Shesha
## Acronyms

<table>
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<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>DA</td>
<td>Development agent</td>
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<td>EC</td>
<td>Ethiopian calendar</td>
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<td>PA</td>
<td>Peasant associations</td>
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<td>PRA</td>
<td>Participatory Research Appraisal</td>
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<td>RBA</td>
<td>Regional Bureau of Agriculture</td>
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<tr>
<td>SNNPRS</td>
<td>Southern Nations, Nationalities, and Peoples Regional State</td>
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<td>WHT</td>
<td>Water harvesting technology</td>
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