

Participatory Innovation Development in water management

in Tigray, Ethiopia

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One of the local innovations identified by the Northern Typical Highlands (NTH) platform of Prolinnova-Ethiopia is an intricate system of harvesting water from waterlogged land to allow cultivation in the long wet season, coupled with storage of this harvested water to use for supplementary irrigation in the following dry season. This had been developed by Mr Abadi Redehay, a 45-year-old man who lives with his wife and four children in Mai Berazio village of Tahtai Maichew District, near the historical town of Axum in the Central Zone of Tigray Region in northern Ethiopia. This local innovation was already known to the local farmers and the development agents (DAs) learned about it from the local people.



Abadi showing one of his water pits (actually too dark to see the pit, because of so much vegetation).

Abadi's innovation

To sustain his family, Abadi has less than 0.5 ha of cropland on reddish and clay soils. He had to be innovative in order to solve the water-drainage problems on his sloping land and to improve the crop productivity. When he was visiting Axum, he saw a sewage canal under construction. He was inspired when he realised that the sewerage system was draining water away so that it did not stay on the soil surface, as it was happening on his farm.

Completely on his own, Abadi dug deep and long canals diagonally across the slope and then placed long and flat stones on both sides of each canal to help the water pass easily. He also put flat stones on top as a cover and replaced the soil on top of these stones. The underground canals lie at depths varying between 40 and 180 cm below the soil surface. During the rains, they capture excess runoff water as well as

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water coming up from deeper levels through capillary action. They lead the water to collection points (excavated pits with earth walls), where it is stored. Water that exceeds the capacity of these pits is drained to a nearby stream.

During the dry season, Abadi draws water from the pits, using a treadle pump, and gives supplementary irrigation to crops in the plots below the pits. He bought the pump with his own money after he was successful in collecting water in this way. Over time, still working on his own, he gradually expanded the drainage system throughout the entire farm, connecting the canals and leading the water to three collection points.

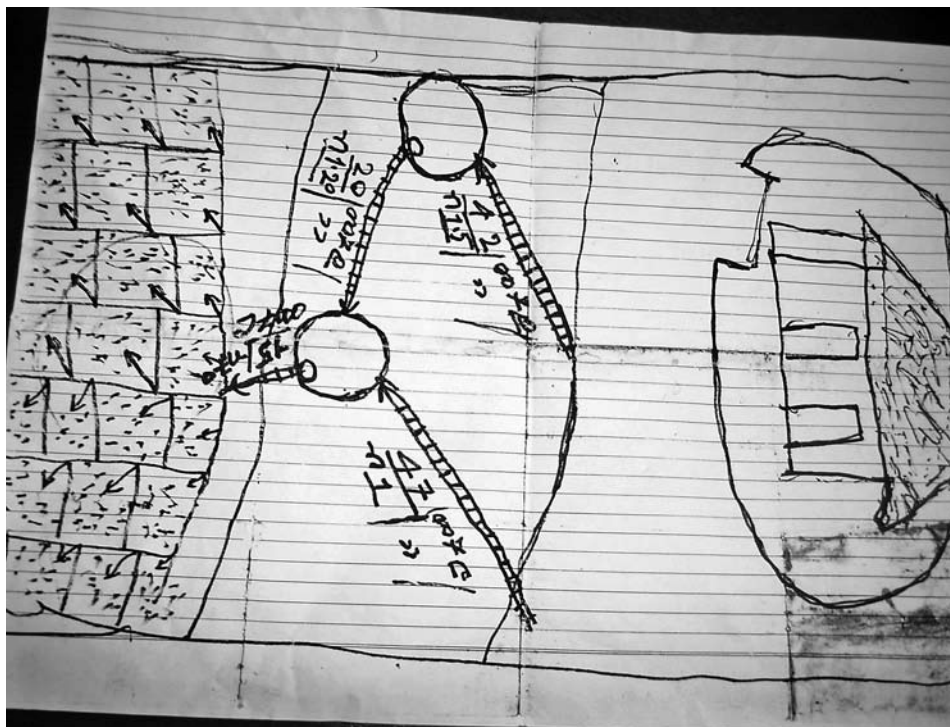
Before he started this innovation, he grew mainly teff, a local cereal that can be sown late in the wet season, and sometimes chickpea, a crop than can be sown in September after the rain stops. Now, because he can sow the land earlier in the wet season, he has more options and, because he can also irrigate land, he can even grow vegetables in the dry season. He gets up to three harvests per year from the same piece of land. In addition, Abadi can harvest more and better-quality forage from his farm boundaries as well as around the

water reservoirs year-round. Because of his innovation in water management, he was able to buy more animals. Abadi and his wife now have two oxen, one cow, one donkey, six goats and several chickens. Before starting his innovation, Abadi did not even have a pair of oxen to plough his land. He had to go off to town to find wage labour, but now he can devote himself entirely to farming, and his neighbours regard him as being relatively well off.

Starting up Participatory Innovation Development (PID)

In April 2005, the NTH platform organised a workshop for farmers. It introduced the concepts of local innovation and Participatory Innovation Development (PID). The workshop participants examined some examples of local innovation, which the farmer innovators presented themselves, and then considered what should be done with the local innovations: whether

1. to disseminate them more widely;
2. to explore questions about the innovations in a PID process; or
3. to see the innovations as useful only for the specific circumstances of the local innovators.



This is a sketch that Abadi made of his underground drainage/waterharvesting system.

The workshop participants visited several farms, including Abadi's farm, and were particularly impressed how he managed the water flows to gain benefits using his drainage technology. Many farmers experience the same problems as Abadi did: temporary waterlogging in one season and insufficient moisture in another season on the same piece of land. On Abadi's farm, inspired by his innovation, the farmers and DAs discussed what they could do together. They brought back their observations and suggestions and presented them to the other workshop participants.

Then, the farmers taking part in the workshop selected three local innovations that they wanted to explore further and possibly improve in PID processes. One of these innovations was Abadi's system of sub-surface drainage and supplementary irrigation with the harvested water. Farmers wanted to try this out on other farmers' plots and see if it works or could be adapted to other conditions. The farmer participants pointed to specific aspects of Abadi's innovation that needed to be further explored, such as the strength of the canals and the capacity and durability of the water-collection ponds.

A second workshop was held in May 2006 to launch the PID activities supported by the NTH team in Tigray Region. In preparation for this workshop, the NTH asked Abadi and the Tahtai Maichew District agricultural experts to suggest three volunteer farmers to do PID on his innovation. Abadi proposed three farmers who live very close to him and to each other in Tahtai Maichew District, who likewise faced water-logging problems on their farms, who were keen to try out his innovation on their adjoining plots, who were on good relations with each other and who were open to sharing their experiences with other farmers.

Adapting as they went along

The farmers had to figure out how to take the same principles the original innovator had used and apply them on different land. As a group, under Abadi's guidance in assessing slopes and water flows, they dug canals draining water from different directions and connected these canals at five points, where they excavated small water reservoirs. They did not use any reinforcement material, because the soil has sufficient clay content to retain the collected water. Indeed, the clayey nature of the soil was causing the drainage problem. Moreover, the farmers involved in the PID thought that putting in reinforcement would affect water flow into and from the small reservoirs, because the water comes into them not only through the canals. However, the experimenting farmers, including Abadi, do recognise that a problem of collapsing reservoir walls may occur after 2-3 years, so they are keeping an eye on this.

Canals connecting these small water reservoirs also lead overflowing water down to a lower area where the three farmers made a larger water reservoir. This is on a piece of land that was useless for cropping because of severe water logging. Excess water from the farm and the smaller water reservoirs flows to this main water reservoir and from there to a nearby stream. Thus far, there are no signs of erosion damage caused by overflowing water, because the farms are near the stream and the banks of the stream are covered with grasses.

The three experimenting farmers have made their collection ponds smaller and shallower than those made by Abadi, partly because their land is stonier. They are adjusting things as they go along, depending on what they find.

In June of this year (2007), the farmers sowed their drained land with cereals that are growing throughout the wet season. In the coming dry season, they plan to grow vegetables on the land below the reservoirs, just as Abadi is doing, using the water from the small and larger reservoirs for irrigation and using their customary water-lifting devices, such as clay pots, can or plastic containers, and Abadi's treadle pump on loan free of charge.

The three farmers and Abadi meet 2-3 times per month to work together and to observe what is happening in this experiment with setting up a new system of joint water management. They look at how well the land is drained, whether, and where they need to build additional canals. They look at the labour they have to invest, the inputs they have to buy, and the level of water collected. They cannot quantify the amount of water because of the irregular size and shape of the ponds. Thus, they monitor and evaluate their work continuously. They also discuss what to do next and how they plan to use the land in the future.

Any interested farmer in the neighbourhood can join these meetings and learn from Abadi and the other farmers, as well as share their own experience in water management. The experimenting farmers have not recorded how many farmers visit them to see their work. Only men come to these meetings in the field, and only male members of the family are involved in this PID activity, as it involves a lot of strenuous digging work.

In an area like Tigray Region, where many activities in agriculture and NRM are supported through Food-for-Work (FFW) or Cash-for-Work (CFW) schemes, it is noteworthy that the experimenting farmers are not receiving any food or cash for the work they are doing to try and improve their land. They receive only some advice from BoARD and ISD staff, and the PID funds that allowed them to buy tools and other things they needed for the experimentation.

The role of different actors in the PID process

Their main external partners in the PID process are staff from ISD (Institute for Sustainable Development) and the DAs and experts from BoARD (Bureau of Agriculture and Rural Development) at village and district level. Thus far, they have had relatively little contact with formal researchers. The Axum Agricultural Research Centre and Axum University were only recently established. Tahtai Maichew District is too far away (about 280 km) from the university in Mekelle, the capital of Tigray Region, for people from there to take part in any of the meetings of the experimenting farmers. However, some staff members from Mekelle University do show interest in PID and have made occasional visits, although the funds made available through Prolinnova–Ethiopia to support PID are not enough to cover their travel costs and per diem payments.

About once a month, someone from ISD attends a meeting of the experimenting farmers. The DAs join the meetings of the experimenting farmers about twice a month, and occasionally the district experts for NRM and agriculture also come. The main tasks of ISD and extension staff are to help the farmers monitor their work and its effects and to help them analyse what they are doing. It was agreed from the outset of the PID that the farmers themselves would do most of the monitoring.

During the PID launching workshop, the experimenting farmers were given a still-photo camera and two films so that they could take their own photographs of their experiment. Abadi himself takes the photos and pays for film development and prints. They

distribute the photographs among themselves, show them to other farmers and use them to show visitors how they did the work, e.g. when they were digging the canals which can now no longer be seen because they are underground. Abadi's wife and the wives of the other farmers in the group are well aware of what their husbands are doing and bring out the photographs to show them to visitors.



Abadi regulating water flow to/from underground canal connected to one of his pits. (Photographer: Tesfahnu Fenta)

The farmers are also keeping written records in a large DIN A4 notebook. Abadi does most of the writing. The DAs and the district experts also write down their observations during their meetings with the farmers, keep their records on file in the district agricultural office, and refer to them when reporting to their colleagues and superiors.

Making the PID process and results more widely known

The experimenting farmers disseminate their interim results when other farmers take part in their regular meeting-cum-working days, during visits to the PID site on farmers' days organised by the Agricultural Office and the District Administration, and through informal communication among farmers. This happens, e.g., when attending church, when gathering to celebrate a saint's day, at market places, at coffee or funeral gatherings or during neighbourhood meetings for other purposes. The men and women sit

together and both take part in these informal discussions, except in the church, where they sit separately.

The Agricultural Office has organised visits of farmer groups to Abadi's farm 3-4 times a year in the last couple of years. Since January 2007, they organised two visits by farmer groups to the new PID site. In addition, by writing about the process in this and other articles³, we from ISD and the BoARD are trying to share the learning even more widely.

A big problem with respect to communication and dissemination is the frequent turnover of extension staff in Tigray, including in the Axum area. The handover from one DA to the next is not well organized. They just find a pile of papers on the desk or in the drawers or cupboards. It has proved quite useful to have posters in the district agricultural office about the outstanding farmer innovators and to have their work featured in the catalogue of local innovations⁴. Prolinnova-Ethiopia has printed posters on local drop irrigation and water-lifting innovation in Tigray but not yet on Abadi's innovation in water management. The NTH platform is planning to make a poster and leaflet of his innovation and the PID process for use within Tigray.



Hailu speaking with a microphone for a film on his innovation.

³ Hailu Araya. 2007. *The story of a smart water harvester in Tigray Region, Ethiopia*. In: *Smart water harvesting solutions for rain, fog, run-off water and groundwater* (Netherlands Water Partnership), pp 36-39.

⁴ PROFIEET (Promoting Farmer Innovation and Experimentation in Ethiopia). 2006. *Catalogue of farmer innovations, Vol. 1*. Addis Ababa: AgriService Ethiopia.