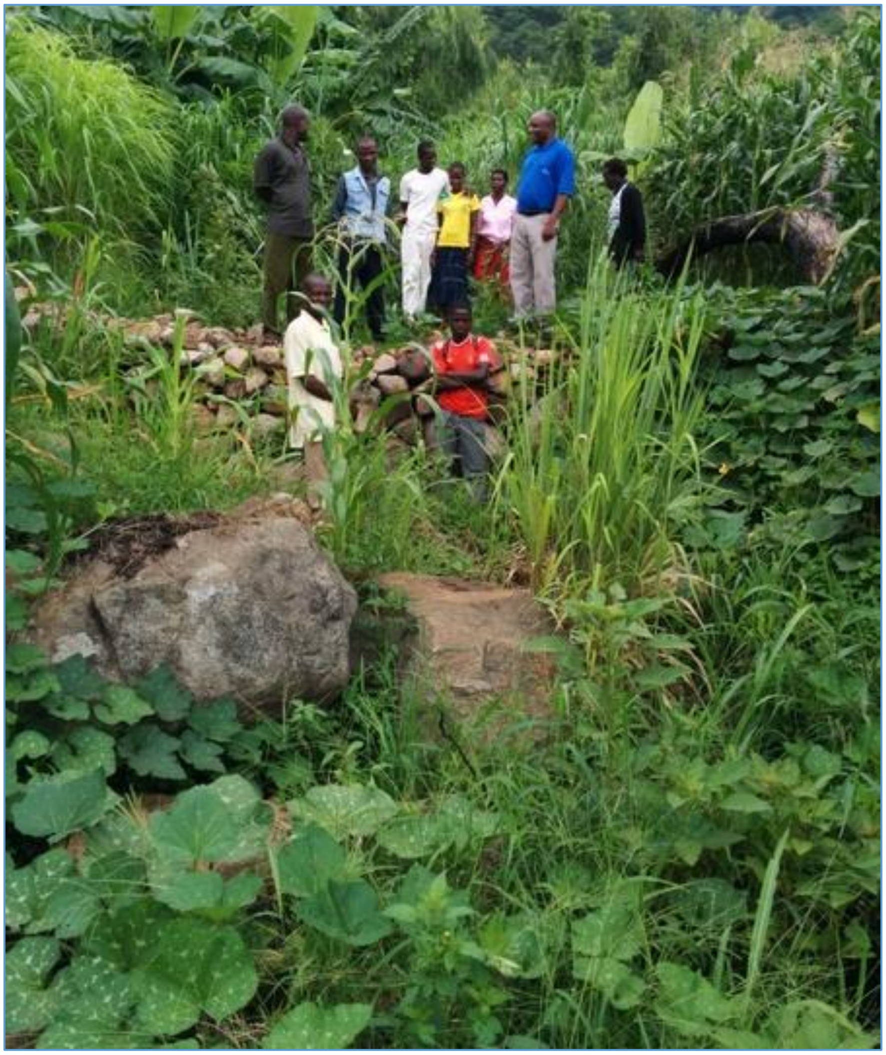
Watershed Development:

Experience from the WALA Program



Land reclamation by check dams. WALA staff and Lingoni Watershed Committee Members (Machinga District)

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Executive Summary

WALA Watershed Synopsis. The Wellness and Agriculture for Life Advancement program (WALA) is a five-year $81m[1] food security program funded by USAID's Food for Peace office. WALA is led by Catholic Relief Services (CRS) and implemented by a consortium of Private Voluntary Organizations (PVOs), including ACDI/VOCA, Africare, Chikwawa Diocese, Emmanuel International, Project Concern International, Total Land Care, and World Vision. WALA's goal is to improve the food security of nearly 215,000 chronically food insecure households across eight Southern Malawi districts by mid-2014.

WALA's chronically food insecure households typically cultivate the most marginal land, which often is characterized by slopes prone to severe erosion. In marginal lands, water capture is more difficult, soils rapidly erode, and productivity subsequently declines. Since a centimeter of topsoil takes 100 years[2] to form, erosion control is paramount to soil and livelihoods protection. Therefore, WALA has implemented watershed management activities in 32 areas across eight districts. Over three years, WALA selected communities, formed watershed committees, trained technical staff, mapped watersheds with GIS technology, and facilitated construction of watershed treatments. WALA treated 2,883 hectares with 1,981 km of erosion control measures,[3] or over three times the length of Lake Malawi.[4] The watershed treatments included: water absorption trenches (33 km), continuous contour trenches (919 km), stone bunds (318 km), check dams (333), marker ridges (377 km), and 339,336 planted trees. WALA invested over $2.2m in Food For Work (FFW) incentives representing a cost of $1.11 per structure-meter.[5]

Objectives and Outputs. The main objective of the WALA Watershed study was to document two main pieces, the WALA Watershed approach and achievements, and the community and staff perceptions of the watershed benefits and results. Specific tasks included: literature reviews, stakeholder interviews, site visits, and mini-learning workshop facilitation. The core products included the watershed learning event, WALA Watershed Report, and WALA Watershed Synopsis Prezi.

Methodology. Over 13 days, the consultant employed qualitative methods[6] interviewing 88 people with a semi-structured interview guide[7] in key informant interviews or informal focus groups.[8] In-depth interviews conducted with 16 WALA and PVO staff, five external Subject

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[1] WALA Mid-Term Evaluation Report, April 2012.

[2] Manual: Natural Resource Management: Basic concepts and strategies, page 36. In-depth interview, Agriculture and Environment Senior Tech Advisor. February 12, 2014. However, topsoil may take up to 500 years to form. (Wikipedia).

[3] Figure includes: water absorption trenches, continuous contour trenches, stone bunds, check dams, and marker ridges.

[4] Wikipedia.com. Length of Lake Malawi is 580 km.

[5] Ibid 3. To obtain USD figures for this report, Malawian Kwacha was converted using the midpoint value average rounded to nearest Kwacha for the month of February 2014 (424 per USD on www.oanda.com)

[6] When possible the qualitative data was complemented and augmented by quantitative data.

[7] See Annex 1. Watershed Interview Guide. Note that this guide was the interview team's high-level tool rather than a script or checklist.

[8] A complete list is found in Annex 2. List of Contacts by Name, Organization and Title.

Matter Experts, and one government staff member.[9] Over the course of six days, the interview team (WALA Irrigation Technical Quality Coordinator and consultant) visited five of the 32 watersheds in four PVOs, which represented nearly one-fifth of the watershed area, by hectares.[10] The focus group team conducted five semi-structured focus group discussions with the Watershed Development Committees (67 people, 30 of whom were female).

Observations. The report is structured into three main themes including: behavior change, technological diffusion and impact. Behavior change required for watershed development has occurred through technological adoption and examples were observed of non-FFW-driven sustainability. Committees have developed a continuum of rules and regulations enforced through a decentralized, self-regulated system. Finally, both supply and demand-driven technological diffusion was reported from WALA watershed areas to non-project areas.

Impact focused on three areas[11]: land reclamation, yield increases, and a rising water table. First, land reclamation was linked to check dam construction in farm fields and in the wider community. Farm field gulley reclamation translated to material gains in arable land. The most visible evidence was found in Lingoni Watershed, where a series of nearly twenty 12m check dams had already reclaimed a two-meter deep barren gulley, and farmers had cultivated half of the gulley.

Second, watershed infrastructure was tied to increased yields because of increased moisture and water retention, principally through water absorption trenches and continuous contour trenches. A female committee member summarized the overall responses, “Before the treatments, dry spells would take over half my yield, and I’d reap five bags of maize. But now, during the last dry spell, my field yielded eight bags of maize.”

Third, communities reported a rising water table and additional surface water encompassing: village streams, deep bore hole wells, and shallow wells. Streams that formally dried up were now perennials. In most communities, bore holes and shallow wells were now perennial. Two-year quantitative time-series data from the Makande Watershed (Chavala District) corroborates the community’s observations. From October 2011 to October 2013, the stream’s flow rate nearly tripled[12] and the two observation wells’ metrics increased by 49 and 64%, respectively.[13]

[9] Only one government member was interviewed due to the scope, detail and level of data that was desired. The intent was to focus on the PVO and community’s data and perceptions of the WALA watershed interventions.
[10] The visited areas constituted 616 hectares of the 2,833 treated hectares, or 22%.
[11] Although there were several other impacts cited by communities, these three were the most cited, by the most respondents across both females and males.
[12] Data: Oct 2011 3.2 L/s to Oct 2013 9.1 L/s.
[13] Data for Oct 2011 to Oct 2013: Observation well #1 (low on the watershed) was 50.5 cm to 82.8 cm, or 63.4%. Observation well #2 (high on the watershed) rose from 39 cm to 57.9 cm, or 48.5%.

Acronyms/glossary

ACDI/VOCA	Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance
CATCH	Consortium Administration and Technical Coordination Hub
CCT	Continuous Contour Trench
CRS	Catholic Relief Services
EI	Emmanuel International
FFP	Food for Peace
FFW	Food for Work
GoM	Government of Malawi
GVH	Group Village Headman (Oversees several Village Headmen)
LDF	Local Development Fund
M&E	Monitoring and Evaluation
PCI	Project Concern International
PVO	Private Voluntary Organization (synonym: International Non-governmental Organization)
ROI	Return on Investment
SCI	Save the Children International
SOW	Scope of Work
TA	Traditional Authority (governmental level above GVH)
TLC	Total Land Care
USAID	United States Agency for International Development
Vetiver	*Chrysopogon zizanioides* a perennial grass of the Poaceae family, planted to protect watersheds
WALA	Wellness and Agriculture for Life Advancement program
WAT	Water Absorption Trench
WOTR	Watershed Organisation Trust (India)
WVI	World Vision International

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Objectives and Methodology

The main objective of this report was to document the WALA watershed approach and achievements, and the community and staff perceptions of the watershed benefits and results. The core products and services included: watershed learning event facilitation, the report "Watershed Development: Experience from WALA Program," and the WALA Watershed Prezi. The scope of the consultancy focused on formative learning and synthesis of achievements rather than an evaluation or operations research.

The methodology encompassed seven activities:

1) Literature review (internal and external documentation and resources);
2) Introductory and background interviews (Watershed Organization Trust) Consultant, CRS Southern Africa Regional Office Agriculture and Environment Senior Technical Advisor, CRS watershed technical staff, Haiti Watershed Program Manager and a former Tanzania Watershed Program Manager);
3) In-depth interviews (PVO staff, WALA CATCH staff, and the Mulanje Government of Malawi Agroforestry Assistant District Forestry Officer for Extension);
4) Five semi-structured focus group discussions with Watershed Committees (67 members, 30% female);
5) Five watershed site visits in four PVOs;
6) Consolidation of watershed outputs[14] (See Annex 3 Summary of Watershed Treatments, Area Treated and Total Cost, by PVO;
7) WALA Watershed Sharing and Learning Event.

Site visit duration ranged from six to nine hours (from February 20 – 26, 2014) in Makande (Chivala District), Chigwirizano (Thyolo District), Mitumbira (Mulanje District), Domasi (Zomba District), and Lingoni (Machinga District). The five watersheds visited covered 616 hectares of treated land, representing more than one-fifth of all the treated WALA hectares (2,833). The visited watershed areas were heterogeneous, categorized as bushveld rocky terrain, farmland, or farmland contiguous to forest. The data collection team (consultant and WALA Irrigation Technical Quality Coordinator) divided the field work into three phases, in-depth interviews with PVO technical field staff, physical treatment/watershed inspection, and semi-structured focus group discussions with the Watershed Committee.

A WALA Watershed mini-workshop was conducted on February 28, 2014 for 19 people, including: 14 PVO technical staff, three CATCH staff, and two WALA Senior Management Team. The workshops objectives were to: share observations from the watershed data collection, conduct watershed learning exchange, and identify key Monitoring and Evaluation (M&E) strengths/gaps. (See Annex 6. WALA Watershed Learning Mini-Workshop Agenda)

[14] Although, out-put level M&E data was maintained at the PVO or watershed level, the data had not been consolidated and aggregated to the WALA program level.

Table 1. List of Watershed Sites Visited (in chronological order)

PVO	Watershed Name	District Name	Attributes	Treatments	Hectares treated
Chikwawa Diocese	Makande	Chavala	Bushveld, including non-cultivated areas	Water Absorption Trench (WAT), Continuous Contour Trench (CCT), stone bunds, check dams, trees, Vetiver	217
WVI	Chigwirizano	Thyolo	Farmland, surrounded by tea estates	WAT, CCT, stone bunds, check dams, trees, Vetiver	141
Africare	Mitumbira	Mulanje	Farmland	CCT, stone bunds, check dams, marker ridges, trees, Vetiver	80
Emmanuel International	Domasi	Zomba	Adjacent to highly degraded forest	CCT, stone bunds, check dams, trees	43
Emmanuel International	Lingoni	Machinga	Adjacent to partially intact forest	WAT, CCT, stone bunds, check dams, trees, Vetiver	135

Watershed Treatments

This section summarizes the WALA watershed treatments (see Annex 3), provides a description of each treatment, and describes how WALA employed FFW. This is a snapshot of WALA's treatments rather than a list of technical specifications found in the reference documents. WALA used three main reference sources: 1) WOTR – Training for WALA on Micro-watershed Development, 2) WALA Watershed Guidelines, and 3) Rainwater Harvesting: Technical Field Manual on Rainwater Harvesting. WALA developed watershed treatments drawn primarily from the WOTR technical guide. However, some treatments were modified and simplified to the Malawian context, often aligned to the Malawi Government's Watershed manual.

Photo 1. Forest WAT constructed in 2001, Lingoni; shows gentleman in red at the bottom of the trench, and gentleman in yellow at top.

*Water Absorption Trench (Photo 1)***.** WATs are utilized to capture water, retain water, and recharge the water table. Given the relatively large size of WATs, they are not indicated for farmers' fields, rather for field perimeters or up-watershed, such as in a forest. WATs are typically one meter wide, less than 60 cm deep, and up to ten meters long. In order to increase water capture, WATs are staggered perpendicularly to the slope like tiles on a roof.

Box 1. Water Absorption Trench Innovation

Given that the watershed treatments were relatively new to the communities, there appeared to be less innovation than efforts to strive for technical compliance. However, one example was found in the Domasi Watershed. The PVO's technical manager modified the "up-slope" shape of the WAT from 90 degrees to 60 degrees. The innovation was meant to prevent small animals from drowning in the deep trench.

Photo 2. Farmer examining a CCT in Domasi

Continuous Contour Trenches (Photo 2). CCTs are excavated along contour lines in farmers' fields. The trenches arrest water runoff and percolate water into the farmer's field, increasing soil moisture content. Given the premium placed on arable land, the CCT's dimensions are considerably more modest than WATs. A CCT's width is

30 cm and depth is between 30 and 60 cm.[15] A crucial structural component is the CCT berm, which reduces lateral water movement every five meters. Without the berm, the CCT's integrity is compromised and may lead to unintended gullies in the field.

Stone Bunds (Photo 3). Stone bunds are low rock walls following a slope's contour. The semi-permeable barriers slow runoff rate, filter water, and spread water over a treated field. Where a plethora of loose stone is available, stone bunds are an indicated treatment. Typically stone bunds are a meter high and wide, and the length depends on the landscape. The critical construction issue is to ensure large boulders form the foundation using smaller stones as fill. Over time, a once stone filled slope may morph into arable terraced farmland.

Photo 3. Members of the Makande Watershed Committee standing on a stone bund.

Check Dams (Photo 4). Check dams are basic stone walls, or plugs, erected in eroded gullies or adjacent to footpaths and roads, in order to reclaim trenches or prevent gully formation. The specifications of the check dams must be suited to the locality, particularly the flow rate. Most of the WALA check dams' dimensions are between 50 cm and 150 cm in height and up to 150 cm in width. Lengths varies considerably, but most are between two and twelve meters. In a relatively short period (one to two rainy seasons), gullies can be reclaimed either in a protected forest or in farmland.

Photo 4. Members of the Watershed Committee standing on a large (~12m) check dam reclaiming a barren gulley, Lingoni

Marker ridges. A marker ridge refers to the construction of crop ridges following a contour. The ground along a contour is level as such water stays in situ. Planting ridges are constructed along the contour line at a recommended spacing of 75 cm. The main purpose of marker ridges is to hold the water within the field, allowing more water to percolate into the soil, thereby increasing soil moisture and recharging the ground water aquifer. Vetiver grass is planted on the contour marker ridge to arrest run-off velocity and reduce erosion.

[15] The Malawi CCT specifications differs from the WOTR guidelines, as WOTR indicates a 60 cm x 60 cm trench.

Afforestation (Photo 5). WALA afforestation activities include the raising and transplanting of trees (indigenous), fruit trees and grass. Afforestation assists in ground water recharging through increased cover and soil retention. In WALA, the most common indigenous species planted were the Cassod Tree,[16] Lebbeck Tree,[17] and the Accacia polylicatha (Mthethe). The most common propagated fruit trees were mango, papaya, banana and peach.[18] Finally, Vetiver grass was raised in nurseries and transplanted throughout the watershed. Vetiver grass grows quickly and reduces erosion along embankments or reinforces watershed treatments.

Photo 5. Tree nursery in Domasi

Box 2. Affecting Change: Watershed Committee and Trees

Examples were encountered exhibiting how watershed committees have affected change above and beyond their community. For example, in Chigwirizano, the community's stream originates and passes through the Makwasa Tea Estate. The tea estate's stream was lined by a myriad of Eucalyptus trees, planted primarily for fast growing timber, but known also for its insatiable thirst relative to indigenous species. After WALA's watershed trainings, Chigwirizano met with the Makwasa Tea Estate advocating supplanting of the Eucalyptus trees with alternatives. Starting in December 2012, the tea estate began felling the Eucalypts trees, replacing them with mahogany and pine.

Pull out quote.

"My child pointed to an indigenous fruit and asked me, 'what are these'?

My child had never tasted our own indigenous fruits before." – Makande Committee Member

Watershed Treatments and the Role of FFW. The WALA watershed approach utilized FFW as an incentive to communities for the watershed construction. The incentive consisted of one ration for every 23 days of work (three and four hours/day), of which 15% was considered the community's in-kind contribution. Each ration was comprised of 15 kg of pinto beans and 3.674 kg of vegetable oil, valued at $28.[19] WALA assumed an average of "2.5 person days" to erect

[16] Senna siamea
[17] Albizia lebbeck (Mtangatanga)
[18] The Watershed Committees did not track tree survival rates, a recommendation that is found in the M&E section. Anecdotally, three communities stated a survival rate of between 50-70%.
[19] Ration costing provided from WALA Commodities Unit, email March 14, 2014.

one cubic meter, thus after one month (23 person days of work) nearly $10m^3$ of structure[20] was constructed with one ration. WALA conducted FFW-incentivized construction during the dry season –the six months when farmers were less occupied with cultivation.

Box 3. Associating Apiculture and Agroforestry (Photo 6).

All visited sites either had plans to introduce, or recently started, apiculture. The most advanced pilot was found in the Lingoni Watershed. Lingoni has a tripartite structure: indigenous forest, timber-bearing forest (primarily Eucalyptus), and farmland. In 2012, WALA staff trained and equipped 18 community members to manage six beehives over the last year. The group hired a local carpenter ($7.07 per hive) to replicate a model hive from Mulanje District. Using goat dung fires, two harvests yielded 10L of honey per harvest per hive, or a total of 120 liters per year. The group sold the honey from the six hives on the local market for $5.66 per liter or a total first year revenue of $675.25. In addition to the possible revenue and plans to expand the pilot, the Watershed Committee members highlighted the importance of how apiculture protects the forest from tree felling since apiculture requires trees for hanging hives and flowers to pollinate. Another member added that people fear bees, which also helps protect the forest.

Photo 6. One of six bee hives in Lingoni Watershed.

Observations

The observation section is divided into three parts behavior change, technological diffusion and impact. Behavior change includes three themes: technological adoption, sustainability and guarding the commons. The impact section focuses on three themes: land reclamation, increasing yields and rising water tables. Finally, the diffusion section covers how the watershed treatments and approach have spread from project areas to non-project areas including supply-driven and demand-driven forces.

Behavior change (adoption, sustainability and guarding the commons). Given that the watershed approach and treatments were relatively new as a concentrated effort in the selected areas, behavior change was critical. How communities adopted watershed technologies, how they viewed sustainability and how they enforced the new rules, were essential.

Technological Adoption. In the watersheds visited, three main types of farmers were found: early adopters, mainstream adopters, and refusers. With regards to the early adopters, watershed treatment adoption rates were fairly homogenous save one positive outlier. The majority of early adoption rates (four of the five watersheds) were approximately 50 - 70%; and one community reported near complete adoption of watershed technologies. Most communities employed an opt-out model (four of the five watersheds), in which farmers could refuse treatments, even though

[20] Figures: 23 days divided by 2.5 person days per 1m3 = 9.2 m3.

this may weaken the ridge to valley model. Most of communities reported that those farmers that were not part of the early adopters became mainstream adopters in the subsequent season.

The watershed structures were considered community-based assets, but households were expected to maintain the structures within their respective fields. Although a comprehensive maintenance survey was not conducted, approximately half of the visited treatments were either in good working order or clearly maintained. The other half exhibited signs of degradation (mostly dams partially-fallen or silted CCTs) or clear lack of maintenance (only a very few). The most common critical issue encountered was lack of CCT maintenance as some trenches were nearly filled or filling with soil.[21]

On the lower end of the adoption rate continuum, Watershed Committee members highlighted that the main resistance factor for the adoption refuser was low risk tolerance. A female member said, "Our farmers are very conservative." Another stated, "Few farmers want to try new things independently." There was no consistent refuser profile. Older and younger and male and female farmers, tended to refuse equally. However, the committee mentioned that the younger farmer refusers were most likely heavily influenced by their parents. A Mitumbira watershed committee member summarized a core refuser complaint, "Farmers complain because the treatments [especially the CCTs] take space from their field, and they think these structures disturb the land." WALA attempted to mitigate this concern by allowing farmers to reduce the CCT's width from 60cm to 30cm (see treatment section for more).

One watershed reported near 100% adoption, which was attributed to senior leadership precedent. In the Lingoni Watershed, Machinga, the Traditional Authority in Chamba insisted that his field be treated before all other fields. The Watershed Committee boisterously exclaimed, "Since the TA's field received the treatments first, nobody could refuse!" and declared, "Unlike others, we had no problems with farmers accepting the treatments."

Although there may be negative consequences with this top-down approach, the Lingoni watershed did not encounter adoption issues reported in the other areas. Possible negative effects could include technical implications and program's benefit distribution. For example, the TA's field should have been sequenced latter as it was "down-watershed," hence possibly weakening the ridge to valley approach if up-watershed was insufficiently treated. The sense of the interview team, was that the positive precedence with regard to a new technology requiring behavior change through technological adoption outweighed the negative aspects (with the caveat that the ridge-to-valley approach remain intact).

[21] This observation indicated that post-project follow-up and/or verification could be a critical component.

Box 4. Opportunity Costs: "Is deforested land worth less than forested?" (Photo 7).

Although the WALA processes for community engagement[1] focused on inclusion, education and mobilization, there was one example encountered in which a farmer felt threatened by the watershed approach. In Domasi, a farmer disagreed to the watershed concept and the overall idea of conservation. A Watershed Committee member recalls the farmer an saying, "If trees are what you want, if there are no trees, you can't manage my land." He cut them down, as he feared the community would usurp his decision-making power and potentially his land. Fortunately, the Watershed Committee discussed the issues with him and he stopped just shy of the ridge, thus sparing at a small strip of land at the top of the ridge.

Photo 7. One farmer disagreed with the Watershed Committee and cleared his land in Domasi.

Sustainability. One key development issue is sustainability, particularly once external incentives cease. All communities purported continued treatment construction (without FFW) and maintenance (of FFW-created structures). However, only Mitumbira provided clear evidence of organized watershed reporting and planning. During the site visit, Mitumbira provided a comprehensive flip-chart presentation to the data collection team, including: a Mitumbira Watershed map, detailed achievements of all treatments per year, the committee structure, and a detailed implementation plan for 2014. Mitumbira presented evidence (targets) that they were planning significant non-FFW activities, both in specific watershed treatments, and non-watershed activities, such as road building. For 2014, Mitumbira plans over 91 km of structures, including: CCTs (over 20 km), stone bunds (18 km), Vetiver (25 km) and marker ridges (28 km). (Photos 8 and 9)

Photo 8. Mitumbira's Watershed plan for 2014.

Photo 9. Mitumbira's Watershed structure and achievements.

Of the watershed's visited, Mitumbira was unique in the sense that the community pro-actively and unilaterally requested the watershed interventions. Mitumbira community members saw the pilot village and were exposed to watershed theory through Field Days. (See diffusion section) This explained, at least in part, the higher level of organization and commitment observed in Mitumbira.

Although the other four watersheds cited non-FFW (new) treatment construction and on-going maintenance of FFW-supported treatments, there was a paucity of evidence compared to Mitumbira. Some small counter examples were given. In Chigwirizano, an older female watershed committee member said she has constructed new CCTs in her field with the help of her sons. All Watershed Committees reported they sporadically visit farmer's fields in order to help ensure maintenance is continued. In general, non-FFW outputs are not tracked. One committee member stated flatly, "We thought these records were for WALA only."

Aside from the Mitumbira example, the greatest evidence of watershed sustainability was found through sheer technological diffusion beyond the project areas. (See Diffusion section)

Guarding the Commons. All of the communities visited had created watershed regulatory systems meant to guard the commons. The control systems are characterized by self-defined membership fees, watershed rules and decentralized enforcement mechanisms. Regulatory infractions passed through an escalation algorithm, summarized in four steps, (including the approximate frequency of its use):

1. The watershed committee discussed the issue and attempted conflict resolution together with the alleged. (most common)
2. If unsatisfactory, the village headman was involved. (several examples)
3. If unsatisfactory, the Group Village Headman was consulted. (uncommon)
4. The police were involved. (rare)

Rules and punishments ranged from explicit in Makande and Chigwirizano to more implicit in Mitumbira, Domasi and Lingoni.[22] The most comprehensive set of rules and punishments was found in Makande including a mix of cash fines and community service. The committee referred to their watershed as "a protected area."

Watershed membership infractions and fees included:

- Membership fee – 49 cents,
- Member tardy to meeting – 24 cents, and
- Inebriated at meeting – 24 cents and dismissed.

Watershed infractions included:

- Tree felling – goat payment and planting seedlings,
- Breaking CCTs – $1.79,

[22] Rules and regulations were not documented, but the committee was clear on the detail.

- Unapproved visitors found in protected area – $2.36,
- Fire starting – no monetary value given, and
- External visitor tardy to a committee meeting – $7.08.

Makande's comprehensive set of rules and regulations appeared to be enforced. For example, in June 2013, a man was apprehended felling trees. Since the dispute was not resolved locally (first three steps), he was taken to the police and obliged to pay the committee $21.23.

Chigwirizano imposed a series of similar rules to Makonde; however, fiscal fines were less common than community service. Rules and punishments (when cited) included:

- Failure to maintain CCTs – forfeit a chicken,
- Mice hunting ban,
- Grazing ban except in designated areas,
- Bush fire ban, and
- Tree felling ban – obligatory planting of 10 more trees.

In Chigwirizano, there were examples of enforcement ranging from social education and correction to incarceration. In 2011, two farmers were filling in trenches because they "failed to understand the watershed principles," which was quickly remedied. In another village, a farmer was caught hunting mice by setting fires and was required to desilt CCTs. A second farmer in the same village was apprehended for tree felling and was incarcerated for one night.

In addition, Chigwirizano mentioned two salient points with regard to grazing and tree felling regulations. Pre-2011, most of the community free-grazed animals; however, by 2014 the vast majority (~80%) practiced zero-grazing. Chigwirizano cited the zero-grazing benefits to individual farmers, especially manure for gardens/fields. Tree felling was banned in communal areas, but permitted at each person's homestead. In order to meet cooking needs, the community was permitted to collect wood at houses and tea estates and sheer select tree cuttings.

The remainder of the watersheds indicated their rules were implicit and suffered fewer infractions. The only exception was found in Lingoni, where a man was caught setting a bush fire, and fined $7.08.

*Technological Diffusion***.** There was evidence that watershed technologies have diffused beyond the project area by both supply and demand forces. Technological diffusion beyond the project area is an indication of successful uptake and increased chances of sustainability.

Supply-Driven Diffusion. Examples of supply-driven diffusion are grouped into two main types, autonomous and facilitated diffusion.

Autonomous Diffusion. Three of the watersheds (Chigwirizano, Domasi, and Lingoni) reported diffusion occurring autonomously simply due to exposure to the new techniques. For example, FFW labor was contracted from non-watershed areas, and after building the treatments in the FFW areas, the treatments started to appear in other adjacent villages. In addition, most of the

Watershed Committees were composed of watershed villagers themselves; however, in one watershed (Lingoni), the committee was purposely composed of people from other villages. Over the course of three years, autonomous diffusion had started. In both examples of autonomous diffusion, the committee were unable to describe the scale of the diffusion.

Project-Facilitated Diffusion. Diffusion was facilitated through WALA's project activities, specifically the Field Days, Review Meetings, and learning exchanges. Field Days and Review Meetings were systemic processes to WALA's operating model[23]; whereas, learning exchange visits were *ad hoc* tailored to specific gaps. Africare is used as an example because the pilot watershed[24] was cited as less successful, but the visited watershed (Mitumbira) was more successful. Mitumbira proactively requested the watershed intervention, which was primarily due to the Field Days and Review Meetings.

Africare reported conducting eight Field Days[25] over two years (2012 and 2013). At the field days, Africare shared WALA's activities from the community's perspective. In a public space, technologies were show-cased and the community was given an opportunity for question and answer sessions. Africare invited the broader community but also targeted specific invitees such as religious leaders, government officials, Group Village Headmen, village headman, and influential people in the community.

The Field Days were designed for a wider audience whereas the Review Meetings focused on a smaller audience at a higher level.[26] Participants in the Review Meetings included a specific community/committee, the GVH, and Africare. On a quarterly basis, Africare presented to the Area Development Committee, conducted a question and answer session, and attended field visits.

Finally, WALA facilitated diffusion through learning exchange visits. For example, in December 2012 WALA organized a two-day exchange visit for twelve committee members to Save the Children in Zomba. Four Mitumbira watershed committee members indicated that there were technical problems in the Zomba watersheds:

- WATs mimicked CCTs, thus they easily burst,
- Check dams sagged in middle,
- Stone bunds were too low (only 50cm high), and
- Stone bund lacked structural integrity (large foundational stones weren't filled with smaller stones).

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[23] Interview with CATCH Irrigation, Agriculture, and Natural Resource Management Technical Quality Coordinators. March 4, 2014.
[24] The Africare Pilot Watershed was not visited. This information is taken from the key informant interview with Africare.
[25] Also called Open Days.
[26] At the Traditional Authority Level.

Demand-Driven Diffusion. Several examples of unsolicited requests from non-watershed areas to the watershed committees were noted. Most of the requests were for voluntary support, however, in two instances remunerated technical support occurred. The remunerated technical support indicated the relatively high value that was placed on the watershed skills.

Voluntary Diffusion. In Chigwirizano, the watershed committee was approached in August and September of 2013. First, four farmers from an adjacent non-WALA village, called Chalingala (a different GVH and different TA)[27] stumbled upon the treatment construction and inquired if Chigwirizano could teach them the treatments. Four committee members (secretary, executive chair, technical chair, and a member) spent a few hours over three days including: meetings with the village chief, technical theory teaching, and demonstration provision. Three farmers followed the basic "ridge to valley" principle. However, one farmer (down-watershed) did not follow the technical advice, and thus most of his treatments were washed away with the rains.

Remunerated diffusion.[28] There were two examples from the Mulanje District highlighting how the committee had monetized watershed knowledge. In both examples the Watershed Committees were beneficiaries of Malawi's Local Development Fund, which is a standardized and decentralized financial mechanism.[29]

In August 2013, the Nkhonya Development Committee (non-project area) hired twenty people from the Khoviwa Watershed Committee and Core Technical Team. Khoviwa trained and mentored 180 Local Development Fund beneficiaries over twelve days in Mandozo Village. The team demonstrated treatment construction techniques including: marker ridges, CCTs, stone bunds, check dams and Vetiver grass planting. The participants were divided into four groups, each group comprised of 50 beneficiaries, led by the Khoviwa team. The Local Development Fund Program used Cash for Work to pay the watershed members and beneficiaries. Each beneficiary received 93 cents per day, for a net transfer of $2,232. Construction output included: 3,600 CCTs, 420 check dams, ~ 9 km of Vetiver grass strips, ~29 km of marker ridges and over 12 km stone bunds.[30]

In August and September 2013, three members[31] of Namwalizaone Watershed provided technical advice to beneficiaries of the Local Development Fund in Mtambo Village (Group Village Headman Mthilamanja). Thuchila Extension Planning Area Government Officials hired Namwalizaone to train the Local Development Fund beneficiaries. First, Namwalizaone trained twelve people in CCTs and marker ridge construction. Then, the trained twelve members and the three watershed members led the Sub Work Groups (200 Local Development Fund beneficiaries). The leaders mentored their respective groups for 48 days. All beneficiaries received wages of 71

[27] There was one report that the Watershed Committee received $11.79 for the three days of training; however, this was not corroborated by the committee itself.
[28] Both examples of the monetized diffusion come from Africare sites (Submitted March 7, 2014).
[29] The goal of the LDF is to empower local communities to take part in the decision making process through improved local governance and development management, in order to reduce poverty and improve services delivery.
[30] The reports from the PVO did not provide uniform outputs as some are cited as total number and others in length.
[31] The Farmer Extension Volunteer, Watershed Development Committee Secretary, and a Watershed Development Committee member.

cents per day for a period of 48 days. Total outputs included 622 CCTs and 2,885 m of marker ridges.

Impact. Three impacts were clearly cited by all committees: land reclamation, increased yields, and a higher water table.

Land reclamation. Land reclamation was not only the most cited impact of watershed management, but also the most visible impact in a relatively short period of time. During site visits, stone bunds indicated signs of incipient terracing[32] and check dams exhibited the most amount of reclamation.

The most dramatic land reclamation example was found in the Lingoni Watershed. A series of nearly 20 check dams was constructed in late 2010 to plug a sizable barren gulley (2m deep by 12m wide) between two maize fields (Photo 10). Within three rainy seasons, the check dams were nearly full with soil and roughly half the gulley has been reclaimed. Farmers have planted maize 3m into either side of the gulley, and pumpkin has spread along the top of the check dam.[33]

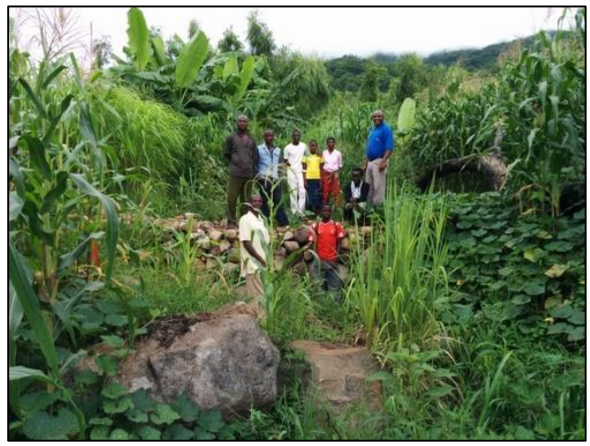


Photo 10. A Lingoni 12m check dam stretching between two fields having reclaimed 50% of the gulley.

The reclamation was not limited to the Lingoni farmland. "Up-watershed" in the Eucalyptus forest, several inspected dams remain in formidable condition without receiving any maintenance. Although the dams were visited in the rainy season, the forest dams had trapped soil to capacity, water was being absorbed into the topsoil, and the former gulley was congested with indigenous grasses.

The average WALA farmer cultivates ½ hectare of land (~70 x 70 meters), and it is common in the watershed areas for the farmland to be gullied on either side. If a farmer reclaims the two edges of their farm, a farmer can reap an additional $20 in revenue per season.[34] Not insignificant, $20 corresponds to 11% of the Malawi's GDP per capita, of $180.[35] For a WALA farmer, $20 also

[32] The Makande Watershed exhibited the most comprehensive set of stone bunds and of the highest technical quality.
[33] A 4 dam section of the gulley was sampled, paced and measured.
[34] Calculations: 5,000m2 is ½ a hectare, or a theoretical 70 x 70m plot. Total reclaimed area = 70m x 3m x 2 areas = 420m2, or nearly 8.4% of their field. 420m2 is 4.2% of one hectare. Assuming an average of 2.024 metric tons per hectare (2,024 kgs/hectare – is the GoM's average yield between Hybrid [2,395 kg/hectare] and Composite [1,653 kg/hectare] Maize for 2011/12), the additional yield is 84 kgs of maize, (extra 1.68 bags of maize). At current market prices ($11.79/50 kg bag), this is $19.81.
[35] Bellmon Estimation Studies for Title II, page 1 of annexes. USAID Office Food for Peace, May 2013. GDP per capita data from The World Bank Database of 2011.

translates into 50% of secondary education term or 20L of vegetable oil.[36] With regard to costing the ½ hectare of gulley protection and reclamation, a series of eight check dams (one per 10m) costs the equivalent of $140 in FFW incentives.[37] Additional benefits such as pumpkin harvests, decreased topsoil erosion, and future degradation were not included in the ROI calculation.

Beyond the Lingoni Watershed, evidence of check dam reclamation was found in all the other four watersheds, albeit on a more modest scale. In the Domasi Watershed, a series of six check dams had begun to collect soil over three rainy seasons. One meter deep gullies have begun to silt. In Makande, many smaller two to three-meter check dams lined the primary road, and similar sized check dams were used in Mitumbira fields to reclaim gullies.

In Chigwirizano, the Watershed Committee emphasized that check dams were key "convincing agents," essential for behavior change. Chigwirizano is adjacent to a tea estate on undulating hills that gain gradient as they near the stream. Check dams were constructed in a concentrated design along the main road into the tea estate, from the tea estate into the community, in the primary foot paths down to the stream and throughout the Chigwirizano farmland.

A female committee member stood on a silted gulley that used to be over her head two years ago. She pointed to the now-filled gulley explaining, "Once everyone saw the soil stay here, instead of running off, they were convinced…it was the check dams that convinced people." Before the check dams, Chigwirizano's path to the stream included several bridges spanning barren gullies. The gullies have filled and the bridges are no longer needed to reach the stream.

[36] Estimates provided by WALA Technical Quality Coordinators.

[37] Calculations: Assuming a check dam with the dimensions: 1m width x 1m height x 5m length = $5m^3$ of material. Eight check dams to cover the gulley = $40m^3$ of material. WALA assumes 2.5 person days per m^3, which is 100 person days for the eight check dams. For every 20 person days worked, one FFW ration (15 kg pinto beans and 3.674 kg of oil) is provided or 20.25 and 7.75, respectively - or a total of $28 per ration. The total FFW cost per ration for the eight check dams is $28 x 5 rations or $140. Ration costing provided from WALA Commodities Unit, email dated March 14, 2014.

Box 5. Allocating Return on Investment – Reclaimed Land (Photo 11)

There were a of couple examples indicating that although land was reclaimed from gullies, the allocation of that ROI could be problematic. In communities, barren gullies are often used for property delineation. A reclaimed gulley is reclaimed arable land, and thus a created surplus resource. In Mitumbira, a long gulley was in the process of being reclaimed. Check dams had reduced the depth of the gulley by half. One farmer altered the check dam so the water would flow along his neighbor's land, thus asserting his claim to the new arable land.

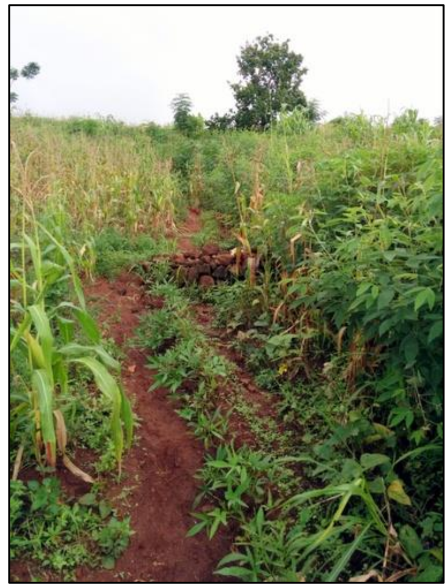


Photo 11. As land is reclaimed, conflicts may occur on how to divide the ROI. One farmer destroyed part of the check so that "his claim" included the gulley.

Increased crop yields**.** All visited watersheds reported crop yields had increased after the development of the watershed treatments.

In Chigwirizano, increased crop yields were framed as a function of food availability and market prices. A female committee member stated, "As of August we'd usually have to buy food to supplement our stores, but now only one in ten households buys food in the lean season." Her colleague commented, "The price of maize has decreased during the lean season. We used to spend \$2.36 for five kg of maize (e.g. was in 2010) to supplement our own maize. But now during lean seasons the price has dropped to \$1.06 per five kg."

In addition to crop yields increasing, one committee spoke specifically to yield resiliency. In Mitumbira, a female committee member explained, "Before we had CCTs and check dams, the seasons with dry spells would take over half my yield, and I'd get only five bags of maize. But now, during the last dry spell, my field yielded eight bags of maize."

In Mitumbira, a community member in her late 50s linked conservation agriculture and watershed activities. She said, "My yield without conservation agriculture and contours was one bag of maize, and now with two seasons of conservation agriculture and watershed treatment, I get up to eight bags, and this year I am expecting ten bags." Her colleague added, "Our crops used to get washed away before the watershed treatments helped us control water."

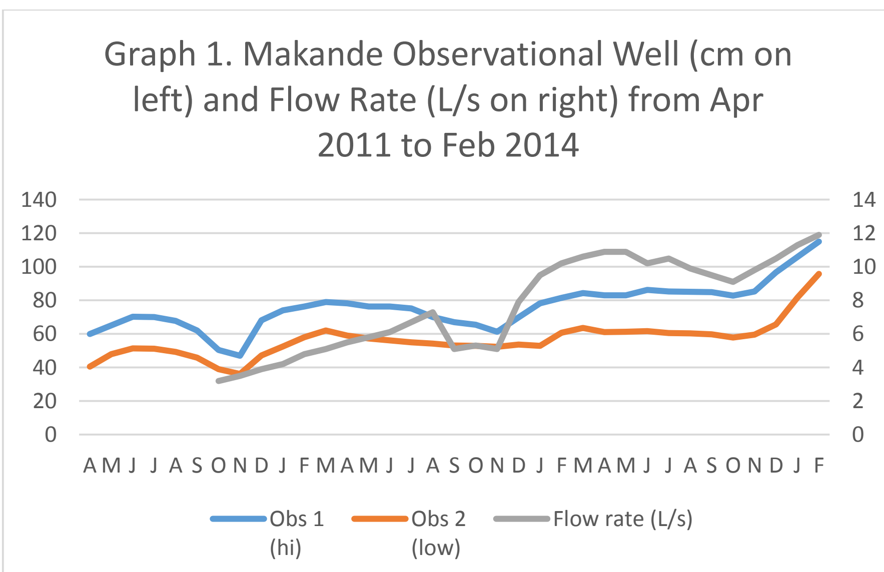
Additional related watershed benefits were highlighted, but not by all communities. Makande and Mitumbira explicitly linked increased food security with nutritional outcomes, "Our children are healthier," and "We have more fruits and vegetables." Chigwirizano has proactively internalized the idea of basic comparison plots. The committee chair pointed to three different plots and stated, "You can see the difference between no CCT, CCTs only and CCT + conservation agriculture."

Rising Water Table. Although only two communities (Makande and Lingoni) explicitly used the terms "rising water table," all communities referenced at least one impact on water availability, such as stream flow, bore hole water availability or shallow well water availability.

With regard to data collection, Makande was the most advanced. The Makande Watershed Committee is the only watershed to measure monthly observation wells and stream flow rates. Starting in April 2011, Makande has obtained metrics from two observations wells, one higher on the watershed, the other lower on the watershed. The metric is in centimeters of water found in the observation well. After six months (October 2011), the Makande committee began measuring the stream's flow rate using the flotation method. Any floating object is dropped in the stream at the same place and timed over the same distance. The volume is estimated and a figure in liters per second is obtained. Since October 2011, the stream's flow rate has tripled and since April 2011 the observational wells have increased significantly. See graph 1.

Makande Observation Wells. There are two observation wells at Makande Obs 1 and Obs 2, lower and higher on the watershed, respectively. The lower observation well had 36.2 cm of water in November 2011 and two years later 59.6 cm, or a 65% increase. The slope of the overall positive trend is 1.6 cm gain per month.[38] The upper observation well had 47 cm of water in November 2011 and two years later 85.3 cm, or an 82% increase. The slope of the overall positive trend is 1.6 cm gain per month.[39]

Makande Flow Rate. The flow rate started at 3.2 L/s in October 2011 and two years later in the same month was measured at 9.1 L/s. Although the flow seems to ebb and flow with a latency to the rainy seasons, the overall trend is upward, with an average slope gain of .3 L/s per month.[40]



[38] Calculation: (95.7 – 40.5 cm)/35 months = 1.6 cm gain per month
[39] Calculation: (115 – 60 cm)/35 months = 1.6 cm gain per month
[40] Calculation: (11.9 – 3.2 L/s)/29 months = .3 L/s per month.

The Makande metrics largely corroborate with the site visit qualitative data. A male committee member focused on how the stream had become perennial, "Our stream used to be dry from June to December before 2011, and now we see the stream just stay." When pressed on possible confounding factors, such as rainfall, the committee countered, "We know it is the treatments and not just good rains because even in dry season the stream still runs." The committee also mentioned potable water availability, "Even the wells, which used to dry up from August to December, now always have water."

Makande linked stream opacity to watershed health, "The stream used to be full of silt, but now it has less sand and sediments." The Makande stream was very clear[41] in February even though February averages the second highest precipitation month per year only to January. Furthermore, February 2014 had received the second highest monthly precipitation since January 2008 or in the last 74 months.[42]

Although Makande had the most data available to support a rising water table claim, this impact was reported in all the other watersheds. In Domasi, there are two main streams in the watershed, and smaller of the two used to dry up in September and October. In Lingoni, a female member said "We have new soil and more water, and increased water flow in our streams." Her male colleague added, "We have a higher amount of water in perennial stream, our shallow wells and two bore holes used to go dry around November, but now they are perennial. The last time it went dry was November 2010, and was not dry in November 2011." Finally, a Lingoni member explicitly linked water capture to water tables, "We saw how the WATs capture water, and we thought that it must eventually come out in our bore holes."

One useful indicator, albeit not definitive of watershed health, is stream clarity. Stream clarity indicates the amount of soil erosion above that observation point. Ideally, a well-treated watershed should be near clear even during heavy rainfall. During the site visits, there were three observational categories – clear, semi-silty, and silty.[43] At the time of the site visits (end of rainy season), Makande's stream was clear, Lingoni and Chigwirizano semi-silty, and Domasi silty. Mitumbira's stream was not observed. In the case of Chigwirizano and Domasi, the committee recognized two salient variables that affected the streams up-watershed commercial activity and their own limitations on watershed coverage. The Chigwirizano stream originated and passed through a tea estate. Aside from the planted tea, the tea estate fields had little overt treatment for soil erosion. In the case of Domasi, a committee member pointed to the silty stream and said, "We should have gone higher [in the watershed] with the treatments, but we started in the village."

[41] Visited on February 21, 2014

[42] Only Jan 2013's precipitation was higher, at 347.7 mm.

[43] In-depth interview with Andrew Fernandez, WALA Watershed Consultant (WOTR). March 21, 2014

Monitoring and Evaluation

Based on an observed paucity of systematic, standardized and aggregated watershed M&E data, WALA Watershed M&E should be strengthened. The aggregated output and impact data cited in this report was consolidated and analyzed during the consultancy (see Annexes 3 through 5). For M&E strengthening two types of recommendations should be considered, a minimal watershed M&E system and a comprehensive M&E system, the former if no additional funding is acquired, the latter if additional funding is secured.

Minimal M&E. The strategy for the minimal M&E should emphasize internal transfer of the decentralized ad hoc M&E activity within WALA. Standardization and aggregation is less important than ensuring each watershed committee has the basic management abilities to plan and track achievements and basic impacts. Watershed planning and tracking systems should be taken from Mitumbira and transplanted to the other watersheds. Mitumbira presented the sole cogent evidence of planned 2014 watershed treatments without continued FFW support. Outputs achieved and planned should be tracked. Impact data systems should be rolled out from Makande to the other watersheds including three key data points: observational wells, stream flow rate and rainfall. Makande has collected the first two data points for over two years and was able to source the third data point in a timely manner. If training in the collection of rainfall data via rain gauges is not possible, the watershed committee might collect and consolidate data from the closest government station.

A summary of the minimum M&E indicators:

1. Watershed outputs planned and achieved, by watershed, bi-annually.
2. Observation well metrics, monthly
3. Flow rate metrics, monthly
4. Rainfall metrics, gathered daily and reported monthly.

Comprehensive M&E system. If the watersheds secure additional funding above and beyond the current project, a more comprehensive and standardized M&E system should be considered. The M&E system approach should include standardization, aggregation, and data quality mechanisms. In additional to the set of M&E indicators above, the watershed technical staff are interested in collecting: tree survival rates, vegetative cover over time, flooding (frequency and area covered), fire (number of fires and area affected / burned), and small scale irrigation farming.[44] Two additional resources should be used to develop a more comprehensive M&E system if additional funding is secured. WOTR developed an M&E form (see Annex 7) in late 2010 that was not implemented. The M&E form should be adapted and honed to suit the new funding source. In addition to this form, the WOTR training manual (Training for WALA on Micro-watershed Development) includes a section on impact monitoring on page 122 in chapter IV.

[44] Contributions of the WALA watershed technical staff during the watershed learning mini-workshop.

Top Learning Points

1. Communities Perceived Benefits of Watershed Management. The interviewed communities uniformly perceived significant benefits of watershed management, particularly, but not limited to land reclamation, increased productivity and increased availability of water.

2. FFW Return on Investment and Scale-up. To construct over 1,980 km of erosion control treatment, WALA invested $2.2m in Food For Work (FFW) incentives translating to a cost of $1.11 per structure-meter. There was no evidence found that significant and considerable scale-up is not possible, especially with integration of the issues raised in the learning points.

3. Check Dam ROI. An average WALA farmer reclaiming gullies of their farm can reap an additional $20 in revenue per season, or 11% of the Malawi's GDP per capita ($180). For a WALA farmer, $20 translates into 50% of secondary education term or 20L of vegetable oil. This series of check dams costs the equivalent of $140 in FFW incentives, thus the dams "pay for themselves" in seven seasons.

4. Local Development Fund Opportunity. In the Africare areas, the GoM has used the Local Development Fund to hire Watershed Committees for technical training resulting in diffusion of watershed technologies beyond WALA project areas. WALA should facilitate cross learning between the GoM, Africare and other PVOs in order to scale up the use of the Local Development Fund mechanism or other local funding options. Although beyond the scope of this report, lessons from other sectors should be gleaned for application to watersheds. In particular, WALA has substantial experience with the Private Service Provider (PSP) approach in Savings and Internal Lending Communities (SILC) programs. If Watershed Committees and or technical staff are able to charge for services to other communities, this may be a source of sustainability.

5. Spreading Watershed Technologies. One community proactively requested watershed treatments due to exposure to pilot village during Field Days. Of the five watersheds visited, this community provided the most evidence of sustainable and autonomous watershed work. Field Days should be continued as not only a learning tool but as a marketing mechanism. Entirely new geographic project areas should create exposure forums, such as Field Days so that watershed management is demanded proactively from new villages.

6. Treatment Marketing and FFW Targeting. The Ridge to Valley approach encourages complete treatment of a designated area starting with the upper most part of the watershed, and this should continue. Given that the treatments are relatively new to most villages, explicit marketing of particular treatments may have advantages. For example, of all the treatments, check dams convinced communities in one rainy season that watershed treatments are effective. Check dams provided quick wins for land reclamation translating

into palatable fiscal returns for farmers. Thus, one option may be to reserve use of FFW or other incentives for the more physically challenging treatments that require longer time frames for visible returns, such as stone bunds and afforestation. Another approach would be to reserve FFW or tailor FFW to focus on the community-based treatments (e.g. WATs, stone bunds, and indigenous afforestation) and use less FFW for treatments in individual farmers (e.g. CCTs, check dams, and homestead fruit trees).

7. Importance of Leadership Precedence. Although not the sole predictor of success, local leadership is pivotal. When local leaders insisted that their fields be treated first, subsequent adoption was less of an issue among other farmers. There was good evidence that support from local leadership significantly increases adoption of watershed treatments by farmers in the targeted areas. New watersheds should consider employing a similar strategy to garner community support.

8. Incentives and Allocating ROI. Extrapolating from the amount of check dams created (330 km), a significant amount of gullied and barren land between fields were reclaimed. Subsequent conflict has arisen in a few cases on how to divide the new arable land, a tangible return on their investment in check dams. In order to avoid future conflict watershed committees should define how returns from the treatments will be divided. It may be that reclaimed land is simply divided between farmers, or it may be more prudent to suggest another strategy that encourages individual ownership. For example, assigning a farmer to an entire gulley and allocating all arable land reclaimed, would provide an incentive for that farmer to not only construct check dams, but also to maintain the structures. This may be a more cogent approach to link a farmer's fiscal returns to their individual investments.

9. Affecting Change: Committee Organization. There are examples of committee affecting significant change and directing their own resources which may be partially controlled by external bodies. Committees lobbied a large tea estate to replace Eucalyptus with Pine and Mahogany. In addition, Watershed Committees stymied tree felling, field burning and open-grazing. WALA should continue support to the Watershed Committees particularly in two key areas: how to lobby at the community level and beyond the community level, and how to better manage themselves. Although a significant and laudable amount of output was noted, evidence the watershed's capabilities to manage information and planning was lackluster.

10. Contextualizing and Capturing Change. The Watershed Committees provided extensive and credible detail as to how the treatments have impacted their lives; however, visual documentation could be a useful tool in order to convince new communities of potential impacts. This should not be limited to the community level, as the individual PVOs did not capture before and after evidence.

11. M&E. Although there was a dearth of systematic and aggregated Watershed M&E available, there was decentralized ad hoc M&E occurring within the program. WALA should either spread the current ad hoc decentralized M&E activities (if no further funding is secured) or scale up and scale out M&E (if further funding is secured). At a minimum, Makande should train the other watersheds in observation well, flow rate and rainfall data collection.

Annex 1. Watershed Interview Guide

Overall guiding questions:

1. What parts of WALA's watershed activities indicate **positive**, **negative or negligible results**?
2. Is there a particular **mix of interventions** that works better than others?
3. What are the **causes of progress/stagnation**?
4. How can "WALA's watershed **methodology" be best described**? (summative)

Specific questions:

1. **Describe** the watershed interventions.
2. What has been the **greatest changes/impact for the community** since watershed activities started? (Probes)
    a. physical benefits,
    b. economic benefits,
    c. environmental benefits
3. What has been the **greatest changes/impact for you** since watershed activities started? (Probes)
    a. physical benefits,
    b. economic benefits,
    c. environmental benefits
4. What watershed activities have **gone well**? Why?
5. What watershed activities have **not gone well**? Why?
6. What examples of **innovations** have you seen?
7. What activities have **transferred to other communities**, even without WALA support?

Domains to consider:

1. Participation/design (e.g. land use maps, property rights/delineation and clarity, length of commitment, linking watershed change to a community or individual's economic interests, finalized plans.)
2. Governance (e.g. Watershed groups, non-technical capacity building efforts, documentation/mgmt, cost recovery mechanisms)
3. Cash for work mechanisms (e.g. supervision controls, quality controls)
4. Primary interventions:
    a. Afforestation
    b. Water control mechanisms (e.g. grass, CCTs, stone gulley plugs, Water absorption trenches, stone bunds)
    c. Water harvesting (e.g. damns, pools, irrigation schemes)
    d. SWC
    e. Grazing controls (e.g. no-graze, limited grazing)
5. PVO oversight/mgmt/monitoring.
6. Costing?

Annex 2. List of Contacts by Name, Organization and Title

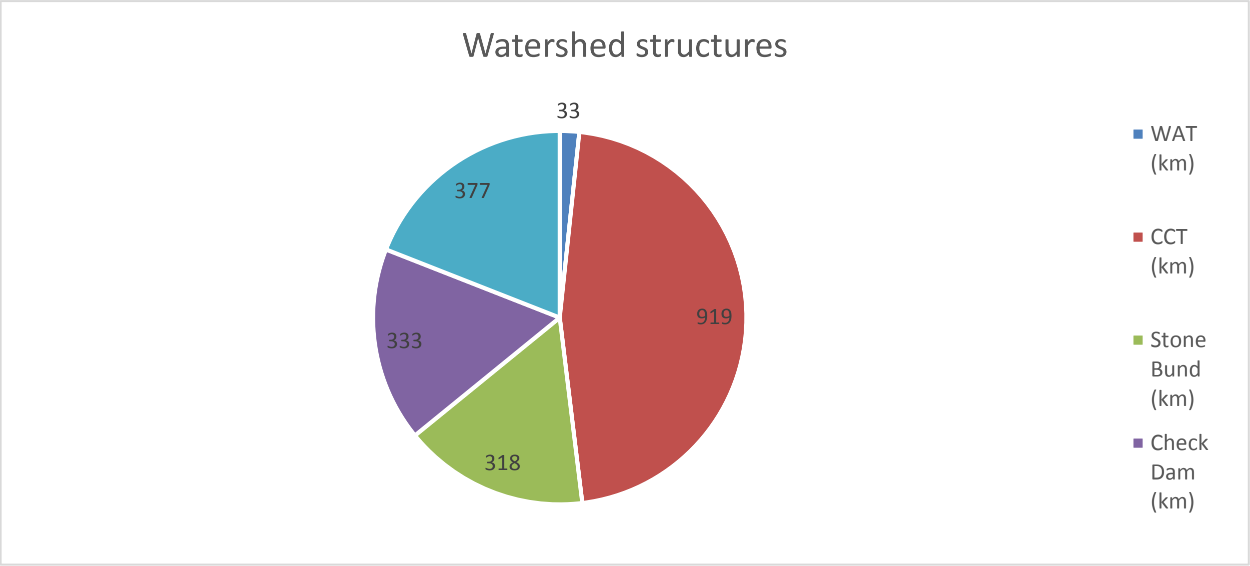
Name	Organization	Title
Shane Lennon	CRS Malawi	WALA Chief of Party
Hazel Simpson	CRS Malawi	WALA Deputy Chief of Party - Programming
Jay Chandran	CRS Malawi	WALA M&E Officer
Juma Masumba	CRS Malawi	WALA Technical Quality Coordinator - Irrigation
David Nthakomwa	CRS Malawi	WALA Senior Project Officer - Agriculture & Natural Resource Management
Wales Magumbi	Africare Malawi	WALA Technical Quality Coordinator - Agriculture and Natural Resources Management
Solomon Chirwa	Chikwawa Diocese	Irrigation and Natural Resources Management Coordinator
Evans Matthews	Chikwawa Diocese	Agriculture Tech Coordinator
Steven Kawaina	Chikwawa Diocese	Field Supervisor
Thokozani Banda	WVI	Agriculture Coordinator
Innocent Ntenjera	Africare	Agriculture Coordinator
Benjamin Muharu	Africare	Field Officer
Lucius Suwedi	Africare	Field Officer
Besta BandaMukhuna	Africare	Field Officer
Absalom Guluza	Africare	Agriculture Business Coordinator
Yobu Mkwinda	Emmanuel International	Irrigation and Watershed Development Coordinator
Mr. Bared Nangwale	Department of Forestry; Improved Forestry for Sustainable livelihoods Program	Assistant District Forestry Officer for Extension
Makande Watershed Committee (23 people, 3 female)	Chikwawa Diocese	Executive and Technical Members
Chigwirizano Watershed Committee (8 people, 4 female)	WVI	Executive and Technical Members
Mitumbira Watershed Committee (18 people, 10 female)	Africare	Executive and Technical Members
Domasi Watershed Committee (10 people, 5 female)	Emmanuel International	Executive and Technical Members
Lingoni Watershed Committee (8 people, 3 female)	Emmanuel International	Executive and Technical Members
Geoff Heinrich	CRS Southern Africa Regional Office	Agriculture and Environment Senior Technical Advisor
Ehsan Rizvi	CRS Lesotho	Former Program Manager of Tanzania Watershed Activities
Kelli Mineard	CRS Haiti	IWRM Program Manager – Watersheds, DRR, Climate, Emergency WaSH
Andrew Fernandez	Independent	Watershed Consultant
Dadi Legesse	CRS Ethiopia	Agriculture and Natural Resource Management Program Manager

Annex 3. Summary of Watershed Treatments, Area Treated and Total Cost, by PVO.

PVO	WAT (km)	CCT (km)	Stone Bund (km)	Check Dam (km)	Marker Ridges (km)	Trees Planted (#)	Total (km)	Treated Area (Ha)	Total FFW Cost
Chikwawa	5	292	179	210	0	50,469	686	595	$486,397
SAVE	23	188	5	75	100	86,694	390	380	$787,350
Emmanuel International	3	74	23	9	0	17,700	109	254	$187,614
Total Land Care	0	170	23	1	0	85,848	195	230	$344,142
World Vision International	2	138	54	25	0	10,642	220	697	$263,276
Africare	0	11	34	13	44	62,645	102	288	$77,370
Project Concern International	0	46	0	0	233	25,338	280	389	$64,993
Totals	**33**	**919**	**318**	**333**	**377**	**339,336**	**1,981**	**2,833**	**$2,211,142**

Note: figures are rounded. Total km figure does not include "trees planted." ACDI/VOCA did not treat watersheds.

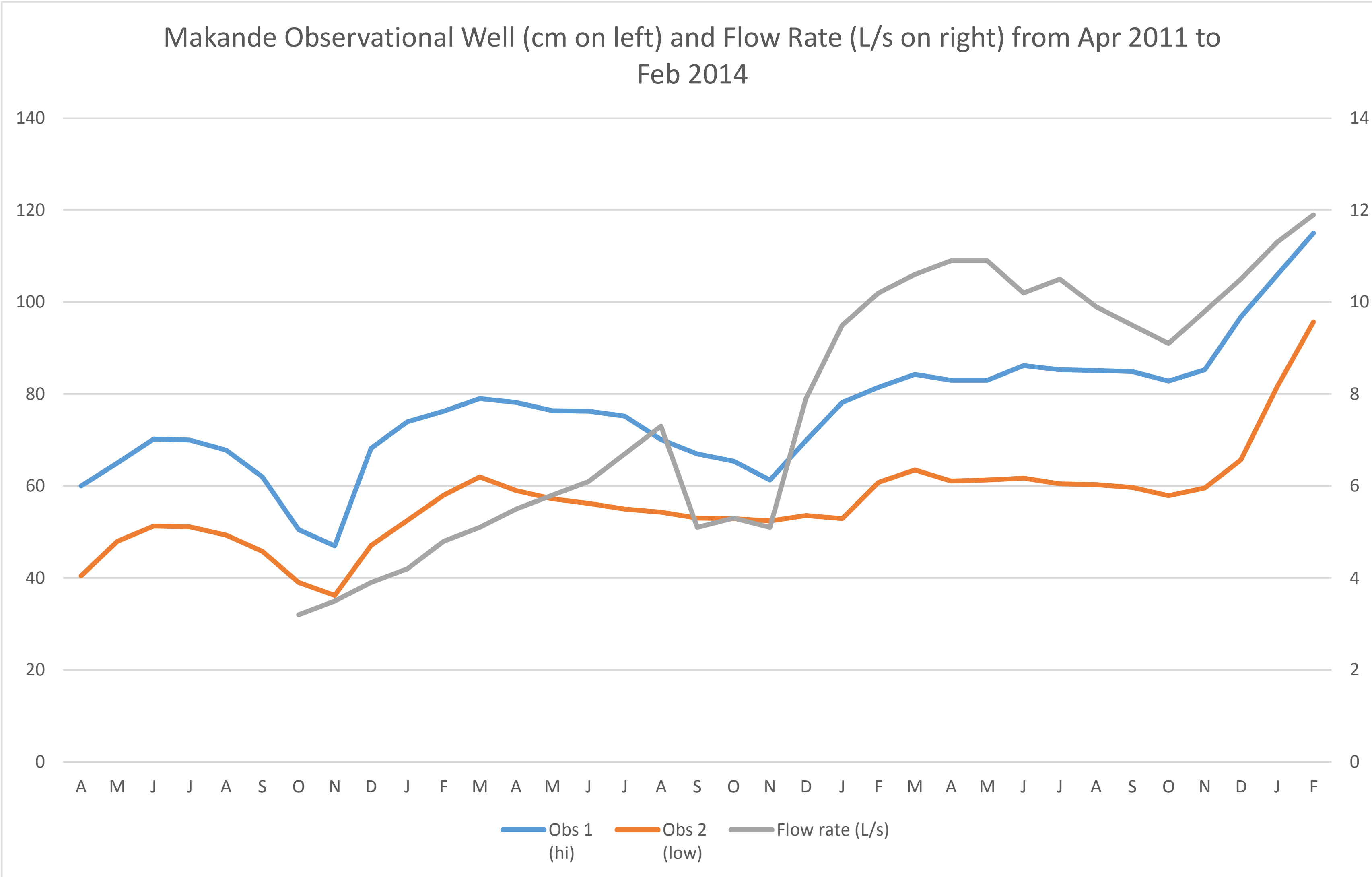
* The communities did not track tree survival rates; however, anecdotally three communities cited a survival rate of 50-70%.



Annex 4. Makande Watershed Observation Well and Flow Rate Data and Graph (Oct 2011 - Feb 2014)

	2011			2012			2013			2014			Monthly Average		
	Obs 1	**Obs 2**	**L/s**	**Obs 1**	**Obs 2**	**L/s**	**Obs 1**	**Obs 2**	**L/s**	**Obs 1**	**Obs 2**	**L/s**	**Obs 1**	**Obs 2**	**L/s**
Jan				74.0	52.5	4.2	78.2	52.9	9.5	105.9	81.6	11.3	86.0	62.3	8.3
Feb				76.3	58.0	4.8	81.5	60.8	10.2	115.0	95.7	11.9	90.9	71.5	9.0
Mar				79.0	62.0	5.1	84.3	63.5	10.6				81.7	62.8	7.9
Apr	60.0	40.5		78.2	59.0	5.5	83.0	61.1	10.9				73.7	53.5	8.2
May	65.0	48.0		76.4	57.2	5.8	83.0	61.3	10.9				74.8	55.5	8.4
Jun	70.2	51.3		76.3	56.2	6.1	86.2	61.7	10.2				77.6	56.4	8.2
Jul	70.0	51.1		75.2	55.0	6.7	85.3	60.5	10.5				76.8	55.5	8.6
Aug	67.8	49.3		70.1	54.3	7.3	85.1	60.3	9.9				74.3	54.6	8.6
Sep	62.0	45.8		67.0	53.0	5.1	84.9	59.7	9.5				71.3	52.8	7.3
Oct	50.5	39.0	3.2	65.4	52.9	5.3	82.8	57.9	9.1				66.2	49.9	5.9
Nov	47.0	36.2	3.5	61.3	52.4	5.1	85.3	59.6	9.8				64.5	49.4	6.1
Dec	68.2	47.1	3.9	69.9	53.6	7.9	96.8	65.7	10.5				78.3	55.5	7.4
Average	**62.3**	**45.4**	**3.5**	**72.4**	**55.5**	**5.7**	**84.7**	**60.4**	**10.1**	**110.5**	**88.7**	**11.6**	**76.4**	**56.7**	**7.8**

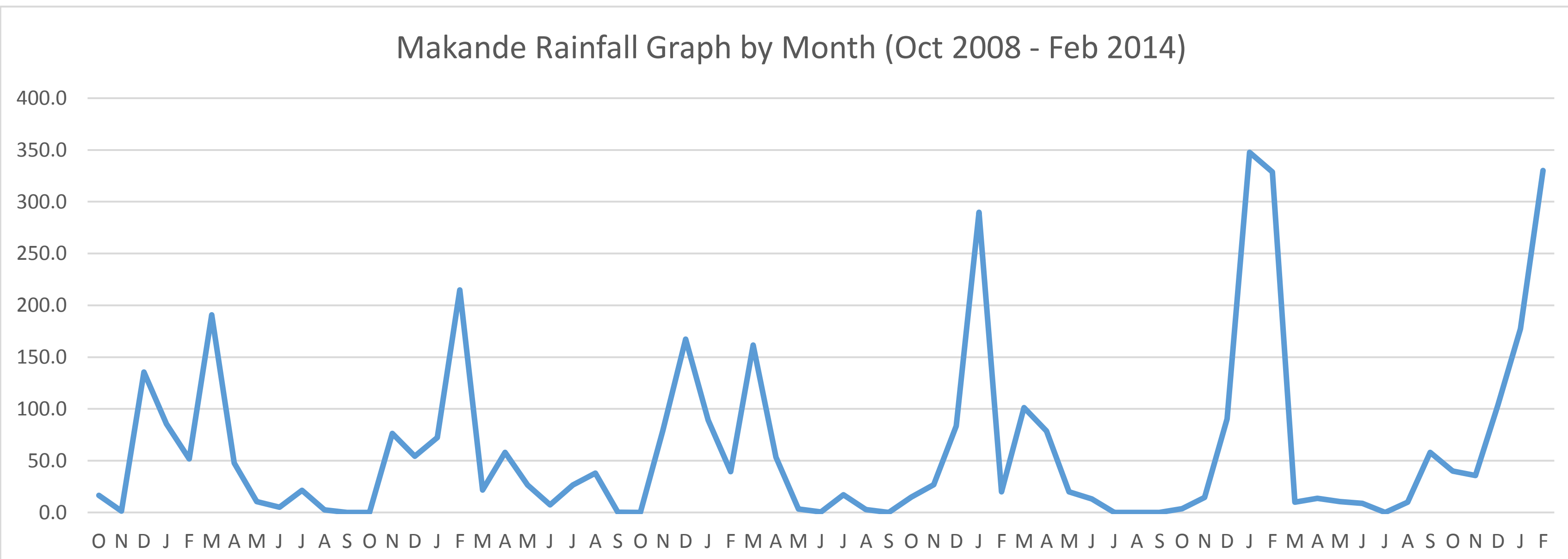
Note: Observation well data is in cm of water. Obs 1 is lower on the watershed; whereas Obs 2 is higher on the shed.


Makande Observational Well (cm on left) and Flow Rate (L/s on right) from Apr 2011 to Feb 2014
140
120
100
80
60
40
20
0
14
12
10
8
6
4
2
0
A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F
Obs 1 (hi)
Obs 2 (low)
Flow rate (L/s)

Annex 5. Makande Watershed Rainfall Data and Graph (Oct 2008 – Feb 2014, mm Rain)

Month	2008/9	2009/2010	2010/11	2011/12	2012/13	2013/14*	Monthly Average
Oct	16.4	0.0	0.0	14.9	3.5	40.0	12.5
Nov	1.2	76.3	79.2	26.7	14.6	35.6	38.9
Dec	135.5	54.4	167.2	83.5	90.3	103.8	105.8
Jan	85.5	72.2	89.2	289.9	347.7	177.3	177.0
Feb	51.6	214.9	39.4	20.0	328.8	330.1	164.1
Mar	190.8	21.8	161.6	101.1	9.9		97.0
Apr	47.8	58.1	53.5	78.7	13.7		50.4
May	10.5	26.5	3.4	19.9	10.5		14.2
Jun	5.0	7.3	0.5	13.2	8.7		6.9
Jul	21.3	26.4	17.0	0.0	0.0		12.9
Aug	2.4	37.9	2.7	0.0	10.0		10.6
Sep	0.0	0.3	0.0	0.0	58.1		11.7
Total	**568.0**	**596.1**	**613.7**	**647.9**	**895.8**	**686.8**	**668.1**

*Incomplete total for this year from Govt Malawi site ~30km from Makande.



Annex 6. WALA Watershed Learning Mini-Workshop Agenda

Friday February 28, 2014 from 8h30 to 12h30; WALA Conference Room

Objectives:

1. To **share observations** from the Watershed data collection
2. To conduct watershed **learning exchange** (innovation/adaptations/diffusion)
3. To identify **key M&E strengths/gaps** carrying forward – how to measure WSD?
4. To **clarify output data collection process**

Participants: ~ 18 people

1. CATCH SMT, objective 1 especially, but invited for all
2. CATCH tech staff
3. PVO technical staff
4. Consultant

Agenda:

1. Intro/synopsis of SOW, 10 - 15 min, Shane or delegate (plenary)
2. Presentation of key observations, 20 min, Chris (plenary)
3. Discussion, 40 min, Juma (plenary – focused on observations, save contributions for #4)
4. Facilitated watershed learning focused on: innovation, adaptation, impact and diffusion domains, 60 min, Chris (World Café methodology)
5. Watershed M&E, 45 min (modified SWOT), Chris (plenary)
6. Watershed outputs discussion, 45 min, (small groups) Juma/Chris
7. Closing, 10 – 15 min, Shane or delegate (plenary)

Information req from PVO technical staff:

1. Bring available output level data per watershed – see attached EXCEL sheet
2. Conduct a quick buzz with office/community staff on: a) what innovations/adaptations have we seen FROM the theory? b) what watershed diffusion have we seen from the watersheds to other WALA or non-WALA areas? (be specific: who? What, when, how, why?)
3. Bring any pre-post pictures and videos that show watershed impact or watershed innovations

Annex 7. WALA Watershed M&E Form – original

PVO LOGO

WALA MICRO-WATERSHED OUTPUT & IMPACT MONITORING FORM

PVO NAME

NAME OF THE WATERSHED:______________________

LOCATION;

TA:________________

DISTRICT:________________

*BEARING:*______________*N:*____________*E:*___________

QUARTER:________________________

YEAR:_______________

CONTACT PERSON: ___________________________

(NAME)

CELL: _________________________

E-MAIL:__________________________

Description of output and impact indicators in watershed development

Preamble

This tool attempts to provide a systematic way of monitoring the impact of watershed development activities implemented by different PVOs in the WALA program. The areas of concern mainly centre on the physical parameters thus regular observation and some technical skills are required. In the recognition of the time it takes to have significant results and appreciate the impacts of the watershed development activities, monitors must ensure systematic and regular strategy to capture every bit of the impact of the activities initiated in their smallest form, hence the development of the format. The format looks at different physical parameters as WSD indicators; VIZ:

Indicator (category)	*Definition*	*Purpose for collecting data*	*Frequency*	*Level of collection*
Soil and Water Conservation (SWC) treatments	All physical structures aimed at reducing the water velocity to ensure infiltration in order to improve soil moisture and recharge the ground water as well as soil erosion, e.g. contour marker ridges, continuous contour trenches, water absorption trenches, etc.	*These are the direct input of the program to develop the watershed in question. Their number, length and area coverage determine the extent to which the watershed is treated*	*Monthly*	*Field level*
Water flow regime	*Discharge of surface water bodies (streams, rivers) in l/sec*	*The discharge is affected by the presence or absence of the SWC treatments in a watershed an increase in the discharge is one of the expected results (impact) of watershed development*	*Monthly (8 months a year)*	*Field level*
Ground water table	*The depth of ground water level from the surface*	*The depth is affected by the presence or absence of the SWC treatments in a watershed, a reduction in the water depth is one of the expected results (impact) of*	*Monthly (8 months a year)*	*Field level*

		watershed development		
Size of Irrigated land and frequency	-	*Holding other factors constant, area brought under irrigation and number of irrigation times in a year is dependent on the availability of either surface or ground water. The indicator is therefore an impact of WSD*	*Annually*	*PVO and field level*
Tree population density	-	*Increase in number of trees per unit area is an impact of aforestation, an integral activity in watershed regeneration and their conservation a sign of behavior change of a community towards watershed development.*	*Twice a year*	*PVO field level*
Rainfall trend	*Amount of rainfall received in a year and its distribution across the months*	*It is an attribute to change in water flow regime and the level of ground water table; its monthly and annual amount is therefore an important information to ascertain the factors that lead to a change in the water discharge and levels.*	*Monthly*	*Field level*

INDICATOR ONE (*OUTPUT*): Soil and Water Conservation structures/treatments

WSD treatment	Indicator		
	Area	Number	Length
Continuous contour trenches (CCTs)			
Water absorption trenches (WATs)			
Contour marker ridges (CMRs)			
Graded bunds			
Ridge alignment			

INDICATOR TWO *(IMPACT)*: Water flow regime

Month	Discharge (l/sec)			
	Year 1	Year 2	Year 3	Year 4
15 April				
15 May				
15 June				
15 July				
15 August				
15 Sept				

15 Oct				
15 Nov				

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INDICATOR THREE (*IMPACT*): The level of the water table				
Month	**Depth of ground water level from the surface (m)**			
	Year 1	**Year 2**	**Year 3**	**Year 4**
15 April				
15 May				
15 June				
15 July				
15 August				
15 Sept				
15 Oct				
15 Nov				

INDICATOR FOUR (*IMPACT*): Irrigated land				
ITEM DESCRIPTION	**PERIOD**			
	Year 1	Year 2	Year 3	Year 4
Total irrigated area (*Ha)*				
Number of irrigation times				

INDICATOR FIVE ***(IMPACT):*** **Tree population density due to regeneration**

ITEM DESCRIPTION	**Year 1**		**Year 2**		**Year 3**		**Year 4**	
	April	Oct	April	Oct	April	Oct	April	Oct
Population density (#/Ha)								
Size of sampled patches (>15mx15m)								
Common tree species noted								

Rainfall trends

ITEM DESCRIPTION	PERIOD (YEARS)			
	YR1	YR2	YR3	YR4
Total rainfall amount (mm)				
Days of rainfall (#)				
Average rainfall intensity (mm/Hr)				