マラウイ共和国
天然資源・エネルギー・鉱業省

マラウイ共和国
シレ川中流域における農民による流域保全活動推進プロジェクト
（COVAMS II）

業務完了報告書

2018年5月

独立行政法人　国際協力機構

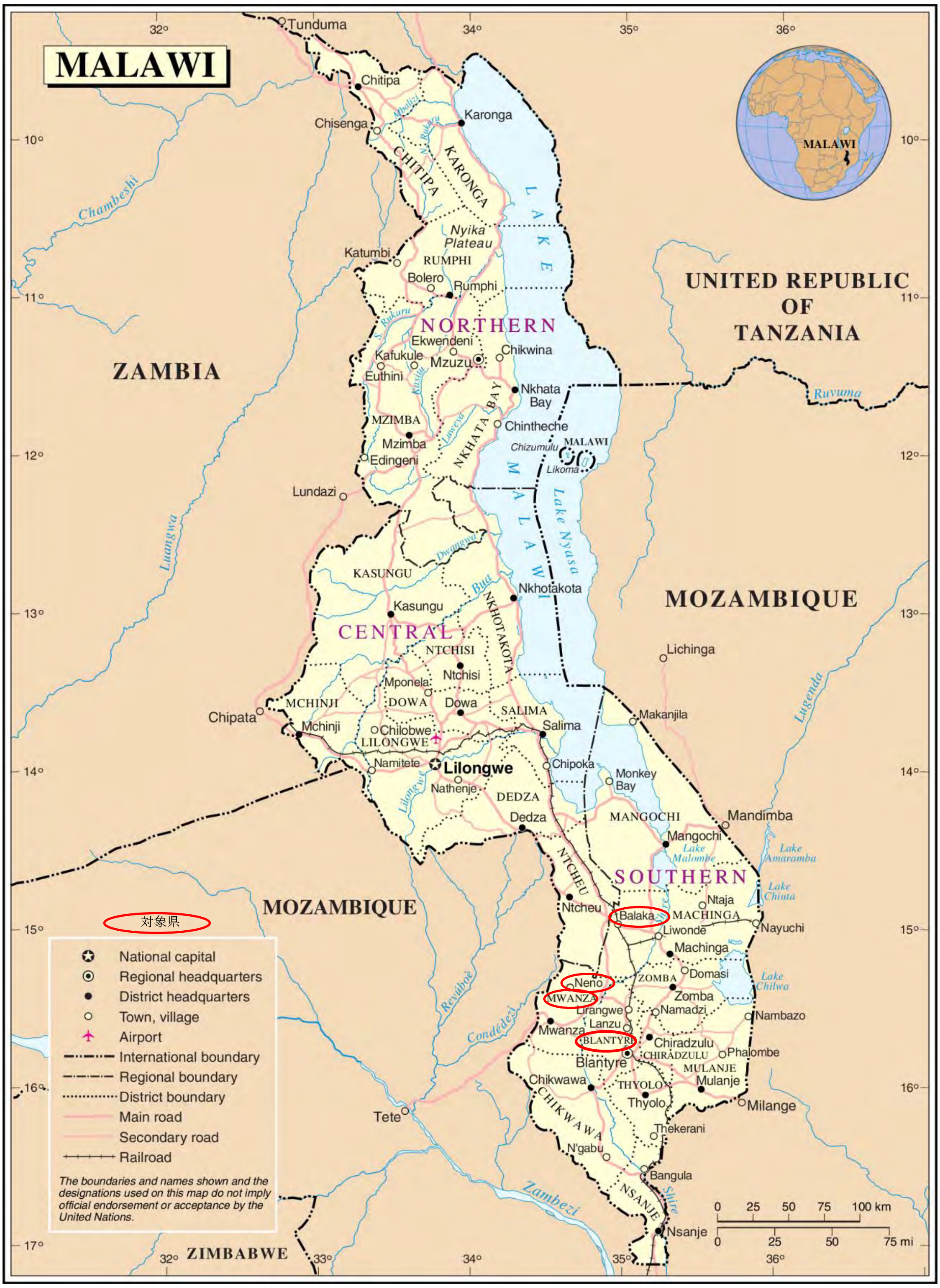
アイ・シー・ネット株式会社

略語表

略語	正式名	日本語
AIP	Annual Investment Plan	年間投資計画
CADECOM	Catholic Development Commission in Malawi	マラウイ・カトリック開発協会
CCO	Conservation Coordination Officer	COVAMS 普及担当官（普及員）
CMFA	Catchment Management through Farmers' Activities	農民の活動による流域管理
COVAMS	Project for Community Vitalization Activities in Middle Shire	シレ川中流域における村落振興・森林復旧プロジェクト
COVAMS II	Project for Promoting Catchment Management in Middle Shire	シレ川中流域における農民の活動による流域保全活動推進プロジェクト
CP	Counterpart	カウンターパート
DC	District Counselor	県知事
DDP	District Development Plan	県開発計画
DMT	District Management Team	県運営チーム
DOF	Department of Forestry	森林局
DPD	Directors of Planning and Development	県計画開発部長
DSDP	District Strategic Development Plan	県戦略開発計画
EAM	Evangelical Association of Malawi	マラウイ福音同盟
FDMF	Forest Development and Management Fund	森林開発管理基金
FISD	Foundation for Irrigation for Sustainable Development	持続的開発のための灌漑財団
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit	ドイツ国際協力公社
GVH	Group Village Head	グループ村落長
ITA	Integrated Training Approach	総合型村落研修アプローチ
LDF	Local Development Fund	地方開発基金
LF	Lead Farmer	リード・ファーマー
MASAF	Malawi Social Action Fund	マラウイ社会行動基金
MBC	Malawi Broadcasting Corporation	マラウイ放送会社
MCFW	Malawi College of Forestry and Wildlife	マラウイ森林野生生物大学
MGS III	Malawi Growth and Development Strategy III	第 3 次マラウイ成長開発戦略
MoAIWD	Ministry of Agriculture, Irrigation and Water Development	農業・灌漑・水開発省
MoCECCD	Ministry of Civic Education, Culture and Community Development	市民教育・文化・コミュニティ開発省
MoNREM	Ministry of Natural Resources, Energy and Mining	天然資源・エネルギー・鉱業省
MWK	Malawi Kwacha	マラウイ・クワチャ（通貨単位）
NFP	National Forestry Policy	国家森林政策
NFLR	National Forest Landscape Restoration	国家森林景観復元事業
OPC	Office of the President and Cabinet	大統領府
ORT	Other Recurrent Transactions	その他反復取引（勘定科目）

略語	正式名	日本語
PDM	Project Design Matrix	プロジェクト・デザイン・マトリクス
PM	Project Manager	プロジェクト・マネジャー
PO	Plan of Operation	実施計画
R/D	Record of Discussions	討議議事録
RFO	Regional Forestry Officer	州森林管理官
RMT	Regional Management Team	州管理チーム
RUSLE	Revised Universal Soil Loss Equation	（米国農務省）土壌流亡予測式
SLF	Senior Lead Farmer	シニア・リード・ファーマー
SPA	Specific Training Approach	特定研修アプローチ
TA	Traditional Authority	伝統的権威
TOT	Training of Trainers	指導者研修
TST	Technical Support Team	技術支援チーム
USD	US Dollar	米ドル（通貨単位）
VDC	Village Development Committee	村落開発委員会
VH	Village Head	村長
WB	World Bank	世界銀行
WFP	World Food Programme	世界食料プログラム
WRI	World Resource Institute	世界資源研究所

プロジェクト位置図



出典: United Nations URL= http://www.un.org/Depts/Cartographic/map/profile/malawi.pdf

業務完了報告書
写真


モニタリングサイトのマーキング
（ネノ県、2018年3月6日）


レビュー会合（ゾンバ県、2018年3月13日）


Office of the President and Cabinetの現場調査
（ムワンザ県、2018年3月14日）


プランニング会合
（ブランタイヤ、2018年3月16日）


COVAMS成果普及セミナー
（リロングウェ、2018年3月26日）


最終合同調整委員会
（リロングウェ、2018年3月27日）

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要約

マラウイ湖を源流とするシレ川流域の森林資源は、南部州全体の人口増や土地利用など、過度の資源利用により、森林伐採が危機的な水準で増加している。マラウイ政府は、農民の活動により流域管理を推進・普及するための技術協力プロジェクトとして「シレ川中流域における農民による流域保全活動推進プロジェクト」（COVAMS II）を日本政府に要請した。本プロジェクトは、「COVAMS アプローチによる農民の活動を通した流域管理（CMFA） が、対象県において広く実施される」を上位目標、「COVAMS アプローチによる CMFA が対象県において制度化される」をプロジェクト目標として、2013 年 3 月から 2018 年 3 月までの 5 年間、マラウイ南部のブランタイア県、バラカ県、ムワンザ県、ネノ県において実施された。

プロジェクトの実施機関は、天然資源・エネルギー・鉱業省森林局である。これに加え、農業・灌漑・水開発省土地資源保全局、同省農業普及サービス局、並びに市民教育・文化・コミュニティ開発省コミュニティ開発局を協力機関として、これら 3 省 4 部局によりプロジェクトを実施した。

プロジェクトの実施体制としては、全体の管理を森林局南部森林事務所の所長がプロジェクトを統括し、約 200 名のカウンターパートがプロジェクトに参加することで運営された。プロジェクトに対しては、当初 JICA 長期専門家が派遣され、その後、2015 年 9 月からは、業務実施契約のコンサルタントが派遣されて、長期専門家の活動を引き継ぐ形で実施された。

プロジェクトのアプローチは、農民の活動による流域管理を促進するもので、農民から農民への研修を通じて、流域保全技術である植林・育林、等高線農法、ガリ保全を、広く普及していくものであった。具体的には、COVAMS 手法という参加型村落開発手法を用いて、植林・育林、小規模ダムの設置によるガリ崩壊の防止、土壌保全型農業の普及を進めた。現場レベルでは、実施機関に所属する 3 省 4 部局の普及職員の指導により、対象村落から選定されたリード・ファーマー（LF）が、近隣の農民に技術移転を行った。プロジェクトは現在までに、4 県において 345 ヵ村を対象として、約 3,000 名の LF が育成され彼らを通じて、約 45,000 世帯が流域管理技術の研修を受けた。これら多数の農民は、それぞれの村落で流域保全活動を継続実践しており、地域の環境保全に長期にわたり寄与することが期待される。

プロジェクトの妥当性の観点からは、「国家森林政策（1968 年策定）」や「国家森林計画（2000 年策定）」などマラウイ政府の環境社会配慮政策に沿ったものである。また、本プロジェクトは、2012 年に日本政府が策定した「対マラウイ共和国援助方針」にも合致しており、日本の援助政策にも合致している。

次に、プロジェクトの有効性に関しては、対象 4 県において COVAMS 手法を用いた CMFA の制度化の促進に顕著な効果をもたらした。また CMFA の技術が、地域の実情に合った適正技術で、流域保全の効果も高いと判断された。

プロジェクトの効率性は、研修と普及活動のための投入を最小限に抑えつつ、対象 4 県において約 3,000 人の農民を LF として育成し、彼らを通じ、約 45,000 世帯に技術を行き渡らせることができた。

また、プロジェクトのインパクトとしては、早くも対象 4 県の当初ターゲットとした 7 つの伝統的権威[1]（TA）以外の TA においても実践が始まりつつあり、隣接する TA においても COVAMS による CMFA を実施するよう求める声が高まりつつある。また、プロジェクト終了後も 3 年程度 CMFA の実践が継続・展開することを目指すアクションプランが整備されている。このプランを用いてプロジェクト終了後も、必要な資金を提供できる有望なドナー等に働きかけを行い、CMFA を継続する可能性を高めたことも正のインパクトのひとつである。プロジェクト対象地域以外への普及を狙ったプロジェクトの上位目標に関しても、投入を抑えた手法である Lean COVAMS を、対象 TA 外にある 5 ヵ村がすでに導入するなど、上位目標を早期に達成する見込みは高い。

最後に、プロジェクトの持続性は特に技術面・組織面では高い。プロジェクトを通じて確立された技術と地域の開発の受け皿となる組織・その能力は、対象村落を自らの力で開発・発展させようとする試みに貢献する。一方、マラウイ側の開発資金の配賦が極めて限定的で、外部資金を上手く活用しながら、マラウイ側の予算と合わせて、CMFA が継続される必要がある。

このように、COVAMS アプローチは、マラウイの村落における流域保全活動の普及・実践により、短期間に広い範囲に流域保全技術を普及させる手法としてマラウイにおいて成果を上げることができた。また、上述の通り、上位目標を早期に達成する見込みは高い。2018 年 4 月には、発電会社である EGENCO の行う流域保全活動の一部を森林局が同社と協力して実施することに合意しており、利害関係が一致する他のドナーからの支援も、期待できる。

一方、本プロジェクトは、普及に重点を置く COVAMS アプローチの考え方に準拠したことから、モニタリングに多くの資源を割いていない。低コストの普及手法の確立を通じた流域管理の実践が本プロジェクトの目的であったものの、長期的には、実践された CMFA が流域全体にどのように貢献しているのかを、検証することが求められる。

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[1] 伝統的権威（TA: Traditional Authority）には TA チーフ（伝統的首長）、集合村落長、村長が含まれる。TA は、マラウイの行政機構に組み入れられている。対象 TA 名は本文　表 11 を参照。

第 1 章　プロジェクトの基本情報

1.1 概要

対象国：マラウイ共和国
プロジェクト名称：シレ川中流域における農民による流域保全活動推進プロジェクト
協力期間：2013 年 04 月 01 日～18 年 03 月 31 日
（うち、2013 年 4 月 1 日～15 年 9 月 31 日の期間を、長期・短期専門家による技術協力プロジェクトとして実施。2015 年 9 月 5 日～18 年 3 月 31 日までの期間を業務実施契約として実施。）

1.2 背景

マラウイは南部アフリカに位置する内陸国で、世界で 9 番目、アフリカでは 3 番目に大きなマラウイ湖（2.4 万 km^2）が国土面積の約 20%を占めている。同国の人口は約 1,490 万人で、サブサハラアフリカ諸国の中でも比較的高い人口密度（156.7 人/km^2）と人口増加率（3.0%）を示している[2]。同国の土地利用は、1990 年の森林面積が 4.2 万 km^2（国土面積の 38%）であったが、2005 年のそれが 3.4 万 km^2（30.7%）に減少するなど、極めて早いペースで失われており、深刻な開発課題のひとつである。とりわけ、マラウイ湖を源流とするシレ川流域の森林資源は、ブランタイア市をはじめ南部州における、農村地域から都市部への人口移動も活発で、都市生活者の薪炭利用による森林伐採も増加している。このように、急激な人口変動に起因する自然資源の過剰な利用とりわけ森林の減少が急速に進んでいる。森林資源の減少は、エネルギー資源の過剰利用のみならず、流域全体の保水能力低下、土壌浸食や劣化により、農業の生産性低下をもたらす要因のひとつとも認識されている。本来厳しい環境に脆弱な地域住民の生活は、貧困などさらに厳しい状況に直面している。また、土壌浸食に起因した土砂流出による河床の上昇は、流域河川の流量減少や下流域の深刻な洪水被害増大の一因ともなっている。シレ川水系の水力発電所は、マラウイの発電能力全体の 94%を占めており、流況の変化は発電能力の低下を招く主要な要因のひとつとされている。

このような状況に鑑み、国際援助機関や NGO は、シレ川流域の環境劣化を緩和するための支援を積極的に行ってきた。例えば世界銀行（WB）は 2014 年 6 月から、個別に立案・実施されている開発計画のセクター間調整の仕組みの導入、緊急度の高い水資源関連インフラ開発への投資、流域の自然林・湿地・生物多様性保護地区の保全能力を回復・強化するため、広域的に適用可能な行政システムの強化や、自然資源の保全方法を確立・支援するためのプロジェクトを実施している。日本はこの WB の支援に先立ち、1999 年以降シレ

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[2] いずれも 2010 年、国連「世界統計ポケットブック」による。

川流域で実施された JICA による開発調査等の結果に基づく技術協力プロジェクト「シレ川中流域における村落振興・森林復旧プロジェクト」（COVAMS I）を実施している。COVAMS I は、「特定の村落を対象とした訓練手法（SVTA）を用いた村落訓練アプローチ」（以下、「村落訓練」という）に基づき、対象地域の農家に対して、プロジェクトが導入した土壌保全技術と植林技術を普及・実践させてきた。その結果、ブランタイア（Blantyre）県内の 2 つの伝統的権威（TA）内の 244 の村落、約 3 万世帯に対して、COVAMS アプローチによる流域保全活動の実践を働きかけてきた。その対象村落の面積は、約 400km^2 でシレ川中流域の総面積 7,350km^2 の 5.4%をカバーしている。一方、プロジェクトの活動をさらに推進するための実施体制の確立には、なお課題が残されていることから、マラウイ政府は、COVAMS アプローチに基づいた土壌保全活動を広範な分野に拡大するための技術協力プロジェクト「シレ川中流域における農民による流域保全活動推進プロジェクト」（COVAMS II）を日本政府に要請した。

1.3 協力内容

1.3.1 上位目標

本プロジェクトの上位目標は、「COVAMS アプローチによる農民の活動を通した流域管理（CMFA） が、対象県において広く実施される」である。

1.3.2 プロジェクト目標

プロジェクト目標は、「COVAMS アプローチによる CMFA が対象県において制度化される」である。

1.3.3 成果

プロジェクトの成果は、以下のとおり。

(1) 対象県及び関係諸機関に対する、予算確保・制度化のための働きかけが行われる。
(2) 対象県関係局行政官の、COVAMS アプローチ運営能力が向上する。
(3) COVAMS アプローチの普及方法及び普及される技術の有効性が検証される。
(4) 全てのレベルの関係機関の指導的立場の関係者間において、COVAMS アプローチのコミットメントが強化される。

1.3.4 活動

(1) 成果 1「対象県及び関係諸機関に対する、予算確保・制度化のための働きかけが行われる」にかかる活動

1-1. COVAMS アプローチによる CMFA の展開先となる関係諸機関をリスト化する。
1-2. 対象県および関係諸機関に対する説明・発表資料を作成する。

1-3. 成果 3 を通じた検証結果を、説明・発表資料に組み込む。

1-4. 流域管理に利害関係を持つ企業などをリスト化する。

1-5. 流域管理に利害関係を持つ企業などを対象とした情報共有／広報セミナーを開催する。

1-6. ドナー／メディア関係者を対象としたフィールドビジットを開催する。

1-7. 活動 1-5, 1-6 から得られたフィードバックに基づき、COVAMS アプローチガイドラインの修正と承認手続きを行う。

(2) 成果 2:「対象県関係局行政官の、COVAMS アプローチ運営能力が向上する」にかかる活動

2-1. 対象県関係局行政官の COVAMS アプローチ実施能力を評価する。

2-2. COVAMS アプローチ及びプロジェクト管理に関する研修を計画する。

2-3. COVAMS アプローチ及びプロジェクト管理に関する研修を実施する。

2-4. 対象県関係局行政官の OJT による能力強化を支援する。

2-4-1. 対象県関係局行政官に対して、COVAMS アプローチを説明する。

2-4-2. 対象県関係局行政官による年間活動計画作成を支援する。

2-4-3. 対象県関係局行政官による、年間活動計画に基づく活動を支援する。

2-4-4. 対象県関係局行政官による活動進捗のモニタリングを支援する。

2-4-5. 対象県関係局行政官による年間活動のレビューを支援する。

2-4-6. 対象県関係局行政官により COVAMS アプローチにかかるガイドラインを作成する。

2-5. 対象県関係局行政官を対象とした COVAMS による CMFA に対する理解度評価を計画する。

2.6. 対象県関係局行政官に対する COVAMS による CMFA の理解度評価を実施する。

(3) 成果 3:「COVAMS アプローチの普及方法及び普及される技術の有効性が検証される」にかかる活動

3-1. COVAMS アプローチの普及方法に係る質問票調査を計画する。

3-2. 計画に基づき質問票調査を実施し、データを収集する。

3-3. 結果を質問票調査報告書としてまとめる。

3-4. COVAMS アプローチの実施費用が算出される。

3-5. 他の LF との比較で、COVAMS の LF（リード・ファーマー）の役割や有効性が示される。

3-6. COVAMS アプローチにより普及される技術に係る検証計画をたてる。

(4)　成果 4:「全てのレベルの関係機関の指導的立場の関係者間において、COVAMS アプローチのコミットメントが強化される」にかかる活動

4-1. 県レベルにおいて県森林局が主体となり CCO（COVAMS 普及担当官[3]）・TST（技術支援チーム）会議が定期的に開催されることを支援する。

4-2. 対象 4 県間の PM（プロジェクト・マネジャー）会議などが、県森林局や州局が主体となり開催されることを支援する。

4-3. 県関係局が主催する省庁関係者や県関係者対象のフィールドビジットを計画する。

4-4. 県関係局が主催する省庁関係者や県関係者対象のフィールドビジットを実施する。

4-5. 省庁関係者や県関係者対象による関係諸機関の訪問と説明を計画する。

4-6. 省庁関係者や県関係者対象によって関係諸機関を訪問し説明する。

1.4 実施機関

本プロジェクトの主たる実施機関と協力機関は以下のとおりである。

（実施機関）

- 天然資源・エネルギー・鉱業省森林局

（協力機関）

- 農業・灌漑・水開発省土地資源保全局、農業普及サービス局
- 市民教育・文化・コミュニティ開発省コミュニティ開発局

（以下、これらのプロジェクト実施機関と協力機関を包括的にいう場合、「3 省 4 部局」という）

1.5 プロジェクト対象地域

プロジェクトは、マラウイ南部のブランタイア（Blantyre）県、バラカ（Balaka）県、ムワンザ（Mwanza）県、ネノ（Neno）県の 4 県を対象としている（プロジェクト位置図（p. iii 前付け）を参照）。

1.6 COVAMS アプローチ

1.6.1 COVAMS アプローチ導入の経緯

COVAMS アプローチは、国際協力機構がマラウイで 2007 年から 5 年間実施されてきた「マラウイ国シレ川中流域における村落振興・森林復旧プロジェクト（Project for Promoting **Co**mmunity **V**italization **A**ctivities in **M**iddle **S**hire）」においてマラウイ南部のブラ

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[3] CCO（COVAMS 普及担当官（普及員））は、COVAMS I ならびに本プロジェクト（COVAMS II）の双方で、現場での普及活動を担当するマラウイ政府の普及員の総称。森林局に加え、農業・灌漑・水開発省ならびに市民教育・文化・コミュニティ開発省に所属する政府職員である。

ンタイア県を中心に開発・展開されてきた普及手法である。同手法は、同じく JICA が 2001-08 に実施して来た「セネガル総合村落林業開発プロジェクト（以下セネガル PRODEFI）」で用いられたモデル（PRODEFI 手法）が端緒となり、のちに「機会均等を保障した研修による参加型村落開発と資源管理（英語名 PRRIE：Participatory Rural Development and Resource Management by Integrated Training for Equal Opportunity）」として開発された PRRIE（後述）に依拠している[4]。

セネガル PRODEFI の第二フェーズにおいて PRRIE アプローチの定めた「5 原則」による住民に対する直接研修が一定の効果を発揮し、対象村落の住民による植林や地域開発への取り組みが著しく加速した。この実績を受け、マラウイでは 2007 年から「シレ川中流域における村落振興・森林復旧プロジェクト（COVAMS）」にこの手法を主要な普及手法として導入することとなった。

当初、COVAMS では PRODEFI と同様に、各村落において住民のニーズに基づく、多様な研修を実施する、いわゆる Integrated Training Approach（ITA：統合型村落研修アプローチ）を採用した。その後 COVAMS では、介入する対象村落地域の住民の多くが、農地の土壌保全技術に対する関心が高いこと、多くが土壌保全手法を受け入れていることが明らかになった。そのため、多数の研修トピックの絞り込みを行い、Specified Training Approach（SPA：特定村落研修アプローチ）に移行することとなった。両者の運営上の違いは、前者（ITA）が地域住民ひとりひとりのニーズを捉えて実施するため、研修後の住民の実践率が高くなる傾向が見られる。しかし、研修ニーズは多様で、実施するには多くの手間が必要となる弱点があった。一方、後者（SPA）は、研修テーマの絞込みをするので、前者に比して定型的かつ迅速に展開することが可能となる。本プロジェクト（COVAMS II）では、プロジェクトの効果が広範に展開し、対象 4 県という広大な地域に早期に展開する必要から、前者に比して費用対効果が高いと考えられる SPA が採用された[5]。

1.6.2　COVAMS 手法と PRRIE モデル

COVAMS II プロジェクトでは、地域住民に対して広範囲に研修を実施することを通じ、対象村落住民の参加を促し、住民の能力開発を通じ村落開発を総合的に進めるために考案された普及モデルである。この手法では、極めて短時間に技術移転を行い、地域住民が移転された技術が広く実践されることも可能である。COVAMS が援用した、「PRRIE モデル」

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[4] 国際協力機構「マダガスカル国ムララノクロム総合環境保全・農村開発促進手法開発プロジェクト PRODAIRE モデルユーザーズマニュアル」 2015 年 1 月 URL= https://www.jica.go.jp/project/madagascar/002/materials/ku57pq00001yqqv5-att/PRODAIRE_user_manual_201501.pdf (2018 年 5 月 21 日閲覧)

[5] 普及技術の絞込みを通じ、「等高線栽培」「ガリ崩壊防止」「植林・育林」の 3 つの技術を普及することとした。

では、その活動を実践する上で、「機会均等[6]」を最重要課題と位置づけ、対象村落の住民への研修を実施している。

プロジェクトが、地域住民に提供する研修は、5 つの原則（①地域のニーズに基づき、②地域の人的・物的資源を用いて、③住民の暮らす現地で、④参加者を選別しないで、⑤多数を対象に研修を行う）」に基づき実施する。

COVAMS の提供する技術のうち、植林・育林に関するニーズは、身近に薪炭を確保することのできる樹木を育てることで、エネルギー供給や土壌流出の課題に対処することを目指している[7]。一般にマラウイにおいて実施されえいる植林事業では、植林・育林を行う場所を主として外部者がトップダウンで決め、外部の資源によって人を雇い、外部で育てた苗木を市場などで購入し、対象地に持ち込んで事業を進めることが珍しくない。一方、COVAMS プロジェクトが採用する PRRIE の 5 原則に従うと、薪炭用の木材を必要とする対象村落住民が、苗木の生産や移植の方法を知っている現地の人から、その技術を習い、自ら（あるいはグループで）苗木を生産する。このとき、技術を習得する機会は全住民に平等に提供される。従来から行われる一般の研修では、参加者を篤農家や予め村落リーダーが指名・選別した者の中から選び、近隣の町などにある研修施設で研修を実施することが多い。PRRIE の原則で実施する研修では、上述のように参加者を選別せずに、全ての住民を対象として、彼ら住民が居住する場所（村）で研修を行う点で大きく異なる。この方法の強みは、「参加したい人はだれでも参加できる」ということである。

1.6.3 COVAMS の普及体制

COVAMS の普及体制は、住民への技術的なサービスが均等かつ効率的に提供されるように、マラウイ既存の普及システムを活用しながら、知識・技術が伝搬・普及するような体制を構築してきた。COVAMS アプローチでは、主として森林局を含む 3 省 4 部局に所属するの普及員が、村落リーダーに対して働きかけ、流域管理・環境保全を含む村落開発への動機づけを行うための会合を複数回行う。この会合を通じ、プロジェクトの支援・介入を行う村落を決める。村落リーダーとの介入・支援への合意が得られた場合、リマナ[8]単位で 15

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[6] プロジェクトが考える「機会均等」は、研修機会の提供を通じて新しい技術・知識へのアクセスについて「機会均等」を保証することを目指しており、全ての住民に対して結果の平等を保証するものではないことに留意が必要である。

[7] 国際協力機構 「プロジェクト研究報告書 アフリカ地域住民参加型自然資源管理における技術普及アプローチの分析 セネガル、マラウイにおける PRODEFI 手法ケニア、エチオピアのファーマーフィールドスクールの経験から」URL= http://gwweb.jica.go.jp/km/FSubject1301.nsf/03a114c1448e2ca449256f2b003e6f57/df47f6d1e3f3f25749257fbe0026deb6/$FILE/ATT0LL4A.pdf/%EF%BD%B1%EF%BE%8C%EF%BE%98%EF%BD%B6%E4%BD%8F%E6%B0%91%E5%8F%82%E5%8A%A0%E5%9E%8B%E8%87%AA%E7%84%B6%E8%B3%87%E6%BA%90%E7%AE%A1%E7%90%86_%EF%BE%8C%EF%BE%9F%EF%BE%9B%EF%BD%BC%EF%BE%9E%EF%BD%AA%EF%BD%B8%EF%BE%84%E7%A0%94%E7%A9%B6.pdf (2018 年 5 月 23 日閲覧)

[8] 村落内の血縁関係を基礎とした住民単位。

世帯を1グループとしたグループ分けを行う。その後、各グループから1人 LF を選ぶ。LF の選定は、所属するグループ内の互選で行うこととしている。この普及体制を構築するのは、3省4部局の普及員が行う。

1.6.4 Lean COVAMS の導入

プロジェクトは、2015年9月以降、業務委託契約に移行し、2018年3月末のプロジェクト終了後の事業のマラウイ側への全面的な移管と、COVAMS による CMFA の制度化をどのように実現・継続するかを議論する必要性が高まった。対象とする村落数も 200 ヵ村を超えるようになり、カバーするエリアの拡大のみならず事業継続の鍵となる LF 研修の対象者数が著しく増えてきた。研修運営上、研修機材や LF 対象者に支払う日当など、ロジ面の負担も膨大である。これらを支える人的・財政的な資源の多くは、技術協力プロジェクトとして日本側が負担しているが、事業終了後もこの体制をマラウイ側で支えることは非常に困難である。プロジェクトは、事業終了後も COVAMS アプローチによる CMFA が継続できるように、対象村落への投入資源を大幅に削減した（Lean な：贅肉のない）COVAMS 手法を導入することを提案した。通常の COVAMS と比較して、最も大きな差異は、LF に供与してきた道具の一部や技術マニュアル類の供与を取り止めることである。また、技術を習得した LF に提供してきた資格証明書や、それを授与する式典の簡略化を行った。資格証明書は、LF の職務に対するモチベーション維持に有効である側面もあることから、村落内既存のリーダーシップに働きかけ、簡易な式典を行うことを奨励している。

プロジェクトからの投入削減の提案に対し、当初マラウイ側関係者から強い抵抗があった。これら農民に対するインセンティブの削減は、普及員の業務を難しくすることが、彼らの懸念である。そのため、プロジェクトは関係者への説得・合意形成に約1年をかけ、提案したアプローチの実践を推奨した。最終的に、2016−17 年度は、Mwanza 県の対象 TA の外側の新しい TA[9]において 5 ヵ村を選定し、試行している。反応は、各県ごとに異なり、現在は Mwanza 県と Neno 県では総じて好意的な反応を得た。

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[9] これまで実施してきた同一 TA 内で、Lean COVAMS を実施すると、近隣の村落と比較して、投入量（供与資材など）に差異が生じ、このことが無用の軋轢・抵抗を生み、普及を妨げることも考えられる。そのため、既往の TA から離れた新しい TA を選んで試行している。

第2章　プロジェクトの実績

2.1 マラウイ側投入実績

(1) カウンターパート

本プロジェクトに対して、マラウイ側から合計約120人の関係者が従事した。プロジェクトは、首都リロングウェの「中央」、ブタンタイア市を中心とする南部をその範囲とする「州」（Region）、プロジェクトの実施対象地域であるバラカ（Balaka）県、ブランタイア（Blantyre）県、ムワンザ（Mwanza）県、ネノ（Neno）県の4つの「県」という3つのレベルの公的機関が関与して運営されてきた。
中央レベルでの主要なカウンターパート（CP）は、天然資源・エネルギー・鉱業省（MoNREM）森林局、農業・灌漑・水開発省（MoAIWD）農業普及サービス局（Agricultural Extension Service）と土地資源保全局（Land Resources Conservation Department）、それに市民教育・文化・コミュニティ開発省（MoCECCD）コミュニティ開発局が関与している。

また、州（Region）レベルでは、森林局南部森林管理官がプロジェクトを統括している。Blantyre県森林局次長が、南部州における管理チームの一員としてプロジェクト活動全般の調整を行っている。県レベルで行われるプロジェクトの活動は、Balaka、 Blantyre、Mwanza、Nenoの4県の県知事に加えて、県森林局長がプロジェクト・マネジャー（PM）として関与している。これらに加えてプロジェクトに係る実務を技術支援チーム（TST）やCOVAMS普及担当官（CCO）を含む、4県にまたがる流域管理に関する利害関係者全てがプロジェクトに関与している。大統領府（OPC）プロジェクトパフォーマンス執行局も関わっている。主要なCPのリストを表1に示した（マラウイ側全要員のリストは、添付Annex 1.2を参照）。

表 1　主要カウンターパート

Title/ Responsibilities	Affiliate/ Ministry	Name
Director	Ministry of Natural Resource Energy and Mining (MoNREM) (until September 2016)	Mr. Clement Z. Chilima Mr. Kester Kaphaizi Botolo
Deputy Director of Forestry Department	MoNREM, Forestry Department	Mr. Thomas Makhambera, Mr. Francis Chilimampunga
Director of Agricultural Extension Service, Agricultural Extension Service Department	Ministry of Agriculture, Irrigation and Water Development (MoAIWD),	Dr. Jeromy Nkhoma
Director of Community Development Dept. Of Community Development	Ministry of Civic Education, Culture, and Community Development (MoCECCD)	Mrs. Clotilda Sawasawa
Deputy Director, Department of Performance Enforcement	Office of the President and Cabinet (OPC)	Mr. Elliot Phiri
Regional Forestry Officer (South)-RFO (S), Department of Forestry,	MINISTRY OF NATURAL RESOURCE ENERGY AND MINING (MoNREM)	Mrs. Cecilia Chauluka
District Forestry Officer, Balaka	MoNREM	Mr. Paul Muhosha (from March 2017) Mr. Baird Nangwale
District Forestry Officer, Blantyre	MoNREM	Mr. Geoffrey Kanyerere
District Forestry Officer, Mwanza	MoNREM	Mr. Gregory Kulemeka (from July, 2016) (Vacant until June 2016) Mr. Brian Mtambo (upto June 2016,).
District Forestry Officer, Neno	MoNREM	Mr. Emmanuel Ngwangwa
Assistant District Forestry Officer, Blantyre, Regional Management Team (RMT)	MoNREM	Mr. Peter Mkwapatira

(2)　執務スペースの提供

マラウイ政府は、首都リロングウェの森林局本庁内と Blantyre 県森林管理官事務所のそれぞれに執務スペースを提供した。

(3)　その他の負担事項

なし。

2.2 日本側投入実績

(1) 現地業務費

日本側は、表 2 に示す現地業務費を負担した。

表 2　現地業務費（日本側負担）

会計年度（日本）	現地経費		機材供与	
	金額	摘要	金額	摘要
2013	23,738,245 円	アクション・リサーチ（集水ピット建設）、現地傭人費、消耗品、ワークショップ、旅費	21,421,252 円	コピー機、オートバイ、ラップトップ PC、車両
2014	26,151,288 円	現地傭人費、消耗品、車両メンテナンス、ワークショップ、旅費	259,492 円	ラップトップ PC
2015	18,163,325 円	現地傭人費、消耗品、車両メンテナンス、ワークショップ、旅費		

(2) 専門家の派遣

本プロジェクトは 2013 年 10 月に開始され、当初は JICA 長期専門家が派遣された（表 3）。その後 2015 年 9 月から、業務実施契約によるコンサルタントチームの派遣となり、前任の専門家の業務を引き継いだ（表 4）。

表 3　JICA 専門家の派遣実績（2013 年 4 月～2015 年 10 月）

職名 / 分野	氏名	所属	派遣日程	
			自	至
i) 長期派遣専門家				
チーフアドバイザー / 森林資源管理	佐藤 朗		2013 年 4 月 10 日	2015 年 10 月 3 日
農村開発	金澤 弘幸	プリメラ	2013 年 4 月 10 日	2015 年 10 月 3 日
業務調整 / 森林資源管理（流域管理）	深井 五月		2013 年 5 月 27 日	2015 年 10 月 17 日
ii) 短期派遣専門家				
アクション・リサーチ	升田 清	オーバーシーズ・アグロフィッシャリーズ・	2013 年 5 月 6 日 2013 年 10 月 1 日	2013 年 9 月 2 日 2014 年 1 月 29 日

職名 / 分野	氏名	所属	派遣日程	
			自	至
		コンサルタンツ		
リサーチデザイン	岡田 洋昭	三祐コンサルタンツ	2013年5月31日	2013年6月29日
普及戦略	赤羽 悦子	日本開発サービス	2014年6月23日 2015年1月9日	2014年12月21日 2015年2月23日
広報戦略	菊池 洋	CDC インターナショナル	2015年5月10日	2015年7月8日

表4　コンサルタント派遣実績（2015年9月～2018年4月）

職名 / 分野	氏名	派遣日程		
		自	至	日数
総括 / 制度化 1	小野澤雅人	2016年2月2日	2016年3月1日	29
		2016年4月17日	2016年8月14日	120
		2017年1月8日	2017年2月12日	36
		2017年5月9日	2017年7月27日	80
		2017年10月28日	2017年12月19日	53
		2018年2月4日	2018年4月2日	58
副総括 / 制度化 2	大石喜久雄	2015年9月13日	2015年9月22日	10
		2015年11月2日	2015年12月12日	41
副総括 / 制度化 2・3	庄智之	2015年11月15日	2015年12月5日	21
		2016年4月24日	2016年5月19日	26
		2016年10月16日	2016年12月13日	59
		2017年3月17日	2017年4月23日	38
		2017年8月6日	2017年9月11日	37
普及技術 1	北窓時男	2016年1月17日	2016年3月1日	45
		2017年1月24日	2017年3月9日	45
		2017年9月3日	2017年10月12日	40
		2018年2月9日	2018年3月30日	50
普及技術 2 / 土壌保全技術	小川菜穂子	2015年9月10日	2015年9月16日	7
		2016年3月1日	2016年3月31日	31
		2016年6月7日	2016年7月8日	32
		2017年3月3日	2017年4月16日	45
		2017年8月1日	2017年9月14日	45
		2018年1月9日	2018年2月20日	43
研修管理 / モニタリング及び評価	佐藤麻美	2015年10月2日	2015年11月15日	45
		2016年5月27日	2016年6月26日	31
		2017年1月13日	2017年2月19日	38
		2017年6月20日	2017年8月3日	45
業務調整 / 研修補助 1	田中香苗	2015年9月8日	2015年11月26日	80
		2016年1月8日	2016年3月6日	59
業務調整 / 研修補助 1	植松歩美	2016年3月15日	2016年5月1日	48
		2016年7月19日	2016年9月4日	48
業務調整 / 研修補助 1	淺羽慶太郎	2017年10月28日	2017年11月27日	31
		2018年1月20日	2018年2月16日	28

職名 / 分野	氏名	派遣日程		
		自	至	日数
業務調整 / 研修補助 2	氣田智子	2016 年 3 月 18 日	2016 年 4 月 14 日	28
		2016 年 9 月 30 日	2016 年 12 月 2 日	64
業務調整 / 研修補助 3	白石いずみ	2016 年 8 月 26 日	2016 年 10 月 6 日	42
		2017 年 1 月 24 日	2017 年 4 月 2 日	69
		2017 年 4 月 28 日	2017 年 7 月 16 日	80
		2017 年 9 月 1 日	2017 年 10 月 15 日	45
		2018 年 2 月 16 日	2018 年 4 月 2 日	46
			プロジェクト終了時（2018 年 4 月 2 日）	1,818
業務調整（トレイニー）アイ・シー・ネット（株）自社負担による派遣	白石いずみ	2016 年 5 月 21 日	2016 年 7 月 28 日	69

(3)　本邦研修と第三国研修

CP の能力強化のため、以下に示す本邦研修とケニアにおけるの第三国研修を実施した（表 5）。本邦研修には合計 28 名、第三国研修には 1 名が参加した。

表 5　本邦研修と第三国研修の実施状況

主題	会計年度（日本）	期間	参加者名	地位・職名	アウトプット
本邦研修					
アフリカにおける生活改善アプローチによる農村コミュニティ開発	2014 年	2014 年 7 月 6 日～8 月 23 日	Ms. A. Chagoma	CCO/Senior Community Development Assistant, Blantyre	2
認証制度やブランド化を通じた森林資源の総合利用による地域振興	2014 年	2014 年 10 月 22 日～11 月 20 日	Mr. G. Kamanga	ARPC/Forestry Officer, Regional Forestry Office South	2
農民主導による普及手法 ～農民の自発性を高めるカリキュラム開発	2014 年	2015 年 1 月 13 日～2 月 13 日	Mr. M. Dzumani	TST/Agricultural Extension and Development Coordinator, Neno	2
			Ms. C. Kalinga	CCO/Agricultural Extension and Development Officer, Neno	
普及活動の運営管理のためのキャパシティ開発	2014 年	2014 年 12 月 1 日～19 日	Mr. G. Rapozo	District Commissioner, Mwanza	1、 2
			Mr. G. Kanyerere	Project Manager/District Forestry Officer, Blantyre	

主題	会計年度（日本）	期間	参加者名	地位・職名	アウトプット
			Mr. B. Mtambo	Project Manager/District Forestry Officer, Mwanza	
			Mr. C. Masanjala	TST/Forest Officer, Blantyre	
			Mr. E. Kalitsiro	TST/District Land Resources and Conservation Officer, Mwanza	
			Mr. T. Kamera	TST/Land Resources and Conservation Officer, Blantyre	
農民主導による普及手法 ～農民の自発性を高めるカリキュラム開発	2015年	2015年1月5日～2月5日	Mr. Cleopas Lameck	Agriculture Extension and Development Coordinator, Mwanza	2
普及活動の運営管理のためのキャパシティ開発	2015年	2015年12月6日～21日	Mr. Charles Kalemba	District Commissioner, Blantyre	1、2
			Ms. Memory Kaleso Monteiro	District Commissioner, Neno	
			Mr. Rodrick Mateauma	District Commissioner, Balaka	
			Mr. Hansford Chitenje Yusuf	Chief Policy and Programme Officer, Performance Enforcement Department, the Office of President and Cabinet	
			Mr. Martin Kausi	Programme Manager, Blantyre Agriculture Development Department, Ministry of Agriculture, Irrigation and Water Development	
			Ms. Gertrude Kalinde Thaulo	Programme Manager, Machinga Agriculture Development Department, Ministry of Agriculture, Irrigation and Water Development	

主題	会計年度（日本）	期間	参加者名	地位・職名	アウトプット
持続可能な自然資源管理による生物多様性保全と地域振興-SATOYAMAイニシアティブの推進	2015年	2015年10月12日～11月14日	Mr. Drake Chiningwa	TST/Assistant Director, Mwanza Department of Forestry, Ministry of Natural Resources, Energy and Mines	2
農民主導による普及手法 ～農民の自発性を高めるカリキュラム開発	2016年	2016年5月1日 ～ 6月1日	Mr. Maxwell John Moyo	CCO/Agriculture, Balaka Agriculture Development Department, Ministry of Agriculture, Irrigation and Water Development	2
普及活動の運営管理のためのキャパシティ開発	2016年	2016年9月30日～10月21日	Mr. Baird Simplex Nangwale	PM/District Forestry Officer, Balaka Department of Forestry, Ministry of Natural Resources, Energy and Mines	1、2
			Mr. Jafali Chisale	TST/Assistant Community Development Officer, Balaka, Ministry of Gender Children Disability and Social Welfare	
			Mr. Aubrey Macheso	TST/Forester, Neno Department of Forestry, Ministry of Natural Resources, Energy and Mines	
			Mr. Inos Wandale	CCO/Forestry Assistant, Blantyre Department of Forestry, Ministry of Natural Resources, Energy and Mines	
			Mr. Kalembwe Devine Makwati	CCO/Forestry Assistant, Blantyre Department of Forestry, Ministry of Natural Resources, Energy and Mines	
			Mr. Elias Anderson Baison	CCO/Agriculture Extension Development Officer, Neno, Department of Agricultural Extension Services, Ministry of Agriculture, Irrigation and Water	

主題	会計年度（日本）	期間	参加者名	地位・職名	アウトプット
				Development	
			Mr. Fyson Livison Seyani	CCO/Senior Forestry Assistant, Balaka Department of Forestry, Ministry of Natural Resources, Energy and Mines	
持続可能な自然資源管理による生物多様性保全と地域振興-SATOYAMAイニシアティブの推進	2016年	2016年10月2日 ～11月5日	Mr. Emmanuel William Ngwangwa	District Forestry Officer, Neno, Ministry of Natural Resources, Energy and Mines	1、2
農民主導による普及手法 ～農民の自発性を高めるカリキュラム開発	2017年	2017年5月1日～6月1日	Mr. Earnest Samson Nkonya	CCO/Agriculture, Blantyre Agriculture Development Department, Ministry of Agriculture, Irrigation and Water Development	2
持続可能な自然資源管理による生物多様性保全と地域振興-SATOYAMAイニシアティブの推進	2017年	2017年10月1日～11月3日	Mr. Gregory Mbawala Kulemeka	District Forestry Officer, Mwanza, Ministry of Natural Resources, Energy and Mines	1、2
第三国研修（ケニア）					
気候変動適応に関するアフリカ地域トレーニング	2016年	2016年10月16日～11月19日	Mr. Farai Kafanikhale	TST/Forester, Balaka Department of Forestry, Ministry of Natural Resources, Energy and Mines	1、2

(4) 資機材の提供

本プロジェクトでは、プロジェクト前半において、運営管理に必要な資機材として、複写機、コンピュータ、プリンターなどが調達された。また、TST用の4WDピックアップトラック4台と、4県のCCOが使用するバイクなどの車両、農家やコミュニティへの技術移転のフォーカル・ポイントとしての役割を果たすリード・ファーマー（LF）に対して、追加のトレーニングを行うための資機材と自転車を提供した。資機材は全てマラウイ側に供与されており、管理も移管されている（表6）。

表 6　提供された資機材リスト

#	年度	品名・規格	価格 (MWK/US$)	数量	合計 (MWK/US$)	搬入・提供時期
1	2013	コピー機	2,627,075.00	1	2,627,075.00	2013 年 6 月 25 日
2		コンピュータ、プリンター	830,878.00	5	4,154,390.00	2013 年 7 月 30 日
3		オートバイ	1,207,134.08	25	30,178,352.00	2013 年 10 月 14 日
4		ラップトップコンピュータ	755,069.33	3	2,265,208.00	2013 年 11 月 18 日
5		4 輪駆動ピックアップトラック	US$25,817	4	US$103,268.00	2014 年 1 月 14 日
			(Exchange rate)	432	44,611,776.00	
6	2014	ラップトップコンピュータ	538,812.50	2	1,077,625.00	2014 年 11 月 18 日

(5)　在外強化費

日本側は LF に対するトレーニングのコストを負担した。これら費用には、マニュアルの印刷、研修資機材、昼食手当などが含まれている。日本側は、CCO に供与したオートバイの燃料費、維持管理費など、また TST や PM などが利用するピックアップトラックの維持管理に必要な資金などを負担した。

2.3 活動（計画と実績）

プロジェクトの活動は、プロジェクト・デザイン・マトリクス（Project Design Matrix:PDM）の改訂により変更された。活動の比較表を添付書類（Annex 3.3）に示した。次章 2.4 に PDM 修正の説明を、修正された成果と活動の進捗状況を 2.5 に詳述する。

2.4 PDM の改訂

(1)　PDM 改訂の必要性

2015 年 9 月に本プロジェクトの実施体制が業務実施契約に移管された際の PDM は 2013 年のプロジェクト開始時に締結された討議議事録（R/D）に基づくものであった。そのため、プロジェクト開始時に想定されたマラウイにおける行政制度に基づいて立案された計画と、現実との間にギャップが存在するようになっていた。PDM に反映された当初の計画は、マラウイの地方分権化が進展することを前提としたものであったが、プロジェクト開始後約 5 年を経てその進捗は当初想定した水準と大きな差異が生じている。プロジェクト関係者は、これらに起因する齟齬を考慮し PDM の各項目を修正・改訂する必要性が明らかにな

った。プロジェクトは、マラウイ政府と JICA との協議を経て、PDM を修正することを提案し、2017 年 6 月に開催された合同調整委員会（JCC）において提案し、PDM の修正が承認された。今回の PDM 変更は、PDM 全体に及ぶものであるが、上位目標とプロジェクト目標に関する主要な部分の比較を表 7 に示す。また PDM 全体の新旧対比表を Annex3.3 に示した。

(2) 上位目標の変更

PDM の上位目標は、「COVAMS アプローチによる農民の活動を通した流域管理（CMFA）が、対象県において広く実施される。」と定義されている。その指標は 2 つあり、「CMFA が対象県の異なる TA に広がる。」と、「COVAMS アプローチを利用した CMFA が、対象県の他のドナーのプロジェクトに使われる。」が定義されている。これら指標には、数値目標が設定されていないので、指標 1 を「COVAMS アプローチによる CMFA が対象県内の少なくとも 2 つの非パイロット TA において実施される。」に、指標 2 を「COVAMS アプローチによる CMFA が県内の少なくとも 1 つの他ドナーの支援プロジェクトに利用される」に変更した（表 7)。

表 7　PDM の修正（新旧比較表）

項目		変更前	変更後
上位目標		COVAMS アプローチによる農民の活動を通した流域管理（CMFA) が、対象県において広く実施される。	
	同指標	1. CMFA が対象県の異なる TA に広がる。 2. COVAMS アプローチを利用した CMFA が、対象県の他のドナーのプロジェクトに使われる。	1. COVAMS アプローチによる CMFA が対象県内の少なくとも 2 つの非パイロット TA において実施される。 2. COVAMS アプローチによる CMFA が県内の少なくとも 1 つの他ドナーの支援プロジェクトに利用される。
プロジェクト目標		COVAMS アプローチによる CMFA が対象県において制度化される	
	同指標	1. CMFA が各県の戦略開発計画に含まれる。 2. COVAMS を利用した CMFA の計画が、対象各県で実施される。	1. 県の関係各局の年次計画において COVAMS アプローチによる CMFA 活動が計画され実践される。 2. COVAMS アプローチガイドラインが関係省庁により承認される。

(3) プロジェクト目標変更の必要性（県開発計画の現状）

PDM には、プロジェクト目標を「COVAMS アプローチによる CMFA が対象県において制度化される」と定義されている。その指標には、1. 「CMFA が各県の戦略開発計画に含ま

れる。」と 2.「COVAMS を利用した CMFA の計画が、対象各県で実施される。」の 2 つが定義されている。

プロジェクトは、これらの目標達成の前提となる、各県の戦略開発計画の策定状況を把握するための調査を実施した。各県の計画は各県の予算策定の基礎となるもので、ドイツ国際協力公社（GTZ）の支援によって定期的に立案されることを前提としていた。4 県における計画の整備状況を見ると、計画を維持・更新するために必要な資源である資金と人材が不足しており、計画は当初想定していたように機能していない。各県の計画開発部長（DPD）の説明によれば、策定された計画が、見直しを継続的に行うための資源とこれを実施するための意思が欠けていることも原因の一つである。表 8 に各県の開発計画の概要を示す。

表 8　県開発計画の現状

<table>
<tr><th>項目・課題</th><th>Blantyre 県</th><th>Balaka 県</th><th>Mwanza 県</th><th>Neno 県</th></tr>
<tr><td>2018 年 3 月以降有効な県戦略開発計画</td><td>存在しない</td><td>存在しない</td><td>存在しない</td><td>存在しない</td></tr>
<tr><td>同計画の現状</td><td>県の戦略開発計画（DSDP）(2011–16)は、2016 年 6 月に失効している。改訂に必要な資源（予算・人員等）不足で、次期改訂は不明。</td><td>戦略実施計画(2013–18)が存在し、2018 年 6 月まで有効。改訂作業の予定と時期は明確ではない。</td><td>戦略実施計画(2011–16) は 2016 年に失効している。改訂や修正の予定はない。</td><td>県戦略開発計画は存在しない。県の開発計画が最上位の計画図書となっている。</td></tr>
<tr><td>戦略開発計画の代替としての県開発計画が存在している</td><td>有効な県開発計画（DDP）(2013–18) が存在している。改訂予定は不明。</td><td>県開発計画（DDP）(2017–22) の改訂作業を行っている。完成時期は、意見集約に時間がかかり不明。</td><td>県開発計画（DDP）の策定作業を進めているが、完成スケジュールは明示できない。</td><td>有効な県開発計画（DDP）(2013–18)が存在している。改訂作業を行うかは不明。</td></tr>
<tr><td rowspan="2">年間投資計画／年間実施計画が存在し、毎年改訂されている</td><td colspan="4">年間投資計画は、学校や道路などインフラ投資を集計・集約したリストである。年間実施計画は、年間予算書類の付属書、または、予算書類そのもので、その位置づけと記載事項は各県で異なる。</td></tr>
<tr><td>その他「Safety Guard Plan」を準備している。同計画は、多くの計画図書のうち唯一流域管理の内容が記載されている。</td><td>年間投資計画（AIP）は策定されていない。予算書のみが作成されている。</td><td>年次予算が策定される一方、DDP は策定されない。予算書により年間予算が承認される。</td><td>現在有効な DDP の付属書として AIP が作成されている。</td></tr>
</table>

プロジェクト目標を2018年3月のプロジェクト終了時までに達成するため、各県が策定する戦略開発計画や投資計画に COVAMS を用いた CMFA を位置づけ、必要な予算措置を講ずるよう働きかける必要がある。しかし、右計画が定期的に改訂されていないことから、プロジェクト目標の指標として成立していない。このように、当初の PDM に定義された指標は、現実の地方行政の枠組みとの間に齟齬がある。これらに鑑み、プロジェクト目標の指標を 1.「県の関係各局の年次計画において COVAMS アプローチによる CMFA 活動が計画され、実践される」と、2.「COVAMS アプローチガイドラインが関係省庁により承認される」に変更した。

2.5 プロジェクトの進捗および達成状況

2.5.1 活動および成果の達成状況

本プロジェクトの PDM に規定された成果の達成状況を以下に示す。

(1) 成果 1 :「対象県及び関係諸機関に対する、予算確保・制度化のための働きかけが行われる」の達成状況

成果 1 に対する指標は、そのほとんどが完了している。また、プロジェクト終了前にメディアによる現場訪問も行われた。加えて、コミュニティラジオやテレビによるプロジェクト活動に関する放映も行われた。成果1には、3 つの指標が設定されている。それぞれの指標に対する達成状況は以下のとおり（表 9)。

- 指標 1-1「少なくとも3つの関係諸機関のニーズに合致した、COVAMS アプローチに関するガイドラインを含む情報提供のための資料が作成され、これを用いた訪問と説明が行われる」の達成状況は、MoAIWD、MoCECCD、森林局などプロジェクトに関係する省庁に対して、COVAMS を普及・促進する取組を行った。
- 指標 1-2「流域管理に利害関係を持つ企業等を対象とした情報共有／広報セミナーが少なくとも2回開催される」の達成状況は、国営電力会社の民営化後、発送電分離により新たに設立された発電会社（EGENCO MW Ltd.）による現場訪問を2017年11月に実施した。同社は、シレ川流域の支流である Rivirivi 川で流域管理のための活動（植林による流況回復・堆砂の削減の取組み）を同社の本業[10]として実施されている。プロジェクトは、将来同社の植林事業に COVAMS アプローチを用いた CMFA が採用される可能性について、同社と対話を行って来た。プロジェクトは、2018 年 3 月に

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[10] EGENCO の環境保全部が本来業務として実施していることによる。同社の社会貢献事業として都市部でも一般市民を対象として公園などで植樹を行っていることに加え、発電事業者の主たる事業分野のひとつとして大規模な流域管理のための植林事業を行っていることに着目している。

EGENCO に対して、プロジェクト終了後も妥当性の高い地域で、かつ事業性を確保できる範囲で森林局との協業・支援を継続することを要請し、基本合意した。

- 指標 1-3「ドナー／メディア関係者を対象としたフィールドビジットが少なくとも 2 回以上開催される」の達成状況は、新聞、コミュニティラジオやテレビなどのメディアによる現場訪問を実施した。例えば、2017 年 12 月から 2018 年 1 月まで、COVAMS を導入した Balaka 県に拠点を置くテレビ局が複数回に渡りテレビ番組を全国放映した。Neno 県において COVAMS を紹介するラジオ番組が、2017 年 12 月から 2018 年 2 月にかけて県内のコミュニティラジオから放送された。各地区における COVAMS を利用した CMFA に関する取り組みは、各地区のコミュニティラジオやテレビなどのメディアを通じて、普及を図っていく予定である。

その他、成果 1 に関連する活動の達成状況は以下のとおりである。

- プロジェクトチームと森林局は、文書の正式な承認のために、COVAMS アプローチを用いた CMFA のガイドラインの内容についてレビューを行った。
- プロジェクトチームは森林局と協力し、森林局傘下の職員養成機関でもあるマラウイ森林野生生物大学（MCFW）に対して、COVAMS アプローチを同校のカリキュラムと教科に組み入れることを提案した。 MCFW の教員との協議により、COVAMS アプローチを包含する短期コースの開発と同アプローチを大学におけるケーススタディのひとつとして位置づける可能性について提案した。その結果、 MCFW の教員によるプロジェクトサイトの訪問を計画し実施してきた。
- プロジェクトは、地方開発基金（LDF）の関係者に対して、同基金が管理するマラウイ社会行動基金（Malawi Social Action Fund: MASAF）に対し、COVAMS アプローチを用いた CMFA を適用する可能性について提案して来た。LDF 関係者と進めた協議の結果、森林局からの提案を LDF 上層部が公式に取り上げ、LDF が COVAMS アプローチによる CMFA 採用するように、森林局を交えた議論を継続することとした。

表 9　成果 1 の指標達成状況

<table>
<tr><td colspan="3">成果 1：対象県及び関係諸機関に対する、予算確保・制度化のための働きかけが行われる</td></tr>
<tr><td colspan="3">（成果 1 にかかる活動）
1-1. COVAMS アプローチによる CMFA の展開先となる関係諸機関をリスト化する
1-2. 対象県および関係諸機関に対する説明・発表資料を作成する
1-3. 成果 3 を通じた検証結果を、説明・発表資料に組み込む
1-4. 流域管理に利害関係を持つ企業などをリスト化する
1-5. 流域管理に利害関係を持つ企業などを対象とした情報共有／広報セミナーを開催する
1-6. ドナー／メディア関係者を対象としたフィールドビジットを開催する
1-7. 活動 1-5, 1-6 から得られたフィードバックに基づき、COVAMS アプローチガイドラインの修正と承認手続きを行う</td></tr>
<tr><td colspan="2">指標</td><td>活動実績
（評価時（2017 年 10 月）および
プロジェクト終了時（2018 年 3 月））</td></tr>
<tr><td></td><td>1-1. 少なくとも 3 つの関係諸機関のニーズに合致した、COVAMS アプローチに関するガイドラインを含む情報提供のための資料が作成され、これを用いた訪問と説明が行われる</td><td><評価時 2017 年 9 月末>
• 1-1 関係諸機関のリストは完成済み
• 1-2 発表資料は完成済み
• 1-3 成果 3 で明らかになった検証結果を、説明資料に反映済み
• 1-4 利害関係を持つ企業などのリスト作成済み
• COVAMS 普及に向けた各省庁（MoNREM, MoAIWD, MoCECCD ならびに OPC など）への働きかけ
• 1-3～1-4 により、対象に応じた説明資料の作成
• MoNREM, MoAIWD, MoCECCD ならびに OPC 関係者によるプロジェクトサイト訪問
<案件終了時 2018 年 3 月> 指標達成済み
• 1-7　ガイドラインの作成・修正、意見の反映を行い、関係者の承認を得た。</td></tr>
<tr><td></td><td>1-2. 流域管理に利害関係を持つ企業等を対象とした情報共有／広報セミナーが少なくとも２回開催される</td><td><評価時 2017 年 9 月末>
• 1-5. 企業向けセミナーは未達成
• 2017 年 11 月～12 月に、以下２社を対象とした広報セミナーを開催予定。（Electricity Generation Company (Malawi) Ltd. (EGENCO MW Ltd.および、Blantyre Water Board Inc.)
<案件終了時 2018 年 3 月> 指標達成済み
• 1-5. EGENCO によるサイト訪問（2017 年 11 月）の実施
• 1−5. 同社との共同での植林・育林を含む流域管理事業についての会合（2018 年 2 月、3 月）
• Water Board は資金難のため実施できず</td></tr>
</table>

成果 1：対象県及び関係諸機関に対する、予算確保・制度化のための働きかけが行われる		
	1-3. ドナー／メディア関係者を対象としたフィールドビジットが少なくとも２回以上開催される	<評価時 2017 年 9 月末> 指標は達成済み • 1−6. 南部の新聞記者を対象としたフィールドビジットを開催済み。（The Daily Times, 2017 年 4 月 6 日） • 2017 年 11 月 TV、ラジオ局を招いたフィールドビジットを各 1 回開催済み • 今後も、各県においてコミュニティラジオ活用を通じた情報発信の試みを継続する。 <案件終了時 2018 年 3 月> 指標達成済み ラジオ局（Neno）、テレビ局（Balaka）による放送は、2018 年 1〜3 月に実施

(2) 成果 2 :「対象県関係局行政官の、COVAMS アプローチ運営能力が向上する」の達成状況

成果 2 に関する活動は全て計画どおり完了している。対象 4 県における CCOs と TSTs による COVAMS アプローチのトレーニングは、2017 年 6 月までに完了した。研修を受講した CCOs と TSTs は、LFs と SLFs に対する訓練を実施した。CMFA のパッケージは、植林と育林、等高線栽培、村落内でのガリ崩壊防止の 3 つから構成されている。COVAMS アプローチにおいて、LFs と SLFs は村民による互選（原則として投票）により、同一の村落の農民のなかから指名されることになっている。プロジェクト開始以来、計 3,795 人の農民が LF として指名され訓練を受講し、そのうちの 3,745 人が 4 県の LF として認定されている。SLF の選定は、LF のなかから 435 人が選抜されて、その全員が SLF の認証を受けている。（表 10）

PDM に記載された成果 2 の指標と、それぞれの達成度は、以下のとおりである。

- 指標 2-1「10 分野の研修 が、少なくとも 1 回以上実施される」は、2017 年 10 月までに、職員を対象とした 10 分野の研修が完了した（表 10 内の項目 2-1 参照)。
- 指標 2-2「対象県の県関係局の行政官のうち CMFA 技術の理解度評価を受審した者の、少なくとも 80%以上が設定された修了要件を満たす」に対する達成度は満足したものと考えられる。プロジェクトは、2017 年 6 月に対象 4 県の CCO と TST など各県の職員を集め、パフォーマンス・レビュー・ミーティングを開催した。同会合において、各県の職制別の業務遂行能力を個人・組織を対象として自己評価と相互評価を行った。会合の期間中には、COVAMS アプローチの理解度評価も実施した。その結果、参加した 14 人の TST のうちの少なくとも 80％、27 人の CCO のうちの 80％以上が COVAMS のガイドラインに準拠した活動を行っていることが確認された。COVAMS を用いた CMFA の理解度は、自己評価によると全項目について 5 段階中 3 以上を示し、業務遂行上満足できる水準にある。

- 指標 2-3「パイロット TA の全村落数の 80%以上（296 村/370 村）において COVAMS アプローチが実施される」の達成度は、以下のとおり。指標では対象 370 村の 80%以上である 296 村以上での実践をターゲットとしている。終了時評価によると、対象村落数 367 村中 347 村（全体の 94.5%）において、実践されていることが確認された。この達成率はターゲットに比較して高水準である。
- 村落の選定で当初 370 村に至らなかった理由は、WB の支援するシレ川流域管理プログラムが、COVAMS の対象 TA ダムベ（50 村）を対象としたことにより、競合を避けるため、目標を TA サイモン（47 村全て）に変更した。そのため、当初よりも 3 村少なくなってしまった。また、Blantyre 県では、当初の目標村数以上の村落において活動が行われている。これは、単一の村を複数の村に分割する近年行われている行政区域変更の結果であると考えられている。
- 指標 2-4「選定された LF の 80%以上（2,910 人/3,637 人）が認証される」は 2017 年 10 月現在で全て完了している。2013 年から 2017 年に指名された 3,795 人の LF のうち 3,745 人に対して証明書を授与し、認定率は 99%に達している。
- 2017 年 10 月末現在、指標 2-5「選定された 80%以上の SLFs（326 人/407 人）が認証される」は達成されている。2015 年から 2017 年に任命された 435 人の SLF の全員がその資格を認定された。

上記に加え、成果 2 にかかる活動により以下が達成された。

- プロジェクトチームは業務実施契約に切り替わった 2015 年 9 月以来、住民への支援がプロジェクトとの間に依存関係を生み出していることを指摘して来た。COVAMS アプローチの 5 つの原則の 1 つは、現地で利用可能な資源を活用することであるが、本プロジェクトに携わる人々は、日本側が提供する様々な支援に依存する傾向がある。例えば、普及活動とモニタリングの実施には、研修資機材や手当の支給が必要となっている。この事は、2018 年 3 月のプロジェクト終了後の持続性の達成やその後の維持に課題となる点を繰り返し説明してきた。プロジェクトが生み出す依存の関係から生じる負の影響を最小限に抑え、プロジェクトの長期的な持続性を確保するため、プロジェクトチームは最小限の投入資源で運営する Lean COVAMS を試行することを提案しマラウイ側関係者と対話を重ねてきた。
- プロジェクトチームは 2017 年 3 月 27 日に Mwanza 県において、Lean COVAMS を実施予定の村落のリーダーたちを招き、Lean COVAMS を実施するための行動計画を作成するためのワークショップを開催した。このワークショップを開催するため、新たに CCO1 人を指名した。同県の TST は、Lean COVAMS がどのような考え方で実施されるべきかを説明し、参加者との議論を通じ、提案された方法で Lean COVAMS を実施するための活動計画を作成した。

- 2016/17年度の時点で、対象村落総数は345村に達し、2013年のプロジェクト開始当初の50村から大幅に増えた（表7)。プロジェクトが現在取り組んでいる世帯の総数は、45,000世帯で、これらを約3,000人のLFと32人のCCOが運営している。

表10　成果2の指標達成状況

<table>
<tr><td colspan="2">成果2：対象県関係局行政官の、COVAMSアプローチ運営能力が向上する</td></tr>
<tr><td colspan="2">(成果2にかかる活動)
2-1. 対象県関係局行政官のCOVAMSアプローチ実施能力を評価する
2-2. COVAMSアプローチ及びプロジェクト管理に関する研修を計画する
2-3. COVAMSアプローチ及びプロジェクト管理に関する研修を実施する
2-4.対象県関係局行政官のOJTによる能力強化を支援する
2-4-1.対象県関係局行政官に対して、COVAMSアプローチを説明する
2-4-2. 対象県関係局行政官による年間活動計画作成を支援する
2-4-3.対象県関係局行政官による、年間活動計画に基づく活動を支援する
2-4-4. 対象県関係局行政官による活動進捗のモニタリングを支援する
2-4-5. 対象県関係局行政官による年間活動のレビューを支援する
2−4−6. 対象県関係局行政官によりCOVAMSアプローチにかかるガイドラインを作成する。
2-5. 対象県関係局行政官を対象としたCOVAMSによるCMFAに対する理解度評価を計画する
2.6. 対象県関係局行政官に対するCOVAMSによるCMFAの理解度評価を実施する</td></tr>
<tr><td>指標</td><td>活動実績
（評価時（2017年10月）および
プロジェクト終了時（2018年3月））</td></tr>
<tr><td>2-1. 10分野の研修 が、少なくとも1回以上、実施される
<table>
<tr><td colspan="2">1.Administrative management capacity</td></tr>
<tr><td></td><td>1-1 Induction management for general management</td></tr>
<tr><td></td><td>1-2 Computer course (Word, Excel and Powerpoint)</td></tr>
<tr><td colspan="2">2. Organizational management capacity</td></tr>
<tr><td></td><td>2-1 Motivation study for government staff</td></tr>
<tr><td></td><td>2-2 Motivation study for farmers</td></tr>
<tr><td></td><td>2-3 Importance of dvision roles</td></tr>
<tr><td></td><td>2-4 Review of job description and establishement of roles for effective management/ monitoring method</td></tr>
</table></td><td><評価時2017年9月末> 指標は達成済み
以下は各研修項目の実施状況。
1-1～1-2 ：OJTにて毎月の書類提出時に指導を各県のPM、TSTに実施。また提出期限を守ることの必要性、そのためのスケジュール管理については、Review Meetingにて説明。
2-2：2015年9月に実施済み
2-1 ～ 2-4, 4, 5：2014年10月(CCO)および2017年6月(対象TST, CCO)に実施済み。
COVAMS活動を担う上でのTST,CCOが持つべき、態度（モチベーション）の再確認そして農民に持ってもらいたいCOVAMSへ対する意識（モチベーション）の共通認識を確認。またTST,CCOがその役割を担う上で必要となる要素（スキル）の再確認・評価をワークショップ形式で実施。また、必要な要素を確認する過程で改めてCOVAMSアプローチに記述のTST,CCOのTORを再確認するとともに、COVAMSアプローチの5原則についても再確認、その原則の理解を深めた。
2-5：CCO対象に2014年10月に上記研修と兼ねて実施済み。
3：2017年2月に実施済み(PM,TST,CCO)。</td></tr>
</table>

成果2：対象県関係局行政官の、COVAMSアプローチ運営能力が向上する		
	2-5 Effective report writing 3. Strategica skill 4. Extension skill 5. COVAMS Approach	Review Meetingにて、1年の活動の成果を確認する際に、各村での目標をきちんと定めた上で、それに必要となる活動、それを妨げる要因を論理的な形式で討論し、翌年の活動計画を検討する機会とした。 <案件終了時2018年3月> 指標達成済み
	2-2. 対象県の県関係局の行政官のうちCMFA技術の理解度評価を受審した者の、少なくとも80%以上が設定された修了要件を満たす	<評価時2017年9月末> 指標は達成済み 2-5 & 2-6 2017年6月のパフォーマンス・レビュー・ミーティングを開催し理解度評価を実施（自己・相互評価、県全体としての評価を実施）。 自己評価の結果： TST－14人中80%、CCO－27人中80%以上がCOVAMS活動で実施するCMFA技術について、5段階評価の中で「自分で実施可能である」の評価に該当する評価3以上を選択している。 <案件終了時2018年3月> 指標達成済み
	2-3. パイロットTAの全村落数の80%以上（296村/370村）においてCOVAMSアプローチが実施される	<評価時2017年9月末> 指標は達成済み 2-4 4村合計で367村中347村においてCOVAMSアプローチが実施された。達成率は95%である。ただし、個別で見れば、ネノ県での達成率が55%と低い。これは、当初の対象TAであったTA Dambe (全50村) にShire River Basin Management Programの活動が入ったため、競合を避けるために、対象をTA Symon（全47村）へ変更したためである。また、ブランタイア県では当初の対象村数以上で活動が行われている。これは、近年の分村傾向の影響と思われる。 <案件終了時2018年3月> 指標達成済み
	2-4. 選定されたLFの80%以上（2,910名/3,637名）が認証される	<評価時2017年9月末> 指標は達成済み。 2-4 2013年から2017年までに選定された3,795人のLFのうち、3,745人が認証された。認証率は99%である。 <案件終了時2018年3月> 指標達成済み
	2-5. 選定された80%以上のSLFs（326名/407名）が認証される	<評価時2017年9月末>指標は達成済み。 2-4 2015年から2017年までに選定された435人のSLF全員が認証された。 <案件終了時2018年3月> 指標達成済み

表 11　対象村落リスト

対象県	計画年度	CCO 数	対象村落（既存／新規）	世帯数	LF 数
4 県 (Balaka, Blantyre, Mwanza, Neno)	2015/16	30	217	32,333	2,186
4 県 (Balaka, Blantyre, Mwanza, Neno)	2016/17	32	345	45,750	3,047

対象県と TA 名

Balaka	Blantyre:	Mwanza	Neno
TA: Chanthunya	TAs: Chigaru & Lundu	TAs: Govati & Nthache	TAs: Mlauli & Symon

表 12　COVAMS による介入実績

県名	年度	植林・育林（本）	保全面積（ha）	チェックダム設置（個所数）	ガリ崩壊防止（個所数）
Balaka	2015/16	34,712	75	552	9
Blantyre		38,188	81	461	17
Mwanza		94,985	38	11,769	2,353
Neno		66,987	78	1, 238	843
Total		234,872	272	14,020	3,222
Balaka	2016/17	213	362	352	データ不在
Blantyre		2,803	257	1,881	23
Mwanza		2,893	309	7,928	2,017
Neno		57,131	193	2,486	716
Total		63,040	1,121	12,647	689

(3)　成果 3:「COVAMS アプローチの普及方法及び普及される技術の有効性が検証される」の達成状況

成果 3 に関する活動は全て予定どおり完了している。プロジェクトによって訓練された LF は、村内の他の農民に対し、CMFA 技術の研修をそれぞれ複数回実施している。彼らの多くは、実際に CMFA 技術を習得し実践している。日本人専門家は、対象敷地内のメイズ畑の土壌浸食に対応するための等高線栽培と、小規模なチェックダムの有効性を検証するための調査を行った。これらの結果は、2015 年 9 月にワーキングペーパーにまとめられた。各指標に対する達成度は以下のとおり（表 13）。

- 指標 3-1「少なくとも 80%以上の LFs が COVAMS アプローチによる CMFA 活動に関する研修を、各分野 1 回以上実施する」の達成状況は、2017 年 1 月の世帯調査の結果、全ての LF が、植林・育林、等高線栽培、ガリ崩壊防止対策の 3 つの技術に関する研修を最低 1 回以上実践していることが確認できた。
- 指標 3-2「少なくとも 80%以上の住民が、LFs によって実施される CMFA 活動に関する各分野の研修を受講する」の達成状況は、同じく世帯調査の結果、植林・育林に関する研修への参加率は初年度が 81.5%、2 年目が 90.3%、3 年目が 88.2%であった。

等高線栽培に関する参加率はそれぞれ 88.8%、95.1%、97.0%であり、ガリ崩壊防止に関する訓練参加率も同様に 85.9%、94.0%、97.1%であった。この結果、指標の参加率を満たしていることが確認された。

- 指標 3-3「少なくとも 50%以上の住民が、CMFA に関する各分野の活動を実践する」の達成度は、苗の生産導入率が初年度で 83.8% 2 年目は 89.6%、3 年目は 90.7%であり、植樹の実践率も同様に 84.6%、88.3%、87.9%。等高線栽培の実践率はそれぞれ 88.9%、97.2%、98.6%で、ガリ崩壊防止技術の実践割合は 69.1%、69.2%、72.1%であった。これら結果から、いずれも指標の実践率を満足している。
- 指標 3-4「COVAMS アプローチの CMFA 技術の 1 つである等高線農法の有効性が明らかになる」の達成度は次のとおり。2015 年 9 月に提出された「Working Paper No.9: Soil Loss Study for Maize Gardens and Small Scale Check Dams」によると、2014/15 年度の耕作期間中に 1,103ha のメイズ畑において等高線栽培によって 19.287m³（17.49m³/ha）の土壌保全が観察された。
- 指標 3-5「COVAMS アプローチの CMFA 技術の 1 つであるガリ補修技術の有効性が明らかになる」は、2017 年 10 月の時点で達成されている。2015 年 9 月に提出された「Working Paper No. 9: Soil Loss Study for Maize Gardens and Small Scale Check Dams」によると、4 つの地区に設置された 21,362 カ所のチェックダムによって合計 1,602m³ の土壌浸食が防止され、それぞれ 0.075m³ が保全されたと推計されている。
- 本プロジェクトは、長期専門家の助言に基づき計画された土壌浸食に関する実験を、a）45 度の直線畝（プロットにおける農作業は「通常どおりの耕作」で比較対照用）、b）等高線耕作、c）入手できる様々な有機物によるマルチングによる土壌の保全、d）堆肥の利用、の 4 条件で実施した。しかし、この実験方法は、水文学で一般に知られた農地における土壌浸食の複雑な挙動や、降雨の特性などを反映せず、単純にすぎる実験条件で行われている。例えば、この実験圃場では、降雨による土砂の流出の要因である、土壌の種類（特に粒形分布のような土の物理的性質）、降雨量と降雨強度、斜面（角度と方向）は考慮されていない。また、長期専門家によって決定された試験圃場の設置場所とその施設設計も、野外実験に必要な条件が考慮されたものではなかった。例えば、圃場内の各プロットからの流出土砂の計測方法は、圃場の流末に掘削・設置された穴の底に貯留した土砂量を計測することとしていたが、穴の壁面とその周辺に積み上げた掘削土砂とが流入・混在し、圃場からの流出土量を正確に計測することは困難である。さらに、この圃場の施設設計と実験方法以前の問題として、事前の文献調査が欠けており、解析につかう流出モデルが明らかにされていないということも指摘できる。そのため、実験圃場に設定された 4 条件の寄与や影響を特定することは困難であった。

- なお、業務実施契約移行後にコンサルタントが行った文献調査では、耕作地や放牧地の長期にわたる土砂流出量を評価するためのモデルは、米国農務省が開発した土壌流亡予測式（RUSLE[11]）の使用がひろく推奨[12]されている。
- 2016年にコンサルタントが行った農民へのインタビューによると、各実験プロットにおける収量は、2016年の南部アフリカの深刻な干ばつにより大きく変動したと考えられる。モニタリングでは、前項のc）に示すような有機物（バイオマス）を利用したマルチングを施した圃場で土壌中の水分を保つことができ収量も比較的高かったという声が聞けた。実際の圃場における耕作方法の採用は、降水量などの気象条件に依存する。例えば、降雨量が比較的多い場合は、等高線栽培の有効性が高い。一方、干ばつが予想される時には、マルチを行うことが最も適切な技術と考えられる。しかし通常の農家が圃場全体にマルチを敷設するには、十分な分量のバイオマスを確保することが困難な場合が多い。メイズの残渣などの有機物は、家畜飼料としての需要があり、畑に敷設するのに充分な量を確保することが困難なためである。

この他、2016年6～7月に、760世帯をランダムに選定のうえ世帯調査を実施した。この調査は、プロジェクトが雇用した調査員によって実施した。この調査の結果、以下のことが明らかになった。

- COVAMSアプローチの強みは、比較的短い期間内に営農技術を普及させる効果がある。
- 介入開始から1年以内に技術（土壌保全、チェックダムの設置など）の実践率が50%を超えた。

プロジェクトの介入が開始されてから2年以内の苗木の生産は合計230万本を超え、平均の苗木生産量は67本/世帯であった（Annex 2.3 世帯調査を参照）。

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[11] USDA. “Revised Universal Soil Loss Equation (RUSLE) - Welcome to RUSLE 1 and RUSLE 2”. URL= https://www.ars.usda.gov/southeast-area/oxford-ms/national-sedimentation-laboratory/watershed-physical-processes-research/docs/revised-universal-soil-loss-equation-rusle-welcome-to-rusle-1-and-rusle-2/ (2018年3月8日閲覧)

[12] 例えば、N. W. Hudson. Field measurement of soil erosion and runoff. Food and Agriculture Organization of the United Nations, Rome, 1993. URL= http://www.fao.org/docrep/T0848E/t0848e00.htm#TopOfPage (2018年3月8日閲覧)

表13　成果3の指標達成状況

成果3：COVAMSアプローチの普及方法及び普及される技術の有効性が検証される	
(成果3にかかる活動) 3-1. COVAMSアプローチの普及方法に係る質問票調査を計画する 3-2. 計画に基づき質問票調査を実施し、データを収集する 3-3. 結果を質問票調査報告書としてまとめる 3-4. COVAMSアプローチの実施費用が算出される 3-5.他のLFとの比較で、COVAMSのLFの役割や有効性が示される 3-6. COVAMSアプローチにより普及される技術に係る検証計画をたてる	
指標	活動実績 （評価時（2017年10月）および プロジェクト終了時（2018年3月））
3-1. 少なくとも80%以上のLFsがCOVAMSアプローチによるCMFA活動に関する研修を、各分野1回以上実施する	<評価時2017年9月末>指標は達成済み。 活動3−1〜3−3は実施済み 2017年1月作成のCOVAMSアプローチ有効性分析質問票調査報告書によれば、育林、土壌保全、ガリコントロールのすべての技術において、100%のLFが1回以上研修している。 <案件終了時2018年3月> 指標達成済み
3-2. 少なくとも80%以上の住民が、LFsによって実施されるCMFA活動に関する各分野の研修を受講する	<評価時2017年9月末>指標は達成済み。 2017年1月作成のCOVAMSアプローチ有効性分析質問票調査報告書によれば、住民による育林研修の研修参加率は1年目81.5%、2年目90.3%、3年目88.2%だった。同様に土壌保全研修は88.8%、95.1%、97.0%であり、ガリコントロール研修は85.9%、94.0%、97.1%だった。 <案件終了時2018年3月> 指標達成済み
3-3. 少なくとも50%以上の住民が、CMFAに関する各分野の活動を実践する	<評価時2017年9月末>指標は達成済み。 2017年1月作成のCOVAMSアプローチ有効性分析質問票調査報告書によれば、苗木生産の実践率は、1年目に83.8%、2年目に89.6%、3年目に90.7%であり、植林の実践率は同様に84.6%、88.3%、87.9%だった。土壌保全技術の実践率は、1年目88.9%、2年目97.2%、3年目98.6%であり、ガリコントロール技術の実践率は同様に69.1%、69.2%、72.1%である。 <案件終了時2018年3月> 指標達成済み
3-4. COVAMSアプローチのCMFA技術の1つである等高線農法の有効性が明らかになる	<評価時2017年9月末>指標は達成済み。 活動3−4、3−5、3−6は実施済み 3-4-1. 2015年9月に提出された”Working Paper No. No.9: Soil Loss Study for Maize Gardens and Small Scale Check Dams”によって、2014/15年の農期に1,103haのメイズ農場が等高線農法により土壌保全され、全体で19,287 m^3（17.49 m^3/ha）の土壌浸食が防止されたことが明らかにされた。 3-4-2 3-4-3 計測方法の提案済み

成果 3：COVAMS アプローチの普及方法及び普及される技術の有効性が検証される		
		<案件終了時 2018 年 3 月> 指標達成済み
	3-5. COVAMS アプローチの CMFA 技術の 1 つであるガリ補修技術の有効性が明らかになる.	<評価時 2017 年 9 月末>指標は達成済み。 活動 3‒4、3‒5、3‒6 は実施済み 3-5. 2015 年 9 月に提出された"Working Paper No.9: Soil Loss Study for Maize Gardens and Small Scale Check Dams"によって、2014/15 年の農期に 4 県合計で 21,362 個のチェックダムが作られ、1 か所あたり 0.075 m^{3}の土壌流失を防いだため、合計で 1,602 m^{3}の土壌流失が防止されたことが明らかにされた。 <案件終了時 2018 年 3 月> 指標達成済み

(4) 成果 4：「全てのレベルの関係機関の指導的立場の関係者間において、COVAMS アプローチのコミットメントが強化される」の達成状況

成果 4 の活動は計画どおり完了した。成果 4 には 4 つの指標が定義されている。これらの達成度は以下のとおりである（表 14）。

- 指標 4-1「県レベルにおいて CCO ・TST 会合などが、県森林管理官事務所が主体となり定期的に開催される」の達成状況は、CCO と TST の月例会合など、村落レベルでの COVAMS 関連会議が定期的に開催されており、指標を満たしている。
- 指標 4-2 の「対象 4 県間の PM 会合などが、県森林局や州局が主体となり開催される」の達成度は、南部州森林管理官（RFO）のイニシアティブのもと月例 PM 会合が定期的に開催されている。この会合はプロジェクト終了後も引き続き開催されると考えられるが、毎月行うための車両の燃料の確保が懸念事項である。
- 指標 4-3「県関係局が主催する省庁関係者や県関係者対象のフィールドビジットが、少なくとも 1 回以上開催され、8 人以上が参加する」の達成度は、以下のとおり。プロジェクトは MoNREM、MoAIWD、MoCECCD、MCFW、他のドナー、民間企業など主要な利害関係者を訪問し、制度化に向けて CMFA の紹介を行ってきた。2018 年 3 月 26 日には、COVAMS による CMFA 普及のためのセミナーを RFO 主催で開催した。この会合は、現在実施している 4 つの対象県に加えて、隣接する Mangochi、Ncheu、Machinga、Zomba の各県の関係者を招致し、COVAMS による CMFA の展開可能性について議論した。
- 指標 4-4「関係諸機関の訪問と説明が省庁関係者や県関係者を対象に、少なくとも 3 回以上実施される」の達成度は、各省庁の職員のイニシアティブにより、プロジェクト終了までに 3 回以上の現場訪問が実施されている。

このほか成果 4 に関連して以下のような活動実績がある。

- マラウイにおいてラジオは、持続可能な保全活動を普及させる有望なアプローチの一つと考えられている。森林局と MoAIWD の間に特別の取り決めがある場合、MBC の

公共放送に割引が適用されることが判明した。この制度を利用して、プロジェクトはMoAIWD農業普及サービス局（Agricultural Extension Services Department）のラジオ番組を制作して、一般の農民に対してCOVAMSを用いたCMFAの普及番組を合計6回放送した。

- ラジオは、新しいアイデアを広報するには有効な媒体であるが、継続的に運営し放送を国営放送会社のMBCを通じて提供するためには、放送の専門家による企画、台本の制作、録音、編集などの熟練した支援が必要となる。コンサルタントは、業務実施契約移行後、国営放送で試行した経験を踏まえ農民や他の聴取者にも魅力的な放送番組を制作するための方法の手続きや必要条件を調査してきた。しかし、それでもなお番組を制作するため約US$500/回の追加費用が必要となる。マラウイ政府の予算確保に限りがあることから、ラジオ番組を持続的に運営していくには予算確保のための課題が多く容易ではないことが判明した。
- COVAMS Iの実施中には、JCCの正式メンバーには、CMFAの利害が一致する民間企業としてブランタイア水道委員会と電力会社（ESCOM）を加えていた。しかし、COVAMS IIにおいては、これら民間企業はJCCメンバーには含まれていなかった[13]。そのため、本プロジェクト前半では民間部門との協業は、充分探求されて来なかった。2015年9月以降、コンサルタントチームは、Blantyreに事務所を置く大企業に対し、COVAMS活動への投資を促す取り組みを行ってきた。このため、COVAMSを周知させるためにマーケティングツールとしてのパンフレット類を更新し、新たなデザインの宣伝媒体を制作してきた。
- 他のドナーや、マラウイで活動する開発パートナーとの協力は、COVAMSの資金確保のために試行すべき分野の一つと認識されている。プロジェクトチームは、世界食糧計画（WFP）と世界資源研究所（WRI）に協力し、COVAMSアプローチをマラウイにおける有望な普及技術として紹介し、導入のための働きかけを行ってきた。各県のCCOは、これら機関との間で技術的な交流を行うためのサイトへの訪問機会多数を提供し、CCOから関係者に技術図書の提供を行ってきた。

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[13] COVAMS I終了時に、同プロジェクトにおいてこれら民間企業が果たすべき役割が明確にならず、特に財政的な支援を必ずしも充分に得ることができなかった。そのため、COVAMS IIを形成する際に、JCCメンバーに加えなかったとのこと。

表 14　成果 4 の指標達成状況

<table>
<tr><td colspan="3">成果 4：全てのレベルの関係機関の指導的立場の関係者間において、COVAMS アプローチのコミットメントが強化される</td></tr>
<tr><td colspan="3">（成果 4 にかかる活動）
4-1. 県レベルにおいて県森林局が主体となり CCO・TST 会議が定期的に開催されることを支援する
4-2. 対象 4 県間の PM 会議などが、県森林局や州局が主体となり開催されることを支援する
4-3. 県関係局が主催する省庁関係者や県関係者対象のフィールドビジットを計画する
4-4. 県関係局が主催する省庁関係者や県関係者対象のフィールドビジットを実施する
4-5. 省庁関係者や県関係者対象による関係諸機関の訪問と説明を計画する
4-6. 省庁関係者や県関係者対象によって関係諸機関を訪問し説明する</td></tr>
<tr><td colspan="2">指標</td><td>活動実績
（評価時（2017 年 10 月）および
プロジェクト終了時（2018 年 3 月））</td></tr>
<tr><td rowspan="4"></td><td>4-1. 県レベルにおいて CCO ・TST 会議などが、県森林局が主体となり定期的に開催される</td><td><評価時 2017 年 9 月末> 指標は達成済み。
各村落において COVAMS 関連の関係者による会議が定例的に開催される。
<案件終了時 2018 年 3 月> 指標達成済み</td></tr>
<tr><td>4-2. 対象 4 県間の PM 会議などが、県森林局や州局が主体となり開催される</td><td><評価時 2017 年 9 月末>　指標は達成見込み。
PM 会議は毎月一回、定例で開催されている。引き続き今後も定例で開催されるものと考えられる。一方、本会議の参集に必要な車両用燃料など一般経費が着実に配賦されていない。移動用の燃料代が毎月配賦されることが安定的な開催に必須である。
<案件終了時 2018 年 3 月> 指標達成済み
会議に参加するための車両燃料代が毎月定期的に配賦されることが必要。燃料の確保について、Malawi 政府の確約が得られず、長期的な実施には懸念がある</td></tr>
<tr><td>4-3. 県関係局が主催する省庁関係者や県関係者対象のフィールドビジットが、少なくとも 1 回以上開催され、8 名以上が参加する</td><td><評価時 2017 年 9 月末>　指標達成の見込み。
南部州主催の COVAMS セミナー（フィールドビジット）を 11 月～12 月開催予定で準備を進めている。参加対象は、現在の対象 4 県、中部シレ川流域に含まれる (Mangochi), Ntcheu, Macchinga, Zomba Chiradzule が対象となる。右準備を 10 月以降現地で行う。
<案件終了時 2018 年 3 月> 指標達成済み</td></tr>
<tr><td>4-4. 「指標 1-1. 関係諸機関の訪問と説明」が省庁関係者や県関係者対象により、少なくとも 3 回以上実施される</td><td><評価時 2017 年 9 月末> 指標は達成済み。
それぞれの機関への訪問・説明は複数回実施されている。
<案件終了時 2018 年 3 月> 指標達成済み</td></tr>
</table>

2.5.2 プロジェクト目標とその指標

プロジェクト目標の達成状況は以下のとおりである。前節で述べたように、計画された成果は全て達成されている。そのため、「COVAMS アプローチによる CMFA が対象県において制度化される」というプロジェクト目標は、プロジェクト終了時までに達成された。以下、2017 年 6 月の JCC において改訂された 2 つの指標に基いて、プロジェクト目標の達成状況について記載する（表 15)。

(1) 指標 1「県の関係各局の年次計画において COVAMS アプローチによる CMFA 活動が計画され、実践される」の達成度

- プロジェクトは年次レビュー会合を開催し、その機会に各県の 2017/18 年度の活動計画を策定、その計画に基づいた活動を実施してきた。その結果、4 県の全てで対象村の最新の情報を収集し、次会計年度の活動計画策定のため、年次のレビュー会合を開催している。しかし、前項で述べたように県の開発計画を定期的に更新する仕組みが機能していないことから、中期的な開発計画と投資計画を地区レベルで準備する仕組みは存在していない。
- COVAMS 終了後に向けたアクションプランの作成は、2018 年 1 月から 3 月にかけて開催した年次レビュー会合において実施した。アクションプランの詳細は、「V. プロジェクト完了後、上位目標達成のために」と別紙のアクションプランで詳細を述べる。
- 指標 2「COVAMS アプローチガイドラインが関係省庁により承認される」は、プロジェクト終了時までに、ガイドラインが承認され、これを印刷のうえ関係者に配布した。ガイドラインの内容は、2018 年 3 月 26 日に開催された普及セミナーで、関係する 4 県と隣接するシレ川中流域の 4 県の討議に付し、その内容と普及方法の課題について議論した。
- 表 11 に示すように、対象となる 4 県の 345 村が COVAMS アプローチに積極的に関与している。加えて、MoNREM、MoAIWD、MoCECCD である CP の全ての組織は、シレ川中流域において、プロジェクト終了後やそれ以降、同流域におけける CMFA の普及や実践に活用される技術文書として策定され、関係省庁で認定された。

制度化の 3 要素として定義した、「行政手続き」、「普及技術」、「予算/財務」の観点からの達成度は、以下のとおり。まず、「行政手続き」は、プロジェクトに関わった 3 省 4 部局の中央〜地方のレベルで、COVAMS による CMFA を実践するための、情報共有や日常の業務を通じて生まれる相互の作用により、将来に渡って、プロジェクトに関係した組織や個人において、行政上の連絡や調整、業務処理に関わる能力が向上したことが指摘できる。プロジェクトは、日常の COVAMS 運営を通じて、月次報告書や燃料の要請など、行政手続きに沿った業務を行っており、関与した CP の能力強化の機会を提供した。日常の報告・連絡などの書類や精算にかかる証憑類を遅滞なく提出すること、正確な報告をするこ

となど、なお改善の余地があるものの、プロジェクト開始時と比較して明確な能力向上が確認された。

表 15　プロジェクト目標の達成状況

プロジェクト目標	指標	達成状況
COVAMS アプローチによる CMFA が対象県において制度化される	1. 県の関係各局の年次計画において COVAMS アプローチによる CMFA 活動が計画され実践される	達成済み ・ 2017 年 2～3 月に開催されたレビュー会合とその後の計画会合を通じ、各県における 2017/18 年度の活動計画を策定した。 ・ 2018/19 年度の活動計画と各県の 3 年程度を見据えたアクションプランは、2018 年 1～3 月に準備された。
	2. COVAMS アプローチガイドラインが関係省庁により承認される	達成済み ・ COVAMS アプローチのガイドラインとマニュアルは、2018 年の JCC 開催前に作成され、MoNREM、MoAIWD、MoCECCD の 3 省 4 部局[14]によって、正式に承認され署名された。 ・ 正式に署名されたガイドラインを印刷・製本のうえ関係者に配布した。

「普及技術」は、5 年間の活動を通じて、当初 50 ヵ村から始まり、約 350 ヵ村において技術移転が行われるようになった。Blantyre 県は、従前のフェーズ（COVAMS）の実績を基礎として、多数の村落コミュニティに働きかけ技術を広めた。今フェーズ（COVAMS II）から対象地域となった 3 県は、当初の立ち上げから、比較的短い期間に、県の地勢や特徴を活かした普及手法を確立することができた。

「予算／財務」面からは、マラウイ政府の予算配賦が滞ることもあり、なお大きな課題がのこった。しかし、これはマラウイ政府全体に共通した課題で、対象県の責に帰すことができない。

中央政府の大統領府（OPC）は、ここまでに見られるような COVAMS の実践を高く評価し、本プロジェクトの活動が将来対象 4 県以外に普及・展開のための取組を支持している。

2.6 その他

2.6.1　環境社会配慮

本プロジェクトは、実施の過程で環境と社会に配慮して実施して来た。JICA が 2012 年 4 月に策定した「対マラウイ共和国別援助方針」には、「農業・鉱業などの産業育成のため

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[14] 3 省 4 部局は、森林局（MoNREM）、農業普及サービス局普及局と土地資源保全局（いずれも MoAIWD）、ならびにコミュニティ開発局（MoCECCD）を指す。

の基盤整備を支援する」ことが示されている。環境保護と気候変動への適応の一環として、植林や流域管理など自然資源保全のための技術協力も重視している。本プロジェクトは、援助政策上の優先事項にも沿ったものである。その観点から、シレ川中流域の 4 県における流域管理と環境保全に関する重要度は、プロジェクト開始以来変わっていない。

COVAMS II に類する技術協力プロジェクトでは、相手国側の人的能力開発を重視している。そのため、「普及活動の運営管理のためのキャパシティ開発」、「持続可能な自然資源管理による生物多様性保全と地域振興-SATOYAMA イニシアティブの推進」、「農民主導による普及手法 ～農民の自発性を高めるカリキュラム開発」など、本邦研修と第三国研修により、CP 研修を通じた人材開発を行うために主導的な役割を果たし、普及方法として COVAMS アプローチを導入してきた。

プロジェクト活動から得られた持続的な効果については、「学校における環境教育における CMFA の導入」を推進している。これは、本邦研修に参加した Mwanza 県の TST が、チャリ村のツーペ小学校における環境教育の中で CMFA を紹介したことに始まっている。CCO から CMFA に関連する技術を、学校の教師に技術移転した結果、現在これら小学校の 5‐6 年生が、苗木の生産、育林、等高線栽培や肥料生産を実践している。Mwanza 県の TST は、CMFA と森林保全の重要性を子どもたちに理解させ、彼らが成人になったときに CMFA を実践することを期待している。この活動を通じて親も CMFA の重要性を理解し、子どもたちから必要な知識・技術を習得することを期待している。同様に Neno 県においても、学校で CMFA を紹介するために TST が活動を始めた。

2.6.2 ジェンダー配慮・平和構築・貧困削減

(1) ジェンダー配慮

ジェンダー問題は貧困緩和政策の一環として、マラウイの国家開発目標の中の重要政策の一つに位置づけられている。同政策では、男女間の意思決定、社会参加などに不平等が存在していると指摘されている。農業に従事する専業農民の 70%は女性である一方、母系・父系社会を問わず､女性は土地使用・所有の権利を持っていない。そのため、女性の生産活動・食糧安全保障確保への関与強化が重要と考えられている。国家貧困削減政策･開発戦略では、農村開発における住民の組織化において、女性の関与の強化が求められている。これまで COVAMS アプローチでは、機会の均等を重視しており、対象となる村落内において対象者を選別せずに技術の普及を行ってきた。そのために対象村落内の全住民を対象とした活動を行うこととしている。とりわけ普及のうえで重要な役割を果たす LF の選定では、全住民を対象として互選を行っている。互選が公平かつ着実に行われることを保障するため、個人の能力や信頼に着目するよう、地域のリーダーとも十分相談し、このプロセスが支持されるよう配慮している。これらを着実に行うために、女性の活動への関与と

参加を支援する一方、男女に LF を公平に割り当てるクオータは行わず、当人の能力と他の住民からの支持に着目して選定されるよう配慮してきた。

COVAMS アプローチを用いた全ての研修は、対象村落内で住民の希望する日に繰り返し実施することを基本原則としている。これは、乳幼児を抱え育児・家事に忙しい女性など、全ての住民が参加できるよう配慮をすることによる。

(2) 貧困削減への対応

本プロジェクトは、「第三次マラウイ成長開発戦略」（MGDS III）に基づき、貧困撲滅に配慮して実施されている。2017年7月策定の戦略は、2022年を目標年次とする5カ年計画で、「水、気候変動、環境管理および人口成長に配慮しつつ、持続可能な経済成長、エネルギー、産業およびインフラ開発を通じて、マラウイを生産的、競争力、弾力性のある国に移行させる」ことを目標としている。MGDS III は、5つの優先分野[15]と8つの開発課題を掲げ、経済成長とともに国民の基礎的サービスへのアクセスの確保を重視している。同戦略において森林セクターは、「農業・水資源開発および気候変動対策」分野に包含されており、これは従前の MGDS からの取り扱いと同様である。次ページの表12に、MGDS III の貧困緩和への戦略と、COVAMS II の提供する技術の関係を示した。機会均等を重視し、対象者を選別せずに技術の普及をめざす COVAMS 手法は、MGDS III の各戦略に親和的である。同手法による村落開発は、地域全体の技術・知識の底上げの効果が高く、伝統的な普及手法[16]、と遜色のない効果をあげることができると考えられる。

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[15] 5つの優先分野とは、（i）農業、水資源開発および気候変動への対応、（ii）教育・技能開発、（iii）エネルギー、産業及び観光開発、（iv）輸送・ICT にかかる社会基盤、ならびに（v）保健・人口 。その他の開発課題には、金融サービス、 社会的弱者への災害管理および社会的支援、ジェンダー、青少年育成、障害者および社会福祉、人間の居住と空間計画、環境の持続性、HIV/エイズの管理、平和と安全保障が挙げられている。

[16] 住民から選定した代表者（篤農家、モデル農家、住民グループなど）を起点とする普及アプローチ。この方法による問題点は、地域コミュニティにおける弱者（例えば貧困層や女性、老人など）が活動から除外されてしまう懸念が常に存在している。

表 16　MGDS III の戦略と COVAMS の関係

MGDS III		COVAMS II
(重点分野 1: 農業、水資源開発と気候変動への対応)		
ゴール: 気候変動と生態系を基盤としたサービスに対応することのできる、農業の持続的転換と水資源開発		ゴール: 対象 4 県において農民の活動による流域管理が広く実践される。
アウトカム	MGDS III に規定された、COVAMS II に関連する戦略例	COVAMS II において開発・紹介された技術
農業生産量と生産性の拡大	・ 農業普及と村落における技術支援の強化。 ・ 誰もが参加することのできる研究、技術開発と普及のための農業の技術改革。 ・ 持続性と費用対効果を高めるための農業機関・農業プログラムの改革。	・ 本プロジェクトは、3 省 4 部局が連携して実施している。 ・ 技術普及の包括的なアプローチをとっている。 ・ プロジェクトの投入量が少なく参加者数が多く、COVAMS のアプローチは費用対効果が高いと考えられている。
栄養と食糧安全保障の改善	・ 全ての人々に食料と栄養に関する教育を行う。 ・ マラウイ固有の食料を保全振興するための教育と調査・研究。	・ プロジェクトによって普及が進められている環境保全型農業により生産性向上と食糧安全保障が強化されている。
農業リスク管理の強化	・ 気候変動に強い農業と持続的な土地・水利用の推進。 ・ 総合的な土壌と土中成分の保全の推進。 ・ マラウイの豊かな生物多様性保全のための総合的対策推進。 ・ 気候変動に強い農業と持続的な土地・水管理に必要な政策的メッセージとインセンティブの両立。	・ 環境保全型農業（等高線農業と堆肥利用など）が紹介される。 ・ 固有種を用いた植林・育林の推進。
水資源へのアクセス向上	・ 雨水管理、節水ならびにその利用。 ・ 集水域の開発と保全のための村落コミュニティの強化。	・ 節水と土壌保全のための等高線農法の紹介。 ・ 広大な対象地域における CMFA の推進。

出典：COVAMS II 専門家

第 3 章　評価結果

3.1 評価 5 項目による評価結果

3.1.1 妥当性

プロジェクトの妥当性は高く、プロジェクト実施期間中一貫してその妥当性に変化は無かった。

(1)　マラウイの開発政策との一致

本プロジェクトは、事前評価時に分析・評価されたマラウイの森林政策との整合性を、終了時評価の現在まで維持している。

マラウイ政府は、コミュニティを基礎とした森林管理や、持続的利用により資源劣化の防止、持続可能な森林管理と社会経済的利益の向上を目的として、国家森林政策（1968 年策定）と国家森林計画（2000 年策定）を採択し、森林資源の有効利用を進めている。

マラウイ政府は、法や政策と現実との間に生じているギャップを埋めるため、国内外の広範な利害関係者とのコンサルテーションを経て、1996 年に改訂された、国家森林政策の見直しを進めて来た。2016 年 6 月には、新しい「国家森林政策（National Forestry Policy: NFP）」を策定した。NFP はマラウイの持続的開発と、森林資源の利用と保全のバランスを取るため、適切な森林利用の枠組みを定め、保全・保護すべき区域の整備と、適切な資源管理を推進している。NFP によると、国土総面積に対する森林の被覆量を、現在の 28%から、2021 年までに 30%まで回復する政策目標を持っている。NFP は、右政策目標の達成に向けて、同政策に規定された諸施策を実施し、森林資源の持続可能な管理を進めるとしている。NFP には、1) 地域社会、市民社会、民間部門の森林保全と管理への参加を促進するための枠組みの提供、2) 木材と森林由来製品とサービスの持続的かつ自給自足の達成、3) 環境保護、生物多様性保全、気候変動管理のための森林の持続可能な管理、4) 適切かつ持続可能な短期・中長期の森林部門の資金調達メカニズム、5) GDP への貢献のためのイニシアティブ開発のための政策実施に必要な人材育成、6) 食糧安全保障向上、エネルギー源確保、気候変動への対応力の向上、水質の改善、などが含まれている。

また、2020 年までに貧困撲滅という国家目標を達成するために、国家森林景観再生戦略（NFLR 戦略）が開始された。同戦略は、2018 年から 2020 年までに、地域の森林や牧場、森林管理、土壌と水の保全、河川流域の復元に関する活動計画が含まれている。さらに NFLR 戦略は、国家森林政策（2016 年）の実施を加速させることを目指している。

(2)　マラウイおよび対象 4 県におけるニーズとの一致

本プロジェクトは、事前評価以来マラウイの開発ニーズと、シレ川中流域の土地保全と森林再生を通した流域管理の必要な対象 4 県のニーズに合致している。

国家森林政策（2016年）によると、マラウイの森林被覆面積は25万haである一方、森林減少率は 2.8%/年と推定されている。森林破壊の直接的な原因は、農地や居留地の拡大、制御不能な火災、収奪的なエネルギー確保（薪炭）、木材の需要などとされている。COVAMS アプローチに基づく CMFA は、対象 4 県の村落に対するプロジェクトの介入と活動により、これら村落で普及し広く実施されてきた。しかし、シレ川中流域における土壌浸食や森林資源の劣化を抑制するため、COVAMS アプローチによる CMFA のさらなる推進が必要である。現在、4 県で森林保全活動が推進されているが、薪炭確保のための違法な伐採はいまなお継続し、森林減少は止まっていない。特に、Blantyre 県では、木質エネルギーが同県における主たるエネルギー源であること、人口増加が継続していることから、木炭の消費が増加し続けている。シレ川への土砂流入は、南部州のみの問題ではなく、電力を全国へ供給している水力発電の稼働率にも大きな影響を及ぼしている。

(3)　日本の対マラウイ ODA 政策との一致

本プロジェクトは事前評価時から終了時まで一貫して、マラウイに対する日本の援助政策と合致している。

2012 年 4 月に策定された我が国の「対マラウイ共和国援助方針」では、「深刻な貧困からの脱却のための支援」を援助の基本方針としている。同方針によると、「農業・鉱業などの産業育成のための基盤整備」と「基礎的社会サービスの向上」の 2 点を重点分野としている。本プロジェクトは、2 つの重点分野のうちの前者に関連し、同方針にも規定されている「環境保全・気候変動への適応策の一環として、植林や流域保全を含む自然資源管理のための協力」に寄与するものである。

3.1.2　有効性

プロジェクトの終了時価時では、「COVAMS アプローチによる CMFA の制度化をさらに進める余地があるものの、プロジェクトの目的が成果によって達成される可能性が高いため、プロジェクトの有効性が高いと判断できる」とされている。

COVAMS アプローチに基づく CMFA の制度化のため、本プロジェクトは、利害関係者の調整のもと、各県のレベルで活動計画を策定する仕組みが整備されている。COVAMS による CMFA を効果的に実施するためのガイドラインとマニュアルが、プロジェクトにより作成され、関係する3省4部局によって正式に承認された。

より効果的な制度化のためには、県議会、ドナーや NGO などの外部からの資金を動員する仕組みの構築が必要である。中央の利害関係者間の資源の有効活用を調整する仕組みも制度化に不可欠なものであると考えられる。これらに対応するため、1) 民間資金の導入（発電会社 EGENCO の COVAMS による CMFA の実施）、2) タバコ税による還付金の導入（Balaka 県）が実施された。

プロジェクトの実施は、対象 4 県において CMFA の制度化促進に顕著な効果をもたらした。その推進力のひとつは、COVAMS アプローチが農家から農家へ訓練と普及活動が実施される点にあり、他方は CMFA がそれぞれの地域の事情に合致した適正技術で、広く応用可能である。

COVAMS の採用している普及アプローチは、公務員である TST〜CCO を経て、一般の農民である SLF〜LF によって形成されているカスケードを通じて技術移転が行われることにある。また、一連の流れを通じて、農民に対する訓練が行われるとともに、従来の方法と比して短期間に技術が普及・伝搬する仕組みになっている。プロジェクトの活動を通じて、過去 5 年間に 32 人の CCO のもと、435 人の SLF、3,745 人の LF が訓練され、それぞれが対象村落において一般農民に対する訓練と普及活動に従事している。その活動は、2017 年 10 月に実施された最終評価の時点で、4 県にまたがる 347 ヵ村、4 万 5000 世帯をカバーするに至っている。当初プロジェクトが開始された 2013 年には、対象村落が 50 村に過ぎない小さな取組が、極めて大きなスケールにまで普及・拡大することができた。また、訓練を受けた村民の多くは、3 つの CMFA 技術の全て、あるいはいずれかを継続的に実践している。

プロジェクトが紹介した CMFA 技術である、植林・育林、等高線農法、ガリ保全は、対象村落で広く普及し実践され、また効果を上げている。2015/16 年度に確認された CMFA 技術の実践による成果は、217 村において 234,872 本の苗木が植えられ、272ha の裸地が保全されたと推定されている。またこの間、14,020 基のチェックダムも設置された。このような植林と育林の最大の効果は、農家が自ら所有する農地や住居の周囲に木を植え育てることを通じて、違法な伐採を減少させることができることにある。彼らは、森林保全や土壌浸食を防止のため、メイズ畑や川岸沿いの共有地に共同で苗木を植えている。等高線農法の実践は、メイズ畑からの収穫量を増やし土壌浸食を減少させることができる。これらを実践する農家は、少ない農地において作業負荷が比較的少ないにもかかわらず、メイズの生産量を増やすことができた。チェックダムを設置した村落では土壌浸食量の減少や土砂堆積物によって浸食された谷の一部の土地が回復した。CMFA 技術が広範に普及しつつある成功要因である、地域で利用可能な資源を使用し、地域住民が適用可能な適正技術を容易に実践できることは注目に値する。一部村民は、植林や育成のため地方の森林局が実施している自然再生活動のための植林に取り組んでいる。

マラウイの等高線栽培は、小学校高学年の使う農業の教科書にも記載されているように、広く知られている技術であるが、実際には目に見える効果を上げていない。本プロジェクトでは、正確なマーカーリッジ[17]の設置とこれを基準にした等高線栽培を確実に行うことと併せて、雨水を着実に収穫するためのボックスリッジの設置によってより効率的な等高

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[17] 農地の等高線に沿って同じ標高になるように最初に設置される深い畝（小水路）で、15m おきに設置されている。畝づくりの基準となると同時に、周辺の流出水を集める役割も果たす。COVAMS が推奨する等高線栽培は、この畝を基準として 0.75m間隔で小さな畝を等高線と平行に配置するよう指導している。

線栽培を行ってきたことである。研修を受けた村民は、この方法を用いて、畝を適切に配置して改良された等高線栽培を着実に実践することが可能となった。ガリ崩壊防止のためのチェックダム設置も、石や岩、小枝などの現地で入手可能な材料を使用して、多数が設置されており一定の効果を上げている。

3.1.3 効率性

本プロジェクトはその活動の効率的な実施には、いくつかの制約があった。しかし、プロジェクトの全体的な効率性は終了時評価の時点で高い。これは、プロジェクトの投入が、COVAMS アプローチによる CMFA を実践するための能力開発と技術の普及の面で、大きな成果を効率的に上げたことによる。

終了時評価の時点で、日本側からの投入はほぼ計画どおりに行われた。派遣された日本人専門家の数や時期、提供された資機材の数量など、投入量は十分であったといえる。日本人専門家のもつ専門知識も十分なものであった。一方、2015 年の業務実施契約移行後に見られたコンサルタントの頻繁な交代は、対象地の状況を学び理解する時間が必要となり、活動の効率性を低下させた。一部の機器の品質と仕様は、県レベルでの TST と CCO の効率的な活動に悪い影響を及ぼした。日本側が提供したピックアップトラックやバイクは、普及活動に欠かせないものであるが、現地の過酷な路面や環境によって、頻繁に修理が必要な状態となり、修理には多くの時間と費用を要した。

マラウイ側の投入の一部は、不十分なものがあった。CP のうち TST と CCO の数は、LF への研修を効率的に行うのに十分だったが、オートバイの燃料費など普及活動に必要な費用は、同政府の予算制約のためマラウイ側で負担することができなかった。制度化を推進する鍵となる県知事（DC）の交代は、それぞれの県に新任の DC が配置されるまでの間、プロジェクトの意思決定に一定期間のタイムラグが生じたことは否定できない。

一方、プロジェクトによって確立された調整メカニズムは、村落への投入資源を効率的に動員し、他のプロジェクトやプログラムによる介入の重複を避けることを可能にした。特に、時間のかかる調整プロセスや重要と考えられている MoNREM、MoAIWD、MoCECCD の 3 省庁間の調整のもと、TST と林業、農業、地域開発にまたがる CCO が動員されてプロジェクトの活動が実施されてきた。

さらにプロジェクトは、訓練と普及活動のための投入を最小限に抑えつつ、約 350 人の村民を LF として育成した。彼ら LF により 45,000 世帯以上がプロジェクトによって導入された CMFA に関する訓練を受けて実践することから、訓練と普及活動がカバーする範囲は非常に広いものとなった。活動の大きな展開は、プロジェクトの高効率化に大きく貢献している。

3.1.4 インパクト

(1) 上位目標の達成見通し

上位目標の達成は、COVAMS を卒業した村落の継続的な努力、3 省 4 部局、県議会、その他のドナーと NGO の支援によって達成されることが期待される。

既に述べたように、プロジェクトは、少ない投資による Lean COVAMS アプローチによって、Mwanza 県の非ターゲット TA の 5 村で COVAMS アプローチによる CMFA を拡大・実施している。対象 TA 周辺に隣接するいくつかの TA においても、COVAMS による CMFA の介入効果が知られるようになり、COVAMS アプローチによる CMFA を行うよう、対象村落への支援を求める声が高まりつつある。2 年間の COVAMS による介入を終えた村落でも、プロジェクトによって訓練された SLF と LF の動員により、雨水の収穫などの活動が、他の政府プログラムや他のドナー・NGO の支援により実施されている。

これらプロジェクト終了後に上位目標を確実に達成するために、CMFA の普及とアップグレードのため、各県がアクションプランを作成した。本アクションプランにより、プロジェクト終了後も CMFA を維持・継続するため、必要な資源を動員する仕組みを検討した。

(2) 負のインパクト

最終評価時には、マイナスの影響は見られなかった。

(3) 正のインパクト

以下のような正のインパクトが確認された。

1) 対象村における農業生産の向上

以下のような正のインパクトが確認された。最終評価の際に実施した農民と LF に対するインタビューで、等高線農法の導入により、メイズなど生産量の増加が確認された。農民の多くは、農地における保水性が改善されることによって、同じ収量を確保するために必要な耕作面積と耕作に必要な作業負荷が減るという効果が期待されるという正のインパクトを得ることができた。試験圃場で確認されたモニタリングデータが不在であることから、これら農業生産への正の影響を客観的に検証することは難しいが、インタビューを受けた農民によると、高価な化学肥料を使用せずとも、等高線栽培によってメイズの生産量が増加したと証言する者が多い。

2) COVAMS 支援を終えた村落における森林回復

COVAMS による支援を終えた村落への訪問では、プロジェクトによって導入された CMFA を通して再植林が進展していることが確認された。評価時点で、モニタリングデータが限られていることから植林への影響を客観的に確認することは困難であるが、目視でも植生の回復が確認できた。また、プロジェクトの支援終了後も、訪問した多くの村落で植林・育林のための苗木の生産が継続していることが確認された。

3)　学校の環境教育における CMFA の導入

プロジェクトのもと、本邦研修に参加した Mwanza 県の TST は、チャリ村のツーペ小学校で、環境教育の一環として、CMFA の活動を紹介していた。同校では、CCO が学校の教師に対して CMFA 技術を指導している。同校では、5−6 年生と教師が CCO の指導を得て、苗木生産と植林・育林、等高線栽培や堆肥生産を実践している。担当する TST によると、生徒たちが CMFA と森林保全の重要性を理解し、将来成人になっても CMFA を実践することを期待している。また、学校で技術を習得した子どもたちを通じて、その両親も CMFA の重要性を理解し、家庭において必要な知識と技術を習得・実践することを期待している。現在、Neno 県でも学校で CMFA を紹介・実践するための活動が TST によって開始された。

4)　緊密で調和のとれた県レベルのサービス提供

本プロジェクトの特徴は、CMFA 拡大のために、3 省 4 部局が協働して全国、州、県レベルでのプロジェクト活動の必要な調整に関与しているということが挙げられる。その結果、複数の省庁にまたがる CCO と TST が、現場において CMFA 実践を働きかける SLF と LF に対して技術的サービスを提供する役割を充分に果たしている。本プロジェクトの採用する CMFA 技術は、林業のみならず、農業、土地保全、生計向上という、マラウイの農民に必要な分野を跨っており、これら複数の省庁が共通して取り組むべき課題である。CCO と TST のアプローチは、各県に 1 人しか配置されていない MoCECCD の役割を補完して、その普及活動を拡大することにも貢献している。MoAIWD の観点からは、農業全般の複数の課題に対応する機能の一部が、他の省庁に所属する CCO と TST の協力も得ることができることから、擬似的なワン・ストップ・サービスに統合して提供することができた。

5)　SLF と LF に対するリーダーシップ強化

4 県に配置されている 3,745 人の認定された LF、435 人の認定された SLF は、技術と技法を実証し普及させる技術リーダーとしてだけでなく、村の開発のための「チェンジ・エージェント」として、シレ川中流域において新しい技術導入のための導入点となることも期待されている。実際に、彼らのリーダーシップは、先に述べたように COVAMS の介入を卒業した村落において、他のドナーや開発パートナーからの支援を効果的に実施するために、有用な地域の資源として高く評価されている。

3.1.5　持続性

プロジェクトの持続性は、COVAMS による支援を終えた村落で CMFA が継続されていることによって確認することができる。プロジェクトによる効果の持続性は、政策・制度、組織、技術、財政のそれぞれの観点から、プロジェクト終了後もある程度継続することが期待される。一方で、いくつかの課題が残っていることも事実である。

(1)　政策・制度面の持続性

シレ川中流域と対象4県ではCMFAや環境保全に関する政策の優先度は今後も高い。国家森林政策2016によると、森林減少と森林劣化の抑制は、持続可能な森林管理に対する包括的なアプローチにより進めることが求められている。コミュニティベースの森林管理、森林セクターの人的・組織的な能力開発、資金調達メカニズム強化などの政策優先分野は、4県においてCOVAMSアプローチに基づきCMFAが継続する蓋然性が高い。

(2)　組織面からの持続性

本プロジェクトが訓練したSLFは、LFや担当する村落の農民にとって技術移転とバックストップの結節点として、プロジェクト終了後も継続的に役割を果たすことができる。そのため、プロジェクト終了後もCOVAMSアプローチによる普及メカニズムが継続・維持されることが期待できる。評価時点で予想できる懸念は、彼らがSLFやLFとしてその役割と能力に自信を持っているにも関わらず、終了後に仲間の農民に対して提供する訓練のための追加のコンテンツや情報が少なくなることにより、彼らが継続的に動機づけされ、村落の中でそれぞれの役割や意識を維持することができるかどうかである。さらに、LFであっても、例えばモザンビークとの国境地域にあるMwanza県では多くが移住労働者として働く経験や可能性を有している。特に深刻な干ばつなどにより食糧不安に直面したときには、訓練されたLFが一時耕作を諦め移住労働者となることによりLFを失う可能性がある。一方、プロジェクトに関与する県職員をプロジェクトが実施されていない他県に異動させることは、将来的にCOVAMSアプローチによるCMFAを他の地域に普及・展開することに効果がある。

しかし、プロジェクトによって確立された調整メカニズムの持続可能性には懸念もある。県レベルでは、CCOとTSTの会合の継続の蓋然性は高いが、プロジェクトが提供したオートバイのメンテナンスと燃料の調達に限度があることから、業務での移動が限られてしまう。プロジェクトからの財政的支援なしに、県レベルの調整メカニズムを今後も維持することは難しいと考えられる。

(3)　技術面からの持続性

技術的な持続性を保証するための重要な課題は、プロジェクトによって訓練されたSLFとLFが活動を継続するかどうかによる。現場における技術的助言など、SLFとLFに対しては、TSTとCCOが定期的なフォローアップを継続することが不可欠である。TSTやCCOによるフォローアップ活動は、SLFやLFが仲間の農家を技術的に支援する活動を継続する動機づけともなる。このように継続的な働きかけをすることによって、暮らしに役立つ雨水収穫やCMFAのための新しい技術や技法を、農民たちが実践するよう動機づけ、奨励することが可能となる。同時に、CCOとTSTはSLFとLFのニーズを認識して、将来にわたり活動を維持し改善することが可能となる。

(4) 財務面からの持続性

マラウイではどのレベルでも自国の予算が非常に限られており、同国の開発予算はドナーや NGO などの外部ソースに大きく依存している。本プロジェクトの活動に関連するその他反復取引（勘定科目）（ORT）予算は、当初マラウイ側がプロジェクト実施を保障する金額が配賦される約束になっていた。しかし、当初は非常に限定された金額が配賦されたが、その後マラウイの国家予算が大幅に削減されたことから、最後の 2 年間は配賦されなかった。したがって、プロジェクト終了後に、マラウイ側の予算から CMFA に対して財政的な支援を継続的に受ける可能性は非常に小さい。

このような状況のもと、本プロジェクトは、研修に必要な投入量を最小限に抑える Lean COVAMS アプローチも導入した。 この方法は、COVAMS アプローチによる CMFA を普及させるために必要な予算を削減するのに役立つと考えられる。CMFA の活動規模は、外部からの支援の有無に依存することから、活動の規模を縮小することにより、小さいながら継続することを可能にしている。

これに加え本プロジェクトは、タバコ課税からの交付金、森林開発管理基金（FDMF）、マラウイ社会活動基金（MASAF）、シレ川流域管理プログラム（SRBMP）など代替となる財源を動員する努力を行った。Blantyre 県では、県独自の予算であるセーフティネットプログラムの実施にかかる予算を CMFA に動員することも可能と考えられる。

高価な化学肥料を使用しない等高線栽培による農業生産の高収量化により、効率的に賄われていない肥料補助金プログラムの予算を集水管理に関連する他のプログラムに配分することができ、改善された等高線栽培の一層の普及に役に立つと考えられる。

3.2 プロジェクト実施とアウトカム達成に寄与した要因

COVAMS の実施に関連し予見することのできる最も大きなリスクは、資金調達である。また、各県のリスクは多様で、例えば、人員配置、地理的条件、特定の年の気候条件とその影響などの違いもあり、成果に至る各県のアプローチは、それぞれで異なることにも留意すべきである。そのようにプロジェクトが 4 県を対象として実施されてきたことにより、以下のような要因がアウトカム達成に寄与して来たと考えられる。

3.2.1 関係者相互の情報共有と協働の重要性

2015 年 9 月に Balaka 県において、業務実施上の過誤が重なり、必要な職員が充分確保されず一部地域で活動が一時中断したことがあった。この状況は、同月に開催された PM 会合において報告され、その場で課題や問題点が分析され、業務は他県の助けを借りて元のように遂行できる状況に戻った。このような事象に対し、関係者が自分の問題として共有された情報から相互に学習し、県を超えて協働する体制になっていた。このように、PM 同

士の情報共有は、関係する 4 県の共同作業を今後も維持するうえで非常に重要なことであると考えられる。

3.2.2　業務の優先度に応じた人員配置

2016 年 10 月の本邦研修に、Neno 県から PM と県の業務に中核的な役割を担う管理者の 2 名が参加した。プロジェクトは研修員の選定にあたり、当該期間中の活動は代理の職員に移管することを条件に右人員が研修に参加することを認めた。しかし、権限を移譲された者は経験不足で、当時実施していた指導者研修（TOT）を円滑に進めるには、業務内容が複雑過ぎ、一部業務が停滞してしまう事象が起きた。この結果、TOT の実施が滞り、事前に立案した計画が日程どおりに実施できない村落が出た。計画の TOT のバックログは、彼らの帰国後すぐに処理され 2016 年 11 月末までに解決することができた。この事象から得られた教訓は、業務のアサイメントをする際に、充分な経験を持った人を配置すること、業務の優先度に応じ、適切な人員を配置することで、万一これがかなわない場合は、3.2.1 にあったように、他県の応援を以来することも考慮に入れて、プロジェクト全体として全体の業務が円滑に実施されるような人員配置に努めることが必要というものである。

3.2.3　予算配賦の課題

業務実施契約に移行した 2015 年 9 月以降、マラウイ政府からの予算配賦が、2 年度にわたり停滞したことは、プロジェクト運営上の最大の課題であった。このような状況を改善するために、中央政府職員が CMFA 推進のために調整と関与を高める必要が指摘されて来たが、予算配賦は財務省の判断やよりマラウイ政府全体の政策判断に依るところが多く、プロジェクトとして対応できる場面に限界があった。

3.3 リスク管理の結果の評価

（1）　Balaka 県における要員不足（3.2.1）への対応

上述のように州森林局全体として調整・支援を行ったことでこの問題は解決された。この事象に見られるように、関係者相互の学習や、州の課題として取り上げる RFO の役割の重要性を確認した。このような取組は、複数の県にまたがるプロジェクトの体制を維持するために、非常に有効であることが分かった。

（2）　2017 年本邦研修時の Neno 県における要員不足（3.2.2）への対応

職員が本邦研修から帰国した時点で、この状況は解決した。重要なタスクのスケジューリングと能力のある人に対して委任することが重要である。

（3）　恒常的な予算配賦上の課題（3.2.3）への対応

今後も資金調達の状況は大きく変わることはない。さまざまなチャネルを通じて資金を多様化させることは、リスクを軽減する 1 つの方法と考える。

3.4 教訓

3.4.1 COVAMS アプローチによる能力開発の有効性と効率性

COVAMS アプローチは、限られた投入資源とこれを利用した訓練により 2 年間に集中的な介入を行うことにより、短期間でより多くの村落をカバーすることを可能にしている。同アプローチは、農民から農民への技術移転によって、CMFA 技術を効果的に普及させることを実現した。この方法は、地域で利用可能な資源を活用して非常に簡単に、その場所で適正技術を広範に普及させることができる。他の一般的な普及手法によって流域管理を普及させる場合、長期的な努力を必要とするが、COVAMS アプローチは、村落を基礎とした活動を通じ、短期間に効率的に広い範囲をカバーすることができる。この方法は、非常に効果的な人的資源開発によって、短期間に普及させることができた。

3.4.2 効率的な資源動員のための調整メカニズム

流域管理はセクターにまたがる課題をカバーする必要がある。そのため、村落コミュニティを基礎とした CMFA を効果的に導入のためには、国、地方、県それぞれの行政機構において関係する省庁やセクターの関係者間の調整メカニズムを確立することが不可欠である。本プロジェクトの利害関係者である 3 省 4 部局は、それぞれ地方にまでくまなく普及員を配置しているものの、その配置は必ずしも充分ではない。また、リソース不足もあり、広大な地域を担当する普及員の移動手段の確保も大きな課題である。仮に、プロジェクトが森林局の普及員のみを対象として活動を設計し支援を行ったとすると、活動対象村落に他の省庁の普及員もプロジェクトとは別の目的で、訪問することが想定される。本プロジェクトでは、異なる使命をもつ 3 省 4 部局をプロジェクトの利害関係者として、それぞれに所属する普及員をプロジェクトにおいて「CCO」として共通の使命をもたせることによって動員した。その結果、マラウイの少ない人的資源にも関わらず、これを効率的に利用して、比較的短期間に必要なサービスを対象地域の隅々まで行き渡らせることができた。様々な省庁に所属する CCO に対してプロジェクトはトレーニングと移動手段（オートバイやその燃料等）を提供することにより、COVAMS の活動に併せて、各省庁が CCO に課している通常の業務も行うことが可能となった。

このような協働の体制は、プロジェクトにとっても関係する省庁にとっても、また対象村落の住民にとってもメリットがあることで、相互に Win-Win の関係にあるプロジェクトデザインであったと評価することができる。このようにプロジェクトは、複数のセクターをカバーする計画に基づき実践するために、必要となる調整メカニズムは、立ち上げやその確立に相当の時間・労力を費やすこととなった。プロジェクトの設計段階では、このような利害関係者の分析が必須であったと考えられる。本プロジェクトは、当初の開発調査とこれに続くパイロットプロジェクトと、前フェーズで関係組織間の信頼性醸成や、組織の役割の分析が奏功したと考えられる。このように、長期的な関与と、この間の試行錯誤は、プロジェクト運営上の基本的な資産として有効に機能したと考えられる。

3.4.3　介入する村落の資源調査の必要性

上述のように本プロジェクトは、COVAMS アプローチによる CMFA の普及を通じて、45,000 世帯という大きな波及効果を実現することができた。このような大掛かりな普及を達成したものの、村落が有する資源の現況調査が充分実施されていないという側面も持っている。そのため、結果として介入の効果を客観的に検証することが困難であった。これは、プロジェクトデザインの今後の検討課題の一つである。一般にプロジェクトに関わる専門家と CP の労力や時間には限界があり、本プロジェクトが取ったアプローチのように「普及」に重点を置くか、事前や事後のモニタリングを含む「資源調査」に労力を割くかの、トレードオフの関係にある[18]。本プロジェクトは、普及に重点を置く COVAMS アプローチの考え方に準拠したことから、村落ごとの資源調査を始めとするモニタリングに多くの資源を割いていない。プロジェクト終了時に抑えていない数字や継続的なモニタリングが行われていないデータが存在し、結果としてプロジェクトの効果を充分に把握できない側面もあったことは否定できない。具体的には流域管理の観点からは、単一の流域の中に村落がどのように分布しているのか、流域の中で脆弱な生態系はどこに存在していて、村落住民がどのような影響を及ぼしているのかなど、住民と環境の関係を把握するための基礎的データが不足していた。これらは、低コストの普及手法の確立を通じた流域管理の実践を目的とした本プロジェクトのスコープの埒外ではあるものの、長期的には、実践された CMFA が流域全体にどのように貢献しているのかを、将来、検証することが求められる。そのために、村落の資源調査を実施して自然資源の現状を把握し、介入後にこれをフォローアップすることが望まれる。このことは、プロジェクトが動員することのできる資源に

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[18] 一般にプロジェクト管理では、事前のベースライン調査、実施中のモニタリングの際に村落における情報収集を通じ必要な質的・量的な情報を収集する。COVAMS アプローチ（基本となった PRRIE 手法）においては、多数の村落での研修実施に重点を置く観点からモニタリングにその資源を「投入しすぎない」ことが謳われている。

限度があることから、プロジェクト終了後に CP が必要なフォローアップを行うために、可能であればマラウイ側に支援をすることも一つの方法である。

3.4.4　流域保全効果の測定について

長期専門家が 2015 年にまとめた報告書[19]によると、2014/15 の収穫期にプロジェクトが設 4 県 7 ヶ所に設置した試験圃場で観測された等高線栽培による土壌流出防止効果は、17.49 m^3/ha と推定されている。また、同じく 2014/15 の収穫期に 4 県に設置された合計 21,362 基の小規模なチェックダムにおける、平均土砂貯留量は、0.075m^3/基（チェックダム 1 基あたり 75 リットル）と推定されている。

等高線栽培は、表流水の流路を畝の設置によって長く取ることで、圃場全体としての平均流速を著しく低下させることができる。その結果、一面の圃場のなかを流下する雨水（表流水）の土壌への浸透量を増大させる効果が期待できる。この浸透効果の外に、人力で設置した不規則な流路（畝）のなかに存する無数の微小なポケット（凹み）に、流出土砂が貯留することによって、面的に大きな土砂の貯留効果を得ることが期待できる。しかし、地表に設置された畝は脆弱で、1 シーズンで形態が変化し、最終的には雨水や風力によって平坦化してしまい、貯留効果を失う。そのため、畝を毎年設置する維持管理が不可欠である。

チェックダムの設置によるガリ崩壊防止技術は、大きな労力が必要である。また、効果を上げるには、適切な場所・大きさ、材質の選定も重要である。例えば、勾配が急な場所では、表流水の流速が大きくなり堆砂効果は少ない。また、大きな石ばかりで堰堤の透水性が大き過ぎれば、堆砂量は限定的になる。一方、勾配が小さい平坦地の流路に設置しても、堆砂量は小さい。比較的平坦な農地全体の土砂流出を抑制するためには、適切な勾配をもつ小流域内に集中的に無数のダムを設置する必要があり、場所の選定、降雨量などに左右されることから、一律に効果を上げることは、その労力も勘案すると必ずしも容易ではない。

植林・育林の流域保全効果は、多数の既往文献にもあるように、土壌の安定や雨水涵養能力の増進など大きな効果が期待できる。ただし、効果が発現するためには長い期間と一定以上の密度と場所の選定が必要なことに留意が必要である。

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[19] Japan Inernational Cooperaation Agency. COVAMS II, Working Paper No. 9: "Soil Loss Study for Maize gardens and Small scale check dams September 2015.

第 4 章　上位目標達成に向けた取り組み

4.1 上位目標達成の見通し

JICA の技術協力プロジェクトにおいて、上位目標はプロジェクト終了後 3～5 年以内に達成されるプロジェクトの意図された結果である。本プロジェクトでは、終了後 3 年以内にその達成が実現されるものと想定している。

本プロジェクトの改訂後の上位目標は、「COVAMS アプローチによる農民の活動を通した流域管理（CMFA）が、対象県において広く実施される」と定義されている。この上位目標には、2 つの指標が定義されており、「COVAMS アプローチによる CMFA が対象県内の少なくとも 2 つの非パイロット TA において実施される」と、「COVAMS アプローチによる CMFA が県内の少なくとも 1 つの他ドナーの支援プロジェクトに利用される」である。各指標に沿ったプロジェクトの達成状況を以下に述べる（表 17）。

表 17:　上位目標の達成度

上位目標	指標	指標達成の見通し
COVAMS アプローチによる農民の活動を通した流域保全活動 (Catchment management through farmers' activities: CMFA) が、対象県において広く実施される。	1. COVAMS アプローチによる CMFA が対象県内の少なくとも 2 つの非パイロット TA において実施される。	【達成済み】 ・ 対象 4 県の非ターゲットの TA が、プロジェクトに対して COVAMS アプローチによる CMFA の実施と農民に対する研修実施を要請している。
	2. COVAMS アプローチによる CMFA が県内の少なくとも 1 つの他ドナーの支援プロジェクトに利用される。	【達成見込み】 ・ 村レベルの組織（VH-SLF-LFs-farmers）は、プロジェクトによって提供された研修によって強化されている。 ・ SLF と LF は、村落開発委員会や村落環境委員会などの地方委員会でリーダーシップを発揮し、SLF と LF は、将来の開発パートナーによる技術移転の焦点として機能している。 ・ 各県において、以下のようなドナー・NGO から、支援策提供されている（Blantyre : WFP、Save the Children、持続可能な発展のための灌漑基金（FISD）、Balaka : マラウイのカトリック開発委員会（CADECOM）、Neno : マラウイ福音協会（EAM）、Save the Children、Hunger Project など）

指標 1「COVAMS アプローチによる CMFA が対象県内の少なくとも 2 つの非パイロット TA において実施される」は、すでに達成済である。プロジェクトは、終了後も継続的に適用可能な、非常に少ない投入でも実施可能な Lean COVAMS アプローチにより、Mwanza 県の非ターゲット TA にある 5 村で CMFA の普及を行っている。対象 4 県に隣接する非 TA からも、COVAMS アプローチによる CMFA に関する研修の実施と県森林管理官事務所による介入を要請する声が上がっている。このことから、指標 1 はすでに達成されており、対象村落がさらに広がる蓋然性が高い。

指標 2「COVAMS アプローチによる CMFA が県内の少なくとも 1 つの他ドナーの支援プロジェクトに利用される」は、早期に達成の蓋然性が高い。COVAMS プロジェクトによる介入を終了した村落の一部には、他のドナーや NGO などが、引き続き CMFA の実践を行っている事例があることが判明している。例えば終了時評価の時点でも、Blantyre 県の Mtambalika 村において国際 NGO であるセーブザチルドレン（Save the Children）がガリ崩壊防止と土壌浸食防止について 72.5ha をカバーする大規模なチェックダムを設置する支援を行っている事例がある。同じく Blantyre 県の村落では、WFP の支援が COVAMS 終了後の村落組織を活用して、雨水収穫の設備を建設する支援を行っていた。この村落では、プロジェクトによって訓練・強化された SLF と LF からなる村落組織を基礎として、村落住民の持つスキルを活用して支援を効果的に実施している。

このように、プロジェクト終了の時点ですでにプロジェクトの支援を終えた村落のなかから、他のドナー等の支援により活動を継続している村落が出ていることを勘案すると、プロジェクト終了後 3 年～5 年の間に同様な取組を他のドナーの支援によって継続する村落が出てくる可能性は高いと考えられる。

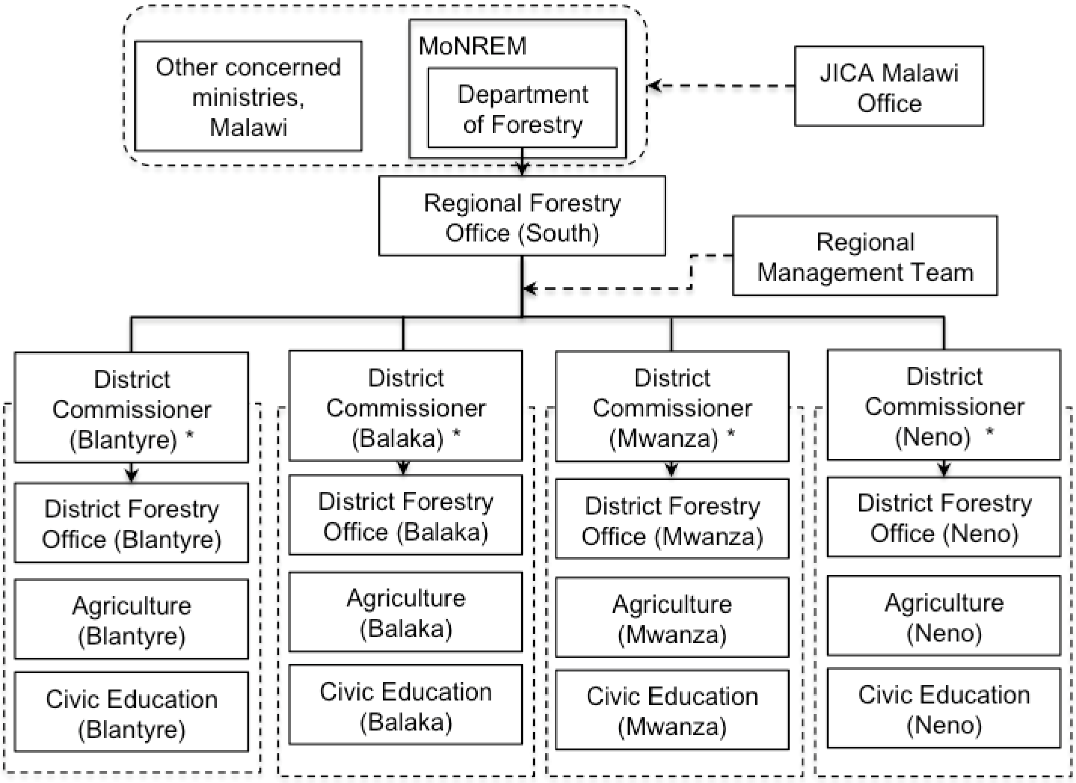
4.2 上位計画達成に向けた事業計画と実施体制

(1) アクションプランの作成

COVAMS の上位計画達成をその目的としたアクションプラン（事業計画）は、2018 年 1～3 月に実施されたプロジェクト最後のレビュー会合の際に作成された。Annex 6 に、2018/19 年以降の各県におけるアクションプランの要約を示した。本計画は、レビュー会合において、4 県の現状分析と、各県参加のセッションによる相互のクロスチェックを経て作成された。本計画は、2018/19 年の県の予算策定を行うための基礎情報として、州管理チーム（RMT）メンバーと RFO ならびに各県で使用される。この計画には、i）COVAMS II 村のフォローアップ、ii）Lean COVAMS の普及、iii）CMFA の拡大、iv）小学校での CMFA、v）将来のドナーとパートナーのリスト、の 5 つの項目で構成されている。この計画の各県における実施を確実にするために、2018 年 3 月 16 日に Blantyre において県知事（DC）と県計画開発部長（DPD）を招いた計画会議を開催し、彼らに計画の詳細を提示・説明を行い、2018/19 年度以降の CMFA への予算配賦を要請した。

(2) 実施体制

上位目標を達成するためのマラウイ側の実施体制を示す（図 1)。上位目標を達成するための活動には、森林局（DOF）本庁が責任を負う。



Project Manager (PM) is assigned at each district.
RFO continues to assume the responsibility of the Project Director.

図 1: 上位目標達成に向けたラウイ側組織の概要図

4.3 上位目標達成のための提言

4.3.1 プロジェクト終了後の運営

(1) CMFA の効率的な運営に向けて

マラウイ側は、各県における今後 3 年間にわたるアクションプランの実施、必要な援助資源の確保と動員、COVAMS アプローチによる CMFA の技術の向上に焦点を当てることが望まれる。各県は、前項のとおりレビュー会合を経て作成されたアクションプランに従って、CMFA を継続・展開することが望まれる。右計画に基づき、COVAMS アプローチによ

る CMFA を普及させ、周辺の村落や TA にさらに手を差し伸べ、CMFA 普及に向けて技術をより一層向上させることが望まれる。作成されたアクションプランは、CMFA を継続実施するために必要な人的資源、財源、物質的資源の特定のみならず、外部財源を動員するための戦略の基礎となるものである。この計画に基づき、県レベルの研修実施など、CMFA 展開に必要な活動の継続と、それを支える予算配賦が行われることが期待される。

(2) 経年変化を記録するためのモニタリング活動

COVAMS によって CMFA を持続的に継続するため、必要な資源を確保するには、CMFA の効果を正確に記録・検証し、その有効性を県知事や、省庁の高いレベルの政策決定者に説明することができることが重要である。そのために、部外者にも理解できるモニタリングが有効と思われる。一例として、衛星画像を用いた定点観測が有効であるが、画像の購入と解析が必要で、プロジェクト終了後の資金に懸念のあるマラウイ側の状況を勘案すると、困難も予想される。そのため、より簡易で安価に実施可能なモニタリング方法を導入することが必要である。本プロジェクトでは、通常のパノラマ写真を利用することを提案し、5 年程度の経年変化をモニタリングすることとした（4.4 に詳述）。

4.3.2 外部資金の確保

政府の予算配賦が厳しい現状から、プロジェクトの運営を今後も継続するために外部からの資金を確保することの重要性は繰り返し述べられてきた。成果 1 にも取り上げたように、発電会社（EGENCO）が計画対象地域内の Rivirivi 川流域において、同社の事業として植林事業を行っていることから、同社との共同事業を模索する試みは有効である。（2018 年 3 月 23 日に森林局において EGENCO と共同で植林を行うこと、そのための資金提供を EGENCO が行うことを基本合意した。このことは、2018 年 3 月 27 日に開催された最終 JCC に報告した。）この合意後、2018−19 会計年度に作成されたアクションプランに基づき、5 月中を目途として、両者関係者によるサイト訪問を実施のうえ、植林・育林を実施する場所の選定の準備を進めている。

4.4 プロジェクト終了時から事後評価までのモニタリング計画

プロジェクト終了後も、マラウイ側が継続して活動に取り組む予定である。

COVAMS の活動は COVAMS に関わるコミュニティやその他の利害関係者からの大きな投入を必要としないため、引き続き政府職員が対象コミュニティを訪問しモニタリングを継続することが重要である。本プロジェクト終了後、3～5 年後に行われる事後評価に備えたモニタリングを行う。その具体的な方法は、プロジェクト終了時に各県 3 カ所のモニタリ

ングサイト[20]を選定し、事後評価までの植生の変化を定点観測することとした。モニタリングサイトには、コンクリート杭を設置し、この場所から年に一回写真撮影をして、植生の変化を観測する。2018 年 3 月中にベースラインとしての撮影を行い、写真集（アルバム）3 冊を作成した。右 3 冊を 1 部はリロングウェの森林局本部に、1 部はブランタイアの RFO 事務所、最後の 1 部は JICA マラウイ事務所において保管することとした。

4.5 事業終了後の COVAMS 展開継続とそのリスク

4.5.1 森林政策における COVAMS アプローチの位置づけ

National Forestry Policy（国家森林政策）、Malawi National Forest Landscape Restoration（国家森林景観復元事業）など、マラウイの森林セクターには、多数の諸政策・計画図書が存在している。これらは、荒廃した森林回復を実現するために現在も有効である。このように、マラウイの森林セクターの計画図書は多数存在しているものの、森林局にはこれらを実施する人的、資金的、制度的な資源が不足している。森林局はこれら計画をロングリストとして掲げることにより、興味をもった開発パートナーが提供する資源を用いて実現することを考えている。これら計画を実施するの段階では、ドナーに依存せざるを得ない状況にある。

4.5.2 実施体制

従来各県の計画では、対象 TA を決定後は、その全村落を対象として COVAMS による CMFA を普及させることを計画していた。この方法は、最終的に TA 内の全ての住民に研修機会を提供することになり、COVAMS アプローチの「機会均等」という考え方に沿った支援の方法とも言える。実際に TA のリーダーたちに説明するときも、全村落を対象にすることは説明を容易にしている。しかし投入資源が限定されるプロジェクト終了後の持続性を高めるためには、対象村落の選定方法に優先度をつける必要もある。今後は、同一 TA 中の森林資源の状況など自然資源の諸条件を分析し、優先度付けを行って介入することが必要となろう。CMFA では住民との協力が不可欠であることから、対象村落の選定方法を転換するため、新たな方法を試行してみることも必要である。新たな選定方法を採用するにあたり、空間計画、植生・土壌など科学的知見に基づいた現状分析が必要であることに加え、村落選定に優先度付けをすることについて、住民や地域リーダーをどのように納得させるかについても検討の必要性が高い。

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[20] 選定されるサイトは、共有林で育林・植林が行われている場所で、パノラマ写真によって定点観測が行える場所とした。

第 5 章　考察および結論

5.1 マラウイ COVAMS

5.1.1 COVAMS アプローチ

1.6 に述べたように、COVAMS アプローチは、JICA がセネガルで実施した、「セネガル総合村落林業開発プロジェクト（以下セネガル PRODEFI）」で用いられたモデル（PRODEFI 手法）を基礎として、のちに「機会均等を保障した研修による参加型村落開発と資源管理（英語名 PRRIE : Participatory Rural Development and Resource Management by Integrated Training for Equal Opportunity）」として開発された PRRIE モデルに依拠している。マラウイ COVAMS は、機会均等の保証のため５つの原則を提唱する PRRIE アプローチを基礎としながら、マラウイ独自の特徴も持っている。これは、実施される地域や組織・社会などの諸条件に併せて柔軟に運用することができるためである。
以下に、マラウイで実践されている COVAMS の特徴について概述する。

COVMAS アプローチでは、住民から選出された LF を活用し、村落への介入を通じて技術移転を行っている。この介入は、普及効果を確かめたうえで２年間を上限として行うことを原則としている。一般に、COVAMS アプローチの手順は、以下のとおり行われる。

(1)　導入（Sensitization Meeting）
GVHs, VHs, やその他の利害関係者への村落開発・環境保全活動への動機づけ

(2)　LF の選挙
15 世帯ごとに１名の LF を互選で選ぶ

(3)　LF に対する TOT の実施
LF に対する TOT の実施

(4)　村落内での研修
COVAMS の 5 原則に従って、自分の所属するグループのなかで、他の 14 世帯に対して研修を実施する。研修は、複数回実施

(5)　モニタリングと評価
原則として、介入は 2 年間を上限とする

5.1.2　プロジェクトのアウトカム

2013年のプロジェクト開始以来、3,000名のLFを養成し、約45,000世帯に対して研修を実施してきた（表18）。

表18　プロジェクトの介入実績（2017年10月時点）

項目	数値
対象村落	347ヵ村
対象世帯	45,705世帯
認証されたLF	3,745人
認証されたSLF	435人

また、技術移転を行った3つの技術の実践率もそれぞれ高い水準にある（表19）。

表19　介入前後の実践率変化 （質問票調査結果)

項目	介入前の実践率（%）	介入後の実践率（%）
土壌保全型農業	25	97
苗木生産	61	79
植林	65	89
ガリ補修	9	69

移転した技術の実践にともなう費用は以下のようにお推定できる（表20）。

表20 コスト分析（質問票調査からの推定）

項目	100本当りの費用（US$）
苗木生産	1.91
植林	1.24

5.1.3　Lean COVAMSの実践

マラウイでLean COVAMSを導入した背景は、プロジェクト目標である「制度化」に向けて、プロジェクト終了後におけるCMFAが継続される可能性を高めるために提案された。この提案の基本は、制度化に必須の 持続性を向上するために、現状の実施方法を見直し、さらに「現地化」「簡素化」「省投入」を進める必要から提案された。また、 セネガル、マダガスカルでの経験から見て、マラウイ COVAMSの実践は、比較的大きな投入やロジで実施されている。セネガル、マダガスカルでは、原則的に財は無投入で、研修提供のみで実施されている。

このような、Lean COVAMS へのプロジェクト提案に対し、マラウイ側の関係者からは、当初強い拒否感が表明された。LF への資機材・昼食代・T シャツなどの支給は、プロジェクトへの参加の強いインセンティブになっており、マラウイ側関係者の業務を促進することに役立っている。そのため、最終的に関係者への説得・合意形成に時間をかけて進めることとなり、試行までに 毎月議論を進め、一年かかった。最終的には、Mwanza 県の 5 ヵ村で試行することになった。この議論を進める過程で一部の職員との間で、COVAMS による CMFA を推進することは、外部機関とのプロジェクトであると同時に、3 省 4 部局の「本来業務」であるという認識の醸成に至った。

5.1.4 Lean COVAMS の適用条件

2016/17 年のシーズンから Mwanza 県の 5 ヵ村で Lean COVAMS を試行して来た結果、以下のような考察ができる。

まず、通常の COVAMS と比較した場合、実務上の差異（コスト比較など）はあまり大きくない（費用の節約は限定的)。また、Lean COVAMS が適用できる村落は、村民たちの開発意識や外部からの支援や課題解決に対するニーズが高いことが必須である。特に、外部からの支援に対する逼迫感のある村落が望ましい。マラウイの場合、多数の NGO やドナーが輻輳的に介入している地域があることから、他ドナーの入っていない遠隔地が望ましい。これは、多くのドナーの介入により、外部者からの支援によって「スポイル」されていない地域において、受容性が高いようである。一方、遠隔地になることから、車両やバイクなどのモビリティが重要である。さらに、 近隣の村落で他の開発パートナーの支援がある地域では、実践することが困難と思われる。特に、近隣の村落において、食糧支援や栄養向上プログラムのため、食料配布が行われている地域で、COVAMS を実践することは難しい。

5.2 COVAMS アプローチの有効性と課題

5.2.1 通常の研修と COVAMS の違い

このように実践されている、マラウイ COVAMS のアプローチは。通常の研修によるキャパシティ・ビルディングキャパシティビルディングとどのような違いや類似点があるのだろうか、下表（表 21）に、通常の研修とマラウイで実践されている COVAMS アプローチを比較した。

表 21　通常の研修と COVAMS との比較

項目		通常の研修	COVAMS
参加者・対象者		選別/ 受講資格・参加条件あり	対象村落住民であれば選別しない
参加者の登録・データ利用		参加者属性把握・データ利用	原則しない / 最小限の HH 調査
講師・トレーナー		地域外・外部講師	住民から選ばれる
コンテンツ		受講者の Needs (Leaner-centered)	
M&E	Reaction	Questionnaire Survey （アンケート）	N/A/ Observation
	Learning	Test/ Observation, etc.	N/A/ Observation
	Behavioral Change	Observation, 360° interview, etc.	実践率、Observation
	Result	投資効果 (R/I etc.)	(HH Survey) ？
費用		安くない / 講師謝金＋Overhead	安い / 現地リソース利用
教材・設備・器具・施設		通常は講師が選択、一般書籍	無し、殆ど不要・限定的
普及カバー率		低い、普及の閾値を越える例は稀	高い、最初から 50%以上を狙う

5.2.2　普及理論からみた COVMS アプローチ

COVAMS アプローチは、イノベーション普及モデル（diffusion of innovations model : エヴェレット・E・ロジャース）を援用している。 イノベーション（新しい概念）を受容する態度をもつ人々を５つのグループに分け、全体は正規分布になっている。それぞれの分布は イノベーター（革新者 : 2.5%）、アーリーアダプター（初期採用者 : 13.5%）でその合計は、全体の人数の約 16%に過ぎない。通常の普及理論においては、まずこの 16%に対して、着実に受容させること目指して普及活動を行う。

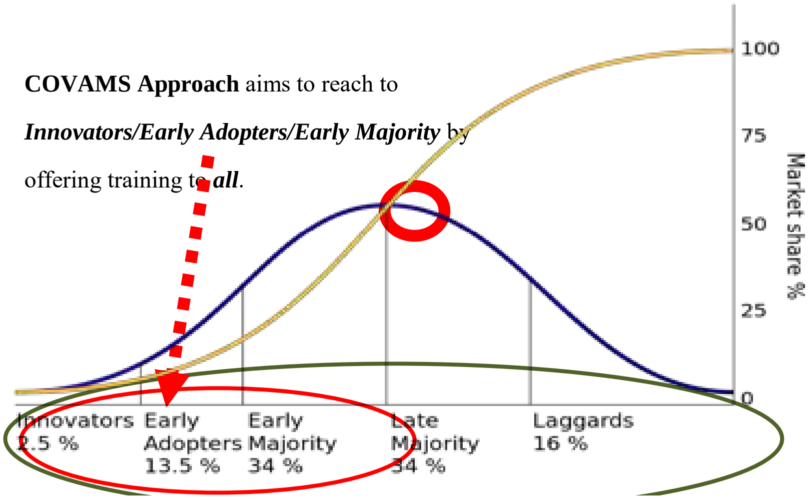

図 1　ロジャースの普及モデル

COVAMS アプローチでは、普及の転回点を上記の 50%としており、アーリーマジョリティ（早期追随者）にまで充分行き渡らせることを目標として普及活動を行っている。COVAMS が提供する技術は、日常の耕作活動において実践できるものを選択しており、転回点から先の早期の普及も見込まれる。講師は、対象村落住民から選ばれる。講師を、15 世帯に対して 1 名の比率で選ぶことにより、密度の高い研修を実施し、ドロップアウトを防ぐことが可能となる。なお、ここで、LF が 15 世帯に 1 名選定されることの意味を普及理論に基づいて説明する（図 2）。

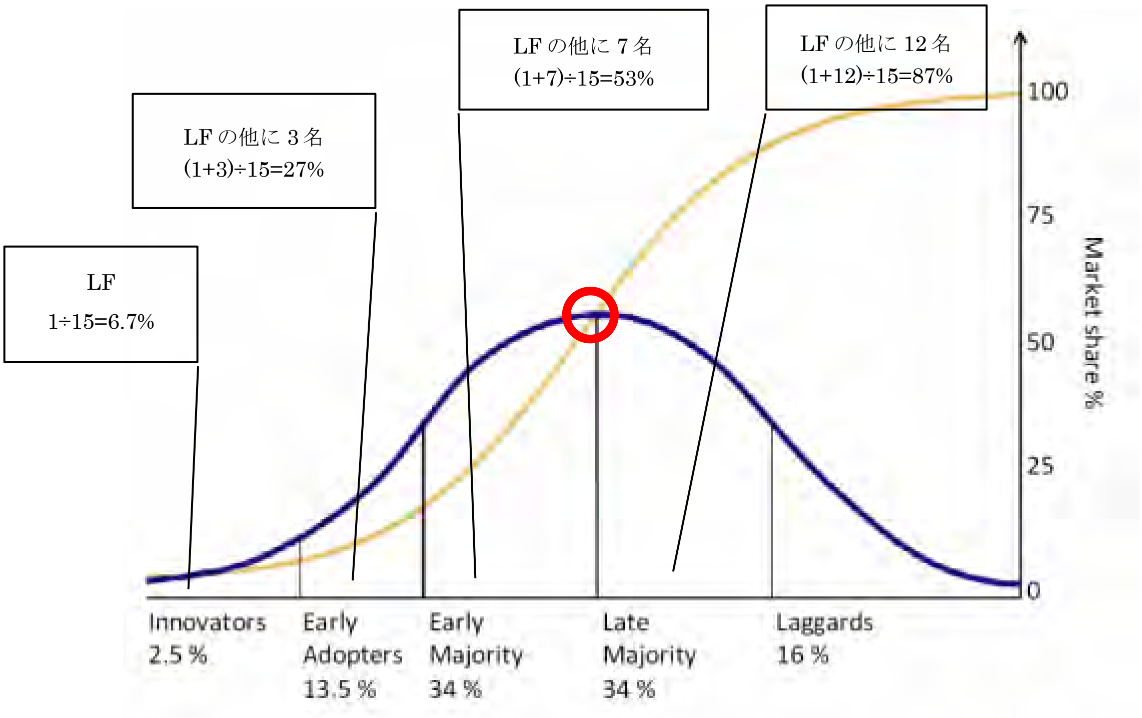

図 2 普及理論からみた LF

15 世帯について 1 名の LF が選定される COVAMS のモデルから、15 世帯（人）を普及対象全体(100%)と仮定すると、LF の選定は人口比 6.7%で、イノベーターに技術移転したことになる。次に、LF が 15 世帯の中から、3 名に対して技術移転すると、この時点で全人口に占める割合が 27%を超えアーリーアダプターに対して普及したことと等価である。さらに、4 名（LF の外に 7 名）へ技術移転すると、この時点で 52%を超え、普及の転回点として設定した 50%を超え、最早技術を受容した人々はマジョリティになる。大きな人口に対して普及活動を行う場合、50%の転回点を超えることは非常に難しい。しかし、COVAMS では LF を密に配置し、グループのなかの少人数を対象として活動を行うことで、高い実践率を得ることができる。これが、COVAMS アプローチが高い実践率を確保する理由の一つである。

5.2.3　COVMS の特徴

(1)　COVAMS の強み

COVAMS が援用する PRRIE アプローチにおける 5 つの原則は、手法・技法の柱となる考え方として、明解かつ理解し易い。この手法は、機会均等を狙っていることから、「社会主義」的なアプローチである。すなわち、コミュニティなど対象者全体で、良くなろうというもの（社会林業、保健など競争的でないもの）に対して親和性が高い 。また、条件が揃えば技術を早期に比較的安価に普及・展開できる普及技術である。また、展開速度が早く、最初から全員参加で行うことから、閾値を超えるまでの速度が早い。通常行われるモニタリングへの投資を最小限にして実施することも正当化できるとされており、従来のアプローチに対し「普及のイノベーション」ともいえる。

(2)　COVAMS の弱み

PRRIE アプローチの 5 つの原則を強調することによって、実施の方法が柔軟性に欠けることになりやすい（実際には、適用場所の条件に併せて柔軟な対応が可能である。しかし、原則を固めることが効果的な実践のために重要である)。

対象者を絞らず 広範な対象者を受け入れることから、脱落者も多くなる。また、 「競争的なもの」「多様性が必要なもの」への親和性は、高くない（詳細な分析が必要)。 また、既往の評価手法をある部分否定している（例えば、モニタリング、インベントリ・空間計画など通常の方法で重要と考えられている点よりも、資源を本来の事業目的である「普及」に振り向ける点)。この考えの背景には、専門家の本来の業務は、「普及」を行うことで、「モニタリング」をやりすぎても、普及には貢献しないという点がある。

最後に、COVAMS を順調に成功させていくと、徐々に対象村落が広がり、またより一層遠隔な場所で事業を行うことになる。そのため、技術移転を行うカスケード（対象者の広がり）が、どんどん大きくなっていく。また、普及のスピードが早いことから、戦端が急速に広がり、膨大なロジが必要となる。本報告で「モビリティ確保の重要性」を繰り返し述べている理由は、この点にある。

5.2.4　COVAMS の課題

これまで述べたように COVAMS アプローチ（あるいは、基礎となった PRRIE モデル）は、単一の普及手法としては、比較的安価かつ迅速に効果を上げる強い特徴を持っている。このアプローチは、密度の高い研修を 5 つの原則に基づいて実施することで、実践率の高いキャパビルを迅速に行うことのできる強みを持っている。この特徴は、普及理論にも合致しており、人的・組織的能力構築の方法としては、理論的にも説明のできる手法である。しかし、この手法を強力に推進しようとすると、相手国政府の政策決定に携わる人達に明

確に説明できる数的なエビデンスの提示が求められる。そのために、COVAMS の介入効果や経済性などについて、ODA の技術協力におけるデータを積み重ねる必要がある。

現在この手法の ODA における実施経験は、限られたもので、JICA 事業としてはセネガル、マラウイ、マダガスカルの 3 例にとどまっている。今後広く展開・適用するためには、規模や運営期間が小さくとも、実際の適用事例を増やすことが必要と考えられる。また、すでに述べたように、普及に資源を振り向けることで、展開速度が早いという利点をもつ反面、事前のベースライン確認や、実施中のモニタリングに、なお資源を振り向ける必要性も指摘されている。特に、事前のベースライン確認、モニタアリングに改善の余地があるので、普及速度を落とさないモニタリングの仕組みを組み込むことが必要である。流域管理に応用する場合は、モニタリングに空間計画をどのように取り入れるかが検討課題となる。近年国際機関でも採用されるようになった、オープンソース・ソフトウェアの GIS[21] を導入することなど、途上国の予算・調達・維持管理体制でも利用することが可能な技術の採用も検討すべきと考える。その場合、本来の普及業務を促進する資源は、十分に確保しつつ、低コストなモニタリング方法の開発と、効果の検証に必要なデータ収集も行うというアプローチが必要となろう。

5.3 結論

5.3.1 プロジェクト全体の総括

プロジェクト全体を俯瞰して、第 1 に、本プロジェクトの実施を通じ、マラウイ国の脆弱な普及システムを補完する仕組みを導入し一定の効果を上げることができたこと、第 2 に、直営による技術協力から業務実施契約に移行するなかで、両者の特徴を活かしたマネジメント例を示したこと、の 2 点を本技術協力の意義として位置づけることとする。

(1) 脆弱なマラウイの普及システムを補完する仕組みの導入

マラウイは、人口密度こそサブサハラアフリカにおいて最も高い国のひとつであるが、最貧国の一つでもあり、その政府機構、なかでも農業・林業セクターとコミュニティ開発セクターの行政機関が有する普及システムは非常に脆弱なものである。本プロジェクトは、密度の高い研修実施を基本として、地域住民のキャパシティ・ビルディングを通じて、農民相互の技術移転・経験の共有を行う仕組みを構築した。特に農民を育成した村落内のリーダーである LF の中から知識・技能・意識の高い人を選抜して、SLF を任命する仕組みを構築したことは、類似の普及システムにない取組であった。このことは、もともと配置が薄く稼働するための資源に恵まれないマラウイの公的な普及システムと、住民との間の

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[21] 途上国に GIS を導入しても、プロジェクト終了後のサブスクリプション・フィー（ソフト更新に必要な費用）の負担が困難となる。例えばオープン・ソースのソフトである QGIS の利用を検討することも有効な手段のひとつと考えられる。

隙間を補完する仕組みとして機能している。COVAMS 対象地域では、3 省 4 部局の公的な普及員を CCO として動員する取組みをするうえに、更に SLF～LF の導入を行い、非常に脆弱な普及システムのもつ課題のいくつかを改善する例を示した。このことは、5 年間に 45,000 世帯への介入達成と密接に関係があると考える。

(2)　直営による技術協力と業務実施契約両者の特徴を活かした業務例を示した

本プロジェクトの運営は、5 年間の協力期間のうち、前半 2.5 年を長期専門家による JICA 直営での実施、後半の 2.5 年を業務実施契約に切り替え、コンサルタントが行った。

前半の直営専門家によるプロジェクト運営は、従前フェーズとの連続性・継続性を維持しつつ、事業の枠組みを構築・立ち上げることであった。この部分は、専門家の専門性の活用、事業フレームが確定するまでの間、一定の試行錯誤が許される、直営による運営が適していたと考えられる。後半の事業実施契約による運営は、制度化という明確な到達点を示すことを通じて、適切かつ効率的な運営と普及範囲の拡大の両立、事業の決着点に向けた CP の意識変化促進などに役立った。

なかでも、当初の開発調査（2000 年）以来長期に渡って支援してきた森林局の関係者に対して、シレ川流域における一連の技術協力が一旦終了するという強いメッセージを与えることができた。すべての JICA 事業にこのことを一般化して適用することは困難であるが、今回の事例からは、業務の特性に応じた専門家チーム組成により一定の効果をあげた。

5.3.2　その他運営上の留意点

(1)　フェージングの効果

前項に関連し、森林セクターへの長期的な支援により、同セクターの真のニーズ把握に寄与することができた。前フェーズの COVAMS I から、長期専門家の活動を経て、CP との間に強い信頼醸成が得られた。このような長期の関与を通じて、受容度の高い 3 つの技術を Specified Training として特定することができた。また、得られた知見・経験を基礎として、COVAMS II（本フェーズ）の立ち上げ業務を長期専門家が担うことができた。最終的に業務実施契約の最後の 2.5 年は、これまでの基礎の上に 4 県へのさらなる拡大と、終了のための移管を中心に業務を進めた。このように、フェーズごとに、異なる使命が明確になり、その使命にもとづく体制で業務が行われたことは、一連のプロジェクトの特長である。

(2)　モビリティにかかる投資の重要性

最後に対象地域が広大なので、関係者に対して モビリティを確保することが重要である。

各フェーズでは、事業を継続するために、モビリティの維持がプロジェクトの重要な柱の一つであった。その事業規模から逆算すると、約 10 年のスパンで必要な投入として車両 6

台、バイク 25 台が必要であった。その結果、45,000 戸への普及を可能とした。COVAMS においては、これらコストは、原価償却の対象という考え方よりも、初めから一定規模の普及を行うための「埋没コスト」として考えるべきである。

(3) 原則の徹底

大きく 3 本の柱があった。第 1 に、COVAMS の「５原則」を愚直に行き渡らせること。そのために、特に専門家はぶれない意思を表明することが大切であった。

第 2 に、広大な地域で業務を行うために、モビリティ確保を優先事項として運営すること。車両関連費は、可能な限り投資する。

第 3 に、「運営を継続する」ことは重要であった。日常、証憑類が集まらないなど、多少のトラブルがあっても、プロジェクトを止めずに、拡大を目指して進める。モニタリングの照査よりも、日々の業務を前に進めることが重要という意識で業務を遂行してきた。第 4 に COVAMS 普及の条件を適用する場合は、当初は小さく作り、大きく育てることを目指した。COVAMS の場合は、当初の開発調査とパイロット事業以来、約 15 年の試行錯誤の結果、得られた果実で運営されて来た。その間、マラウイ・日本の両方で蓄積された人的・組織的・技術的資産に加えて、他国（セネガル、マダガスカル）で積み上げた知見に依って運営・実施されてきた。

第 5 に、マラウイでは、最初の利害関係者との関係性づくりなどにおいて 伝統的権威（TA）の分析・役割の解明、権威の尊重、行政機構としての仕組み理解などが重要であった。また、参加する公務員の能力向上を行ううえで、必要となるコンピテンシー（必要な業務遂行能力：Skill, Knowledge, Attitude）をきちんと書き出し、記録する「言語化」に務めた。このプロセスを通じて、習得目標や技術的な到達点を明確化すること、作成された評価基準に基づき、相互評価を導入し、人的能力開発のモニタリングを客観的に行えるようにしてきた。

以上

List of JICA Experts

【Long-term】			
Mr. Akira SATO	Chief Adviser/ Forest Resource Management	2013 April 10 - 2015 October 3	Nil
Mr. Hiroyuki KANAZAWA	Rural Development	2013 April 10 - 2015 October 3	Primela Ltd.
Ms. Satsuki FUKAI	Coordinator/Forest Resource Management (Watershed Management)	2013 May 27 - 2015 October 17	Nil
【Short-term】			
Dr. Kiyoshi MASUDA	Action Research	2013 May 6 - September 2 2013 October 1 - 2014 January 29	OAFIC Co. Ltd.
Dr. Hiroaki OKADA	Research Design	2013 May 31 - 2013 June 29	Sanyu Consultants INC.
Ms. Etsuko AKABANE	Extension Strategy	2014 June 23 - 2014 December 21 2015 January 9 - 2015 February 23	Japan Development Service Co. Ltd
Mr. Hiroshi KIKUCHI	Extension Material	2015 May 10 - 2015 July 08	CDC International

Name	Name	Title/ Expertise	Assignments		
			From	To	Days
Mr. Masato	Mr. Masato ONOZAWA	Team Leader/ Institutionalization 1	2-Feb-16	1-Mar-16	29
			17-Apr-16	14-Aug-16	120
			1-Jan-17	12-Feb-17	36
			9-May-17	27-Jul-17	80
			28-Oct-17	19-Dec-17	53
			2-Feb-18	2-Apr-18	58
Mr. Kikuo	Mr. Kikuo OISHI, PhD	Deputy Tem Leader/ Institutionalization 2	13-Sep-15	22-Sep-15	10
			2-Nov-15	12-Dec-15	41
Mr. Tomoyuki	Mr. Tomoyuki SHO	Deputy Tem Leader/ Institutionalization 2 & 3	15-Nov-15	5-Dec-15	21
			30-Apr-16	19-May-16	26
			16-Oct-16	13-Dec-16	59
			17-Mar-17	23-Apr-17	38
			6-Aug-17	11-Sep-17	37
Mr. Tokio	Mr. Tokio KITAMADO, PhD	Extension Technology 1	17-Jan-16	1-Mar-16	45
			24-Jan-17	9-Mar-17	45
			3-Sep-17	12-Oct-17	40
			9-Feb-18	30-Mar-18	50

Name	Name	Title/ Expertise	Assignments		
			From	To	Days
Ms. Naoko	Ms. Naoko OGAWA	Extension Technology 2/ Soil Conservation Technology	10-Sep-15	16-Sep-15	7
			1-Mar-16	31-Mar-16	31
			7-Jun-16	8-Jul-16	32
			3-Mar-17	16-Apr-17	45
			1-Aug-17	14-Sep-17	45
			9-Jan-18	20-Feb-18	43
Ms. Mami	Ms. Mami SATO, PhD.	Training Management/ M&E	2-Oct-15	15-Nov-15	45
			27-May-16	26-Jun-16	31
			13-Jan-17	19-Feb-17	38
			20-Jun-17	3-Aug-17	45
Ms. Kanae	Ms. Kanae TANAKA, J.D.	Project Coordinator/ Assistant Trainer 1	20-Sep-15	26-Nov-15	80
			8-Jan-16	1-Mar-16	59
Ms. Ayumi	Ms. Ayumi UEMATSU	Project Coordinator/ Assistant Trainer 1	15-Mar-16	30-Apr-16	48
			19-Jul-16	4-Sep-16	48
Mr. Keitaro	Mr. Keitaro ASABA	Project Coordinator/ Assistant Trainer 1	28-Oct-17	27-Nov-17	31
			20-Jan-18	16-Feb-18	28
Ms. Tomoko	Ms. Tomoko KIDA	Project Coordinator/ Assistant Trainer 2	18-Mar-16	14-Apr-16	28
			30-Sep-16	1-Dec-16	64
Ms. Izumi	Ms. Izumi SHIRAISHI	Project Coordinator/ Assistant Trainer 3	31-Aug-16	1-Oct-16	42
			24-Jan-17	2-Apr-17	69
			28-Apr-17	16-Jul-17	80
			1-Sep-17	15-Oct-17	45
			16-Feb-18	2-Apr-18	46

Counterpart List

Name	Designation in Government
Dr. D. Kayambazinthu	Director of Forestry
Mr. R. Kabwaza	Director of Forestry
Dr. C. Chilima	Director of Forestry
Mrs. C. M. Chauluka	Regional Forestry Officer (S)
Mr. U. S. Mbandambanda	Deputy Programme Manager, Blantyre ADD
Mr. S. A. Kamanga	Deputy Programme Manager, Blantyre ADD
Mr. A. Benati	Deputy Programme Manager, Machinga ADD
Mr. I. Chipeta	Deputy Programme Manager, Machinga ADD
Mr. P. M. H. Mkwapatira	Assistant District Forestry Officer
Mr. G. E. Kamanga	Regional Planning Officer (RFO S)
Mr. R. Kwelepeta	Chief Agricultural Extension Officer, Blantyre ADD
Mr. P. Kabuluzi	Chief Agricultural Extension Officer, Machinga ADD
Mr. R. Baluwa	Acting Chief Agricultural Extension Officer, Machinga ADD
Mr. R. Makungwa	Chief Agricultural Extension Officer, Machinga ADD
Mr. T. Chigowo	Chief Land Resource and Conservation Officer, Blantyre ADD
Mr. A. Kawejere	Chief Land Resource and Conservation Officer, Machinga ADD
Mr. F. Kwezani	Senior Land Resource and Conservation Officer, Machinga ADD
District Commissioner	
Mr. A. Chibwana	District commissioner, Blantyre
Mr. C. Kalemba	District commissioner, Blantyre
Mr. B Nkasala	District commissioner, Blantyre
Mr. G. Rapozo	District commissioner, Mwanza
Mr. J. Nguluwe	District commissioner, Mwanza
Mr. H. Gondwe	District commissioner, Mwanza
Mrs. M. K. Monteiro	District commissioner, Neno
Mr. A. Phiri	District commissioner, Neno
Mr. L. Nhlane	District commissioner, Balaka
Mr. R. Mateauma	District commissioner, Balaka
Blantyre District	
Mr. F. Matewere	Director of Planning and Development
Mr. G. Kanyerere	District Forestry Officer
Mr. M. Kamolomo	District Agriculture Developent Officer
Ms. J. Bondwe	District Community Development Officer
Mr Kupilingu	District Community Development Officer
Mr. M. Mbulaje	District Environment Officer
Mr. C. Masanjala	Assistant District Forestry Officer
Mr. J. J. Chigwiya	Senior Forestry Assistant
Mr. M. Simba	District Land Resource and Conservation Officer
Mr. T. Kamera	Assistant District Land Resource and Conservation Officer
Mr. C. Mthyoka	Assistant District Land Resource and Conservation Officer
Ms. P. Kadamanja	District Land Resource and Conservation Officer
Mr. N. Phiri	Agricultural Extension and Development Coordinator
Ms. J. Mulekano	Assistant Community Development Officer
Mr. K. Makwati	Forestry Assistant
Mr. I. Wandale	Forestry Assistant
Mr. M. Kavalo	Forest Guard
Mr. J. Andiwochi	Forestry Assistant
Mr. P. Kwachera	Agricultural Extension and Development Officer
Mr. P. Kalua	Agricultural Extension and Development Officer
Mr. E. Nkonya	Agricultural Extension and Development Officer
Mr. C. Yesaya	Agricultural Extension and Development Officer
Ms. A. Chagoma	Senior Community Development Assistant
Mr. I. Qoma	Agricultural Extension and Development Officer
Mr. Pakundikana	Agricultural Extension and Development Officer

Counterpart List

Name	Designation in Government
Mwanza District	
Mr. E. Chihana	Director of Planning and Development
Mr. B. Mtambo	District Forestry Officer
Mr G Kulemeka	District Forestry Officer
Mr. V. Wandale	District Agriculture Developent Officer
Ms. C. Chisenga	Acting District Agriculture Developent Officer
Mr. E. Mbendera	District Agriculture Developent Officer
Mr Kamawa	District Agriculture Developent Officer
Mr. P. M. Banda	District Community Development Officer
Mr Mponda	District Community Development Officer
Mr. J. Mwenechanya	District Environment Officer
Mr. J. Lichapa	District Agriculture Extension Methodology Officer
Ms. M. Chisale	Assistant District Forestry Officer
Mr. D. Chiningwa	Forestry Assistant
Mr. C. Lameck	Agricultural Extension and Development Coordinator
Mr. S. Kasambwe	Agricultural Extension and Development Coordinator
Mr. E. P. Kalitsiro	District Land Resource and Conservation Officer
Mr. F. Chaima	Assistant Community Development Officer
Mr. L. Fungulani	Senior Forestry Assistant
Mr. P. Chakana	Forestry Assistant
Mr. A. Benson	Forest Guard
Mr. F. Banda	Forest Guard
Mr. M. Zulu	Agricultural Extension and Development Officer
Mrs. C. Bingala	Agricultural Extension and Development Officer
Mr. H. Cherani	Agricultural Extension and Development Officer
Mr. A. Phiri	Agricultural Extension and Development Officer
Mr. M. Ngondo	Agricultural Extension and Development Officer
Mrs. S. Sodzapanja	Assistant Community Development Officer
Mr. M. Zilambalala	Community Development Assistant
Mr. C. Kaunda	Agricultural Extension and Development Officer
Mr. K Tembo	Agricultural Extension and Development Officer
Mr. I Chilanga	Agricultural Extension and Development Officer
Neno District	
Mr. M. Mwakhwawa	Director of Planning and Development
Mr. H. Chitema	Director of Planning and Development
Mr. E. Ngwangwa	District Forestry Officer
Ms. L. Mphande	District Agriculture Development Officer
Ms. R. Bvulumende	District Community Development Officer
Mr. D. Itimu	Acting District Environment Officer/District Fisheries Office
Mr. H. Bolokonya	District Environment Officer
Mr. D. Itimu	District Environment Officer
Mr. A. Macheso	Assistant District Forestry Officer
Mr. M. Tandaude	Agricultural Extension and Development Officer
Mr. A. Siska	Agricultural Extension and Development Coordinator
Mr. F. Magodi	Assistant District Forestry Officer
Mr. M. Dzumani	Agricultural Extension and Development Coordinator
Mr. S. Mzungu	Assistant District Land Resource and Conservation Officer
Mr. D. Gonambali	Assistant District Land Resource and Conservation Officer
Mr. V. Sambuka	District Land Resource and Conservation Officer
Mr. B. K. Mangulama	Forestry Assistant
Mr. F. Lopanda	Forest Guard
Mr. S. Chapasuka	Forest Guard
Mr. J. T. Banda	Agricultural Extension and Development Officer
Mr. E. Baison	Agricultural Extension and Development Officer
Ms. C. Kalinga	Agricultural Extension and Development Officer
Mr. T. Y. Nathaniel	Agricultural Extension and Development Officer
Mr. L. Mchawa	Community Development Assistant
Mr. M. Gazamiyala	Forestry Assistant
Mr. D. Mcheka	Forestry Assistant

Counterpart List

Name			Designation in Government
Balaka District			
Mr.	D.	Gondwe	Director of Planning and Development
Ms.	V	Kamasumbi Chirwa	Director of Planning and Development
Mr.	D	Zingeni	District Agriculture Development Officer
Mr	K	Nguluwe	District Community Development Officer
Mr.	C.	Kamwendo	District Forestry Officer/District Environment Officer
Ms.	A.	Chilingulo	District Forestry Officer
Mr.	B.	Nangwale	District Forestry Officer
Mr.	P.	Muhosha	District Forestry Officer
Mr.	W. D.	Ndhlovu	District Agriculture Developent Officer
Mr.	E.	Kadunga	District Agriculture Developent Officer
Mr.	M.	Chirambo	District Community Development Officer
Mr.	B.	Kamanga	District Environment Officer
Mr.	W. M.	Kalipinde	Assistant District Forestry Officer
Mr.	G.	Kamwaza	Agricultural Extension and Development Coordinator
Mr.	B.	Chimenya	Assistant District Land Resource and Conservation Officer
Mr.	C.	Nyirenda	District Land Resource and Conservation Officer
Mr.	J.	Chisale	Senior Community Development Assistant
Mr.	P. S. B.	Zisiyana	Forestry Assistant
Mr.	B.	Mvula	Forestry Assistant
Mr.	F.	Seyani	Forestry Assistant
Mr.	Z.	Banda	Agricultural Extension and Development Officer
Mr.	R. S.	Ndala	Agricultural Extension and Development Officer
Mr.	M.	Moyo	Agricultural Extension and Development Officer
Ms.	R.	Mazibuko	Senior Community Development Assistant
Mr.	S	Maluwa	Forestry Assistant

Training for Malawian Counterpart Personnel in Japan and Other Countries

Subject of training	Fiscal Year of Japan	Duration	Participants Name	Position	Output (Project Component)
Training In Japan					
Rural Community Development by Life Improvement Approach for Africa	FY 2014	2014 Jul. 06 - 2014 Aug. 23	Ms. A. Chagoma	CCO/Senior Community Development Assistant, Blanytre	Output 2
Regional Development by Systematic and Comprehensive Utilization of Forest Resources through Forest Certification System and Product Branding	FY 2014	2014 Oct .22 - 2014 Nov. 20	Mr. G. Kamanga	ARPC/Forestry Officer, Regional Forestry Office South	Output 2
Capacity Improvement in Operation and Management of Extension Activity	FY 2014	2014 Dec. 01 - 2014 Dec. 19	Mr. Gift Rapozo	District Commissioner, Mwanza District	Output 1 & 2
			Mr. G. Kanyerere	Project Manager/District Foresry Officer, Blantyre	
			Mr. B. Mtambo	Project Manager/District Foresry Officer, Mwanza	
			Mr. C. Masanjala	TST/Forest Officer, Blantyre	
			Mr. E. Kalitsiro	TST/District Land Resources and Conservation Officer, Mwanza	
			Mr. T. Kamera	TST/Land Resources and Conservation Officer, Blantyre	
Farmer-led Extension Method	FY 2014	2015 Jan. 13 - 2015 Feb. 13	Mr. M. Dzumani	TST/Agricultural Extension and Development Coordinator, Neno	Output 2
			Ms. C. Kalinga	CCO/Agricultural Extension and Development Officer, Neno	
Capacity Improvement in Operation and Management of Extension Activity	FY 2014	2014 Dec. 01-19	Mr. Gift Rapozo	District Commissioner, Mwanza District	Output 1 & 2
			Mr. G. Kanyerere	Project Manager/ District Forestry Officer, Blantyre	
			Mr. B. Mtambo	Project Manager/ District Forestry Officer, Mwanza	
			Mr. C. Masanjala	TST/ Forest Officer, Blantyre	
			Mr. E. Kalitsiro	TST/ District Land Resources and Conservation Officer, Mwanza	
			Mr. T. Kamera	TST/Land Resources and Conservation Officer, Blantyre	
Farmer-led Extension Method	FY 2015	2016 Jan. 05- Feb. 05	Mr. Cleopas Lameck	Agriculture Extension Development Coordinator/ Mwanza	Output 2
Capacity Development in Operation and Management for Extension Activities	FY 2015	2015 Dec. 06- 21	Mr. Charles Kalemba	District Commissioner, Blantyre	Output 1 & 2
			Ms. Memory Kaleso Monteiro	District Commissioner, Neno	
			Mr. Rodrick Mateauma	District Commissioner, Balaka	
			Mr. Hansford Chitenje Yusuf	Chief Policy and Programme Officer, Performance Enforcement Department, the Office of President and Cabinet	
			Mr. Martin Kausi	Programme Manager, Blantyre Agriculture Development Department, Ministry of Agriculture, Irrigation and Water Development	
			Ms. Gertrude Kalinde Thaulo	Programme Manager, Machinga Agriculture Development Department, Ministry of Agriculture, Irrigation and Water Development	
Promotion of SATOYAMA Initiative: Biodiversity Conservation and Community Promotion through the Sustainable Management of Natural Resources	FY 2015	2015 Oct. 12 – Nov. 14	Mr. Drake Chiningwa	TST/ Assistant Director, Mwanza Forestry Department Ministry of Natural Resources Energy and Mines	Output 2
Farmer-led Extension Method (Curriculum Development for Motivating Farmers)	FY 2016	2016 May 01 – Jun. 01	Mr. Maxwell John Moyo	CCO/ Agriculture, Balaka Agriculture Development Department, Ministry of Agriculture, Irrigation and Water Development	Output 2

Subject of training	Fiscal Year of Japan	Duration	Participants Name	Position	Output (Project Component)
Capacity Development in Operation and Management for Extension Activities	FY 2016	2016 Sept. 30- Oct. 21	Mr. Baird Simplex Nangwale	PM/ District Forestry Officer, Balaka Forestry Department, Ministry of Natural Resources Energy and Mines	Output 1 & 2
			Mr. Jafali Chisale	TST/ Assistant Community Development Officer, Balaka, Ministry of Gender Children Disability and Social Welfare	
			Mr. Aubrey Macheso	TST/ Forester, Neno Forestry Department, Ministry of Natural Resources Energy and Mines	
			Mr. Innoce Wandale	CCO/ Forestry Assistant, Blantyre Forestry Department, Ministry of Natural Resources Energy and Mines	
			Mr. Kalembwe Devine Makwati	CCO/ Forestry Assistant, Blantyre Forestry Department, Ministry of Natural Resources Energy and Mines	
			Mr. Elias Anderson Baison	CCO/ Agriculture Extension Development Officer, Neno, Department of Agricultural Extension Services, Ministry of Agriculture, Irrigation and Water Development	
			Mr. Fyson Livison Seyani	CCO/ Senior Forestry Assistant, Blaka Forestry Department, Ministry of Natural Resources Energy and Mines	
Promotion of SATOYAMA Initiative: Biodiversity Conservation and Community Promotion through the Sustainable Management of Natural Resources	FY 2016	2016 Oct. 02- Nov. 05	Mr. Emmanuel William Ngwangwa	District Forestry Officer, Neno, Ministry of Natural Resources Energy and Mines	Output 1 & 2
Farmer-led Extension Method (Curriculum Development for Motivating Farmers)	FY 2017	2017 May 01 – Jun. 01	Mr. Earnest Samson Nkonya	CCO/ Agriculture, Blantyre Agriculture Development Department, Ministry of Agriculture, Irrigation and Water Development	Output 2
Promotion of SATOYAMA Initiative: Biodiversity Conservation and Community Promotion through the Sustainable Management of Natural Resources	FY 2017	2017 Oct. 01 - Nov. 03	Mr. Gregory Mbawala Kulemeka	District Forestry Officer, Mwanza, Ministry of Natural Resources Energy and Mines	Output 1 & 2
Third-country Training (Kenya)					
Regional Training on Adaptation to Climate Change	FY 2016	2016 Oct. 16 - Nov. 19	Mr. Farai Kafanikhale	TST/Forester, Balaka Forestry Department, Ministry of Natural Resources Energy and Mines	Output 1 & 2

Equipment Provided by JICA

No.	FY	Item	Unit Amount	Unit	Cost （MKW)	Date	Condition
1	2013	Copier	2,627,075.00	1	2,627,075.00	2013. 06. 25	A
2		Computer and printers	830,878.00	5	4,154,390.00	2013. 07. 30	A
3		Motorbike	1,207,134.08	25	30,178,352.00	2013. 10. 14	B
4		Laptop computer	755,069.33	3	2,265,208.00	2013. 11. 18	A
5		4WD pickup	USD 25,817	4	USD 103,268.00	2014. 01. 16	A x 3, B x 1
			Exchange rate	432	44,611,776.00		
6	2014	Laptop computer	538,812.50	2	1,077,625.00	2014. 11. 18	A
				TOTAL	**84,914,426.00**	**MKW**	

Note that all equipent provided were transferred to the Malawian side.

A: Good, B: Passable, C: Out of use

Plan of Operation (Original)

Version 1
Dated November, 2015

Project title: Project for Promoting Catchment Management Activities in Middle Shire (COVAMS II)

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Period of Project: Five (5) years, April, 2013～March, 2018
Project Site : Four (4) districts in Middle Shire (Blantyre, Balaka, Mwanza and Neno Districts)

																																													Monitoring	
Inputs		Year	2015					2016												2017												2018												Remarks	Issue	Solution
		Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
Expert																																												Consultation as needed	The first dispatch of the Team Leader has been delayed	Another team member will be dispatched in November for a short term to take place for the Intitutionalization activities.
	Team Leader/ Institutionalization 1	Plan			▨	▨		▨	▨			▨	▨	▨	▨	▨				▨	▨			▨	▨	▨	▨	▨				▨	▨	▨	Dispatch is until March 2018											
		Actual																																										
	Deputy Team Leader/ Institutionalization	Plan		▨	▨	▨				▨	▨						▨	▨	▨				▨	▨						▨	▨															
		Actual		■																																										
	Extension Technology 1	Plan						▨	▨												▨	▨						▨	▨				▨	▨												
		Actual																																										
	Extension Technology 2/ Soil Conservation Technology	Plan		▨			▨						▨	▨											▨	▨		▨	▨				▨	▨												
		Actual		■																																										
	Training Management/ M&E	Plan			▨	▨								▨	▨					▨	▨													▨												
		Actual			■	■																																						
	Project Coordinator/ Asssitant Trainer 1	Plan		▨	▨	▨	▨	▨	▨	▨		▨	▨	▨	▨	▨						▨	▨	▨	▨	▨	▨					▨	▨	▨												
		Actual		■	■	■																																						
	Project Coordinator/ Asssitant Trainer 2	Plan								▨	▨						▨	▨	▨											▨	▨															
		Actual																																										
Training in Japan/ 3rd Countries																																												8 seats for 2015/2016		
	Country Specific Training	Plan																										▨	▨															
		Actual																																										
	Group and Region Focused Training	Plan						▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨														
		Actual																																										

Inputs Malawian side		Year	2015					2016												2017												2018												Remarks	Issue	Solution
		Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
Staff																																												In October 2015, a new PM and TST has been allocated in Balaka. There has also been some member exchange of the CCOs.	Commitment of the District Management Team members are scarce	Together with the Regional Project Coordinator and the Project Managers, the Japanese experts will encourage the DMTs to participate in the monthly meetings, and if necessary, reorient the members with the COVAMS Approach
	Project Director	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
		Actual	■	■	■	■																																								
	Regional Project Coordinator	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
		Actual	■	■	■	■																																								
	Regional Management team members	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
		Actual	■	■	■	■																																								
	Project Managers	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
		Actual	■	■	■	■																																								
	District Management team members	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
		Actual	■	■	■	■																																								
	Technical Support Team members	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
		Actual	■	■	■	■																																								
	Conservation Coordinating Officers	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
		Actual	■	■	■	■																																								
	Supporting staff	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
		Actual	■	■	■	■																																								

Office rooms																																														
Regional Management Team and Japanese advisor	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨				
	Actual	■	■	■	■																																											
District Management team members	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨				
	Actual	■	■	■	■																																											
Operational funds																																												Actions were taken by the GoMW side to allocation C/P funds for the project equipement maintance fees.		Maintanances fees of the project equiments and other activity costs needs to be allocated from the GoMW side.	Japanses experts will encourage and provide assistance to the district members as well as the regional members to apply for the fundings from the GoMW side.
Development funds	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨				
	Actual																																															
ORT	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨				
	Actual																																															
Activities	Year						2016												2017												2018												Responsible Organization		Achievements	Issue & Countermeasures
Sub-Activities	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	Japan	GoMW		
Activities for Output 1: Plans of CMFA using COVAMS approach are integrated in to District Implementation Plan/Annual Investment Plan of target districts.																																														
1-1. Orient stakeholders in the districts on the COVAMS II project and COVAMS approach	Plan		▨																																								J	M		
	Actual																																													
1-2. Set up district management team under DESC	Plan		▨	▨																																							J	M		
	Actual																																													
1-3. Facilitate group village headmen in target districts to include CMFA using COVAMS approach in the village - Team of advisors headed by Chief	Plan			▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨																			J	M		
	Actual																																													
1-4. Implement training sessions for the district staff to strengthen their abilities on formulating activity implementing plan and annual input plan towards budget allocation	Plan				▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨										J	M		
	Actual																																													
1-5. Integrate CMFA plan into district implementation plan and/or annual implementation plan (DIP/AIP), based on VAPs	Plan									▨	▨											▨	▨																					M		
	Actual																																													
1-6. Obtain approval from full council on the DIP/AIP	Plan											▨	▨											▨	▨																			M		
	Actual																																													
Activities for Output 2: Capacity of management and extension staff in target districts is improved in operation of COVAMS approach.																																														
2-1. Assess capacity of district staff in operation of COVAMS approach through observation and assessment survey.	Plan						▨	▨																																			J	M		
	Actual																																													
2-2. Prepare capacity improvement plans on COVAMS approach and project management	Plan						▨	▨																																			J	M		
	Actual																																													
2-3. Improve capacity of district staff by On the Job Training through implementation of COVAMS approach	Plan		▨	▨																																							J	M		
	Actual																																													
2-3-1. Introduce COVAMS approach to district teams	Plan		▨	▨																																							J	M		
	Actual																																													
2-3-2. Prepare annual working plan	Plan		▨	▨																																							J	M		
	Actual																																													
2-3-3. Implement COVAMS approach according to the annual working plan	Plan		▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨										J	M		
	Actual																																													
2-3-4. Monitor progress of implementation of COVAMS approach	Plan					▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨										J	M		
	Actual																																													
2-3-5. Review annual activities	Plan								▨	▨								▨	▨	▨											▨	▨											J	M		
	Actual																																													

2-4. Improve capacity of district staff by training			Plan			▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨										J	M		
			Actual																																									
2-5. Monitor degree of capacity improvement of district staff			Plan			▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨										J	M		
			Actual																																									
2-6. Evaluate capacity improvement plan and improve it if necessary			Plan								▨	▨								▨	▨	▨											▨	▨											J	M		
			Actual																																									
Activities for Output 3: Effectiveness of the COVAMS approach, both extension method and extension subjects, is verified through research.																																																
3-1. Conduct research on extension method of COVAMS approach			Plan																																						J	M		
			Actual																																									
3-1-1. Design research			Plan		▨	▨		▨	▨																																		J	M		
			Actual																																									
3-1-2. Conduct research survey and data collection			Plan			▨	▨		▨	▨																															J	M		
			Actual																																									
3-1-3. Compile result of survey and data collection as a report			Plan							▨	▨																						▨	▨	▨										J	M		
			Actual																																									
3-2. Conduct research on extension subjects of COVAMS approach			Plan																																						J	M		
			Actual																																									
3-2-1. Design research			Plan		▨	▨																																			J			
			Actual																																									
3-2-2. Conduct research according to the design			Plan			▨	▨																																		J	M		
			Actual																																									
3-2-3. Compile result of the research as a report			Plan							▨	▨																						▨	▨	▨										J	M		
			Actual																																									
Activities for Output 4: Ownership of the COVAMS approach is enhanced among leaders of all levels.																																																
4-1. Plan activities to promote understanding of the leaders and organizations on the CMFA using COVAMS			Plan																																						J	M	Meetings have been organized to visit the C/Ps and the related agencies to promote and seek for coordination of the COVAMS approach	
			Actual																																									
4-1-1. List up target groups of the promotion			Plan		▨	▨	▨																																		J	M		
			Actual																																									
4-1-2. Compile action plan to promote understanding of the target groups			Plan				▨	▨																																	J	M		
			Actual																																									
4-1-3. Prepare necessary explanation materials for promotion			Plan				▨	▨																																	J	M		
			Actual																																									
4-2. Implement planned activities to promote understanding of the leaders and organizations on the CMFA using COVAMS approach			Plan						▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨										J	M		
			Actual																																									
4-3. Evaluate promotion results and modify/ improve plan if necessary			Plan										▨	▨												▨	▨																		J	M		
			Actual																																									
Duration / Phasing			Plan			▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨								Latter half of the COVAMS II Project has begun from October 2015			
			Actual		■	■	■																																					

Monitoring Plan	Year						2016												2017												2018												Remarks	Issue	Solution
	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
Monitoring																																													
Joint Coordinating Committee (JCC) Meeting	Plan		▨	▨					▨			▨												▨									▨										The first JCC of the latter half of the project has been extended due to the Team Leader's hospitalization, and the shcedule of JICA.		
	Actual		■																																										
Baseline and endline surveys	Plan						▨	▨																																				Sufficient information of the baseline data was not available	Baseline survey will be implemented in January 2016.
	Actual																																												
Set-up the Detailed Plan of Operation	Plan	▨																																											
	Actual	■																																											
Submission of Monitoring Sheet	Plan			▨					▨						▨							▨					▨						▨												
	Actual																																												
Monitoring Mission from Japan	Plan																																										It will not be implemented during this latter phase		
	Actual																																												
Joint Monitoring	Plan			▨					▨					▨							▨					▨							▨										As the first JCC has been postponed, the approval of the monitoring sheet has been delayed. Thus the first joint monitoring will be after the first JCC, with the results of the baseline survey in hand.		
	Actual																																												
Post Monitoring	Plan																																												
	Actual																																												
Reports/Documents																																													
Training Materials	Plan						▨											▨	▨											▨	▨												Training Materials wil be revised whenever necessary		
	Actual																																												
Project Completion Report	Plan																																	▨											
	Actual																																												
Important Events																																													
General Election	Plan																																												
	Actual																																												
Review and renew the Revenue Mobilization Strategy	Plan				▨	▨	▨	▨									▨	▨	▨	▨									▨	▨	▨	▨													
	Actual																																												
Review and/or Revise Activities	Plan												▨	▨											▨	▨																			
	Actual																																												
Public Relations																																													
New Letter	Plan			▨			▨			▨			▨			▨			▨			▨			▨			▨			▨			▨											
	Actual																																												
	Plan																																												
	Actual																																												

Plan of Operation (Revised)

Version 4
Dated 31 October, 2017

Project title: Project for Promoting Catchment Management Activities in Middle Shire (COVAMS II)

-

Period of Project: Five (5) years, April, 2013～March, 2018
Project Site : Four (4) districts in Middle Shire (Blantyre, Balaka, Mwanza and Neno Districts)

Inputs	Year	2015					2016												2017												2018												Remarks	Monitoring	
	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		Issue	Solution
Expert																																													
Team Leader/ Institutionalization 1	Plan			▨	▨		▨	▨			▨	▨	▨	▨	▨				▨	▨			▨	▨	▨	▨	▨				▨	▨	▨	Dispatch is until March 2018											
	Actual						■	■			■	■	■	■	■				■	■			■	■	■	■																			
Deputy Team Leader/ Institutionalization 2	Plan		▨	▨	▨				▨	▨						▨	▨	▨				▨	▨						▨	▨															
	Actual		■						■	■						■	■	■				■	■			■	■																		
Institutionalization 3	Plan																																												
	Actual					■																																							
Extension Technology 1	Plan						▨	▨												▨	▨						▨	▨				▨	▨												
	Actual						■	■												■	■						■	■																	
Extension Technology 2/ Soil Conservation Technology	Plan		▨			▨						▨	▨											▨	▨		▨	▨				▨	▨												
	Actual		■			■						■	■							■				■	■		■	■																	
Training Management/ M&E	Plan			▨	▨								▨	▨					▨	▨													▨												
	Actual			■	■								■	■					■	■																									
Project Coordinator/ Asssitant Trainer 1	Plan		▨	▨	▨	▨	▨	▨	▨		▨	▨	▨	▨	▨						▨	▨	▨	▨	▨	▨					▨	▨	▨												
	Actual		■	■	■		■	■	■		■	■									■	■	■	■	■	■																			
Project Coordinator/ Asssitant Trainer 2	Plan																																												
	Actual															■	■																												
Project Coordinator/ Asssitant Trainer 3	Plan																																												
	Actual												■	■	■				■	■		■	■																						
Project Coordinator/ Assitant Trainer 4	Plan																																												
	Actual																																												
Training in Japan/ 3rd Countries																																													
Country Specific Training	Plan																										▨	▨															8 seats for 2015/2016		
	Actual																																												
Group and Region Focused Training	Plan						▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨														
	Actual																																												

Inputs Malawian side	Year	2015					2016												2017												2018												Remarks	Issue	Solution
	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
Staff																																													
Project Director	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
	Actual	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																	
Regional Project Coordinator	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
	Actual	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																	
Regional Management team members	Plan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨			
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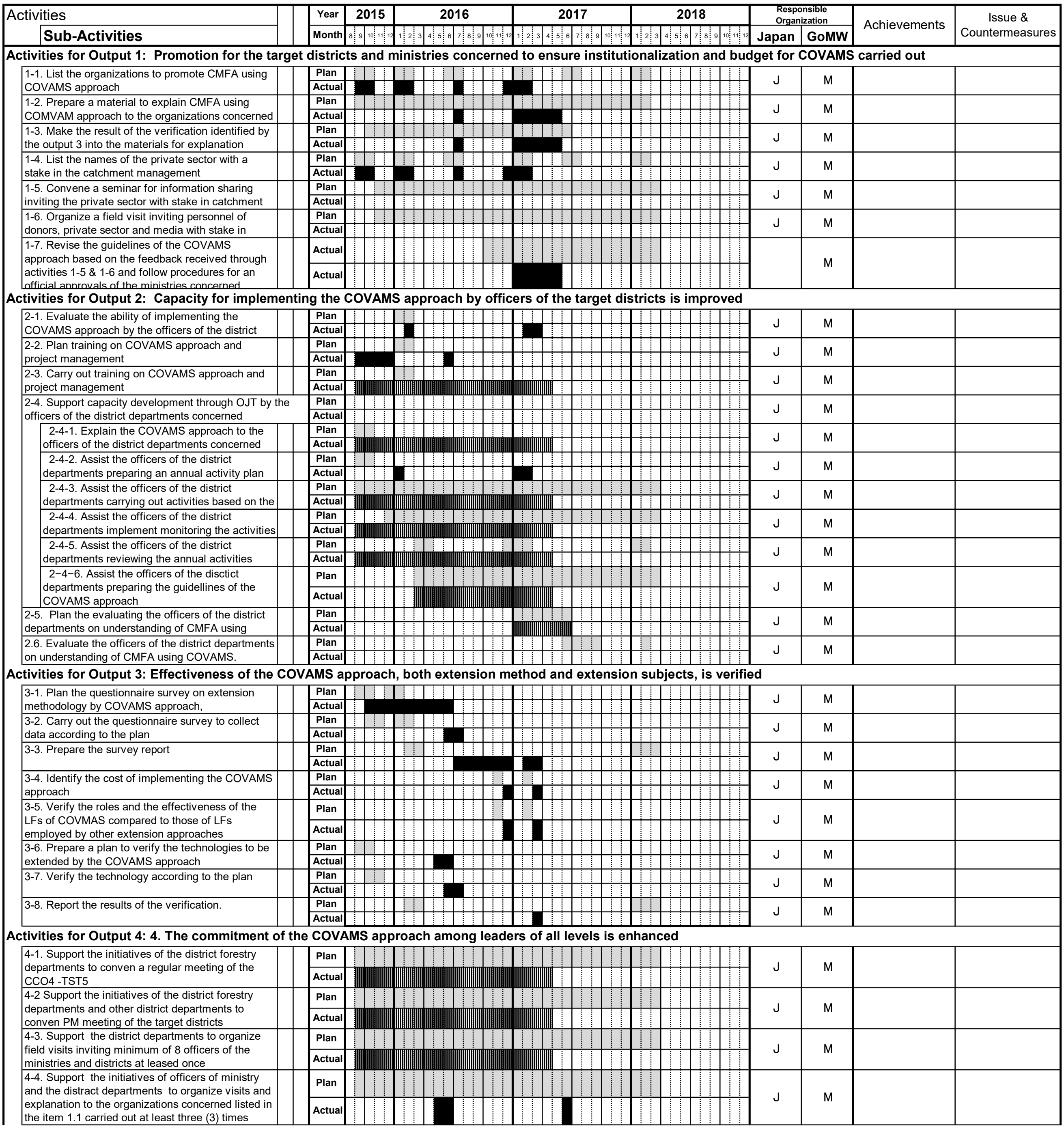

Activities Sub-Activities	Year Month	Responsible Organization Japan	 GoMW	Achievements	Issue & Countermeasures
Activities for Output 1: Promotion for the target districts and ministries concerned to ensure institutionalization and budget for COVAMS carried out					
1-1. List the organizations to promote CMFA using COVAMS approach	Plan	J	M		
	Actual				
1-2. Prepare a material to explain CMFA using COMVAM approach to the organizations concerned	Plan	J	M		
	Actual				
1-3. Make the result of the verification identified by the output 3 into the materials for explanation	Plan	J	M		
	Actual				
1-4. List the names of the private sector with a stake in the catchment management	Plan	J	M		
	Actual				
1-5. Convene a seminar for information sharing inviting the private sector with stake in catchment	Plan	J	M		
	Actual				
1-6. Organize a field visit inviting personnel of donors, private sector and media with stake in	Plan	J	M		
	Actual				
1-7. Revise the guidelines of the COVAMS approach based on the feedback received through activities 1-5 & 1-6 and follow procedures for an official approvals of the ministries concerned	Actual		M		
	Actual				
Activities for Output 2: Capacity for implementing the COVAMS approach by officers of the target districts is improved					
2-1. Evaluate the ability of implementing the COVAMS approach by the officers of the district	Plan	J	M		
	Actual				
2-2. Plan training on COVAMS approach and project management	Plan	J	M		
	Actual				
2-3. Carry out training on COVAMS approach and project management	Plan	J	M		
	Actual				
2-4. Support capacity development through OJT by the officers of the district departments concerned	Plan	J	M		
	Actual				
2-4-1. Explain the COVAMS approach to the officers of the district departments concerned	Plan	J	M		
	Actual				
2-4-2. Assist the officers of the district departments preparing an annual activity plan	Plan	J	M		
	Actual				
2-4-3. Assist the officers of the district departments carrying out activities based on the	Plan	J	M		
	Actual				
2-4-4. Assist the officers of the district departments implement monitoring the activities	Plan	J	M		
	Actual				
2-4-5. Assist the officers of the district departments reviewing the annual activities	Plan	J	M		
	Actual				
2−4−6. Assist the officers of the disctict departments preparing the guidellines of the COVAMS approach	Plan	J	M		
	Actual				
2-5. Plan the evaluating the officers of the district departments on understanding of CMFA using	Plan	J	M		
	Actual				
2.6. Evaluate the officers of the district departments on understanding of CMFA using COVAMS.	Plan	J	M		
	Actual				
Activities for Output 3: Effectiveness of the COVAMS approach, both extension method and extension subjects, is verified					
3-1. Plan the questionnaire survey on extension methodology by COVAMS approach,	Plan	J	M		
	Actual				
3-2. Carry out the questionnaire survey to collect data according to the plan	Plan	J	M		
	Actual				
3-3. Prepare the survey report	Plan	J	M		
	Actual				
3-4. Identify the cost of implementing the COVAMS approach	Plan	J	M		
	Actual				
3-5. Verify the roles and the effectiveness of the LFs of COVMAS compared to those of LFs employed by other extension approaches	Plan	J	M		
	Actual				
3-6. Prepare a plan to verify the technologies to be extended by the COVAMS approach	Plan	J	M		
	Actual				
3-7. Verify the technology according to the plan	Plan	J	M		
	Actual				
3-8. Report the results of the verification.	Plan	J	M		
	Actual				
Activities for Output 4: 4. The commitment of the COVAMS approach among leaders of all levels is enhanced					
4-1. Support the initiatives of the district forestry departments to conven a regular meeting of the CCO4 -TST5	Plan	J	M		
	Actual				
4-2 Support the initiatives of the district forestry departments and other district departments to conven PM meeting of the target districts	Plan	J	M		
	Actual				
4-3. Support the district departments to organize field visits inviting minimum of 8 officers of the ministries and districts at leased once	Plan	J	M		
	Actual				
4-4. Support the initiatives of officers of ministry and the distract departments to organize visits and explanation to the organizations concerned listed in the item 1.1 carried out at least three (3) times	Plan	J	M		
	Actual				

Duration / Phasing	Plan			▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨								Latter half of the COVAMS II Project has begun from September 2015
	Actual		■	■	■																																						

Monitoring Plan	Year						2016												2017												2018												Remarks	Issue	Solution
	Month	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
Monitoring																																													
Joint Coordinating Committee (JCC) Meeting	Plan		▨	▨					▨			▨												▨									▨												
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Submission of Monitoring Sheet	Plan			▨					▨						▨							▨					▨						▨												
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Monitoring Mission from Japan	Plan																												▨	▨															
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Joint Monitoring	Plan			▨					▨					▨							▨					▨							▨												
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Review and renew the Revenue Mobilization Strategy	Plan				▨	▨	▨	▨								▨	▨	▨	▨	▨								▨	▨	▨	▨	▨													
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Review and/or Revise Activities	Plan												▨	▨											▨	▨																			
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Guidelines for COVAMS Approach

Prepared by
Project for Promoting Catchment Management
Through Farmers Activities (COVAMS II)

Department of Forestry
Ministry of Natural Resources, Energy and Mining

In cooperation with

Japan International Cooperation Agency

March 2018

Preface

November 2017 marks a decade-long journey undertaken by Malawi and Japan. Their journey began in 2007 when COVAMS was first introduced to conserve the catchment areas, and to mitigate siltation of the Middle Shire River. The approach was first implemented in 7 villages in Blantyre. Five years later, COVAMS was upgraded to COVAMS II, and today, this approach is disseminated in 345 villages across Balaka, Blantyre, Mwanza and Neno.

To reduce siltation, COVAMS provided to villagers technical training courses on soil conservation, as well as galley controlling, soil conservation agriculture, and tree growing. Then, following its success, COVAMS II takes a step further to institutionalize the approach by fast and wide dissemination. Always aiming for effective soil conservation, it also attempts to optimize cost-effectiveness, and to disseminate other relevant technologies.

To institutionalize COVAMS beyond the 4 districts and ultimately nationwide, the Government of Malawi and Japan International Cooperation Agency (JICA) drafted this very official guideline which carefully navigates its users to apply the COVAMS theories in their distinct environment. Should the user be a farmer, Lead Farmers (LFs), Senior Lead Farmers (SLFs), Conservation Coordination Officers (CCOs), Technical Support Team (TST) members or District Management Team (DMT) members, this guideline specifically describes the operational procedures to follow from household to district level, and how to monitor their progress.

Middle Shire River catchment area management and mitigation of siltation have become a common goal today, as Malawi faces issues related to water and electricity shortage due to climate change. COVAMS II proved its legitimacy by successfully implementing its approach in 45,705 households. Now that the decade-long journey is coming to a checkpoint, the project seeks other potential stakeholders to understand, share and sustain this opportunity.

1st of March 2018, Lilongwe

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Revision History

Release No.	Date	Revision Description
Rev. 0	2018/2/15	Approved and distributed

List of Abbreviations

AOB	Any Other Business
CCO	Conservation Coordination Officer
CMFA	Catchment Management through Farmers' Activities.
COVAMS	Project for Community Vitalization Activities in Middle Shire
COVAMS II	Project for Promoting Catchment Management in Middle Shire
DMT	District Management Team
DOF	Department of Forestry
F	Female
GVH	Group Village Head
H/H	Household
JICA	Japan International Cooperation Agency
LF	Lead Farmer
M	Male
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MoCECCD	Ministry of Civic Education, Culture, and Community Development
MoNREM	Ministry of Natural Resources, Energy and Mining
RMT	Regional Management Team
SLF	Senior Lead Farmer
TA	Traditional Authority
TOT	Training of Trainers
TST	Technical Support Team
VDC	Village Development Committee
VH	Village Head

Table of Contents

List of Appendices

The Guidelines for COVAMS Approach contain detailed information on the requirements and operating procedures necessary for successful initiation and implementation of COVAMS approach. The Guidelines address to readers who are still new, and to users who are already accustomed to COVAMS Approach. For the former, should the readers be officers from another district, those from the private sector, or the international organization, the Guidelines should give an overview of the approach and its implementing sequence. For the latter, should the user be assigned extension workers, or managers of districts, the Guidelines should specifically describe the operational procedures to follow from household to district level, and how to monitor their progress. COVAMS Approach initially aims at the mastering of soil erosion control, gully control and tree growing[1] at village-level. Then, the approach extends its techniques to neighboring villages, through the trained LFs.

COVAMS Approach is neither to replace the conventional extension methodologies practiced in Malawi, nor to promote it as a better methodology over others. It is an option amongst others to know, when agility of extending knowledge becomes an issue. Because COVAMS approach is to intervene the target community for a period of two years, its advantage is to transfer knowledge to a large number of beneficiaries rapidly, compared to the other extension methodology. COVAMS provides extension professionals more choices in selecting suitable extension methodologies.

1 INTRODUCTION

The Project for Community Vitalization and Afforestation in Middle Shire (COVAMS) was implemented by the Department of Forestry (DOF) of the Ministry of Natural Resources, Energy and Mining (MoNREM); the Ministry of Agriculture, Irrigation and Water Development (MoAIWD); the Ministry of Civic Education, Culture, and Community Development (MoCECCD) of the Government of Malawi; with the technical assistance from Japan International Cooperation Agency (JICA), to conserve catchment area in order to mitigate siltation into the Middle Shire River. The Project was launched in November 2007 and concluded in November 2012. In September 2013, it was expanded to a new Project: “Project in Catchment Management Activities in Middle Shire (COVAMS II)”, covering the four districts of Blantyre, Balaka, Mwanza and Neno. The Project is expected to conclude in March 2018.

COVAMS approach, an extension approach derived from the Project, is a flexible methodology encouraging farmers of the Middle Shire river basin, for conservation practices of soil erosion control, gully control and tree growing, in order to protect the catchment area in the four districts.

The approach employs low cost and easy-to-use technologies, effective for extending conservation practices in all Traditional Authority (TA) areas in all four districts within the Middle Shire.

The coverage of COVAMS is incremental – starting with a small number of villages per period of time in a TA area, before moving to another set of villages, targeting potentially interested farmers in conservation farming. The target farmers are expected to turn out to be “early adopters” and “early majority” of “diffusion of innovation model[2]” whose share reaches to 50% of village households (H/H).

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[1] “Tree growing” in this guidelines refers to such techniques including tree seedling raising, planting and management, protection of natural vegetation, protection and conservation of trees and forest, and agroforestry.

[2] For example, Rogers, Everett (16 August 2003). Diffusion of Innovations, 5th Edition. Simon and Schuster. ISBN 978-0-7432-5823-4.

1.1 Essence of COVAMS Approach

1.1.1 COVAMS approach

COVAMS approach is aimed at extending conservation practice among farmers in the Middle Shire catchment area. The approach allows many farmers to practice conservation technologies and enables rapid extension in target villages at a low cost. Moreover, it addresses cross-cutting issues on catchment conservation. The approach uses villagers as trainers called as Lead Farmers (LFs). COVAMS approach is an evolutional extension method based on the conventional approach for faster, wider and more effective dissemination of technologies.

There are five principles in COVAMS approach. They are:

- Meeting the residents' needs,
- Utilizing local instructors and resources,
- Taking place within a village,
- Making open to everyone, and
- Repeating, because it is necessary to encourage more residents to participate and practice.

1.1.2 Five principles of COVAMS approach

(1) Meeting the resident's' needs

The approach advocates simple, quick but useful and helpful training methodology in conservation.

(2) Utilizing local instructors and resources

Trainers shall be found and nominated within the villages. Use procurable and available resources in the villages to ensure sustainability of the practice.

(3) Taking place within villages

This makes it easy for everyone – even a mother with a baby on her back, or an elderly – to participate in the training, because the distance to the training venue is within reach.

(4) Open to everyone

COVAMS training is open to all H/Hs in villages where the training courses are conducted.

(5) Repeating training to encourage more residents to participate.

COVAMS aims at extending agricultural techniques at a faster and wider pace, to cover the village population. To do so, training can be repeated as necessary to meet the demand of both trained and untrained farmers. It may be postponed or rescheduled when only a few villagers can attend the training due to unforeseeable circumstances.

Its core value is to provide equal opportunity to H/Hs to undergo practical training. The approach encourages beneficiaries to replicate the activities at H/H level after receiving training using their own resources. Currently the approach extends three agricultural techniques in soil erosion control, gully control, and tree growing to promote catchment management through farmers' activities (CMFA).

1.2 Content of Training Provided by COVAMS

Training items include soil erosion control, gully control and tree growing. These are the cores of COVAMS training as a method for mitigation of negative situations.

1.2.1 Soil erosion control

A combination of techniques is introduced to promote erosion control. Some examples include the following:

(1) Maize growing

- Contour hedges,
- Tool making for slope assessment and contour identification,
- Contour ridging made with box ridges,
- Soil structure improvement (manure making), and
- Swale making (e.g. construction and digging of swale).

Farmers may acknowledge the importance of soil erosion control through maize growing. The following are typical topics covered in the training:

- Elements for maize growing (fertilizer / water / soil fertility),
- Timing of planting seeds,
- Spacing,
- Weeding (timing / method), and
- Relationship among maize growing, manure application and contour ridging.

(2) Contour hedges

Contour hedges involve the construction of hedgerows with recommended plants and grasses, or along contour markers to check run-off, as well as stabilizing contour marker ridges.

(3) Tool-making for slope assessment and contour identification

- How to make a slope assessment tool,
- How to make a contour identification tool with line level, and
- How to make an A-frame.

(4) Contour ridging with box ridges

- How to assess the slope of a garden,
- How to identify contours using line level and A-frame,
- How to construct contour markers,
- How to realign planting ridges according to the contour markers, and
- How to make box ridges.

(5) Soil structure improvement

Farmers are encouraged to practice agro-forestry and to use manure, to improve soil fertility and soil structure. A "*Chimato*" method[3] is commonly used to make manure. Conservation Coordinating Officers (CCOs) shall consult beforehand with the Lead Farmers (LFs) regarding the method farmers prefer to use in manure making.

(6) Swale making

Farmers are given the training of the construction of swale along the contour markers.

1.2.2 Gully control

Check dams are small- and medium-sized water retaining structures, constructed with locally available materials such as brushwood and stones.

1.2.3 Tree growing

Typical topics to promote tree growing and planting include the following;

- Introduction of tree growing and seed collection,
- Seedling production method,
- Direct sowing method,
- Natural regeneration method, and
- Tree growing-related options.

The contents of each topic are as follows:

(1) Seedling production method

This involves the collection of seeds of indigenous trees; how to raise tree seedlings up to an out-planting stage of the seedlings; and the management of the planted seedlings and woodlots.

(2) Direct sowing method

The training focuses on suitable tree species, and how to prepare sowing pits, as well as how to sow seeds.

(3) Natural regeneration method

This is done through the management of *Lizaya*[4] in order to regenerate trees. This method involves "weeding". It is important to introduce additional activities to have a successful natural regeneration methodology.

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[3] "*Chimato*" method is a composting technique that the Land Resource Conservation Department of MoAIWD is currently recommending. In this technique, soil is put between layers of organic matters; and at the end the surface of the composting heap is smeared with soil. Many farmers in Malawi already know how to make compost using this technique. Hence, the only issue to promote manure making is: how do farmers collect sufficient organic matters.

[4] *Lizaya* is defined as a village conserved forest area where communities can use the natural tree regeneration method.

(4) Tree growing related options

Farmers may receive training on grafting and beekeeping during the second year, only if they are committed to tree growing during the first year. This may be an incentive to villagers to commit themselves to tree growing. To do so, farmers may procure planks to make beehives and requires preparing rootstocks.

1.2.4 Farming techniques and technologies

This section covers selected farming techniques and technologies that farmers may practice. Examples include the following:

1.3 Expected Outcomes from the Intervention by COVAMS

COVAMS continues its interventions in villages for a period of two years, expecting the following outcomes:

- LFs gain training skills in soil erosion control, gully control and tree growing,
- Techniques are acquired through demonstration plot prepared by each LF, and
- There are more farmers who practice all the techniques and continue the activities spontaneously.

During the initial two years, CCOs make themselves available for supporting newly elected LFs, and for providing technical know-how through Training of Trainers (TOT). The CCOs must cultivate good working relationship among all stakeholders, which is key to achieving success. The CCOs fully support the LFs during the first two years of COVAMS but such support gradually subsidizes as LFs gain more experience, making them increasingly capable to operate without the support of the CCOs. From the third year and onward, the frequency of monitoring and support (CCOs visiting LFs and their villages) may be reduced.

1.4 Operation Structure, Roles and Tasks

COVAMS approach utilizes the LF system. The LF system is an extension methodology widely practiced in Malawi. A group of community member works under the direct supervision given by a LF who offers to the group extension services related to agricultural activities in conjunction with the project. Project staff (i.e. CCOs in the case of COVAMS) is responsible for promoting and implementing sustainable agriculture technologies by collaborating LFs. LFs are prominent reference persons for village farmer-to-farmer extension services. The LFs play a major role that contributes to improving the production through technology transfer. LFs are trained to deliver specific technologies to farmers. LFs are to perform three functions: impart their knowledge on local conditions, constraints and solutions to fellow farmers; teach fellow farmers a simple set of technologies that would conserve the natural resources base; and provide means to share knowledge and information within the community.

1.4.1 Operation structure during the first year

The operation structure under COVAMS approach during the first year is illustrated in Figure 1-1.

CCOs carry out TOT to LFs in each village. LFs are expected, in turn, to train farmers in soil erosion control, gully control, and tree growing techniques. The recommended number of LFs is one per 15 H/Hs - (up to 18 households is acceptable). A group of H/Hs under the same kinship in a part of a village is referred to as *Limana* in Chewa language.

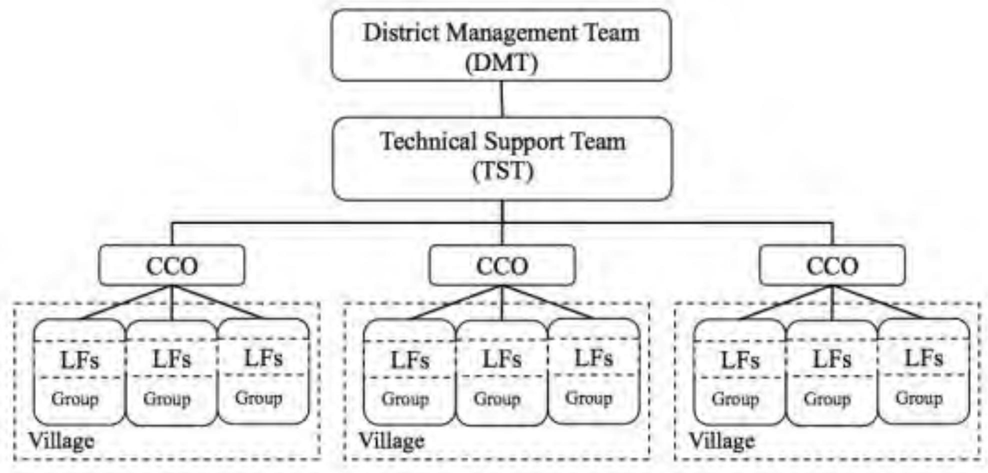

Figure 1-1 Operation Structure (First Year)

1.4.2 Operation structure during the second year

The operation structure under COVAMS approach during the second year and beyond is shifted, as shown in Figure 1-2. The number of villages covered by COVAMS increases annually as indicated in Figure 1-2. A Senior Lead Farmer (SLF) facilitating interactions with the CCOs, provides guidance to all LFs in a village. The SLF is selected by other LFs as the best performer out of all the LFs, and the CCOs appoint him / her as a SLF, based on his / her performance. For their mobility, SLFs will ideally be entitled to bicycles.

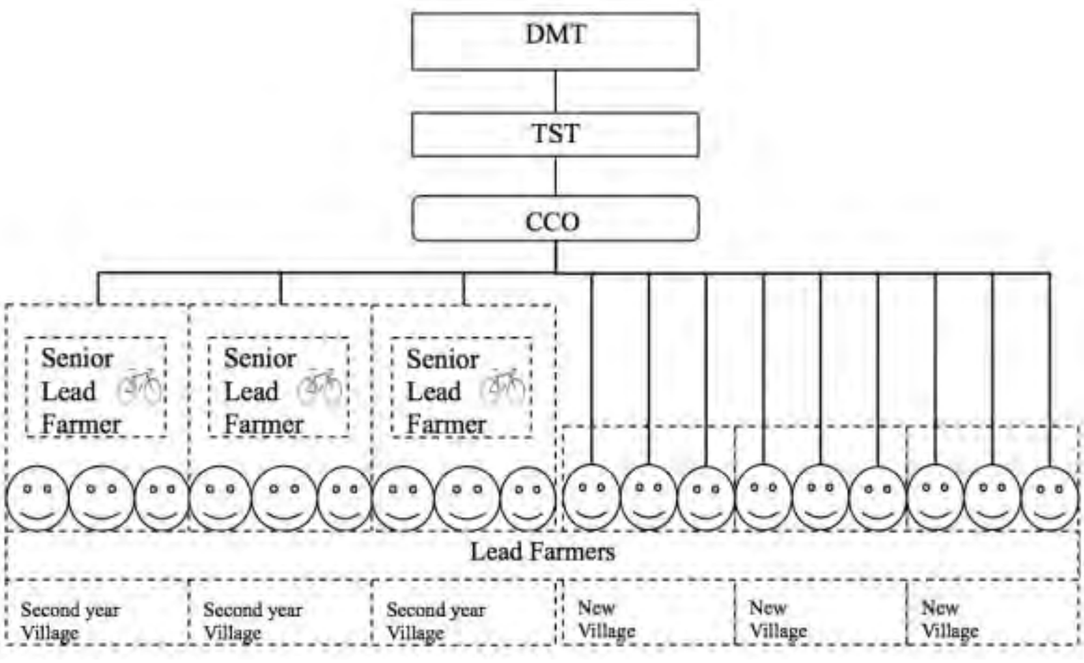

Figure 1-2 Operational Structure (Second Year)

1.4.3 Tasks of Lead Farmers

Tasks given to LFs are:

- To compile lists of H/Hs for submission to the CCOs,
- To conduct sensitization meetings (second year, optional),
- To construct demonstration plots,
- To consult with the group members on a plan for training, and inform the date of the training to all the group members,
- To conduct training on soil erosion control, gully control, and tree growing techniques,
- To provide technical support, and
- To attend the LFs' meetings and share points and conclusion of the meeting with fellow group members.

1.4.4 Tasks given to Senior Lead Farmers

Tasks given to SLFs are:

- To conduct re-sensitization meetings during the second year with Village Heads (VHs),
- To train LFs on conducting sensitization meetings (second year, optional),
- To conduct refresher courses on soil erosion control, gully control and tree planning to LFs,
- To organize LFs' meetings in their villages,
- To monitor and supervise activities carried out by LFs,
- To attend SLFs meeting organized by CCOs, and
- To report to CCOs on the activities carried out.

1.4.5 Tasks given to Conservation Coordinating Officers

The following tasks are given to CCOs:

- To collect information of target villages on the number of H/Hs,
- To conduct sensitization meetings for the first-year villages,
- To conduct TOT for LFs and SLFs,
- To assess the understanding on soil erosion control, gully control and tree growing among LFs and SLFs,
- To monitor the villagers' practice related to CMFA and to analyze progress, as well as to implement additional measures when they are necessary,
- To backstop LFs' meetings,
- To conduct monthly SLFs' meetings, and
- To submit monthly reports and work plan to TST.

1.4.6 Tasks given to Technical Support Team

The following tasks are given to TST:

- To conduct orientation on COVAMS approach to CCOs,
- To plan and conduct training for CCOs on soil erosion control, gully control and tree growing,
- To monitor CCOs' performance and assess their capacity,
- To advise measures to improve CCOs' capacity and their performance,
- To assess LFs' performance as well as those of CCOs,
- To implement the plans, and
- To submit and explain monthly reports and monthly operation plans on COVAMS approach to the DMT.

1.4.7 Tasks given to District Management Team

DMT undertakes the following:

- To draw an expansion strategy in the district and manage progress,
- To control quality of work and coordinate all activities under COVAMS,
- To sensitize TA leaders and VHs on the importance and benefit of soil erosion control, gully control and tree growing,
- To determine the number of LFs of target villages,
- To scrutinize measures and operation plans submitted by TST,
- To assess progress of training and practice on the ground, and
- To produce quarterly and annual reports.

1.4.8 The roles and responsibilities of District Management Team

DMT is responsible to oversee the day-to-day implementation of COVAMS-related activities in his / her designated district. His / her typical roles include the following:

- To keep record of extension officers, and
- To monitor the degree of enthusiasm or unity of the villagers toward development activities.

DMT shall prepare a road map[5] on the COVAMS coverage of villages in the selected TA.

The following are the basic procedure of DMTs for leading COVAM approach:

- Identification of the number of extension officers from MoNREM, MoAIWD and MoCECCD,
- Identification of the extension officers' duty section and their residents,

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[5] Preparation of "road map" is further explained and discussed in 2.2.1

- Collection of information on the number of group villages and villages, and the number of H/Hs in each village,
- Collection of information on the villages in terms of viability in development activities and leadership,
- Determination of priority areas based on degradation of natural resources, climate condition through use of vegetation and physical maps when available, and
- Determination of the number and selection of CCOs in the designated TA.

2 OPERATION PROCEDURES

This section outlines operation procedures of COVAMS approach in the Middle Shire (Balaka, Blantyre, Mwanza and Neno Districts).

Activities during the first year have been shown separately from those during the second year, and further explanation has been provided on the linkages between activities within and across years, and geographical boundaries based on the jurisdiction of TA, group villages and villages splitting down to H/H levels.

Figure 2-1 shows steps in implementing COVAMS activities. These steps begin with the selection of TA during the first year. The process continues until the Project is in full operation going into the second year.

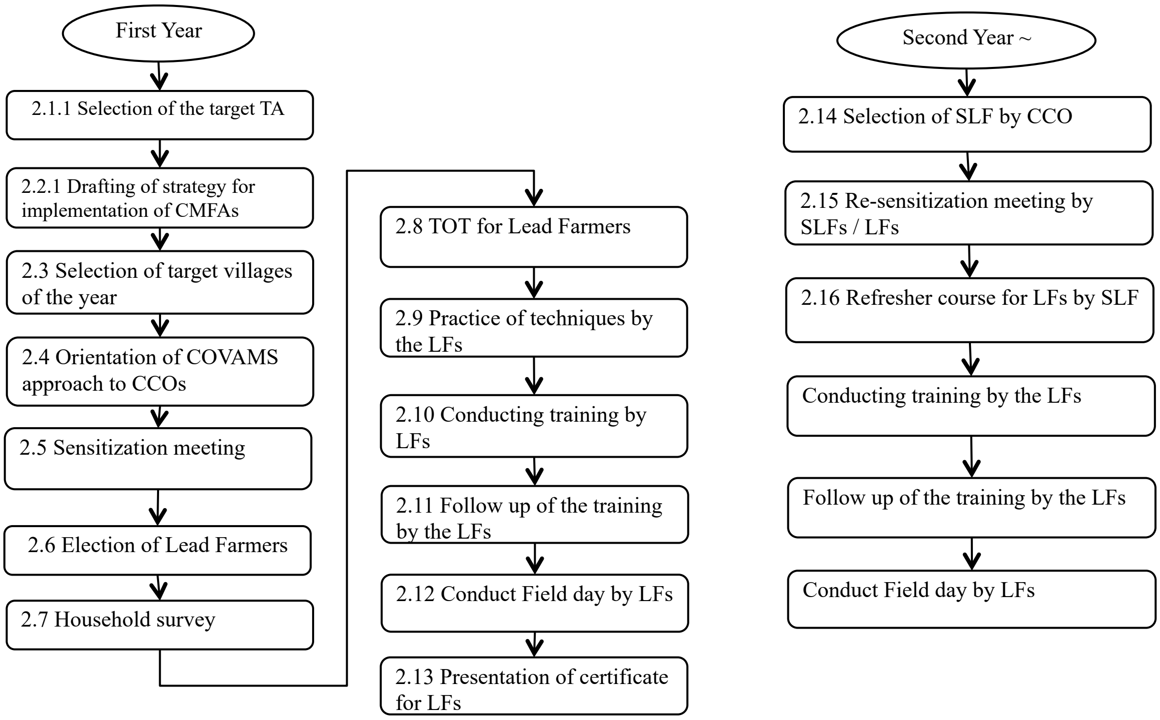

Figure 2-1 Implementing Sequence of COVAMS Approach

2.1 Selection of Traditional Authority

From a management point of view in implementing COVAMS approach, village selection over many different TAs is neither practical nor recommended. The village selection shall be focused in one particular TA to start initially. To do so, a set of criteria to prioritize the selection of TAs may be developed when the intervention using COVAMS approach is introduced. One example for prioritizing village selection may be to look into such issues as the seriousness of soil erosion and its impact to the livelihood of people affected by soil loss. It does not mean an accurate spatial data on erosion is prerequisite to start COVAMS approach. A rapid survey or a preliminary study compiling readily available data and interviews may be enough to justify the start of activities. The activities plan may be easily modified once the activities start. The necessary data of good quality becomes more available as the intervention by COVAMS continues.

2.2 Drafting Strategy for Implementation of COVAMS Approach

2.2.1 Preparation of COVAMS road map

When the selection of TA is made, DMT shall prepare a road map on how they shall cover all the villages with COVAMS approach in the selected TA. The following are the procedures for DMT to prepare the road map:

- Identification of the number of extension officers in MoNREM, MoAIWD and MoCECCD,
- Identification of the posts of extension officers on duty and their residence,
- Collection of information on the number of group villages and villages, and the number of H/Hs of each village,
- Collection of information on the villages in terms of enthusiasm of the villagers (H/Hs) for supporting development activities through identified extension officers, and
- Selection of capable CCOs in the TA and their number, and their distribution within the jurisdiction of the target TA.

DMT shall contact the departments concerned to inquire the information on the availability of extension officers assigned in the selected TA. DMT shall request the extension officers to see if the target villages are enthusiastic and supportive to village development activities intervened by COVAMS. The information is helpful for selecting the first few villages to introduce COVAMS to the TA.

To disseminate CMFAs to the target area promptly, DMT shall take some other issues into consideration. DMT shall request all the departments involved to mobilize their extension officers as much as possible. The fund to support such involvement shall be secured. The number of motorcycles available for the activities is another important consideration to ensure the mobility of extension officers to extend the coverage of COVAMS.

In case there are no motorcycles are available, procuring them is an option to ensure mobility for CCOs, taking the number of villages within the target TA into consideration. Motorcycles are important for the sake of proper management of COVAMS activities, in order to secure mobility of CCOs and to maintain communication among farmers, LFs and CCOs for monitoring ongoing activities in villages. If no motorcycles are available, bicycles may be an alternative. More extension officers are needed when the same service coverage on the COVAMS roadmap is implemented.

An ideal number of villages to work with are 3 to 4 in the very first year. This is particularly so for newly assigned CCOs, because he / she is not fully familiar with what COVAMS is all about during the initial year. He/ she may realize how much commitment and effort is necessary for making effective communication and building trust in communities once COVAMS activities are initiated.

A typical operation of COVAMS approach in a TA is explained in the following sections:

2.2.2 COVAMS operation plan

Below is a hypothetical plan of operation:

(1) First year

A typical operation of COVAMS approach starts by selecting seven (7) group villages during the first year. At least three to four villages shall be enthusiastic about development activities, and such villages shall be carefully selected. These villages shall be included to give a positive influence to other villages. All the villages shall be supported by CCOs.

(2) Second year

CCOs may add three to four new villages in the same TA to expand COVAMS activities. SLFs shall be nominated from the LFs of the second-year villages, to assist the CCOs for providing support to the LFs on behalf of the CCOs. Upon nominating the SLFs, the CCOs provide SLFs another TOT covering topics such as how to organize effective sensitization meetings, and refresher courses focusing on the three techniques to LFs that the SLFs are in charge. The CCOs shall carry out training to LFs selected in the newly extended villages, while the SLFs continue training LFs in the second-year villages simultaneously, so the outreach from the COVAMs continues seamlessly. CCOs and TSTs, however, shall not leave the SLFs alone in carrying out these activities. Instead, CCOs and TSTs shall monitor how the training provided by the SLFs has been performed.

LFs are requested to repeat the same training to encourage farmers to practice and adopt the techniques promoted by COVAMS. In doing so, LFs may have acquired experience in providing training. With an expected assistance to CCOs provided by SLFs, some workload and burden of CCOs to the villages where the COVAMS activities are on-going, CCO may be reduced when the village activities continue without major issues. CCOs may be able to allocate their efforts to negotiate village leaders to join COVAMS activities.

Figure 2-2 and 2-3 illustrate a typical operation:

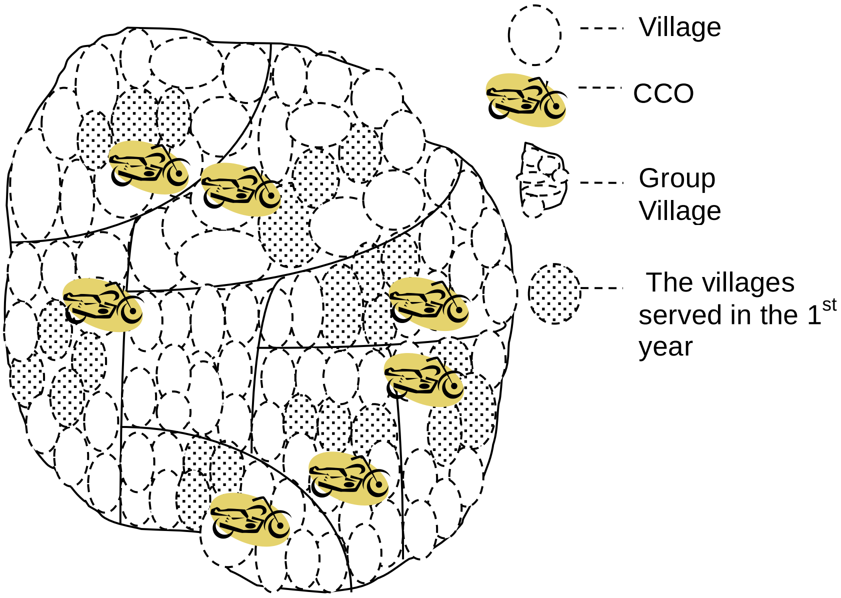

Figure 2-2: Typical TA Operation during the 1st Year

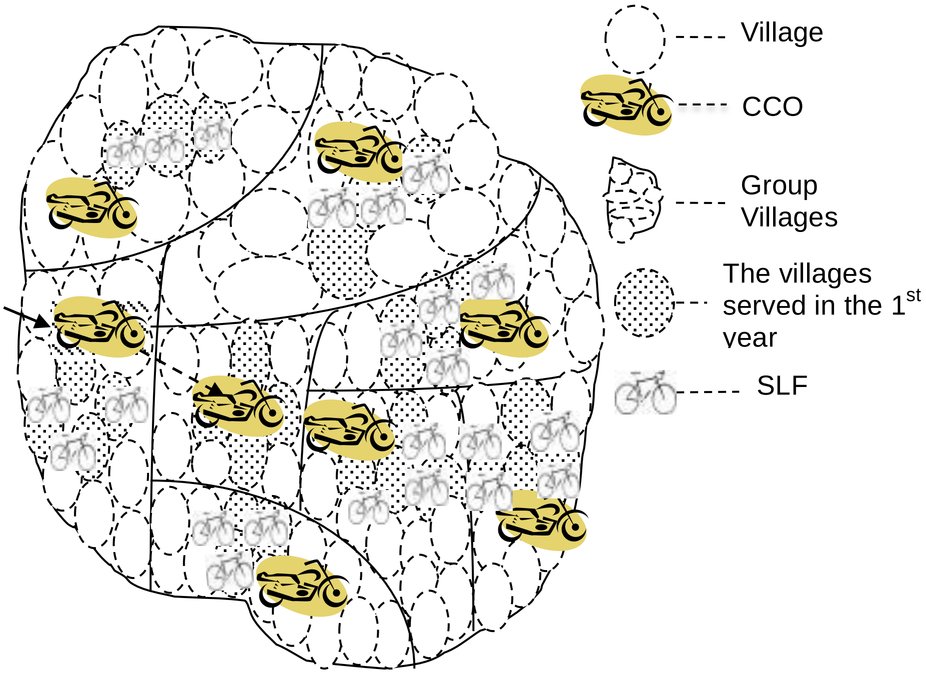

Figure 2-3 Typical TA Operation during the 2nd Year

(3) Third year

DMT shall consult with CCOs for monitoring their work progress. In the most conceivable cases, all the villages assigned to a CCO may have been covered by COVAMS activities, by the beginning of the 3rd year. DMT may request these CCOs who have completed their work in all villages they were assigned, to move on to the remaining villages and extend COVAMS in a prompt manner.

DMT is solely responsible for deciding whether to introduce COVAMS to other TAs. The minimum of 50% of the H/H adoption rate in a village is an indicator for measuring the success of the COVAMS activities. When 50% of H/Hs in a village adopts the technique in soil erosion control, gully control and tree growing without or with minimal supervision, assistance to the village is no longer needed.

2.2.3 Coordination by DMT

It is very important to have close communication with LFs / SLFs and to have frequent monitoring on their activities and farmers' practice for making the approach effective. In order to achieve this, it is very important to select committed extension officers, especially during the first year for positive impact. Therefore, DMT coordination is crucial in identifying committed extension officers and allocating them with motorcycles. In some cases, extension officers may have genuine reasons to work beyond their areas under their jurisdiction. Note that this can only be done with approval from the relevant authority.

2.2.4 Formation of Technical Support Team

TST shall be formed immediately to receive orientation on COVAMS and to assist DMT effectively.

2.3 Selection of Target Villages

2.3.1 Selection of group villages

Selection of group villages should be in accordance to the road map, considering the available extension officers and resources, unless the district is capable of covering all group villages in a TA from the beginning. Selection will be based on the information that CCOs collected in the villages. Through the experience of COVAMS project, the practice rate of the farmers becomes effective when the Group Village Head (GVH) is enthusiastic in development activities. Therefore, the priority shall be given to those villages whose GVH is enthusiastic and influential, in order to have meaningful impact to the practices of farmers, and positive influence over other group villages. The other issue that needs to be considered for the selection of group villages is the quality of extension services provided by the extension officers. A good outcome from intervention depends on the hard-working attitude of extension officers.

2.3.2 Selection of target villages of the year

As previously mentioned, the number of villages for a CCO shall be limited to three or four during the first year, so it is necessary to select the villages of the year. This experience shows that no matter how hard CCOs work, they can make very limited impact if a VH (Village Head) is negligent, and has no interest in the activities of development in his / her village. The village selection, therefore, is important for bringing success through the intervention to the TA.

2.4 Orientation to CCO

Selected CCOs will undergo orientation on COVAMS approach, organized by DMT on the usage of posters for the preparation of sensitization meetings. CCOs learn how to conduct sensitization meetings with COVAMS posters provided by DMT. The COVAMS poster shows the problematic situation of gardens, commonly observed in the Shire River basin. The poster also illustrates countermeasure activities to the above situation. It also explains benefits that may be expected from the countermeasures COVAMS activities introduce.

2.5 Sensitization Meetings

Sensitization meetings attempt to make village leaders and others aware of current issues and challenges in their villages.

2.5.1 Procedures

A sensitization process shall be carried out at three different community levels. The initial step to start COVAMS activities is to meet the TA, and to carry out sensitization meeting for the local stakeholders at the respective TA. The sensitization meeting follows by the stakeholders of the respective GVHs and the VHs, then the target villagers. The sensitization meetings shall be organized by the TA, because of enhancement of ownership in the course of intervention. Once the TA becomes aware of the necessity of introducing COVAMS activities under his / her jurisdiction, request the TA to call all the GVHs and VHs to the sensitization meeting, arranged by the TA.

Prior to the date of the planned sensitization meeting for the villagers, an invitation shall be delivered to all the H/Hs. CCO must discuss with the VH on how they are to deliver the invitation. Especially, the VH shall invite *Limana*[6] heads, so that they may be able to deliver the invitation to the sensitization meeting, to their fellow *Limana* members. The sensitization meeting is generally held once in every village. However, if the size of the village is too large to walk until the village center, or if the number of the H/Hs is large, then the meeting may be planned more than once. In case the villagers' turnover is very poor, then the meeting shall be repeated anytime to increase the understanding of COVAMS benefits.

2.5.2 Contents of the sensitization meeting

(1) Sensitization for TA

When the above preparations are completed, DMT shall make contacts with the leaders of the TA selected, to promote and explain topics such as CMFAs, COVAMS approach, the road map, selection of group villages and villages, and how the activities will be carried out. DMT requests the TA to organize a sensitization meeting, inviting all the GVH and their Village Development Committee (VDC) members and the VH. The invitation letter shall be drafted by DMT, signed by the TA, and photocopied a sufficient number of times, for their distribution to all the GVHs and VHs.

(2) Sensitization for GVH, VH, and VDC

DMT explains the same to GVH, VH, and VDC.

(3) Sensitization for villagers

A successful promotion and implementation of CMFAs depends on whether or not villagers understand the benefit of conserving their land and tree growing. Special attention to the benefit of the villagers from practicing the technologies shall be paid, so that ownership in the activities is fostered. If there are some farmers with experience in soil conservation activities in the past, then they shall be given a chance to speak about his / her experience, such as the increase of yield, etc., during the sensitization meeting. CCOs shall explain that COVAMS

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[6] *Limana* means clan in Chewa language

approach employs the LF system. They shall also describe their expected roles in detail, so that the villagers will elect LFs effectively.

2.6 Election of Lead Farmers

Upon completion of the sensitization meeting, the villagers elect LFs. The election defines the success of the training, since it will nurture trust between LFs and the villagers. At the same time, the elected farmers will have pride on being LFs, following the electoral procedure.

One likelihood occasion is that VHs or other local leaderships appoint LFs without considering the importance of election. It is not accepted under COVAMS approach. The electoral process in COVAMS is considered as one of the most important factors for motivating LFs. Therefore, the election process for LFs is not negotiable under COVAMS.

2.6.1 Procedures for Lead Farmers' election

CCOs shall pay special attention to the following:

- CCOs are not allowed to tell villagers the number of required LFs calculated from the strategy prepared by DMT. It is because the number of H/H claimed by VHs is, in most cases, more than reality. Instead, CCOs explain the villagers to elect LFs by *Limana*, considering the number of H/H.
- A general rule is to elect one LF for every 15 H/H. The figure may be adjusted, based on the size of the solidarity (kinship) and the (social and physical) distance to the adjacent group or *Limana*[7].
- Villagers shall be explained in advance that LFs are to be elected by a majority vote.
- The LF election may be carried out during the sensitization meetings, if the number of people present exceed the majority. The election has to be rescheduled when the attendance is small.
- CCOs are to collect all the names of the elected LFs for submission of the list to the DMT.

2.6.2 Eligibility for being a Lead Farmer

In light of its roles, the responsibilities and the tasks given, LFs must be literate.

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[7] Suppose there are two *Limana* in a hypothetical village; one is composed of 17 H/Hs and another is composed of 13 H/Hs. It makes sense to keep these two *Limana* rather than separating the *Limana* with 17 H/Hs into smaller two, or merging them together and spitting them into two *Limanas* with 15 H/Hs. If the size of a *Limana* is as small as 6 H/Hs, combine another small *Limana* unless the locations of the two are isolated. In case the size of a *Limana* is as large as 20 H/Hs, then it may be split into two *Limana*.

2.6.3 Explanation of conditions to be a Lead Farmer

Once the LFs are elected, their roles and responsibilities, as well as working conditions shall be explained clearly to them. It was observed that some of the newly elected individuals had no willingness to serve as LFs, or they quit being LFs after completing TOT. Accepting the LF position is a serious confirmation – all LFs must commit themselves to serve. CCOs shall hold an explanation with the elected LFs, to explain their expected roles and conditions, before starting TOT.

The roles and tasks given to LFs were explained in 1.4.3, and their work requirements are, but not limited to, as follows:

- to conduct a H/H survey,
- to participate in and complete TOT for LFs conducted by a CCO,
- to practice all the techniques by themselves in their premises, and
- to participate in LFs' monthly meeting.

The LFs must demonstrate the following:

- to complete a demonstration plot on the techniques in their gardens, with a minimum size of 500 m² for soil conservation,
- to make two check dams made with at least two different materials (brush wood and stones),
- to raise at least 50 tree seedlings and to plant them in their premises. Also create minimum of 20 stations using direct sowing method,
- to gain experience in conducting training on the three techniques, and
- The fellow villagers must accept the LF.

2.7 Household Survey

Guided by CCOs, LFs shall carry out H/H surveys to collect the information shown in Table 2-1.

Table 2-1 Household List (Example)

Village name: Kumpita

Name of Lead Farmer: Hana Rodric

Name of Limana Head: Henry Moses

Ref. No	Name of household's head	Age	Female / Male	No. of family members staying together, excluding the household head
1	Henry Moses	45	M	3
2	Elube Lazalo	50	F	2
3	James Rodric	38	M	5 LF's H/H
4	Daglas Spencer	28	M	3
5	Faines Mulaka	40	F	4
6	Peter Phiri	35	M	3

Note: The name of the H/H head used in the list shall be the registered name used for official purposes, such as the national voter registration, etc. DMT shall compile and consolidate the data on the villages as soon as it is submitted. When it is ready, DMT shall give each LF a copy of the result of the H/H survey through CCOs.

2.8 Training of Trainers for Lead Farmers and Senior Lead Farmers

Elected LFs shall participate in TOT covering all the techniques under COVAMS approach.

2.8.1 Trainer, venue and expectations

All the training is carried out by CCOs during the first year. During the second year, SLFs who received the training course in their respective villages from CCOs, may conduct refresher courses training fellow LFs in the second-year villages. TOTs to LFs in the first-year villages are conducted by CCOs, sequentially in one village at a time while smaller villages may join other larger villages. Training may take place anywhere within the village, in a building or open ground. LFs are advised to complete the training without skipping a day, to ensure the farmers acquired the necessary skills and knowledge, for further sharing with them by the end of the exercise. VH has to involve as many farmers as possible, because support from VH is key to a successful adoption, according to observation.

2.8.2 Contents of Training of Trainers

(1) Training of Trainers (first year)

There are three topics which TOT covers, namely soil erosion control, gully control, and tree growing. The contents of each subject are explained in “1.2 Content of Training Provided by COVAMS” in page 3. Additionally, facilitation skills and benefits of the techniques may be included.

(2) Refresher course (second year)

TSTs and CCOs shall analyze general skills and knowledge of the three techniques, acquired by the LFs in their districts, and identify any shortfalls LFs may have. The training contents may be redesigned and modified whenever necessary. SLFs conduct refresher courses for LFs in the second-year villages, while CCOs conduct TOT in the first-year villages. SLFs conduct refresher courses.

2.8.3 When to conduct Training of Trainers

When to carry out TOT is flexible. Whenever LFs have time, a session may be carried out. The ideal months for conducting TOT for LFs may be between May and July, so that they have ample time to practice soil erosion control, gully erosion control and tree growing techniques, before conducting training for their fellow farmers.

2.8.4 Village meeting after the training

When TOT is completed, CCO shall communicate with the VHs of each village to request a village meeting. The purpose of the meeting is to acknowledge LFs who were awarded the provisional certificate by the villagers. In addition, the roles and responsibilities of LFs shall be explained and understood by villagers.

2.9 Techniques Demonstrated by Lead Farmers

2.9.1 Soil erosion control

LFs will practice all the techniques they learnt during the training in their gardens before they start training the fellow farmers, so that they can conduct the training with confidence. At the same time, it helps LFs to know where to emphasize in each technique during the training. LFs use their own gardens for demonstration during training for *Limana* members.

2.9.2 Gully reclamation and control

Practice of several small-scale check dams with stones and brushwood in LFs' gardens or premises of their homes.

2.9.3 Tree growing

Each LF is expected to practice raising tree seedlings - at least 50 of any tree species. This practice shall start soon after TOT is completed. DMT may provide necessary inputs for the practice. CCOs must monitor seedling production such as watering and root pruning. "Direct sowing" should be practiced with 20 planting stations. Attention must be paid to land preparation for direct sowing. The time for starting direct sowing is in the beginning of the rainy season so that enough moisture can be expected. Note that DMT may provide LFs necessary inputs such as tubes and tree seeds to encourage LFs to promote the technique.

2.10 Conducting Training by Lead Farmers

2.10.1 Preparation for conducting training

Each person shall prepare the following for training. A list of items for preparation is shown in Table 2-2. The descriptions of the tasks to be carried out by each individual are explained in the following:

Table 2-2 Preparation for Training

Title / Person	· Preparation for Training
DMT	· Preparation of invitation cards · Procurement of training materials · Production of manuals
CCO	· Explanation of the training procedure · Distribution of invitation cards · Distribution of training materials · Distribution of manuals
LF	· Practice of the techniques · Production of training plan

(1) Description of the preparation made by District Management Team

(i) Preparation of “Invitation cards” and training report materials

Prior to the training in a village, DMT shall prepare the “Invitation cards”. The cards are to be distributed to each H/H before LFs start the training.

(ii) Procurement of training materials

Under COVAMS approach, some training materials may be supplied to LFs. Specific materials to be procured depends on the availability of such materials and funds allocated. What to be procured is decided by DMT. The materials are supplied based on necessity; therefore they are not always supplied to all participants. Typical training materials required for the topics are as the following:

- Soil erosion control
    - ➢ Materials for making tools such as slope identifying tools and A-Frames
    - ➢ Strings
    - ➢ Line Levels
    - ➢ Nails
- Tree growing
    - ➢ Tubes: 100 tubes for each training
    - ➢ Tree seeds (three different sizes such as small, medium, and large)
- Gully reclamation and control
    - *Panga* knives

The training materials may be supplied to LFs during TOT.

(iii) Production of manuals

The manuals on the three techniques may be produced (photocopied) and provided to the LFs.

(2) Description of the preparation made by CCOs

(i) Explanation of training procedures

For the planning of the training, the following are some of the points to consider:

- LFs shall discuss with group members on the most convenient date and venue of conducting the training for each subject, and have a consensus amongst the members. LFs may conduct the training either jointly or individually, and
- The date and venue of the training shall be communicated to VH to seek his / her involvement.

(ii) Conducting training

- Effective training affects the participants’ attainment of skills and knowledge in soil erosion control, gully control and tree growing. LFs shall pay attention to let everyone practice during the training, because COVAMS training shall emphasize on practicality rather than theory,
- All COVAMS training shall conclude in a day or two, so the villagers may have enough time to adopt the techniques back in his / her garden. LFs must make themselves available for fellow farmers to give them advice, and
- The training will be conducted by a *Limana* or any group, so anyone from a different group may join if the timing and venue are convenient for him / her. CCOs shall instruct LFs that COVAMS training is open at any time so that everyone will have multiple opportunities to participate and to take advantage of it.

(iii) Distribution of Invitation cards

- CCOs shall request LFs to distribute the cards to each household of the village on their behalf.
- VH may have to be a part of the distribution because his / her involvement affects the outcomes of COVAMS activities. The role of VH is to call for the meeting upon request of the CCO, when the handover of the invitation cards to LFs takes place.

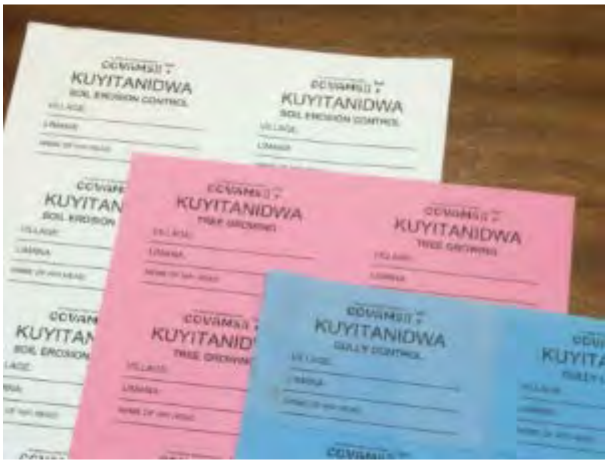

Figure 2-4 Examples of the Invitation Cards

(iv) Distribution of training materials / manuals

- If the manuals and materials are supplied, the delivery shall be completed in advance to avoid confusion. CCO must make sure that all necessary materials are ready for the training on the day of TOT.
- In addition, CCO may request LFs to find and bring materials and tools available at home (such as poles, etc.) on the date of the training.

(3) Description of the preparation made by Lead Farmers

(i) Practice of the techniques

- Prior to the training to their fellow farmers, LFs shall make sure they can make the demonstration plots as they were taught. (See Section 0 in page 17).
- LFs shall follow the explanation made by CCOs for the planning of training.

(ii) In case of unforeseeable changes in schedule, etc.

- LFs must make sure a few days before, that all the group members can attend the training as previously planned.
- If the date of the training needs to be rescheduled, consult with the group (*Limana*) members for the new date and venue. Make sure any change in schedule shall be informed to all members.
- The change of the schedule shall be informed to CCO.

2.10.2 Implementation of training

LFs shall inform the dates and venues of conducting the training to CCOs. CCOs shall visit the training to oversee and assess the implementation as much as possible. Interviewing *Limana* heads or other group members to seek their opinions on the overall performance from time to time, would be another practical method to monitor the implementation.

2.11 Follow-up of the Training

Follow-up activity means that trainers provide post-training technical and moral support to the farmers. Follow-up in COVAMS activities is primarily provided by LFs to *Limana* / group members. It is sometimes provided by CCOs when such supports appeared to be necessary.

2.11.1 Follow-up by Lead Farmers

(1) Soil erosion control

Farmers may have difficulty in the practice of making tools, identification of slopes, construction of contour markers, and realignment of planting ridges. Construction of contour markers and realignment of planting ridges are sometimes a challenge for farmers due to the complexity of the terrain of plots. LFs are expected to provide technical support when farmers face difficulties. CCOs must communicate to the community members that LFs are always available to assist them. The follow-up must be given to any farmers. It doesn't matter if the request was from an individual or group, or from those who participated in the training or not.

(2) Tree growing

Raising tree seedling doesn't require high-level techniques, as long as there is a proper selection of species. Seedling production, however, needs careful attention for watering and root pruning. Attention to keeping moisture by careful watering makes a difference in the growth of seedlings. The root pruning reduces possible risks of damages occurred during the time of transplanting. It also has a benefit of controlling growth. Therefore, it is important to monitor farmers' activities and give appropriate advice whenever necessary.

Follow-up during out-planting seedlings is necessary, especially when making a pit of the right size that fits the size of the seedling. Also, soil compaction around the seedlings after transplanting is necessary. In many cases, inadequate compaction can dry up the seedlings. Direct sowing practice requires some attention on land preparation. Clearing the weeds and preparing pits for sowing seeds are particularly important.

(3) Gully reclamation

Attention should be paid to the size of check dams. In most cases, relatively large check dams are built with stones. When the check dam is not properly constructed, it retains too much water that eventually pushes through the retaining wall, causing unexpectedly dangerous run off. Therefore, LFs shall follow-up when the farmers are to construct a relatively large check dam.

2.11.2 Follow-up by CCO

The follow-up by CCOs may primarily focus on the activities carried out by LFs. Initially, LFs may face challenges in conducting the training, and CCOs must closely LFs in these early stages of conducting the training. There are two ways to know the level of understanding of LFs on the techniques. One is through LFs' monthly meetings (refer to Appendix B1: Checklist for LF / SLF monthly meeting); the other is through a field visit (refer to Appendix B2: Field checklist for CCO and for LF). Due to resources and time availability, CCOs shall pay attention to organizing monthly meetings regularly and visit the field to monitor progress when necessity arises.

2.12 Arrangement of Field Day

Filed Day is the most effective event among all COVAMS activities, to encourage farmers to demonstrate and learn conservation techniques. COVAMS approach recommends that LFs shall conduct Field Day in each village, aiming at maximizing participation. To make it possible, Field Day shall be conducted by LFs.

2.12.1 Preparation and training for Field Day

(1) Who shall lead Field Day

An individual or group of LFs may carry out Field Day for the entire village, or *Limana* members may use their own gardens. To make it happen, CCOs shall train LFs how to conduct Field Day events.

LFs are not always fully confident of practicing and demonstrating all three techniques. To encourage LFs who are not confident and who did not practice all the techniques in the previous season, they may continue practicing them during the current season, to improve their techniques. An invitation to become a trainer for the event shall be given to LFs who performed well in adopting and demonstrating all the techniques during the season.

(2) Arrangement for Field Day

The decision can be made by LFs together with VH. The contents of Field Day shall be a combination of the three techniques of soil erosion control, gully control, and tree growing. Field Day must take place at the LFs' gardens to demonstrate all the techniques as examples, and it may be completed as a half-day event.

(3) When would be the most appropriate time to organize the event?

Field Day shall be organized at least twice annually, considering the nature of maize growing. The first time shall be during February at vegetative stage, while another occasion would be during April at reproductive stage.

2.13 Presentation Ceremony

LFs maybe awarded by recognizing their hard work and dedication. By doing so, it motivates LFs to work harder for their communities. As such, a certificate presentation ceremony may be taken place in the presence of government senior officials such as District Commissioners, Project Managers (PMs), Agriculture Development Division officers and Regional Forestry Officers. It may be difficult to conduct the ceremony in one place due to the cost to gather the LFs at the place; hence, several ceremonies may be planned combining adjacent villages. The suitable time during the year for the ceremony is between April and May, so that the awarded LFs can work during the coming season with higher motivation.

2.14 Selection of Senior Lead Farmers

One SLF is elected to represent every 15 LFs in a village. CCOs are responsible for selecting the SLF based on the performance during the previous year, and the commitment of the entire candidate LFs in the village during the previous year. The criteria for the selection must be clear and accountable so that other LFs would not have any objections.

2.15 Provision of Bicycle

SLFs are expected to coordinate LFs' activities by disseminating information, providing technical support to LFs, attending SLF meeting organized by CCOs, etc. Having such roles and responsibilities, SLFs may be entitled to use bicycles to ensure their mobility. It must be stressed, however, that the ownership of the bicycle is not on a particular SLF, but on the group of LFs of the village. Once a SLF leaves from the post, the bicycle has to be given to another SLF who replaces his / her post.

2.16 Re-sensitization Meeting by Senior Lead Farmers / Lead Farmers

During the second year of intervention, COVAMS approach recommends that SLFs conduct re-sensitization meetings. Re-sensitization training focuses on the review of the first-year result rather than repeating the earlier contents. It is recommended to have one large village re-sensitization meeting and one small re-sensitization meeting at *Limana* level. LFs shall conduct re-sensitization meetings at *Limana* level while SFLs do similar meetings at village level. SLFs shall be trained on how to conduct the village re-sensitization meeting while it is not necessary for the LFs to be trained for conducting the *Limana* level re-sensitization.

2.16.1 Village level re-sensitization

The content of the meeting is, more on the review of the village's performance of the previous year. The CCO responsible for the village shall give the results of the training conducted by LFs and the number of participants, as well as the number of practicing farmers beforehand. Moreover, the result of production through reviewing Field Day taken place in the village should be presented during the re-sensitization meeting. SLF shall inform them during the meeting, and facilitate a discussion during the evaluation of the result, causes of the result and the way forward for the following season. Additionally, an explanation of COVAMS posters should be presented by SLF.

2.16.2 Training for Senior Lead Farmers on conducting re-sensitization

The training contents shall follow the agenda of the meeting. The training comprises of the following:

- The performance of the village during the previous year,
- Assessment of the result,
  - LFs' performance
  - Farmers' practice
- Analysis (causes) of the result,
- Experience of the practice farmers (benefit),
- Way forward for the following season, and
- Explanation of COVAMS posters.

An emphasis of the training shall be given to practice over the theories. Participants are encouraged to try and practice the knowledge and skills attained while the training is still in progress. DMT will award certificates to SLFs at the end of the training, for recognition of their contribution towards training, and for motivating them for further commitment.

It might be difficult to convince SLFs to work for the villages as resource persons without providing incentives or compensation. Hence it is necessary to explain the condition of work thoroughly, and to agree with them prior to nominating them as SLFs. The acknowledgement of SLFs' dedication and services to their communities shall be made by occasions such as official ceremonies or church services, possibly publishing it through medias. Such recognition will motivate not only those awarded, but also others to dedicate to the services.

2.16.3 *Limana* (group of households) level re-sensitization

Re-sensitization meetings shall be carried out in order, beginning at *Limana* level, then at the village. The objective of the *Limana* re-sensitization meetings is to share with participants results on maize growing, tree growing, and gully control; and to provide a forum for practicing farmers to share their own experiences on the three techniques. At the end of the re-sensitization meetings, the stakeholders shall prepare a joint action plan for the following season.

2.17 Refresher Courses

Refresher courses are organized for LFs during the second year of intervention, in order to consolidate both knowledge and practice in soil erosion control, gully control and tree growing. Such refresher courses are also tailored to boost LFs' confidence of their practice.

In most cases, CCOs may add new villages during the second year, and are preoccupied with tasks such as TOT for the new LFs elected from the new villages. Therefore, COVAMS approach is designed to nominate SLFs for conducting a refresher course. SLFs were chosen because of his / her performance during the previous year. While they are knowledgeable and skillful enough to demonstrate the techniques, the refresher course will be provided by SLFs. SLFs receive skills and knowledge from TOTs to teach adequately, and to deliver the techniques to the fellow LFs.

2.18 Option for Enhancing Sustainability

The procedures of COVAMS approach explained in these guidelines were derived from the experiences of technical cooperation between Malawi and Japan. According to the principles of COVAMS approach, it aims at maximizing the usage of local resources available. This is based on a belief that reliance to external resources has a weakness in terms of sustainability.

The set of materials listed in the guidelines (explained in Section 2.10.1) is not considered entirely as locally available resources. COVAMS training ultimately needs no external inputs if the principles are strictly applied. Therefore, the list may be a reference only if sustainability is a prime factor to consider. Procurement and supply of materials may be adjusted, depending on the availability of fund and ease of delivery. COVAMS II has developed "Lean COVAMS" in consideration of enhancing sustainability even after the Project is terminated. Lean COVAMS is a revised approach of COVAMS by making use of goods in a village as much as possible. The JICA technical cooperation project has tried and implemented Lean COVAMS for one year and found there is no difference from the implementation process of conventional COVAMS as explained elsewhere in the guidelines. The approach uses goods available in the village as much as possible, to minimize reliance to external resources. The comparisons of the conventional COVAMS and Lean COVAMS in terms of cost, and the outcome has been carefully reviewed. The comparison is shown in the Table 1 "Cost estimate for two-year activities through COVAMS approach" in Appendix A.

3 MONITORING AND EVALUATION

In the operation of COVAMS approach, the areas to note are steady increasing, in parallel with the number of villages to cover, and the number of farmers who adopt and practice the techniques. Monitoring and evaluation, therefore, shall focus on the following viewpoints:

- Steady increase of the number of villages and timing of the activity
  - Progress of COVAMS approach activities in the villages
  - Progress of expansion of target villages in the district

- Achievement of the expected number of farmers who are practicing
  - Quality of the activities done in order to motivate potential farmers and create the environment for conducting training effectively by LFs.

In order to monitor the quality, the following areas have to be closely assessed:

- Understanding of COVAMS approach and benefits by practicing, as well as disadvantages of the villagers by not practicing
- Status of support from the village leaders to LFs
- Method of information dissemination for equal opportunity of participation in COVAMS to the entire villagers
- Understanding of the three techniques by LFs and villagers
- Understanding of the roles of SLF

3.1 Monitoring COVAMS Activities in Villages

Farmers are expected to practice the techniques when the training is completed so the activities of COVAMS approach follow the farming calendar. DMT has to monitor and guide all the activities to be carried out within the appropriate time scale in the calendar, following the annual work plan prepared by the district staff.

3.2 Monitoring Expansion of Target Villages

COVAMS approach expansion plan shall be prepared in each district. COVAMS approach is steady increasing the number of villages, covered by the shortest possible period with more than 50% of farmers of all H/Hs adopting the technique. DMT shall monitor carefully whether or not the pace of expansion matches with the plan. If the pace for extending COVAMS is slower than it was originally planned, then DMT shall analyze the causes of the problem, and place appropriate measures to fix the situation.

3.3 Monitoring Activities by Lead Farmers.

3.3.1 Monitoring understanding of the benefit of COVAMS

By assessing the items below, the quality of both the sensitization meetings carried out by CCOs, and Field Day carried out by LFs are clearly identified. These items are:

- Benefits of practicing techniques on COVAMS activities,
- Disadvantages of not practicing COVAMS activities, and
- Understanding on the roles of LFs.

Other elements that may reflect the quality of activities are explained in the following:

- Sensitization meeting is very important in motivating farmers in their practice, since it is conducted at the beginning of intervention. Therefore, the quality of the meeting shall be monitored, and if there are any shortfalls, then TST shall provide some additional measures such as retraining CCOs and repeating the meeting to fix the problems.
- Field Day will provide good influence to the farmers' second-year practice. During Field Day, the names of encouraged and committed farmers will be listed into the name list. By counting the number of farmers on the list, the quality of Field Day will possibly be assessed.
- The quality of activities can also be assessed with the number of participants in the training, and the adoption rate of farmers during the first year. Through monitoring those results, the management may develop an idea on how the re-sensitization meeting is carried out. The contents and the delivery of training by SLFs during the re-sensitization meeting shall be revisited, if the result is lower than the expectations.
- The overall practices performed by LFs and the number of training courses conducted, may be an indicator to the perception and understanding of the roles and responsibilities of LFs. When something is not working correctly with a LF and the problem is persistent, then the LF has to be consulted. If nothing is improved or changed, then replacing the LF is an option, should such decision be mutually agreed among community members and village leaders.

3.3.2 Monitoring village leaders support

In the Malawi context, a degree of influence by a VH over any activities within the village is significant. In a village where VH supports COVAMS activities by LFs and the villagers, farmers' practice rate is generally very high. Monitoring VH's attitude towards LFs and the farmers may give a good view on what is going on. At the same time, it is also important to create good relationship between CCO and VH in order to secure a good working ground for LFs to perform. If the attitude of VH is not favorable, then CCO shall intervene into the situation to resolve the difficulties.

The support from VH can be assessed through his/ her attendance to sensitization meetings, the number of participants during training and the number of farmers practicing. When those numbers are lower than expected during the first year, a support from VH is not as high as expected. In this case, CCO may intervene into the situation to fix the difficulties for the second year for improvement.

3.3.3 Monitoring the dissemination of information for ensuring equal opportunity

Among the five principles of COVAMS approach, “ensuring equal opportunity for participation to training” is the most significant. In other words, the information on training must reach every H/H in the village. COVAMS approach recommends distributing the invitation cards to every H/H for ensuring access to the information. CCOs have to check whether or not the invitation cards are properly distributed. If not, then CCO must take every possible measure to fix the problem.

3.3.4 Monitoring the understanding of soil erosion control, gully control and tree growing

The quality of TOT for LFs carried out by CCOs can be assessed through monitoring the quality of field practice of the three techniques demonstrated by the LFs. In particular, the facilitation skills of CCOs may be evaluated through LFs’ quality of contents, training design, as well as its delivery.

Effective training is a combination of skills to practice three techniques, and capacity for facilitating training. The former may be attained by themselves practicing in his / her own garden. The latter is challenging because it requires trial and error through actual training. When monitoring farmers’ practice, if its adoption and quality of work is less than expectation, then TST may closely watch how the training is practiced within the community. There may be some room for improvement, and additional measures and advice may be necessary and effective. An intensive monitoring toward the practice of LFs, particularly those who recently started his / her work is more important. The monitoring of practice by farmers shall be carried out regularly, to see if there is any shortcoming in it. In such case, advice shall be given to LFs during the regular LFs meeting, to avoid any embarrassment he / she may feel having his / her practice by CCO in front of farmers.

3.3.5 Understanding of the roles of Senior Lead Farmers

To assess SLF performance, it will help to monitor the indicator and measurements in

Table 3-1. During the second year, COVAMS approach recommends to utilize the SLF system to reduce the workload of CCOs, and to increase the number of villages under COVAMS approach. However, it is not very clear if the system works properly or not at the beginning of the second year. Hence intensive monitoring of SLFs' activity at an early stage of the second year is necessary, especially by TST. The SLF system is a key to sustaining the activities of COVAMS approach in the village. CCO and TST must give a backstopping to SLFs until familiarizing with their roles.

Table 3-1 Indicators and Measurements for Monitoring

Purpose of Monitoring	Indicators	Measurements
Improvement of the quality of sensitization meeting	Understanding of COVAMS approach	• No. of villagers participated • No. of attendants in the meeting • No. of participants in the training • No. of practicing farmers
	Benefit of practice	• No. of participants in the training • No. of practicing farmers or its rate against entire H/Hs of the village
	Understanding of the roles of LF	• No. of LFs who are practicing • No. of training conducted
Improvement of the quality of relations with VH	Status of support from village leaders to LFs	• Attendance to sensitization meeting by village leaders • No. of participants in the training • No. of farmers practicing
Assurance of equal opportunity	Method of information dissemination	• No. of attendance at the sensitization meeting • No. of participants in the training
Improvement of the quality of TOT by CCOs	Understanding of the three techniques by LFs	• Demonstration plot developed by LFs
	Acquisition of facilitation skill	• Contents and quality of training for the villagers by LFs • Quality of practice of the techniques by farmers
Improvement of the capacity of SLFs	Understanding of the roles of SLF	• Implementation of re-sensitization meeting by SLF • Quality of the re-sensitization meeting • Quality of the refresher course for LFs • Quality of training for villagers by LFs • Implementation of LFs meeting in the village

Table 3-2 Annual Activity Schedule

Month	Items / Technique	Activity
January	Gully	• Training on gully reclamation and control
	Tree	• Tree growing
February	Tree	• Monitoring on management of planted tree seedlings
	Gully	• Training by LFs • Follow-up on the practice
	Management	• Selection of next target villages
March	Tree	• Monitoring of management of planted tree seedlings
	Soil	• Field Day on maize harvest at LFs' demonstration plot
	Gully	• Follow-up on the practice
	Management	• Introduction to COVAMS for headmen • Confirmation of headmen's willingness to join
April	Tree	• Training on beekeeping • Monitoring of management of planted tree seedlings • Explanation on tree growing activity
	Management	• Explanation and training for village resources selected from LFs for conducting sensitization meeting (if necessary) • Preparation and implementation of Sensitization meeting • Selection of LFs • Collection of H/H list
May	Tree	• Training on beekeeping • Monitoring of management of planted tree seedlings • LF training (TOT)
	Soil	• Selection of LFs in the new target villages • Refresher course for SLF / LF • LF training (TOT)
	Management	• Implementation of sensitization meeting • Collection of H/H list • Brush-up course for SLFs
June	Tree	• Monitoring of management of planted tree seedlings • LF training (TOT) • Production of seedlings and practice of direct sowing by LFs • Monitoring LFs' practice
	Soil	• LF training (TOT) • Construction of demonstration plot by LFs • Monitoring LFs' practice
July	Tree	• Training on tree growing • LF training (TOT) • Monitoring LFs' / farmers' practice
	Soil	• Construction of demonstration plot by LFs • Monitoring LFs' / farmers' practice
	Management	• Collection of training report
August	Tree	• Training on tree growing • Follow-up on and monitoring of practice
	Soil	• Soil erosion control training by LFs • Follow-up on and monitoring of practice
	Management	• Collection of training report
September	Tree	• Training on tree growing • Follow-up on and monitoring of practice
	Soil	• Training on soil erosion control by LFs • Follow-up on and monitoring of practice

Month	Items / Technique	Activity
	Gully	• TOT for LFs on gully • Practice of check dam construction
	Management	• Collection of training report
October	Tree	• Demonstration of direct sowing method and distribution of seeds • Follow-up on and monitoring of practice
	Soil	• Training on soil erosion control by LFs • Follow-up on and monitoring of practice
	Gully	• Training on gully reclamation and control
	Management	• Collection of training report
November	Tree	• Monitoring on seedlings management (watering and pruning)
	Soil	• Soil conservation training by LFs • Follow-up on practice • Monitoring of practice • Confirmation of the number of villagers who are practicing
	Management	• Collection of training report
December	Tree	• Follow-up on out-planting practice
	Management	• Confirmation of the number of villagers who are practicing and areas

Appendix A: Cost estimation of the activities through COVAMS approach

1. PURPOSE OF THE COST ESTIMATION

The cost of utilizing COVAMS approach varies depending on what kind of technology is spread by when, or with whom it shall be carried out. To make these matters clear, a cost comparison on COVAMS approaches based on different conditions is presented. One challenge is: there are a few parameters to include when cost estimation is to be carried out.

The idea here is to present and compare two classifications of COVAMS approach: one is the cost based on the practice following each procedure explained in these guidelines; another is the so-called “Lean COVAMS” approach, which is a modified practice by eliminating most of the external inputs listed for the conventional COVAMS (see Section 2.18. Option for enhancement of sustainability in the guidelines, for an explanation of “Lean COVAMS”). Beside the reduced cost by eliminating goods for implementation, there is a difference between the two approaches. The conventional COVAMS approach may be suitable when agility in both penetration and extending coverage is mattered. Supported by a relatively high level of inputs such as materials for farmers, bicycles and motorcycles for ensuring SLFs and CCOs, it may take advantage of the enthusiasm of target communities and mobility. On the other hand, Lean COVAMS may be suitable when risks of reliance to external material inputs are concerned, in a view of long-term ownership and sustainability. Lean COVAMS is suited when financial resources are not adequate, while extension work needs to reach out to as many communities as possible. COVAMS aims at minimizing dependency to incentives given from outside. It rather attempts to facilitate farmers understand their own benefits by voluntarily participating in development activities to improve their own lives.

The two different approaches share the same five principles of COVAMS. The activities of the two make no difference in terms of process and procedures. The activities of the two shall follow in accordance with the COVAMS Approach Guidelines.

2. ASSUMPTIONS OF THE ESTIMATION

The following assumptions were made to estimate the cost of implementing COVAMS. They were built based on Project experience in the four target districts in Malawi.

A CCO oversees one hundred LFs on average. An average of 15 LFs are elected in a village. Six to seven villages may be assigned to one CCO under his / her responsibility. From these figures, the cost necessary to COVAMS over a two-year period may be easily estimated.

The basis of this calculation is that a CCO trains one hundred LFs and seven SLFs from 6 to 7 villages within a two-year intervention. The expenses for materials and fuel are based on the market price obtained between June 2016 and May 2017. The element of cost is shown in Figure 1.

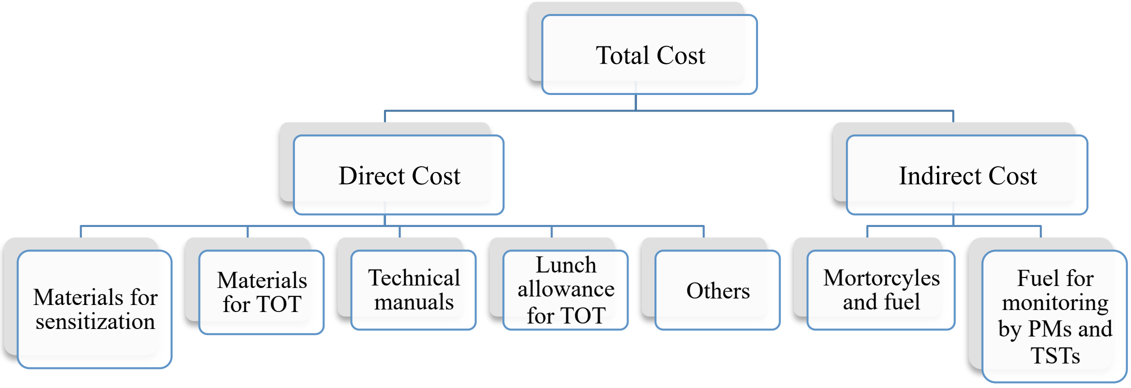

Figure 1: Element of Cost for Implementing COVAMS

3. CALCULATION OF THE COST

3.1 Direct Cost

Direct cost consists of the following items: materials for sensitization, materials for TOT, technical manual, lunch allowance, and others.

3.1.1 Sensitization Materials

Production of posters for the sensitization meeting mainly used by CCOs may be outsourced to a print shop. The black and white posters used by LFs are produced with black and white A3-sized papers.

3.1.2 Materials for Training of Trainers

The training materials outlined in the guidelines are provided to LFs at the first-year TOT. The items include a *panga* knife, a line level and nylon threads to measure contour lines, nails to make “A-frames” for aligning contour lines, polythene tubes for seedling production, a notebook and a pen. Polythene tubes are provided at TOT for distribution to the fellow farmers. For Lean COVAMS, items distributed are limited to notebooks, pens, strings, and line levels.

3.1.3 Technical manuals

The technical manuals include tree growing, soil conservation and gully reclamation. They are outsourced to a print shop for production, and are provided to LFs. For Lean COVAMS, the manuals are only provided to SLFs.

3.1.4 Lunch allowance for Training of Trainers

A lunch allowance of 800 MKW/day is provided to LFs and SLFs during TOT. The duration of TOT for LFs during the first year and second year take four days. TOT for SLF during the first year and second year takes three. The lunch allowance is provided to both conventional and Lean COVAMS.

3.1.5 Fuels for Motorcycle

The annual expenses for running a motorcycle are calculated from the actual expenditures between June 2016 and May 2017. The expenses related to motorcycles during the second year are deemed at a half of the annual expenses, because SLFs are nominated to assist CCOs.

3.1.6 Others

Other expenses included are: T-shirt for LFs and SLFs, and bicycles provided to SLFs.

3.2 Indirect Cost

3.2.1 Motorcycle and its depreciation

Ensuring mobility for extension officers responsible for monitoring and overseeing COVAMS activities is one of the major factors for designing extension activities. The expenses related to motorcycles are not negligible. They vary depending on how many new motorcycles are to be procured, when estimating the cost of COVAMS activities. If existing motorcycles are available, then how many more motorcycles to be procured is a complex question. If the office equips some motorcycles, which may be allocated to the activities, then the expenses on repair and maintenance shall be considered. Newly procured motorcycles may not require repair and maintenance, but their depreciation may need to considered instead. Ensuring mobility is a key element of designing COVAMS approach, while procuring a new motorcycle is, however, not absolutely essential. General recommendation for any agencies that would like to adopt COVAMS shall look into the possibility of utilizing locally available resources, including readily available motorcycles instead of procuring new motorcycles.

3.2.2 Fuel cost for management staff such as Project Manager and Technical Supporting Team

The fuel cost for the monitoring of field activities by PM and TST is also considered variable. The more area the activities reach out, higher becomes the cost of fuel. The frequency of carrying out site visits shall be carefully reviewed, based on the necessity and available resources including time, effort and budget.

3.3 Things to consider

COVAMS approach is not a perfect solution for every situation. It has advantages and, at the same time, limitations. One particular success may not be replicable in other locations, since all communities are different. COVAMS approach may not be attractive when community members receive regular external support, such as financial support or food baskets for the improvement of nutrition, etc., from other development partners.

Table 1: Cost estimate for two-year activities through COVAMS approach

Items	To whom	COVAMS			Lean COVAMS		
		U.P. (MKW)	Qty.	Amount (MKW)	U.P. (MKW)	Qty.	Amount (MKW)
I. Sensitization							
1. Posters (color, plastic poster)	CCO	82,500	1	82,500	82,500	0	0
2. Posters (black and white, A3 paper)	LF	2,550	100	255,000	2,550	0	0
3. Envelop (A3)	LF	100	100	10,000	100	0	0
II. TOT (SLF / LF)							
4. Marker Pen (3 colors × 10 sets)	CCO	1,750	10	17,500	1,750	0	0
5. Flip Chart	CCO	3,000	1	3,000	3,000	0	0
6. Masking Tape	CCO	1,100	1	1,100	1,100	0	0
7. Notebook	LF	495	100	49,500	495	100	49,500
8. Pen	LF	120	100	12,000	120	100	12,000
9. Document Folder	LF	195	100	19,500	195	0	0
10. Panga Knife (soil conservation)	LF	995	100	99,500	995	0	0
11. Strings (soil conservation)	LF	450	100	45,000	450	100	45,000
12. Nails (soil conservation)	LF	950	300	285,000	950	0	0
13. Line Level (soil conservation)	LF	2,500	100	250,000	2,500	100	250,000
14. Polythene Tubes (100 pots/LF) (tree growing)	LF	200	10,000	2,000,000	200	0	0
III. Technical manuals							
15. Manuals (three techniques)	LF	5,693	300	1,707,900	5,693	21	119,553
IV. Lunch allowance for TOT							
16. TOT for LF (8 days / 2 years)	LF	800	800	640,000	800	800	640,000
17. TOT for SLF (6 days / 2 years)	SLF	800	42	33,600	800	42	33,600
V. Fuel							
18. Fuel for CCO activities (7 villages x 1.5 year)	CCO	32,280	10.5	338,940	32,280	10.5	338,940
VI. Others							
19. T-shirts	LF	4,000	107	428,000	4,000	107	428,000
20. Bicycle	SLF	45,000	7	315,000	45,000	7	315,000
			Total (MKW)	6,593,040		Total (MKW)	2,231,593
			Total (USD)@700	9,418.63		Total (USD)@700	3,187.99

Appendix B: Check Lists

Appendix B-1: Check List for LF / SLF monthly meeting

A. Progress report

- Limana meetings conducted
- Number of trainings conducted
- Challenges encountered
- Explanation of the field practices during the reporting period
- Number of H/H / technology
- Number of seedlings raised / planted
- Number of gullies reclaimed
- Number of check dams
- Area conserved in acers
- Others (raised by CCO and SLF)

B. Plans for the following month

C. AOB

Appendix B-2: Field Check List for CCO and for LF

■ TRAINING

1. Quantity

- Number of SLF trained
- Number of LF trained
- Number of Farmers trained

2. Quality

- Facilitation
- Participation
- Contents delivered (more practical)

■ PRACTICES

A. Tree Growing

A-1. Quantity

- Number of seedlings to be raised (target)
- Number of seedlings to be raised / species
- Number of seedlings planted / species
- Number of trees surviving
- Area under natural regeneration (in ha per CCO, in acer per LF)

A-2. Quality (Management practice)

- Management on nursery
- Management on woodlot
- Management of areas and trees regenerated

B. Soil and water conservation

- Number of heaps / type of manure
- Area applied manure
- Materials used and processing / procedure
- Orientation of ridges (proper)
- Distance between marker ridges and ridges
- Presence of water harvesting technologies and their dimensions
- Management on nursery
- Management on woodlot
- Management on areas and trees regenerated

C. Gully Reclamation

- Number of check dams constructed
- Number of gullies reclaimed
- Orientation of check dams
- Materials used in check dams

D. Others (raised by CCO, SLF and LFs)

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COVAMSⅡ

Project for Promoting Catchment Management Activities in Middle Shire

Forestry Department

Field Manual in Tree growing

NJIRA ZIMENE ANTHU ANGATHE KUTSATA POFUNA KUBWEZERETSA NKHALANGO

ZOLINGA

1. Anthu athe kudziwa njira zosiyanasiyana zimene zimatsatidwa pobwazeretsa nkhalango.
2. Munthu adzitha kukhala ndi ufulu wosankha njira yokomera iye.

KUFUNIKA KWA MITENGO/ NKHALANGO

1. Kupeza nkhuni milimo matabwa.
2. Kugulitsa nkupeza makobili.
3. Mitengo imateteza nthaka kuti isakokoloke ndi madzi.
4. Mitengo ina imagwiritsidwa ntchito ngati mankhwala.
5. Mitengo imabwezeretsa / kuwonjezera chonde mu nthaka.
6. Kukopa alendo ndi kukongoletsa malo.
7. Anthu amatha kupeza mwayi wantchito zosamalira nkhalango.

NJIRA ZOBWEZERETSERA MITENGO /NKHALANGO

KUKHAZIKITSA NAZALE

Njira iyi imafunikira ngati tiri ndi mapulani ofuna kudzala malo a akulu
Kapenanso ngati kabweredwe ka mvula kuderako kali kovutavuta.

UBWINO NDI KUYIPA KWA NAZALE

UBWINO WA NAZALE	KUYIPA KWA NAZALE
➢ Njira iyi imafunikira ngati tikuganizira kubzala malo a akulu komanso ngati kuderako mvula imabwera movuta.	➢ Pamafunika ndalama zochuluka zogulira zipangizo monga; Makeni, Machubu,Wilibala, Fetereza ndi zina zotero.
➢ Munthu amabzala mtundu wa mitengo yomwe akuyifuna.	➢ Timakhala ndi nthawi yayitali yogwira ntchito monga, kumanga mpanda, kuthira dothi mumachubu, kufesa mbewu, kuthirira, kudula mizu ndi zina.
➢ Mbande zimakhala zili ndi nsinkhu wabwino nthawi yobzala.	➢ Timadulanso mitengo yokula kula kale kuti timangire mpanda wa nazale, mmalo mogwiritsa mitengoyo ntchito zina.
➢ Mbande zimakhala zili ndi maonekedwe abwino ndinso zokhwimitsidwa bwino zisanadzalidwe.	
➢ Tikhoza kugulitsa mbande	

ngakhale kwa anthu akutali ndikupeza ndalama.	

NTHAWI YOKONZEKERA MANAZALE

Nazale iyenera kukhazikitsidwa miyezi iwiri tisanayambe kufesa mbeu\njere zathu Monga Epulo ndi Meyi chifukwa njere zambiri zimafesedwa miyezi ya Juni, Ogasiti Komanso kwa mitenga yokula pangonopangono monga Pine, Mlombwa ndi ina tiyenera Kukhonzekera nazale miyezi ya Febuluwale ndi Marichi.

Mbande timakazala kumunda pamene mvula yayamba kugwa ndipo chinyontho Chikupezeka mdothi kuya kuposa phazi limodzi.

Chinthu chofunika kuchiwonetsetsa ndichakuti tiri ndinjere za mitengo yomwe tikufuna kufesa tisanayambe kugwiritsa ntchito njirayi.

KUTOLERA NJERE ZA MITENGO.

CHIFUKWA CHIYANI KUTOLERA NJERE?

- Izi zimatithandiza kukhala ndi njere zochuluka,komanso zopanda mtengo (zaulele). Mitengo yomwe ikumera kudela lathu, njere zake zidzameranso bwino mu nazale zathu chifukwa ndi za mdera lanthu lomwelo.

NANGA NGATI MITENGO INA SIIMERA MDERA LATHU?

- Tifunse alangizi a za nkhalango atithandize kupeza njerezo,Tiwonetsetse kuti mitengo yake ikhoza kumera bwino m’dera lathu.
- **Komanso tikhonza kukapeza njerezi ku FRIM [Forestry Research Institute of Malawi] kapenanso ku ICRAF.**

NJERE ZIMAPEZEKA KUTI

- Njere zimapezeka mu zinthu monga izi:
    1. Zipatso.
    2. Muzikhokhombe.
- Nthawi zina njere zimayoyoka mu zikhokhombe zikadali pa mtengo.

KUTOLERA / KUPEZA NJERE KUMUDZI KONKO

- Pofuna kutolera njere timayangana mitengo yomwe ingatipatse zotsatira tikufuna podzala mitengoyo monga:

NTCHITO (ZOLINGA)	MAONEKEDWE A MTENGO WA NJERE
1.Nkhuni	• Mtengo wa nthambi zambiri. • Mtengo wophukira nthambi zambiri ukadulidwa monga, chitimbe, bulugama, kasha, malayina.
2.Milimo	• Mtengo wowongoka.

	• Wopanda nthambi zambiri.
3,Zipatso	• Mtengo wa zipatso zokoma, zopanda matenda, zoyenda malonda, zosavuta kuzipeza mumtengomo.
4.Mpanda	• Mtengo uziwoneka wa nthambi zogundizana mothinana.
5.Kubwezeretsa chonde	• Mtengo womwe masamba ake amawola msanga.

Kumbukiralani
1.Osangotolera njere chifukwa njerezo nzosavuta kuzipeza mumtengomo kapena kuti mtengowo uli pafupi nafe, koma tolerani njere kuchokera ku mtengo womwe ukupatseni zotsatira zomwe inu mukuzifuna.
2.Njere zochokera mu mtengo wabwino zimatipatsanso mitengo yabwino.

NTHAWI YOTOLERA NJERE.

Nthawi yabwino yotolera njere ndi pamene zizindikiro izi zikuoneka m'malo momwe njere zimapezeka:

1. Zipatso / zikhokhombe zikusintha mtundu kuchoka kobiliwira kunka ku bulawuni {brown}.
2. Pamene zipatso/zikhokhombe zilimba.
3. Pamene zikhokhombe ziyamba kusweka zikadali pa mtengo pomwepo.
4. Ngati njere idulidwa ndi mpeni imalimba komanso imaonetsa komera {embryo} koti kakhonza kumera.

NJIRA ZOTOLERA NJERE

- Ndi nzeru kutolera njere kuchokera ku mitengo ingapo osati umodzi wokha.

Pali njira zingapo zotolera njere kuchokera ku zipatso komanso ku zikhokhombe ndipo izi timazipeza pouyang'ana mtengo wa njerewo.

1. Kuyala mphasa kapeni pulasitiki pansi pa mtengo kuti njere ziziyoyokerapo.
2. Kuthothola zipatso kapeni zikhokhombe ndi manja utayima pansi ngati ungazifikire.
3. Kugwedeza mtengo wonse kuti njere ziyoyokere pansi.
4. Kukwera mumtengo ndi kuthothola zipatso / zikhokhombe.

   Dziwani ichi: Kukwera mumtengo kungakhale koopsa choncho nthawi zonse tisakhale tokha pogwiritsa njirayi.

KUCHOTSA NJERE MU ZIPATSO / ZIKHOKHOMBE

I. Njere za muzikhokhombe

- o Yanikani zikhokhombe pa dzuwa mutaziyika pa choyala. Njere zimachoka zokha zikhokhombe zikayamba kuuma ndi dzuwa.
- o Zikhokhombe zina zimalimba kuti zitseguke zokha choncho zikayamba kutseguka ziyikidwe mu thumba ndi kulimenya kuti njere zituluke [petani kuchotsa zosafunika].

II. ZIPATSO ZA MITENGO MONGA IYI;

- Indiya.
- Nimu [neem].
- Malaina.
- Kankhande.

Vikani m'madzi zipatso zakezo kwa tsiku limodzi kapeni masiku awiri.Zitsukeni kuchotsa nsuzi wake.

Ziviyikeninso njerezo m'madzi ndipo muchotse zonse zimene zayandama ndikuzitaya

Yanikani zotsalazo padzuwa.

III. NJERE ZOKHALA NDI MAPIKO monga kadale, mkolong'onjo.

Tikitani njere ndi manja kapena ndi pena pali ponse polimba.

IV. NJERE ZA ZIKHOKHOMBE ZOLIMBA monga mulombwa

Izi timazisunga monga momwe zililimo kufikila nthawi yofesa pamene timazidzutsa[Pre-treament].

- Kumbukilakni kuyanika njere pa dzuwa kwa masiku angapo kuti ziume bwino komanso kuti zisungike nthawi yayitali.

KUCHOKOCHA/KUSANKHA NJERE

Chotsani ndikutaya njere zonse zomwe ndi;

1. Zowonongeka ndi tizilombo
2. Zosaoneneka bwino
3. Zonyala
4. Zosiyana mtundu/mawonekedwe ndi zinzake

KUSUNGA NJERE

Kasungidwe ka njere kamatengera ndi mtundu wa njerezo.

- Njere zomwe zimachokera ku zikhokhombe kawiri kawiri ndi zomwe zimasungidwa nthawi yayitali m'malo momwe mpweya siulowa [air tight containers] Izi ndi monga; msangu,ngongomwa,kasha ndi zina.
- Njere zomwe sizichokera mu zikhokhombe monga;Nimu,masuku,nyowe,mkundi ndi zina.

  -Ziyenera kufesedwa nthawi yomweyo
  -Ngati zingasungiwde koma ndi nthawi yochepa,zisungidwe mu nsalu yodutsa mphepo ndinso zisathinane.

MALANGIZO

- Njere zisasungidwe mu pulasitiki nthawi yayitali chifukwa zimaola.

- Osasunga njere kuti zidzafesedwe chaka china mtsogolo.s

KUFESA NJERE ZA MITENGO

KUKONZA DOTHI LABWINO LA MUNAZALE

Dothi labwino lowumbira machubu mu nazale liyenera kukhala losakanizidwa motere:
Mbali zitatu za dothi, Mbali imodzi ya mchenga, ndi Mbali imodzi manyowa.

(1)

Mulingo woyenera wa dothi la munazale
Dothi: Mchenga: Manyowa = 3:1:1

Gwiritsani ntchito chida chimodzi
Potengera manyowa, mchenga

KUTHIRA DOTHI MMACHUBU

Thirani gawo limodzi ma magawo awiri a chubu ndi dothi losakanizidwalo ndipo litsenderedwe kuti chubuco chithe kuyima. Keneka dzadzitsani chubucho.

(1)

Tsegulani kukamwa kwa chubu ndi zala zitatu.Thilani dothi muchubu pang’onopang’ono kufikira litadzadza gawo limodzi mwa magawo atatu a chubucho. Likakwana gawo limodzi mwamagawo atatu a chubuyo,

(2)

Kokerani chubu m’mwamba ndikuchinyira dothi pogwiritsa ntchito zala.

(3)

Dzazitsani dothi muchubumo koma lisatsenderedwe

M’malo mwa machubu tikhonzaso kugwiritsa nchito zinthu monga:

- Mapaketi a suga.
- Mapaketi a chibuku.

KUDZUTSA NJERE

Kunyika m’madz ozizira: Njere zonse zomwe zikopa zake ndi zotera ndi bwino kuti njere zimenezi ziviikidwe m’madzi ozizila kwa maola okwanira makumi awiri ndi mphambu zinayi musanafese.

Kuviika m’madzi

Kukhebula/Kuthena njere: Uku ndi kudula mbali imodzi ya nejre ndi cholinga choti madzi alowe mkati mwa njereyo mosavuta kuti njereyo imele mosavuta.Tikhonza kugwiritsa ntchito mpeni , chowengela zikhadabo, kapena kukhutiza njereyo pa chinthu cholimba monga mwala. **Onetsetsani** kuti musadule njereyo mbali yomwe njere imamerela.Njere zomwe tingagwiritse njira ndi monga; mtangatanga, kasha.

Kukhebula/ Kuthena

Kuchotsa chikhokhombe cha njere: Njere zina zimamera bwino pamene zikhokhombe zachotsedwereratu poswa zikhokhombezo mitengo imeneyi monga m'mbawa.
Kukazinga njere: Njere zinanso zimamera bwino zikawauka ndi moto.Njere za Naphini zawonetsa kuti zimamera bwino zikawuka ndi moto choncho njere ngati zimenezi ndibwino kuzikazinga pa moto wotentha ngati moto wowaula tchire kwa mhindi zokwanila imodzi kapena ziwiri.

1.4 KUFESA NJERE

Njere zikhonza kufesedwa m'machubu kapena mumapaketi a sugar, chibuku, maphale osweka ndi zina zambiri m'maenje okuya 1.5 mpaka 2 cm kutengera ndi kukula kwa njereyo.

(1)

Thirani madzi okwanira musanabzale mbeu.

(2)

Pogwiritsa ntchito kamtengo kumbani dzenje lobyalapo mbeu. Ndipo kuya kwa dzenjelo kulingane ndikukula kwa njele.

(3)

Byalani njere imodzi kapena ziwiri (molingana ndi mtundu wa mbeu) ndikukwilira.

Komwe zinthu ngati zimenezi ndizovuta kuzipeza , njere zimathekanso kuzifesa m'mabedi (Swazi bed) bedi limeneli limakonzedwa ndi dothi lomwe tinasakaniza bwino lija pa miyezo iyi;

- Mulifupi lizikhala losapitilira 1m kuti pothilira madzi azitha kukwanila bedi lonse.
- Utali likhale molingana ndi Kuchuluka kwa njere znu
- Kutalika kuchokera pansi likhale lopyolera 30cm
- Njere zifesedwe pa mipata ya 5cm
- Lembani mzere kuchokera mphepete mwa

  bedi kulowa mkati 10cm ndikuzungulira bedi lonse.

KUTHILIRA

KATHILIRIDWE KOYENERA KA NJERE

- Kuthilira kuchitike m'mawa kapena madzulo kuti dothi la m'machubu likhale la chinyontho nthawi zonse , **Onetsetsani** kuti musathilire pamene dzuwa litentha kwambiri chifukwa izi zimatha kupha njere zanu.
- Osathilira mopitiliza muyezo chifukwa izi zimapangitsa lowe munazale zomwe ingapangitse kuti mbande zanu ziziwola komanso mitsitsi kuonongeka ngakhalenso kusowa kwa mpweya mnthaka
- Onetsetsani kuti madzi akulowerera mpaka pansi pa chubu cha mbande kapena bedi la mbande zanu
- Onetsetsaninso kuti njere za maso ang'onoang'ono zikuthiliridwa ndi zifafa za maso ang'ono

ZINTHU ZOMWE TIYENERA KUZIGANIZIRA POFUNA KUTHILIRA

- M'mene nyengo yatsikulo ilili (kwatentha,kuli mitambo,kapena kuli mvula).
- Kwakhala kukugwa mvula kapena ayi.
- Mtundu wa dothi lomwe munagwiritsa ntchito powumba machubu, kodi ndi la mchenga,lamakande ndi zina zotero.
- Msinkhu ,nthawi yomwe mbandezo zakhala,mtundu wa mitengoyo (species).
- Kodi pali shedi kapena ayi.
- Kupezeka kwa udzu wophimbira (mulch) kapena ayi.

NTCHITO ZOGWIRIDWA MBANDE ZIKAMERA

KUPATULIRA MBANDE

Ndi kuchotsa njere m'malo m'mene zamera zopitilira ziwiri kusiya imdzi kuti izimera bwino.Timachotsa zimene zikuoneka kuti ndi zofooka,zoonongeka,kapena zodwala.

KUDZALIKIRA MBANDE ZA MITENG

Uku ndikuchotsa mbande zing'ono zing'ono pa bedi pofesera ndikukazibzala m'malo monga mchubu,mumapaketi a chibuku ,sugar ndi zina ndicholinga choti zipatsane mpata womera bwino.

ZIFUKWA ZODZALIKIRA MBANDE ZA MITENGO

- Kuchepetsa kuthinana kwa mbande pa bedi lofesera, zomwe zingapangitse kuti mbande zikhale zonyozoloka, zofowoka, ndi zowoneka zamatenda.
- Kuchepetsa kulimbilana chinyontho ndi chakudya zomwe ndizofunika pakakulidwe ka mbande.
- Kuchepetsa kulimbana kwa mizu pansi panthaka.

Onetsetsani kuti: mbande zikudzalikidwira pansi pa mthunzi. Mpofunikanso kusamala pochepetsa kufa kwa mbande. Nthawi yoyenera kudzalikira mbande ndipamene mbande zafika msinkhu wa 1inch (1-2cm) komanso zamera masamba oyamba.

Zoyenera kutsata podzalikira mbande

- Thilirani bedi la mbande musanayambe kuzula.
- Mbande zazulidwazo zisakhale padzuwa.
- Nthawi zonse gwirani masamba a mbande.
- Tsenderani dothi la m'mbali mwa mbande

Ndondomeko ya kadzalikidwe kka mbande

- Musanayambe kudzalikira thilirani mbande zam'mabedi kapena m'machubu.Tipulani mbandeyo pogwiritsa ntchito ka mtengo.
- Zulani mbandeyo bwino pogwira masamba, ndipo muonetstse kuti mitsitsi siyinawonongeke.
- Ikani mbandezo m'matope pokadzalikira.
- Gwiritsani ntchito ka mtengo pobowola dzenje lodzalapo mbande.
- Ikani mbandeyo mubowolo powonetsetsa kuti mizu siyinapindike.
- Tsenderani dothi kuzungulira ka mbande kodzalidwako.
- Onetsetsani kuti mbande zikuthililidwa komanso kuyikidwa panthunzi kufikira zitakhwima.

Zoyenera kupewa podzalikira mbande

- Onetsetsani kuti mizu ya mbande siyinatulukire panja.
- Onetsetsani kuti simunakwilire thunthu kapena masamba a mbande.
- Tsenderani dothi kuzungulira ka mbande kodzalidwako.
- Onetsetsani kuti kadzenje kobowoledwako ndikokwanira kudzalapo mbandeyo bwinobwino.
- Onetsetsani kuti mbandeyo yayima chilili ikadzalidwa.

MTHUNZI

Zolinga zoyikira mthunzi

- Kupereka mthunzi wokwanira mogwirizana ndi mtundu wa mtengo.
- Kuteteza mbande ku dzuwa, mphepo, matalala ngakhale madontho a mphamvu a mvula.
- Kuteteza kutayika kwa madzi kuchoka m’masamba chifukwa cha dzuwa kapena mphepo.
- Kuchepetsa kuwuma kwa nthaka.
- Mthuzi umathandizanso kuti kutenthera kofunika pakakulidwe ka mbande kupezeka.
- Kuchepetsa kuwonongeka kwa mbande chifukwa chakuzizira.

Zinthu zomwe tiyenera kuziganizira pofuna kuyika mthunzi

Mthundu wa mbeu
Pafupifupi mitundu yonse ya mitengo imafuna mthunzi pamene yadzalikidwa.

Nyengo
Mthunzi uyenera kimasinthidwa molingana ndi m’mene kwachera patsikulo.

Dela kapena malo
Mtundu wa dothi, kukwera, kutentha ndi kuchuluka kwa mvula imene delalo limalandira zimapangitsa Kuchuluka kapena kuchepa kwa mthunzi molinga ndi mtundunso wa mbeu.

Onetsetsani kuti: mthunzi woyikidwa ukhale pautali wa 60cm kuchokera pomwe mbeu zalekezera.

Kutipulira m’machubu
Kutipulira m’machubu kumathandiza kuti mbande zisamalimbirane chakudya, kuwala, malo okulira , chinyontho ndi tchire.

Kudulira mizu
Timadulira mitsitsi ndicholinga chofuna kuletsa mbande kukanilira mdothi pa nthawi yomwe tikukabzala kumunda komanso kuti mitsitsi ya mbande ichulukendicholinga choti isakavutike kugwira ikakabzalidwa kumunda.

NJIRA ZODULIRA MITSITSI

Kunyamula	Kugwiritsa ntchito manja	Kugwiritsa nchito mpeni
		
Machubu amanyamulidwa ndi kudula mitsitsi yonse yomwe yatulukira pansipa chubu.	Tikhonzanso kugwiritsa ntchito manja podula mizu yotulukira.	Lowetsani mpeni wautali ndiwokuthwa pansi pa machubu ndikuwuyendetsa kudala mitsitsi yonse yomwe yatulukira pansi pa machubu ngakhalenso pa bedi lofesera njere.

KULIMBITSA MBANDE

Kulimbitsa mbande ndi kuchepetsa kuthilira ndicholinga choti mbande ziyambe kuzolowera kukomana ndi nthawi zosowa ndi kuzolowera nyengo ya kumunda.Izi timachita pochepetsa Kuchuluka kwa madzi komanso nthawi mwachitsanzo mamawa okha basi m'malo mwa mamawa ndi madzulo.

KUSAMALIRA MPHUKIRA.

Iyi ndi njira yomwe timasamalira zophukira za ku zitsa, mphukira zochokera ku mizu kapenanso ku mitengo yomwe yamera kuchokera ku njere zogwa kuchokera ku mitengo.

UBWINO NDI KUYIPA KOSAMARA MPHUKIRA

UBWINO WAKE	KUYIPA KWAKE
➢ Mitengo imapirira ku chilala chifukwa mizu yake yakhazikika kale	➢ Umakhala ndi mitengo imene sumayifuna
➢ Mitengo imakula bwino chifukwa mizu yakhazikika kale	
➢ Ntchito ya kunazale, kukumba maenje, ngati njira yodzaliratu njere, pamakhala palibe	
➢ Zipangizo sizimagulidwa monga za ku nazale	
➢ Mitengo monga miphakasa yomwe njere zake ndizosowa tikhoza kukhala nayo	

➢ Mitengo ingapo imamera pa chitsa chimodzi	
➢ Siyifuna mitengo yomangira nazale	

NTHAWI YOYENERA KUSAMALIRA MPHUKIRA
Nthawi yoyenera ndi kumayambiriro amapeto amvula pamene udzu usanayambe kuuma.

Zoyenera Kutsata:


2013/08/02 08:00

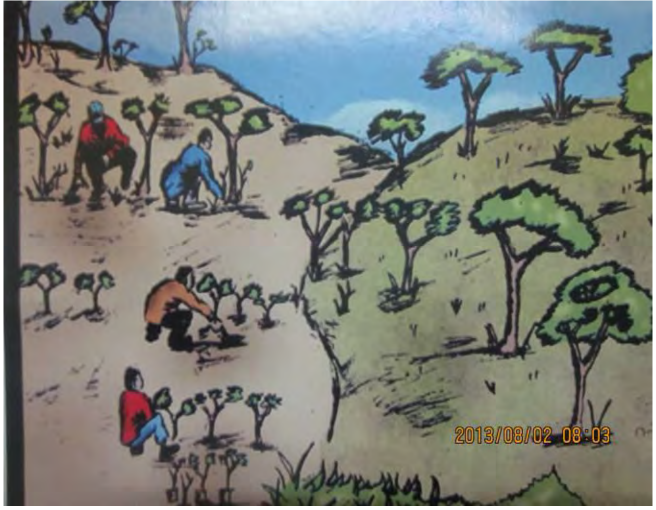
Tentherani nkhalango yanu mofulumira chaka chili chonse mwakasinthasintha.


2013/08/02 08:02

Limirani nkhalango yanu m'malo osankhidwa Posupula mizu.


2013/08/02 08:02

Dyetsani ziweto zanu mosamala ndipo chitani Kasinthasintha wa malowo chaka chilichonse.


2013/08/02 08:03

Byalanimitunduyamitengoyoyenreram'maloopanda mitengo.

Konzani njira zopewera moto kuzungulira nkhalango yanu.

Yang’anirani bwino malo amene mumatengako Mbeu za mitengo yanu.

Patulirani mphukira munkhalango yanu.

Kololani nkhuni zanu mosamala.

Kololani mitengo yanu nthawi yoyenera.

Tolani mbeu ndimanja anu ndikumwaza mnkhalango.

Dulani mitengo yanu kupititsapatsogolo mphukira.

Budulani nsonga zamitengo.

Tsegulani madanga mnkhalango yanu.

Kupalira ndi kugwiritsa ntchito moto kumabwerezedwa mzaka zotsatira monga njira yosamalira nkhalango.

Chidziwitso: Tigwiritse ntchito moto kumitengo yokhayo yomwe siidana ndi moto.

KUDZALIRATU NJERE

Timagwiritsa njira imeneyi pamene mvula yayamba kugwa chifukwa njirayi njosalira kuthirira ayi

UBWINO NDI KUYIPA KOBZALIRATU NJERE.

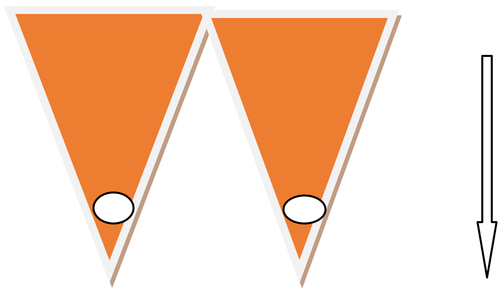
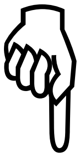
UBWINO WAKE	KUYIPA KWAKE
➢ -Ndiyosalemetsa;Ntchito zonse zakunazale sizimakhalapo monga;Kumanga mpanda,kuthira dithi mumachubu,kuthirira ndi zina zotero	➢ -Mitengo yomwe njere zake nzazing;onozingono nkovuta kugwiitsa ntchito njirayi(bulugama,cendereya)
➢ -Siyifuna ndalama zogulira	➢ -Ndikovuta kudzala malo akulu

machubu,makeni,mawilibala ndi zina	pogwiritsa ntchito njira iyi.
➢ -Mitengo yokula kale siyimadulidwa ndi cholinga chomangira mpanda wa nazale	➢ -Siungagulitse mbande za mitengo.
	➢ -Kupatulira mbande ndi ntchito ina yapadera.
	➢ -Kumalo kumene mvula ndiyovuta njirayi mbande zambiri sizingamere.

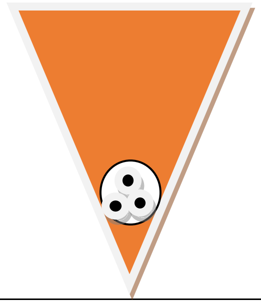
NTHAWI YOYENERA KUKHONZEKERA

Tionetsetse kuti takonzeratu malo amene tidzadzale njere zathu zimene tiri nazo mvula isanabwere Ndipo pamene mvula idzayambe kugwa\ kubwera tiyambe kudzala njerezo pa malowo Mosatira utali\ muyezo woyenera ndi mtundu wa Mitengoyo.

KUKUMBA MAYENJE

	
Tikumbe mayenje molingana ndi mbeu zomwe tikufuna kubyala. Tikatha tiyike mizere yopanga 'V' kuti izithandiza kusunga madzi.	Tikumbe dzenje lakuya theka la chala cha nkomba phala.

KUBYALA

		
Pobyala tisaunjike mbeu malo amodzi.	Pogwiritsa ntchito manja tikwilire molingana ndi kukula kwa njerezo.	Tikakwilira titsendere ndi phazi kapeni manja. Chidziwitso: Titsendere pang'ono pongofuna kuti njereze zigwirane ndi chinyonth chamudothi.

Pamene mbeu zamera tilambulire Ngati tinango byala osalambulira.

KUDZALA NTHAMBI ZA MITENGO

Nthambi zosadzulidwa komanso zodulizidwa bwino potsatira muyezo monga 2m -2m Zimadzalidwa m'maenje akuya 60 cm.

UBWINO NDI KUYIPA KOBZALA NTHAMBI

UBWINO WAKE	KUYIPA KWAKE
➢ Mitengo yozalidwa munjirayi imagwiritsidwa ntchito mwansanga chifukwa imakula mofulumira.-	➢ Ndiyolemetsa ngati tifuna kudzala malo akulu a) Kututa ndi kusamala nthambizo b) Kukumba maenje akulu-akulu
➢ Nchito za ku nazale sizikhalapo	➢ Ndi mitengo yochepa yokha yomwe nthambi zake zimaphukira
➢ Siyimafuna ndalama zogulira zipangizo monga za kunazale	

NTHAWI YOYENELA KUKHONZEKERA

Mitengo ina monga Mlombwa timayenera kuduliza nthambi zake pamene mtengowo utayoyola masamba koma usanayambe kuphukira ndipo nthambizo zizalidwe pamene mtengowo ukuyamba kuphukira angakhale kuti mvula isanayambe kugwa.

Maenje akhale okula bwino lomwe (60cm kuya kwake). Titha kuchita izi miyezi ya October ndi November.

Komanso nthambi zina monga za Gliricidia chamwamba titha kudzala pamene nvula Yayamba kugwa

KUDZALA MBANDE

Kulembera mokumba maenje

Tiyenera kulembelera bwinobwino malo odzakumba mayenje molingana ndi mtundu wa mitengo yodzadzalidwa komanso ntchito yake.

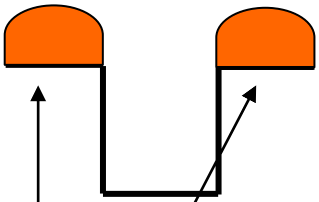
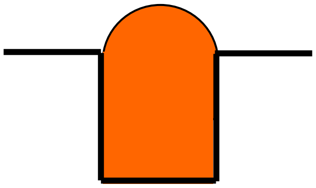
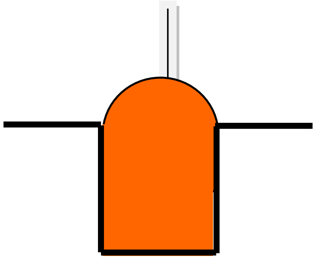
kukumba mayenje

Pokumba mayenje, dzenje likumbidwe pamulingo wa 30cm mulitali,30cm mulifupi komanso 30cm kuya.

Makumbidwe

- Panthawi yokumba, tikumbe dothi lapamwamba lachonde ndikuliyika mbali imodzi, komanso dothi lapansi ndikuliyika mbali yina ya dzenje lokumbidwalo.
- Panthawi yokwilira, tiyambe ndi thothi lomwe linali pamwamba nthawi yokumba ndikumalizira dothi lomwe linali pansi.
- Potsiriza ikani kamtengo kuti malowo azidziwika.

Kakumbibwe mzithunzi

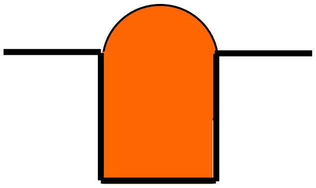
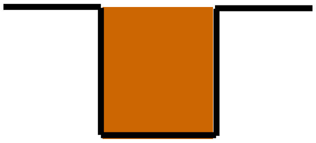
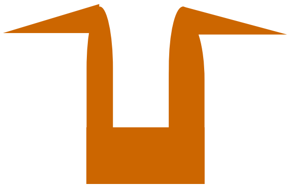
		
1. Mukakumba dzenje bwezeretsani dothi lapamwamba poyambilira kanako lapansi mudzenjelo.	2. Dothi mwabwezelalo lichite kaphiri padzenjepo.	3. Potsiriza ikani kamtengo kuti malowo azidziwika.

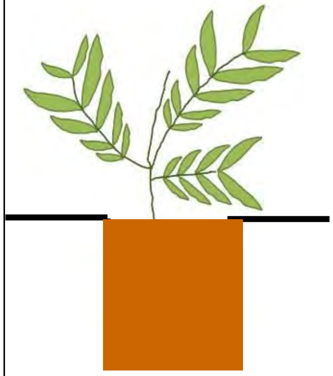
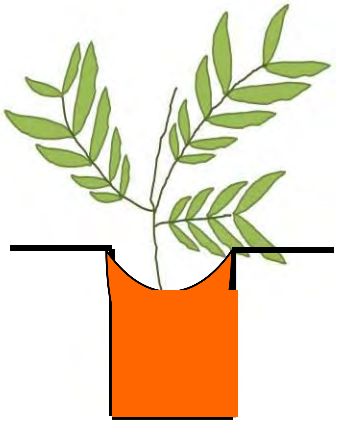
kubyala

Ntchito yobyala mbande kiumunda iyenera kuchitika pamene mvula yagwa mokwanira.

Ndondomeko ya kabyalidwe

- Chotsani kamtengo kanayikidwa padzenje kaja.
- Pogwiritsa ntchito manja kapena khasu salazani malo panakumbidwa dzenje paja.
- Kumbani bowo lkkwanira kudzalapo mtengo pakati pamalo adzenje aja.
- Ikani mtengo mubowo lokumbidwalo ndikuchotsa chubu kapena pakatimunadzalidwa mbandeyo.
- Chotsani chubu kapena pakati pokoka.
- Kwilirani mabndeyo ndipo pomaliza Onetsetsani kuti mwatsenderapogwiritsa ntchito mapazi.

		
1. Chotsani kamtengo kanayikidwa padzenje kaja.	2. Pogwiritsa ntchito manja kapena khasu salazani malo panakumbidwa dzenje paja.	3. Kumbani bowo lokwanira kudzalapo mtengo pakati pamalo adzenje aja.

		
4. Chotsani pulasitiki/chubu ndipo ikani mbande padzenjepo	5. Kwilirani dothi kulekezera m'mene munalekezera dothi la mu chubu.	6. Tsenderani dothi kuzungulira mbandeyo. Pangani kabeseni kuti madzi azikodwamo.

Werengani zambiri mu gawo la zowonjezera. ☞

ZOWONJEZERA

MITENGO YAKATUNDU WOPANGIDWA KUCHOKERA KU MITENGO

KATUNDU	KUCHULUKA KWAKE	KUMUNDA	KUMSIKA	NDEMANGA
Mapolo	2-4 inches 5-6 inches 6-8 inches	K60.00 K80.00 K100.00	K200.00 K350.00 K450.00	
Nkhuni	Mendulo imodzi	K600.00	K3200.00	
Matabwa	6x7x1″ 9x7x1″ 10x7x1″ 12x7x1″ 12x7x2″	K285.00 K385.00 K485.00 K550.00 K1000.00	K450.00 K550.00 K650.00 K750.00 K2200	Matabwa onsewa ndi a mitengo ya chilengedwe Mitengo yosakhala yachilengedwe mtengo wake umatsikirapo
Mipini ya makasu	Umodzi	K80.00	K170.00	

Mitengoyi ikhonza kukwera molingana ndikukwera kwa zinthu pa msika

MITUNDU YAMITENGO NDI NTHAWI YOGWIRITSA NTCHITO

MTUNDU	NTHAWI	NTCHITO
Gliricidia	Zaka ziwiri	Manyowa,mbewu,nkhuni,kudyetsa ziweto
Kesha wa milimo	Zaka zisanu	Milimo,nkhuni
Kesha wa maluwa	Zaka zisanu	Milimo,nkhuni
India	Zaka zisanu	Milimo,nkhuni
Mtangatanga	Zaka zisanu	Milimo,nkuni,
Bulugamu,	Zaka zinai	Milimo,nkhuni
Mphakasa	Zaka zinai	Nkhuni
Chitembe	Zaka zinai	Nkhuni

Dziwani ichi: Kupitilira zaka zimezi mitengo imeneyi ikhoza kuchekedwa matabwa.

NDONDOMEKO YA MMENE TINGATOLERERE NJERE ZA MITENGO PA CHAKA

Mtundu wa Mitengo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nkunkhu						■	■	■				
Mthethe						■	■	■	■			
Minganzolo						■	■	■	■			
Msambamafumu					■	■	■	■				
Mtangatanga						■	■	■	■			
Mtangatanga						■	■	■	■			
Chitimbe						■	■	■	■			
Mpasa	■	■	■							■	■	■
Mtondo										■	■	■
Muwale	■	■									■	■
Msangu							■	■	■			
Kachere				■	■	■	■	■	■			
Gliricidia										■	■	■
Kamsatsi			■	■	■	■						
Mbawa								■	■	■	■	
Lukina						■	■	■	■			
Indiya					■	■	■					
Chammwamba						■	■	■	■			
Kesha wa milimo							■	■	■			
Kesha wa maluwa							■	■	■			
Naphini			■	■	■	■	■					
Sendrella	■										■	■
Msikidzi	■										■	■
Kankhande					■	■	■					
Masawo						■	■	■				
Kankhande					■	■	■	■				

KABYALIDWE KOMANSO NYENGO YOMWE MBEU ZOSIYANASIYANA ZINGAKHALIRE MU NAZALE

Mtundu wa Mitengo	Njere pa phando/chubu	Kuya kwa dzenje lobyalira	Nyengo ya ku nazale
Nkunkhu	2	1.5 mpaka 2cm	Masabata 8 mpaka 12
Mthethe	3	1.5 mpaka 2cm	Masabata 8 mpaka 12
Minganzolo	2	1.5 mpaka 2cm	Masabata 8 mpaka 12
Msambamafumu	1	4 cm	Masabata 10 mpaka 16
Mtangatanga	3	1.5 mpaka 2cm	Masabata 8 mpaka 12
Mtangatanga	2	1.5 mpaka 2cm	Masabata 10 mpaka 16
Chitimbe	3	1.5 mpaka 2cm	Masabata 10 mpaka 16

Mpasa	3	1 cm	Masabata 10 mpaka 16
Mtondo	1	3 cm	Masabata 10 mpaka 16
Muwale	3	1.5 mpaka 2cm	Masabata 10 mpaka 16
Msangu	2	1.5 mpaka 2cm	5 to 12 weeks
Kachere	3	1 cm	Masabata 10 mpaka 16
Gliricidia	2	1.5 mpaka 2cm	Masabata 8 mpaka 12
Kamsatsi	3	3 cm	Masabata 8 mpaka 12
Mbawa	5	3 cm	Masabata 10 mpaka 16
Lukina	3	1 cm	Masabata 8 mpaka 12
Indiya	3	3 cm	Masabata 10 mpaka 16
Chammwamba	3	1.5 mpaka 2cm	Masabata 10 mpaka 16
Kesha wa milimo	3	1.5 mpaka 2cm	Masabata 8 mpaka 12
Kesha wa maluwa	3	1 cm	Masabata 8 mpaka 12
Naphini	5	1.5 mpaka 2cm	Masabata 8 mpaka 12
Sendrella	5 to 10	0.5 cm	Masabata 10 mpaka 16
Msikidzi	3	1.5 mpaka 2cm	Masabata 10 mpaka 16
Kankhande	3 nuts	1.5 mpaka 2cm	Masabata 10 mpaka 16
Masawo	3 nuts	1.5 mpaka 2cm	Masabata 10 mpaka 16
Kankhande	3nuts	1.5 mpaka 2cm	Masabata 10 mpaka 16

NDONDOMEKO YAKAGWIREDWE KA NTCHITO

NO	MWEZI	NTCHITO
1	January	• Kudzala mbande,mmalo amene takhoza. • Kugulitsa mbande zomwe takonza kuti tigulitse
2	February	• Kukonza malo anazale,polambula. • Kumanga mpanda wa nazale,kapeni kukonza mpanda wophwasuka. • Kukonzekera zida zogwiritsa ntchito mu nazale monga machubu. • Kulimira koyamba mitengo yodzalidwa kapeni mphunkira.
3	March	• Kukonza mkati mwa nazale. • Kututa dothi ndi nchenga. • Kuthira dothi mu machubu. • Kufesa mitundu yina ya mitengo yochedwa kukula monga-Mlombwa,Pine ndi nkungudza.
4	April	• Kukonza ma bedi ofesera njere. • Kuthira dothi mumachubu. • Kudzala mbande mumachubu,monga mbawa. • Kuthirira madzi. • Kutipulira mmachubu

5	May	- Kufesa njere zochedw kumera, kuwokera mbande mumachubu. - Kupitiliza kuthira dothi mmachubu. - Kuthirira. - Kuzulira udzu mu nazale.
6	June	- Kupitiliza kuthira dothi mumchubu. - Kulimira kachiwiri mitengo yodzalidwa/Mphukira. - Kulimira mu nazale. - Kuthirira. - Kufesa njere zomera nsanga.
7	July	- Kufesa njere zomera nsanga monga bulugama ndi kasha wa milimo. - Kkuwokera mbande mu machubu. - Kuthirira. - Kulimira udzu mu nazale.
8	August	- Kuwokera mbande za mitengo yokula msanga. - Kukonza mthudzi pa malo owokerera mbande. - Kuthirira. - Kudulira mitsitsi.
9	September	- Kupitiliza kukhonza mthudzi pa malo wowokerera mbande. - Kuthirira. - Kuzulira udzu. - Kudulira mitsitsi ya mbande.
10	October	- Kuchepetsa mthunzi. - Kuthirira. - Kulimira munazale ndi mmachubu (kutipulira). - Kudulir mitsitsi. - Kuyamba kulimbitsa mbande.
11	November	- Kupitiliza kulimbitsa mbande. - Kuchokocha mbande.(za msinkhu umodzi mbali imodzi.) - Kudulira mitsitsi. - Kukonzekeratu malo odzala mbande pokumba maenje.
12	December	- Kudzala mbande. - Kugulitsa mbande zomwe takonza kuti tigulitse.

Njere zamitengo yokula msanga tingayambe kuyifesa mwezi wa June mpaka mwezi wa July.Pomwe zochedwa kukula tingayambe kuzifesa mwezi wa March mpaka mwezi wa May.

jira zitatu zodzutsira njere

Kukhukhuza

Kukhebula

Kunyika m’madzi

MITUNDU YA MBEU NDIKADZUTSIDWE KAKE

No.	Mphaksa	Kungofesa
1	Mpinjipinji	Kungofesa
2	Binu/Jerejere	Kungofesa
3	Chammwamba	Kungofesa
4	Ntondo	Kungofesa
5	Chinama	Kungofesa
6	Chitimbe	Kungofesa
7	Kesha wamilimo	Kukhebula
8	Katope	Kunyika m’madzi maola 24
9	M’mbawa	Kunyika m’madzi maola 24
10	Gilirisidiya	Kunyika m’madzi maola 24
11	Nthudza	Kunyika m’madzi maola 24
12	Ngongomwa	Kunyika m’madzi mawola 24
13	Mombo	Kukhebula/kunyika m’madzi maola 24
14	Mtangatanga	Kukhukhuza/kungobyala
15	Indiya	Kukhukhuza/kungobyala
16	Likina	Kukhukhuza/kungobyala
17	Msangu	Kukhukhuza/kunyika m’madzi maola 24
18	Mthethe	Kukhukhuza/kunyika m’madzi maola 24
19	Nkunkhu	Kukhukhuza/kunyika m’madzi maola 24

ZITSANZO ZA MITENGO YOMWE TINGATHE KUGWIRITSA NTCHITO MNJIRA IMENEYI

MTENGO	NTCHITO YAKE.
1.Bulugama	Nkhuni,Milimo,Matabwa,Kugulitsa
2.Caccia	Nkhuni,Milimo,Kukongoletsa malo.
3.Mbawa	Matabwa,Nkhuni,Kusunga madzi
4.Gliricidia	Nkhuni,Kubwezeretsa chonde mthaka
5.India	Matabwa,NkhuniZakudya za ziweto
6.Msangu	Kuwonjezela chonde mthaka, zakudya za ziweto

ZITSANZO ZA MITENGO YOMWE IMAPHUKIRA

MTENGO	NTCHITO ZAKE
1.Mphakasa	Nkhuni Milimo,Kugulitsa
2.Mombo	Nkhuni,Milimo,Mingoma,Mipini,Luzi
3.Nkuyu	Kusunga madzi,Kudya
4.Tsanya	Ziboliboli,Nkhuni,Matabwe,Nkhuni,Milimo,Misi,
5.Naphini	Ziboliboli,Nkhuni,Matabwa,Milimo
6.Katope	Kusunga madzi, Nkhuni
7.Chitimbe	Nkhuni,Kudya

ZITSANZO ZA MITENGO YOMWE TINGATHE KUGWIRITSA NTCHITO NJIRAIMENEYI

MTENGO	NTCHITO ZAKE
1.Ngongomwa	Nkhuni,Matabwa,Mankhwala
2.Mango	Kudya,Nkhuni,Matabwa
3.Malalanje	Kudya,Nkhuni, Kugulitsa
4.Mapeyela	Kudya, Mankhwala, Nkhunikugulitsa
5.Nimu	Mankhwala,Nkhuni
6.Mbawa	Matabwa,Nkhuni, Kusunga madzi
7.Pichesi	Kudya Kugulitsa,Nkhuni
8.India	Kudyetsa ziweto, Nkhuni,Matabwa

ZITSANZO ZA MITENGO YOMWE TITHA KUDZALA NTHAMBI ZAKE

MITENGO	NTCHITO ZAKE
1.Mlombwa	Matabwa,Mankhwala ammimba,Nkhuni
2.Kachere	Kusunga madzi,Ulimbo,Kudya zipatso
3.Nsatsimanga	Kumangire mpanda,kupangira dizilo.
4.Ntumbu	Kumangira mpanda,mankhwala azilonda
5.Chammwamba	Ndiwo,mankhwala oonjezela chitetezo nthupi.
6.Gliricidia	Kuwonjezera nthaka,nkhuni

NJIRA ZOTETEZERA MITENGO KU CHISWE

Kudera komwe chiswe ndi vuto lalikulu tiyenera kutsata nfundo izi kuti titeteze mitengo yathu ku chiswe:

Mu Nazale

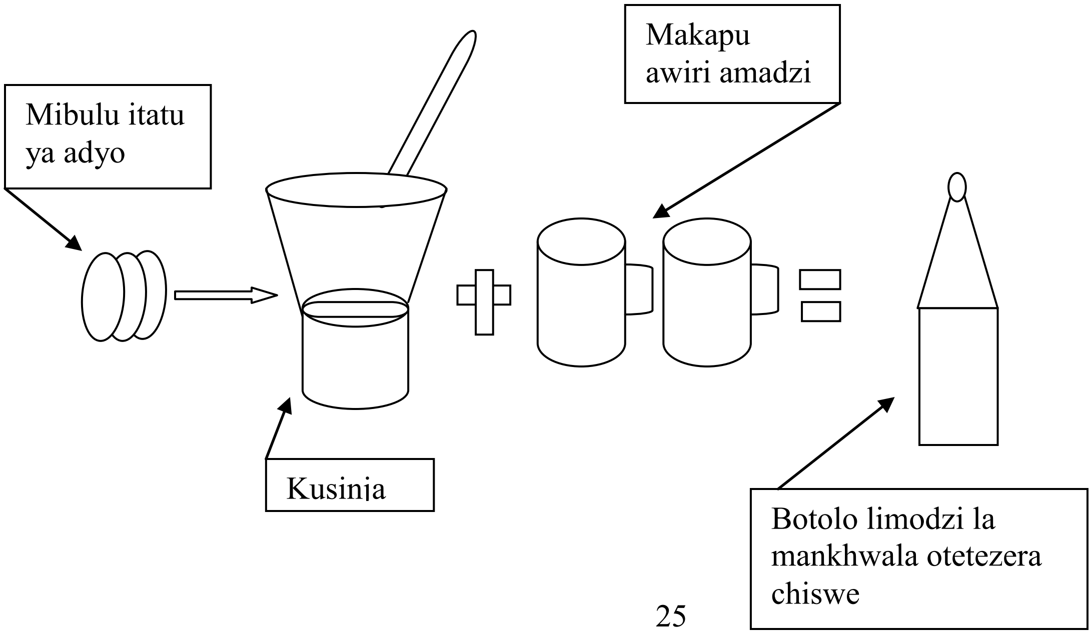
1. Panthawi yomwe tikuyika dothi m'machubu tikhonza kusakaniza dothi lathu ndiphulusa kapeni makala (onyenyanyenya). (Neem ndimtengo wodziwikiratu umene umagwira ntchito bwino)
2. Kubyala njere zowonjezera kuti tiwonjezere mwai wa mbande yina kupulumuka ku chiswe.
3. Tipewe kugwiritsa ntchito za nthochi m'malo mwa machubu chifukwa zimakopa kwambiri chiswe.
4. Ngati tikudziwa malo omwe chiswe chikuchokera, tikathire mafuta agalimoto ogwira kale ntchito (Oil) pa chulu chomwe pali chiswecho.
5. Ngati tingakwanitse tikhonzaso kuthira nkodzo pachulucho.
6. Kuphwasula njira za chiswe.
7. Kuwotcha/kutentha dothi lomwe tikufuna kugwiritsa ntchito munazale yathu.
8. Kusaka ndikupha make gang'a.
9. Kuyika mathunthu a nthochi mozungulira nazale yathu.

CHIDZIWITSO: Njira 1, 3, 4, 5, 7 ndi 8, zikhonzanso kugwiritsidwa ntchito kumunda wa mitengo.

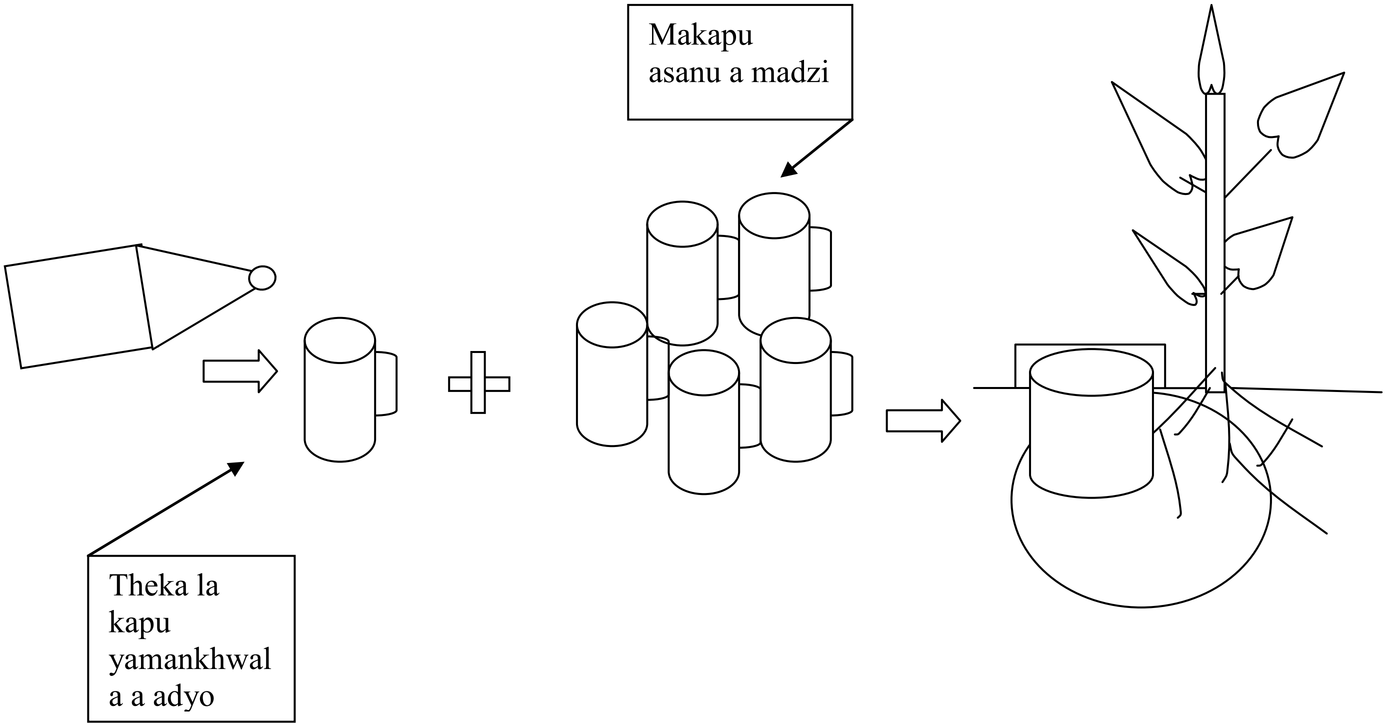
Kumunda wa mitengo

1. M'munda wa mitengo ing'ono ing'ono tipewe kupalira nkusiya zinyalala momwazikana. Tikapalira zinyalala tiziyike mozunguliza (rings). Izi zimathandiza kukopa chiswe kumtundu wina wachakudya.
2. Kumalo komwe kuli kouma tikuyenera kubyala njere kapena mbande zathu kumayambiliro kwa nyngo ya nvula kuti tipereke mpata kwa mbeu zathu kuti zikhazikike ndikukula mwathanzi.
3. Tikhonzaso kumathilira mitengo yathu ndimadzi osakaniza ndi adyo pogwiritsa ntchito njira ya drip:

Poyamba sakanizani adyo potsata njira iri m'musiyi:



Kuthilira;



3. Molingana ndi mitengo yomwe imamera kudera lathulo tikhonzaso kubya mitengo yomwe imapilira kuchiswe.

MITUNDU YA MITENGO YOMWE IMAPILIRA KU CHISWE

No.	**Mtundu Wa mtengo**	**Dzina la Sayansi**
1	Neem	Azadirachta indica
2	Mthethe	Acacia polyacantha
3	India	Melia azedarach
4	Bluegum	Eucalyptus microcorys
5		
6		
7		

For better life, better environment

COVAMS II

Project for Promoting Catchment Management Activities in Middle Shire

Forestry Department

Field Manual in Soil Conservation

Zamkatimu

1. Kupanga Chimato

1.1 Zida

i. Zinyalala (Mapesi)
ii. Ndowe
iii. Phulusa
iv. Madzi
v. Ndodo
vi. Matope

1.2 Kapangidwe ka Chimato

① Kukonzekera Zida

1) Tikonzekere zipangizo zokwanira tisanayambe kupanga chimato. Izi zimathandiza kusunga nthawi. Zipangizo zikakwana tiyambe kuyeza malo a chimato.

② Kayezedwe

2) Tingayeze bwanji ndi thupi lathu.? Tikatere ndipafupifupi 1 m.

3) Mulingo wabwino wa Chimato ndi 1m x 2m.

4) Mukapeza muyezo wa Chimato lemberani pomwe Chimato chipangidwe.

5) Mukalemberera ikani njerwa m'bali.

6) Pa 60 cm iriyonse ikani mitengo kuti mupange mphako.

7) Mphako zimenezi zimathandizira kuti mpweya uziyenda bwino.

8) Mukayika mitengo ndi njerwa zimawoneka chonchi.

9) Konzani ndodo ziwiri za 1.5m.

10) Ziyimitseni mbari mwa mitengo yogonekedwayo.

③ Kuwaza Phulusa

11) Phulusa limathandiza kuteteza chiswe kuti chisalowe mu Chimato

12) Tikamaliza kitsira Phulusa tit sire madzi

④ Kuyika Zinyalala

13) Ikani Zinyalala/mapesi zoduladula pa mulingo wa 20cm-30cm

14) Chonde tisachinyire zinyalala

15) Zinyalala zisapyole m'mene talemberera.

16) Zinyalala zikakwana mulingo wa20cm-30cm tiwaze ndowe pamwamba pake.

17) Tikatha kuthira ndowe tithire madzi okwanira mpaka zinyalala zones zinyowe.

18) Tikamaliza, tipange ndondomeko yomweyi mpaka chimato chitalike 1m.

⑤ Kumata

19) Tikamaliza kuyika zinyalala pa mulingo wa 1m, tifundise chimato chathu ndi udzu, mapesi kapeni zisaka. Tikonze dothi lomatira.

20) dothi lathu likapya tiyambe kumata chimato chathu

21) chimato chimawoneka chonchi tika maliza kumata

⑥ Kuchotsa ndodo

22) Pakatha masiku atatu tichotse mitengo ija tinagoneka ndinso ndodo zomene tinayimika. Pochotsa mitengo kapene ndodozo m'mabowomo mumatuluka mpweya wotentha. Ngati simutuluka mpweya wotentha ndiye kuti chimato chathu sitinakonze bwino. Izi zimachitika ngati sitinathire madzi okwanira Pakapita nthawi chimato chathu chikasiyakutentha tiziwonjezera madzi m'mabowomo.

Nthawi yopuma!!

2. Kuyeza katsetserekedwe ka malo

2.1 Kukonzekera zida

① Zipangizo

- i. Ndodo ziwiri
- ii. Chingwe chotarika 10m
- iii. Levulo

② Kukonzekera Ndodo

1) Koyimikira ndodo zathu tidulize ndi chikwanje chakuthwa kuti kukhale thyathyathya

2) Yezani ndodo imodzi ndikuyilemba pa mulingo wa 160cm kuyambira pansi.

3) Dulani ndodo yomwe munayilemba pa mulingo wa 160cm.

4) dulaninso ndodo yina pa mulingo wa 160cm.


5) Yezani ndodo imodzi malo atatu motalikana 50cm pena paliponse. (Tikaphatikiza 150cm). Ndodo imeneyi muyilembe kuit 'A'

6) Yezani ndodo ina pamulingo wa 150cm kuchokera pansi pogwiritsa ntchito ndodo "A" . ndodo imeneyi muyilembe "B"

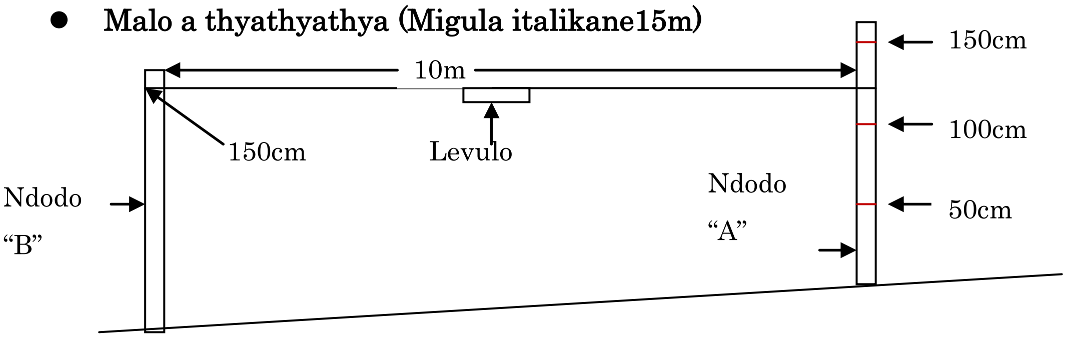
③ Kumanga chingwe pa ndodo ndi kuyika levulo pa chingwe


7) Tikonze chingwe chotalika 10m koma chipyoleko pang'ono kupangira pomanga pa ndodo zathu. Timange mothinisa chingwe pandodo 'B' pamene talemba 150cm. Mbaliyina timange mpokhwepesa ku ndodo 'A'

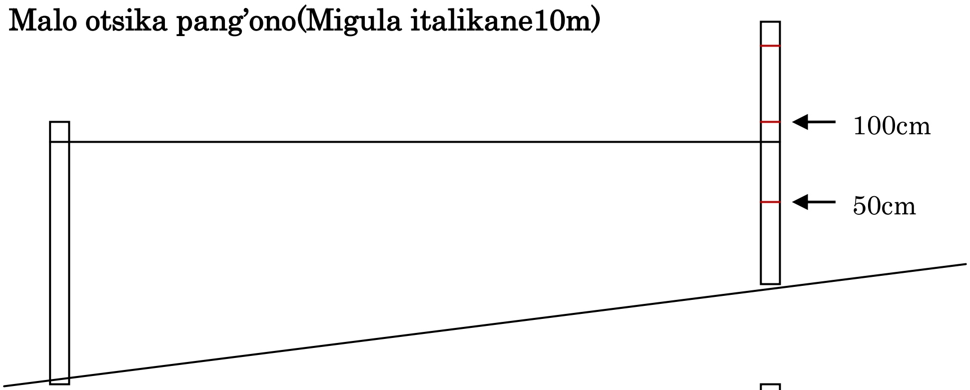
8) Tikamaliza kumanga chingwe kumitengo tiyike levulo pakati pa chingwe pamene ndi 5m

2.2 Kuyeza katsetserekedwe ka malo

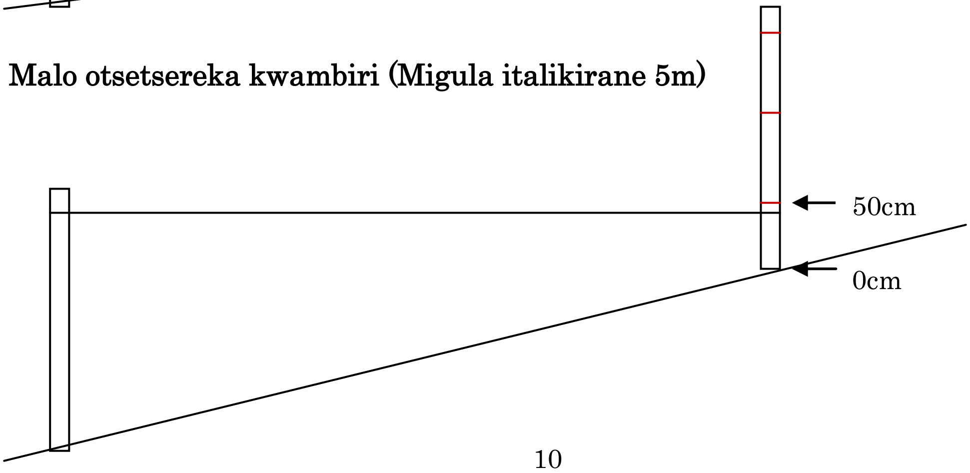
- **Malo a thyathyathya (Migula italikane15m)**



- **Malo otsika pang'ono(Migula italikane10m)**



- **Malo otsetsereka kwambiri (Migula italikirane 5m)**



1) Ndodo "A" ikhale kuntunda kwa munda umene tikufuna tiyeze. Kokerani ndodo 'A' kumusi kuti chingwe chikungike. Munthu wachitatu ayenera kuyang'ana malo a mpweya mu levulo ndikumuuza munthu wogwira ndodo 'A' ngati chingwe chiyenera kukwera mwamba kapeni kutsika.

2)Munthu woyang'ana levulo awuze wan dodo 'A' kuti asasunthe ngati madzi amu lavulo afika pakati-kati.

3) Munthu amene wagwira ndodo 'A"anene pamene chingwe chili ndipo wolembera alembe ndi kufotokoza kutsetsereka kwa malo

4) Tikhome chikhomo pamene tinayimika ndodo 'B"kuti chizatithandize kudziwa katalikidwe ka migula.

3. Kupanga Migula

3.1 Kukonzekera Zida

① Zida ('A'-Felemu) –ndodo zitatu, misomali itatu, chingwe, mwala, hamala (mwala),chikwanje, zikhomo.

1) Tipeze mitengo itatu yowongoka bwino ndipo iwiriyo tiyidulize bwinobwino pansi pake kuti pakhale thyathyathya.

2) Mitengo iwiriyo tiyimike pamodzi ndipo pogwiritsa ntchito dzanja lathu tiyike chizindikiro pamene pathera zala zathu.

3) Tikatha kuyika zizindikiro tidule nsonga imene yasala pamene panafika zala zathu.

4) Tikadula ndodozo, tiziyike pamodzi ndikukwezanso nkono wathu mpaka pamwamba pandodozo.

5) tikwezenso nkono wathu ndikuyika chizindikiro pamene pathere dzanja lathu.

6) Mitengo iwiriyo tiyipingase ndikuyimangirira ndichingwe ndi kukhoma misomali pamene tinayika chizindikiro

7) Tiyimike mitengoyo ndikuyitambasula mpaka pamene tinakhoma msomali pafike pamphumi.

8) iri chiyimile chonchi tisonyeze ndimkono pamene pali mchombo wathu.

9) Titenge mtengo winandikuwuyika mopingasa potengerapamene panafika mchombo wathu.

10) Tiwonesetse kuti mtengo wathuwo uli chimodzimodzi mbali zones ndikuyikamo zizindikiro.

11) Tiyike zizindikiro pamene mitengo yoyimayo inayima ndicholinga choti tikamayigoneka isasinthe.

12) Tidule nsonga zonse zotsala molingana ndi m'mene tauyezera mtengo wathu.

13) Mtengo wawopingasawo ukhomedwe mbali zonse ndimisomali m'malo m'mene tinayika zizindikiro.

14) Mangani chingwe pakati pamene pasemphana mitengopo.

15) Kokani chingwe kuti chifike m'musi.

16) Tiyeze utali wa chingwe kuchokera pa mtengopo kifika pamene tingamangirire mwala pogwiritsa ntchito dzanja ndipo tiyikepo chizindikiro.

17) Timange mwala kuchingwemofananiza ndi chizindikiro chathu

18) Ngati chingwe chinali chachitali tidule.

19) Tiyimike kuti tione ngati malo tinayimika aja ndiomwewo.

20) Ikani chizindikiro pamene chingwe chikudutsa pamtengo wopingasawo mwala ukayima.

21) Tikatha titembenuze ndipo ndodo ziyime pomwe zinaima kale.

22) Yendetsani mwala wakuchingwe ndipopamene ungamenye katatu ikani chizindikiro chachiwiri.

23) Pazizindikiro ziwirizo tipeze pakati pake pogwiritsa ntchito kamtengo kapena udzu.

24) Tikatero tiyikepo chizindikiro. Chingwe chimawoneka chonchi chikayima pakati pachizindikiro.

② Kapangidwe ka Layini Levulo

Zida: mitengo iwiri, chingwe, levulo, chikwanje,zikhomo, mwala

1) Dulizani ndodo zonse ziwiri kuti zikhale za thyathyathya.

2) Yezani kutalika kwandodo poyerekeza ndi msinkhu wanu ndipo ikanipo chizindikiro.

3) Mukapeza utali wandodo zanu dulani pomwe munayika zizindikiro.

4) Ndipo yezani kutalika kwa laini levulo yanu potengera muyezo wa pachifuwa chanu.

5) ndipo ikanipo chizindikiro.

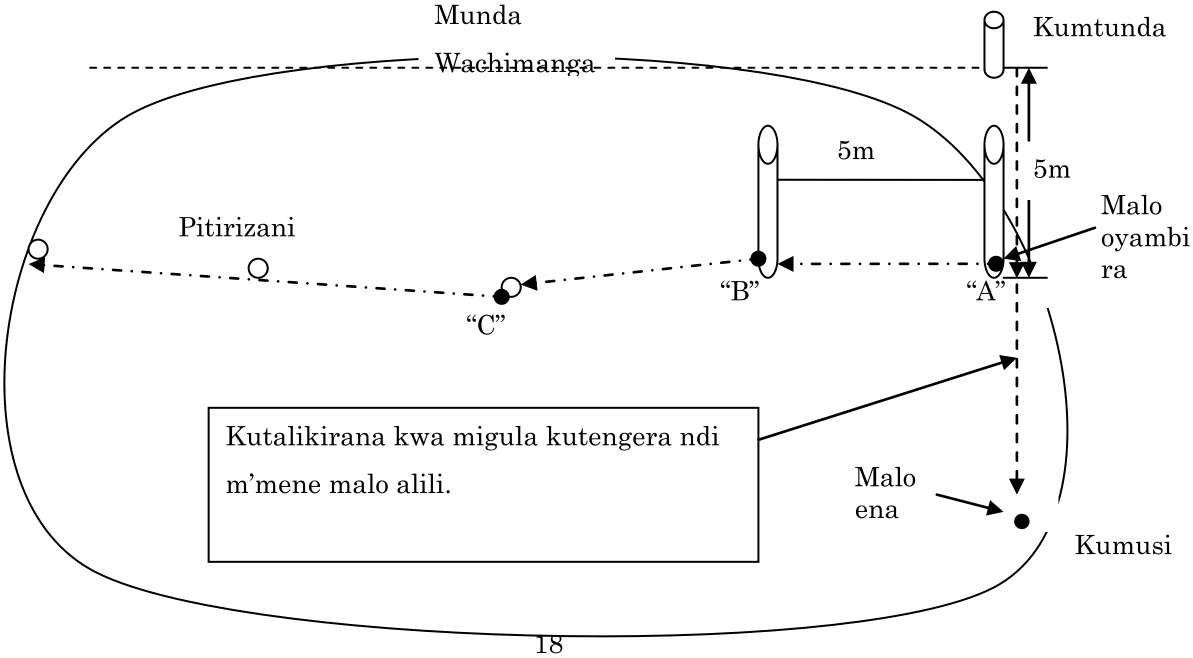
6) Mangani ndodo Mbali zonse ndichingwe chotalika 5m muzizindikiro muja.

7) Umu dim'mene imawonekera Laini Levulo takamaliza kupanga.

8) Tipeze pakati poyika Laini Levulo popinda chingwe pakati ndikuyikapo chizindikiro.

9) Ikani Levulo pakati pachizindikiro.

3.2 Kupanga akalozera



Kutalikirana kwa migula kutengera ndi m'mene malo alili.

① Kuyika Zikhomo

①-1 Pogwiritsa ntchito Laini Levulo

1) Khomani chikhomo kumtunda kwa munda ndikuyeza 5m kulowera kumusi kwamunda kuchokera pachikhomopogwiritsa ntchito Laini Levulo.

2) Mgula wathu woyamba uyambire pomwe takhoma chokhomochi (5m kulowa mkati mwa munda). Tikatero tiyambe kuyeza pogwiritsa ntchito aini Levulo.

3) Tikayimika Laini Levulo yathu tionetsetse kuti chingwe chakungika.

4) Wogwira ndodo yotsogola 'B' ndiamene amasunthasuntha ndicholinga choti madzi amulevulo akhale pakatikati.akawona kuti afika pakati ayime.

5) Ikani chikhomo pamene pali ndodo 'B'. zikatele ndiye kuti malo a ndodo 'A' ndi ndodo'B' ndiofanana.

6) Sunthani ndodod "A' kuti ikayime pamene panali ndodo "B'. Ndipo ndodo 'B' itsogolenso. Mwachidule ikaime pa malo amene tingawatchule kuti 'C'.tiwonenso nga madzi afaanana ndikukhomanso chikhomo. Tipange chimodzimodzi mpaka kumapeto.

①-2 Pogwiritsa ntchito A-Felemu

1) Kagwiritsidwe ntchito ka 'A' felemu ndichimodzimodzi Laini Levulo. Imikani ndodo yoima yambali imodzi ya'A' Felemu pamalo "A' ndipo onetsetsani kuti 'A' Felemu yaima mowongoka.

2) Suntha suthani mwendo 'B' kuti uyime pamalo pomwe pakufanana ndi malo 'A'.

3) Tiwonetsetse kuti 'A' Felemu yathu yaima mowongoka ndipo tiuyendetse mwala wathu wakuchingwe.

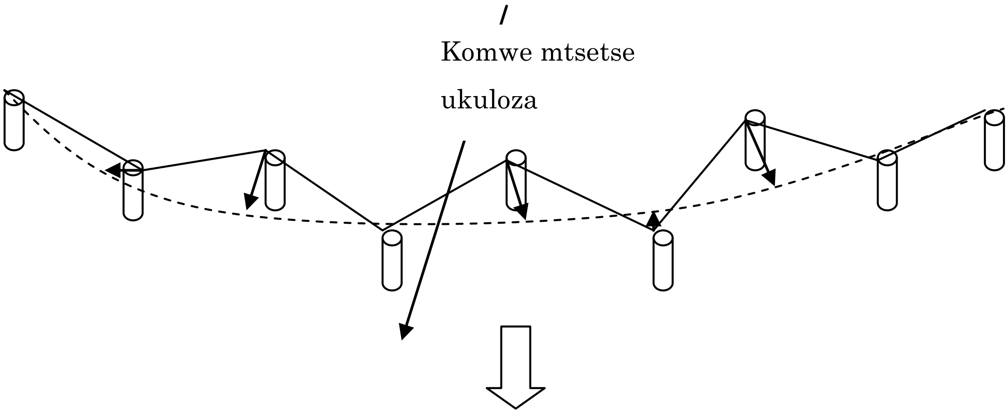
4) Tiwonetsetse kuti chingwe chikumenya mtengo wopingasa katatu paja tinayika chizindikiro. Ngati chingwe sichimenya pamodzimodzi katatu tizisuntha mwendo 'B' kuti tipeze malo omwe chingwe chingamenye katatu pa chizindikiro.

5) tiyike chikhomo pamene chingwe chamenya katatu, kutanthauza kuti malo 'A' ndi 'B' ndiofanana.

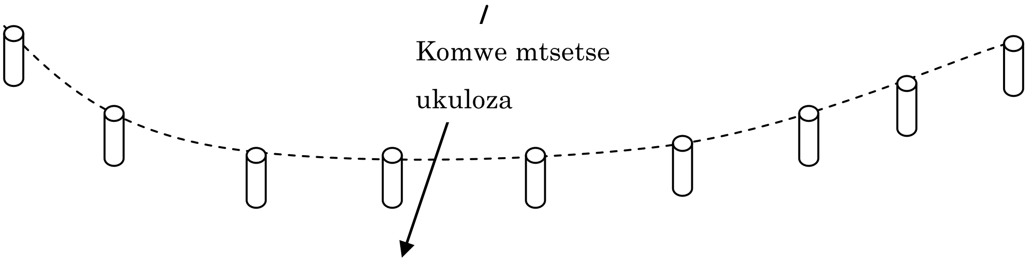
6) Mwendo 'B' uli ma;lo omwewo sunthani mwendo "A' pamalo ena pamene tikufuna tiyeze (C) pozunguza "A' Felemu. Titsatire ndondomeko imeneyi mpaka kumaliza.

② Kuwongola Zikhomo

Tisaulime mgula tisanawongole zikhomo



Tikatha kuongola zikhomo tilime mgula



1) Pamafunika anthu atatu powongola zikhomo. Ayime mbali imodzi yazikhomo zotsatana. Anthu awiri aziyang'ana munthu amene azimuuza kuti asunthe chikhomo. Munthu amene asunthe chikhomo ayang'ane munthu wachitatu ndikutsimikizirana ndimunthu wachiwiri kuti zikhomo zaima mofanana

2) Ngati kuli koyenera kuti chikhomo chisunthe munthu wachiwiri auzidwe mbali yosunthira mpaka awonetsetse kuti zikhomo zafanana.

3) Chikhomo chikhomedwe pamene payima munhtu wachiwiri. Munthu wachitatu ayime pachikho chomwec ho koma ena awiri akayimenso pazikhomo zakutsogolo. Titsatire ndondomeko yomweyi mpaka kumaliza.

4) Zikhomo zonse zikawongoledwa zimawoneka chonchi.

1) Kuti mgula wathu uwongoke bwino, tigwiritse ntchito chingwe dipo tizilima motsatira chingwe.

2) Undani mbali zonse

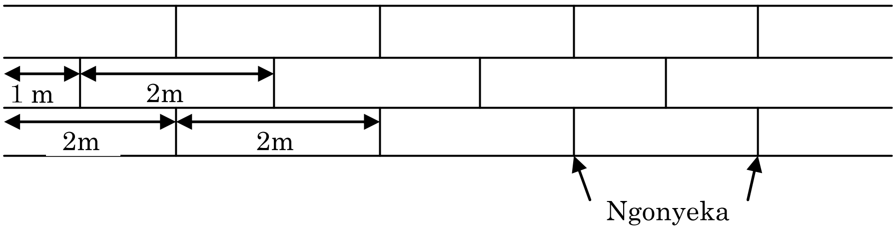
3) Tikamaliza kuunda mgula wathu uwoneke chonchi.

Apa mungathe kuwona mmene mizere yathu yoyamba imayendera tisanalime mgula.

3.3 Kubweza mizere

1) Posatira mgula, tiyambe kubweza mizere. Mzere woyamba wakumtunda utalikane 90cm ndi mgula chifukwa ndiumene titazakumbe ngalande yokololera madzi. Koma mizere yonse yotsatira italikane 75cm.

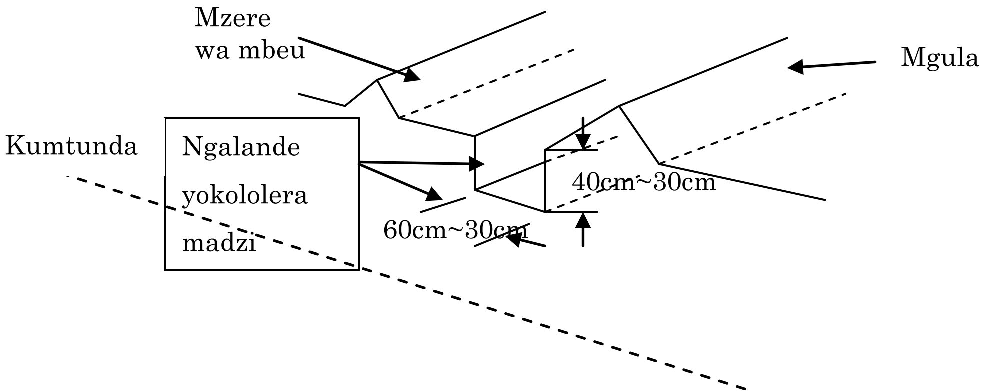
3.4 Kupanga Ngonyeka



1) Tipange ngonyeka pakati pamizere motalikana 2cm.

2) Tikamaliza mzere woyamba tisalimbanenso ndikuyeza, tiyike ngonyeka pakati powonera ngonyeka za mzere woyamba.

4. Ngalande zokololera Madzi (Swale)



A Ngalande imeneyi imakumbidwa kumtunda kwa munda wathu. Ndipo imayenera kuti iye 40cm ndipo mulitali 60cm. Chifukwa chakulimba kwanthaka nthawi yachilimwe mukhonza Kukumba m'mene mungathere koma isachepere 20cm.

For better life, better environment
COVAMS II
Project for Promoting Catchment Management Activities in Middle Shire
Forestry Department

Field Manual In Gully Control and Reclamation

(Chichewa)

Zamkatimu

1.0 KUTETEZA NDI KUKONZA NGALANDE ZA MADZI

Zigwembe ndi chimodzi mwa zotsatira zoopsa chifukwa cha kukokoloka kwa nthaka m'dziko muno. Izi sizikhudza minda yokha komanso zimakhudza Madera okhalamo, malo odyetsera ziweto, madambo kapena m'mitsinje, miseu ndi milatho. Vuto la zigwembe limakula chifukwa cha m'chitidwe wolima m'malo otsetsereka kwambiri komanso m'mphepete mwa mitsinje, kulima kophwanya migula, kugwiritsa ntchito njira za m'minda zosakwezera komanso malire a m'munda, kudyetsa ziweto mowirikiza kufupi ndi malo otungira madzi ndi m'madimba, kulambula malo komanso kudula mitengo mosasamala ndi njira zina zotetezera nthaka zomwe zimapangidwa mosasamala.

2.0 Kodi Zigwembe ndichiyani?

Ming'alu kapena ngalande zikulu-zikulu zozama theka la mita (0.5m) zimatchedwa zigwembe. Chigwembe ndi ngalande yomwe imang'ambidwa ndi madzi othamanga omwe amathamanga nthawi imene mvula ikugwa yambiri ndi pamene yagwa kumene.

2.1 Zinthu zimene zimapangitsa zigwembe

- Kulima m'malo otsetsereka kwambiri.
- Kulima m'mphepete mwa m'tsinje.
- Kuphwanya migula.
- Kudyetsa ziweto pa malo amodzi mowirikiza.
- Kudula mitengo mosasamala.
- Miseu, ngalande komanso njira zodutsamo madzi zosakonzedwa bwino.
- Njira zosakwezera.
- Kuchepa kwa njira zotetezera nthaka.

2.2 Kuipa kwa zigwembe

2.2.1 kumtunda

- Kukokoloka kwa nthaka.
- Kuchepa kwa malo olima.
- Kuguga kwa nthaka.
- Kuchepa kwa zokolola.

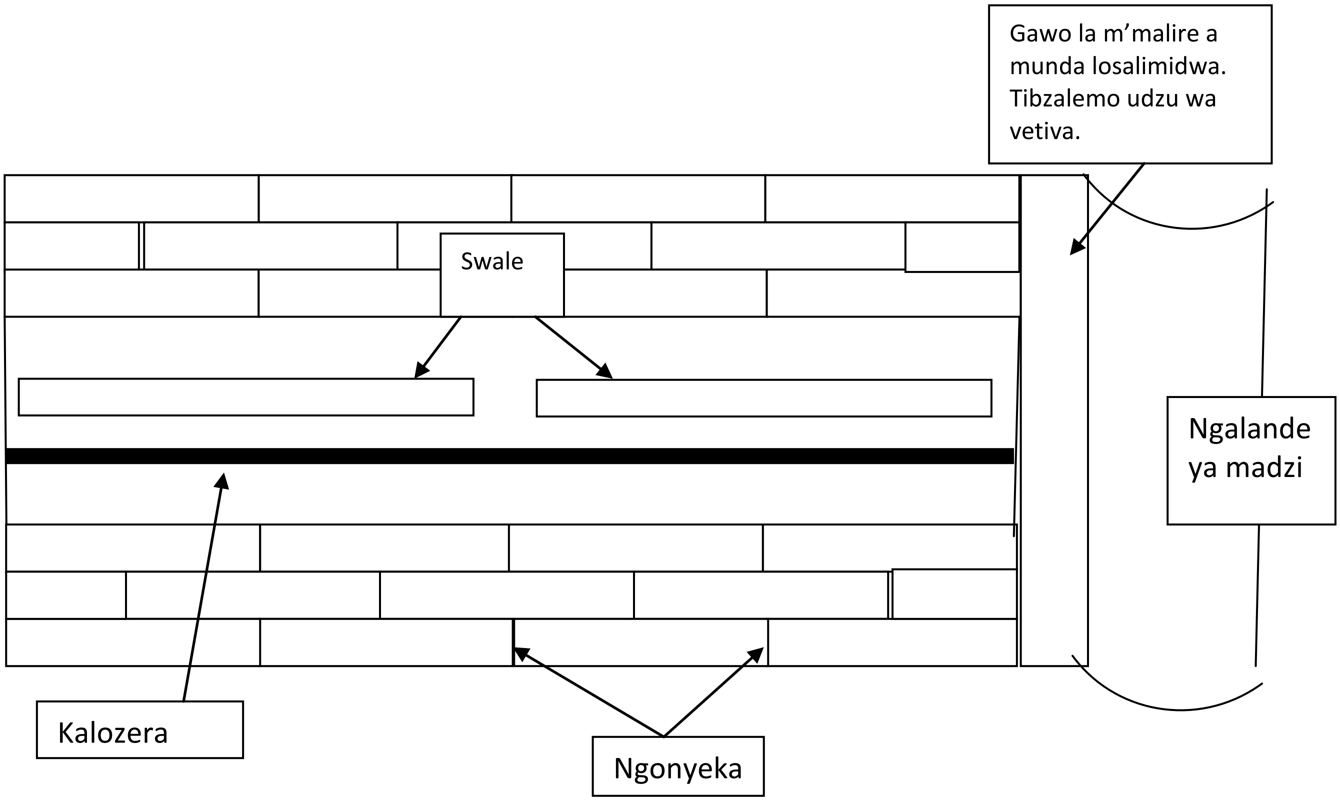
2.2.2 Kumusi kwa zigwembe

- Kuduka kwa miseu.
- Kukwilirika kwa mitsinje ndi nyanja.
- Kuonongeka kwa makina opangira magetsi.
- Kusokonekera kwa ntchito za makampani komanso zipatala.

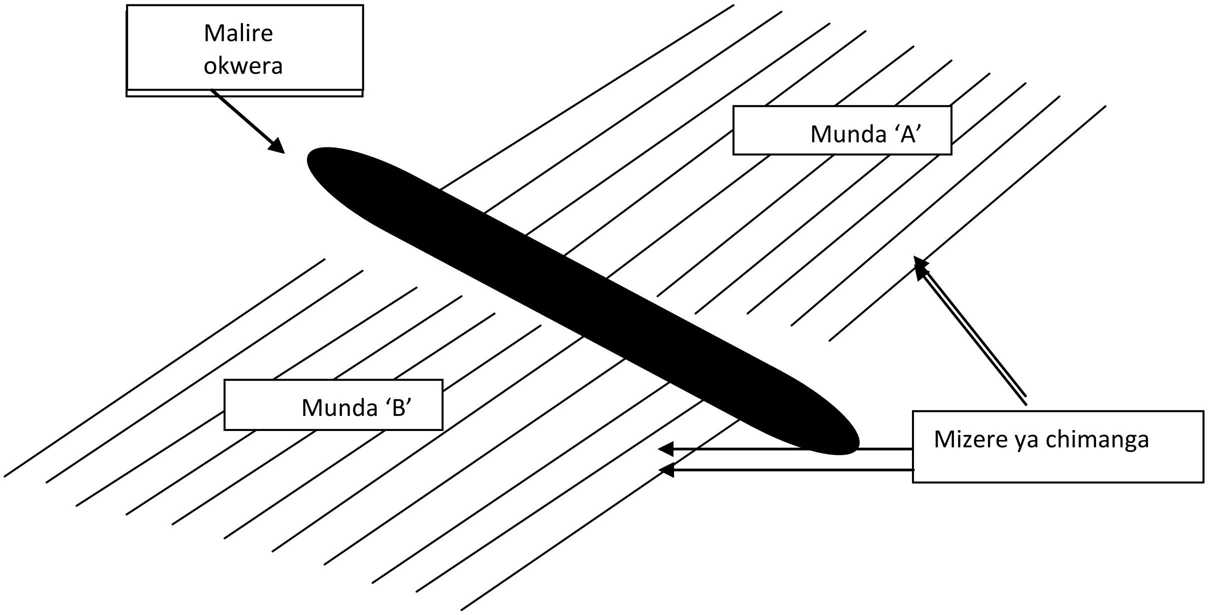
3.0 Kupewa zigwembe

Njira yabwino yothana ndi vuto la zigwembe ndikulimbikitsa kugwiritsa ntchito njira zomwe zimathandiza kuti madzi azilowa m'dothi ndikuchepetsa kuthamanga kwa madzi:

- Tiyenera kukonza minda yathu poyika migula ndi ngonyeka, swale, kutseka kumapeto a mizere ndikusiya gawo lakumapeto a munda lomwe lachita malire ndi ngalande za madzi losalimidwa ndikubzalamo udzu wa vetiva kuteteza makoma angalandezo kuti angagwe.



- Njira ndi malire a minda yathu zikhale zokwezera.



- Zitsamba zotchinjiriza nthaka ku madzi a mvula pa migula ndi kubzala mitengo.

4.0 Kukonza Zigwembe

Ngati m'malo amene tikukhala kapena m'minda mwathu sitinatsate njira zoyenera zomwe zimathandiza madzi a mvula kulowa pansi kapena tadula mitengo mosasamala ngalande za madzi zikhonza kukula mosavuta nkusanduka zigwembe.

Pamene zigwembe zachitika m'mdera lathu, choyamba tiyenera kulingalira chomwe chikuyambitsa vuto la kukokoloka kwa nthaka ndikupeza njira zothetsera vutoli.

4.1 Choyambitsa

- Kuchuluka kwa madzi.
- Kuthamanga kwa madzi.

4.2 Kupewa kwake

- Pofuna kuchepetsa kuchuluka kwa madzi tiyenera kupanga akalozera ndi ngonyeka m'minda mwathu kuti madzi akhale ndimpata wolowa pansi pamene nvula yagwa.
- Pofuna kuchepetsa kuthamanga kwa madzi tiyenera kumanga ma tchinga kuyambira kumtunda kwa ngalande za madzi.

4.3 Kodi tchinga ndichiyani?

Tchinga ndi khoma kapeni mpanda womwe ungamangidwe mungalande ya madzi kapena chigwembe ndicholinga chochepetsa kuthamanga kwa madzi kuti nthaka isakokoloke.

4.4 Kamangidwe ka ma tchinga

4.5 Malo oyika tchinga

Tisanamange tchinga lathu tiyenera kuyendera ngalande yathu kuti tiwone malo abwino omwe tingayike tchinga lathu kuti lisakokoloke. ***Monga;*** Tisayike tchinga lathu malo omwe madzi amathamanga kwambiri ndi mwamphanvu kuti tchinga lathu lingakokoloke.

Mukhonza kumanga matchinga amitundu yosiyana malinga ndi zipangizo zomwe mwakwanitsa kupeza.

5.0 Mitundu ya ma tchinga

5.1 Tchinga la miyala

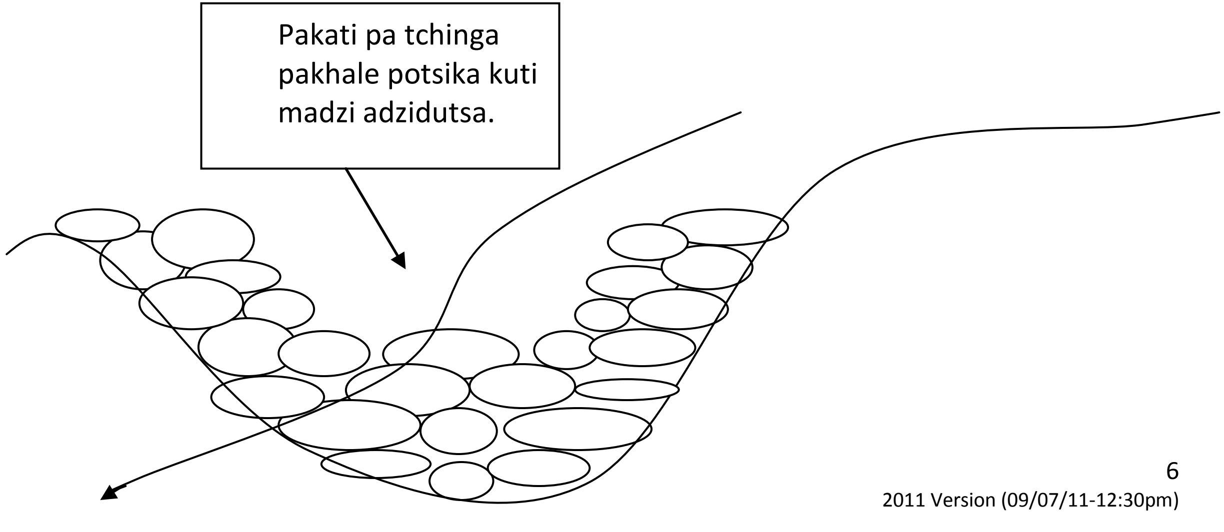
5.2 Zipangizo zofunika

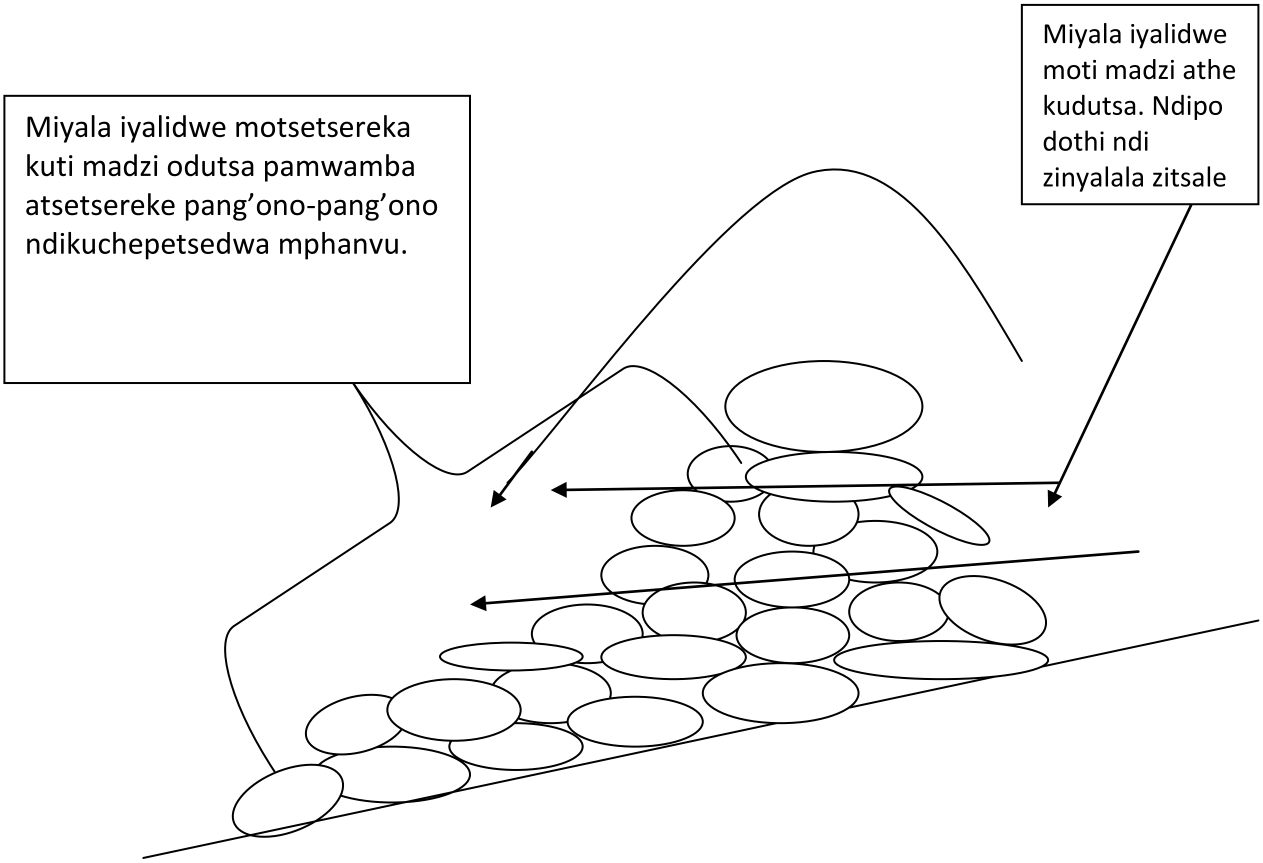
- Miyala.
- Makasu.
- Vetiva, nthochi ndi zomera zina zoyenera monga nsenjere.

Kumalo kumene kuli miyala yambiri, miyala ikhoza kugwiritsidwa ntchito popanga tchinga powunjika miyalayi

5.3 Kamangidwe

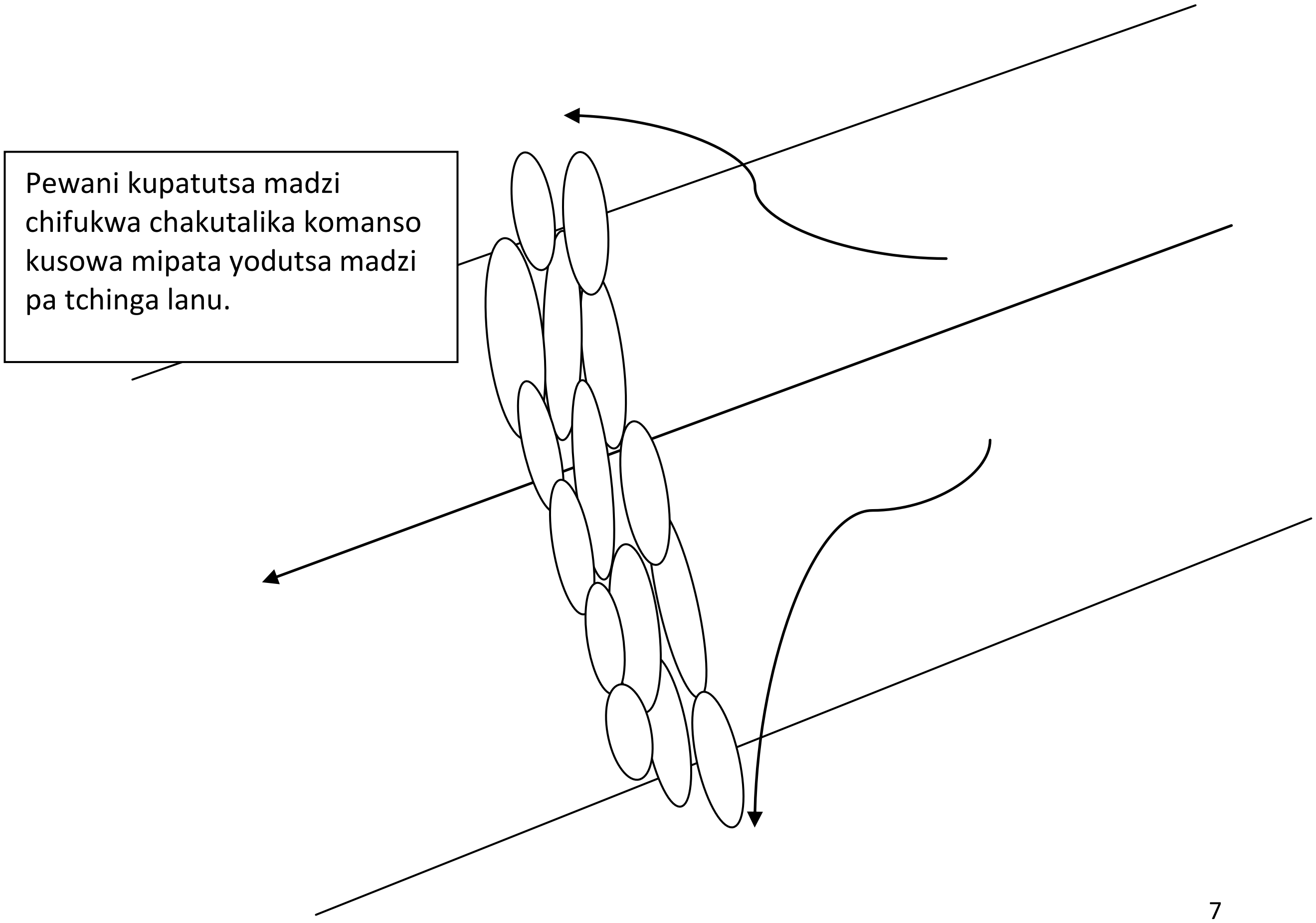
Miyala imaunjikidwa mpaka ku zipupa.





Miyala iyalidwe motsetsereka kuti madzi odutsa pamwamba atsetsereke pang'ono-pang'ono ndikuchepetsedwa mphanvu.

Miyala iyalidwe moti madzi athe kudutsa. Ndipo dothi ndi zinyalala zitsale



Pewani kupatutsa madzi chifukwa chakutalika komanso kusowa mipata yodutsa madzi pa tchinga lanu.

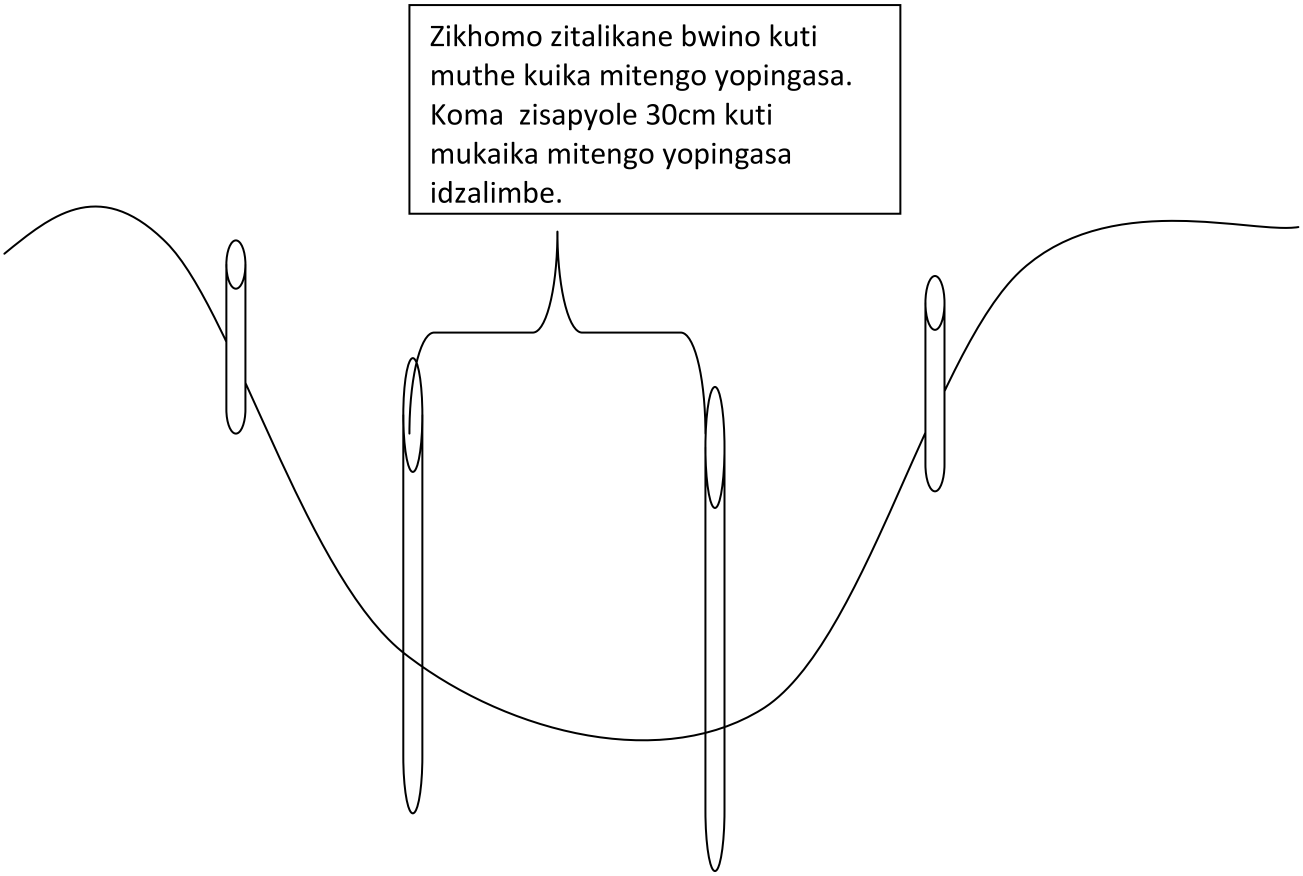
5.4 Tchinga la Mitengo

5.5 Zipangizo zofunika

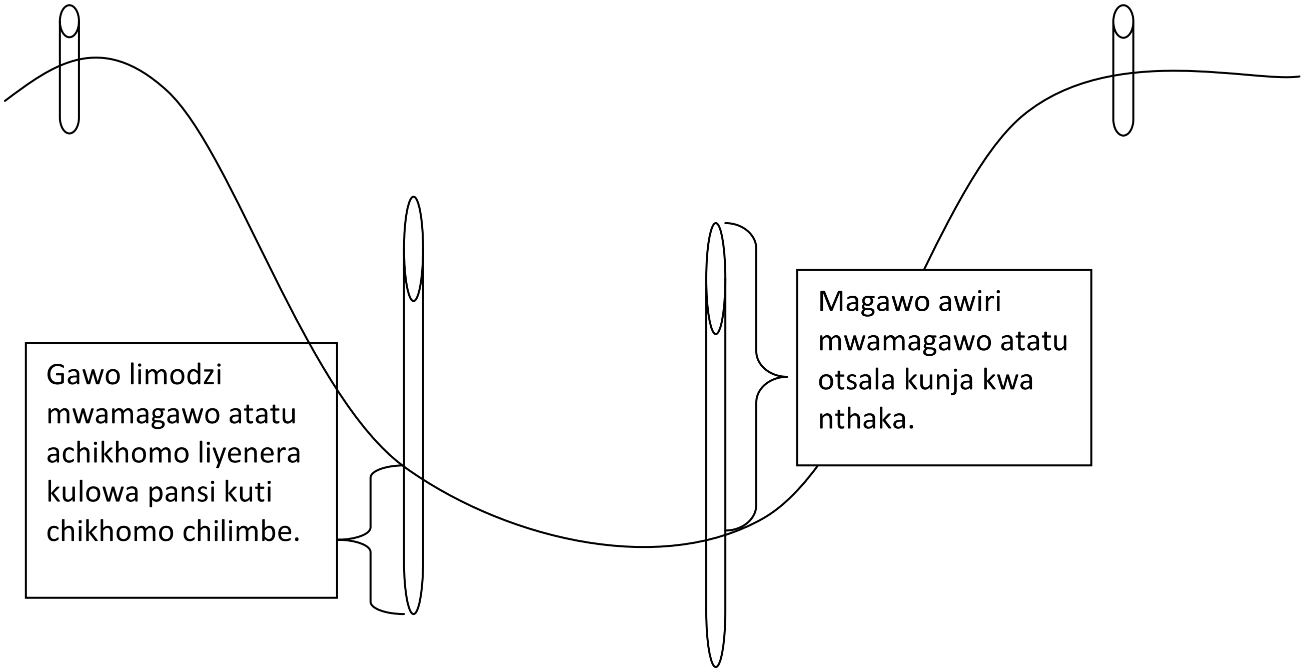
- Zikhomo.
- Mizengo (yamitengo kapeni nsungwi)
- Zingwe.
- Vetiva, nthochi ndi zomera zina zoyenera monga nsenjere.

5.6 Kamangidwe

1. Zikani/khomani mitengo pansi pa ngalande mpakana kukhoma la ngalandeyo.



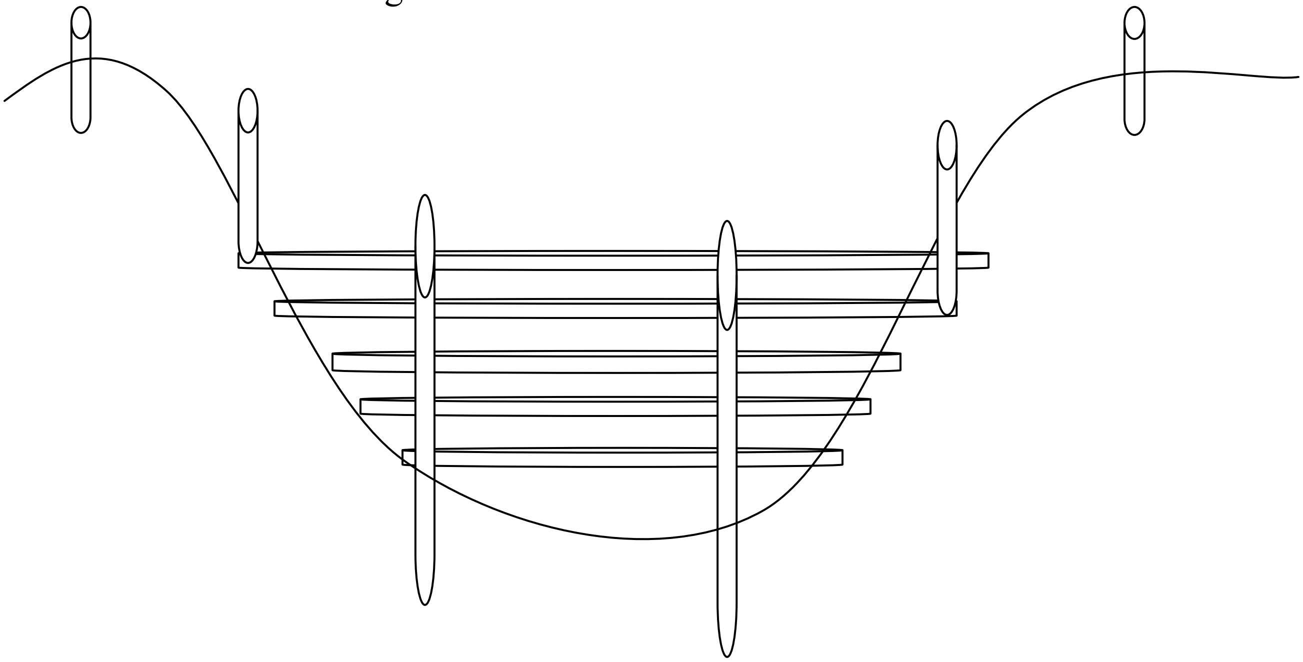
Kakhomedwe



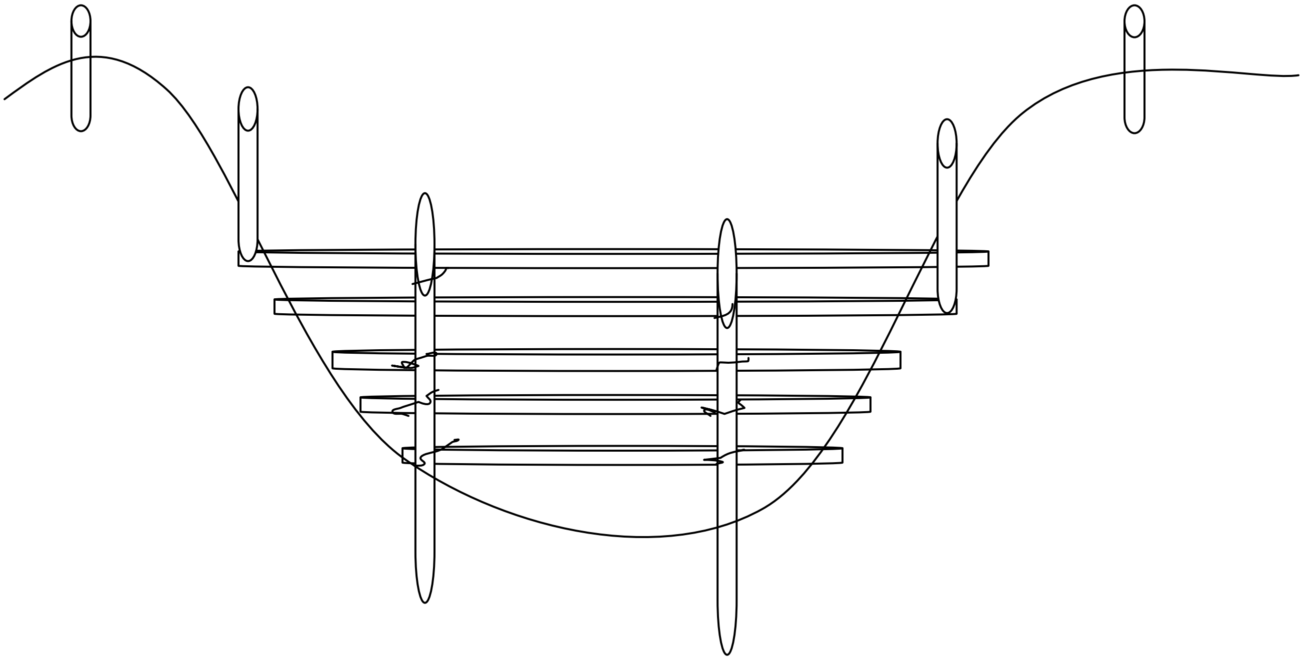
Gawo limodzi mwamagawo atatu achikhomo liyenera kulowa pansi kuti chikhomo chilimbe.

Magawo awiri mwamagawo atatu otsala kunja kwa nthaka.

2. Gonekani mitengo yopingasa kuchokera pansi pa ngalande mpaka m’makoma a ngalande.

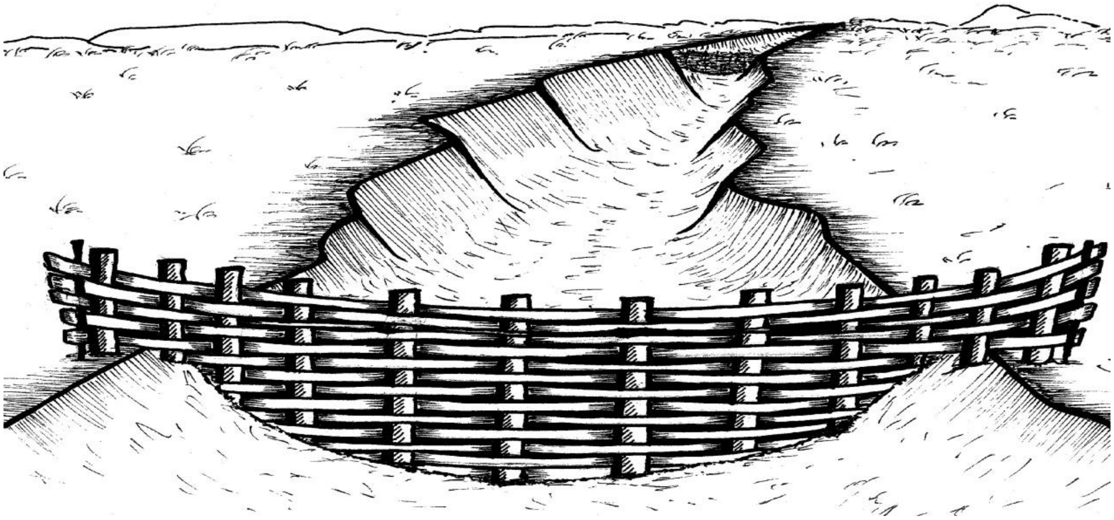


3. Khomani kapena mangani mitengo yopingasa kuzikhomo kuti ilimbe.



4. Njira yina, mukhoza kuluka mitengo yopingasa pakati pazikhomo kuyambira pansi mpaka pamwamba pa ngalande monga tilukira zokolera nsomba, nkhokwe kapena mabasiketi.

Source: Landcare Practice in Malawi 2002



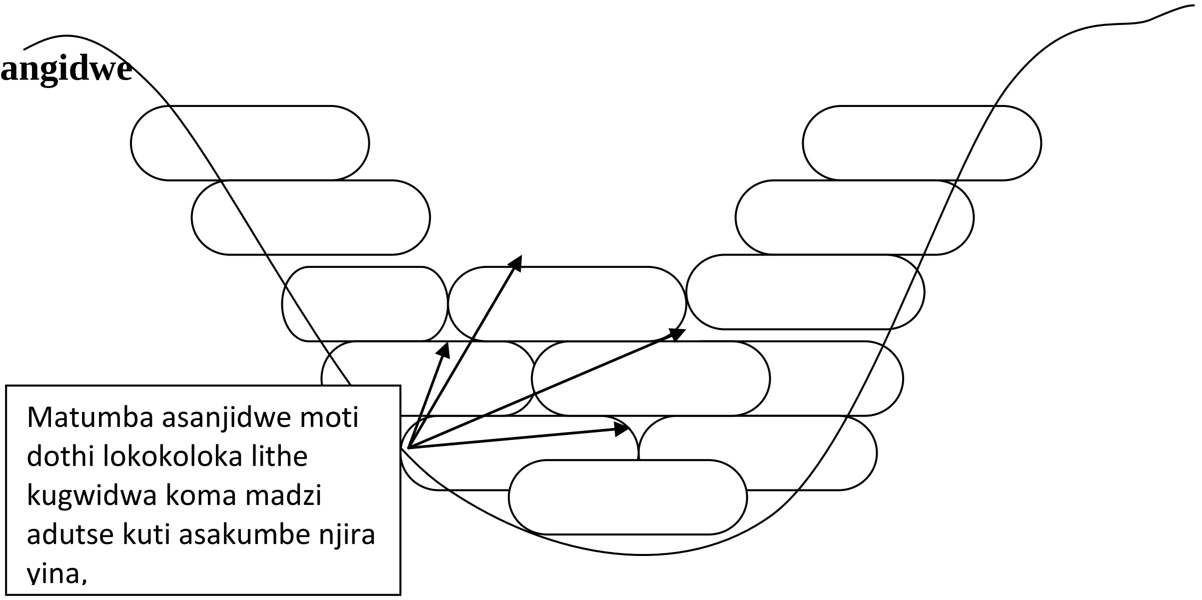
5.7 Tchinga la Matumba

Ndikupezeka kwa matumba, tikhonza kumanga matchinga a matumba a mchenga kapena dothi posanja matumbawa kuchokera pansi mpaka pamwamba komanso m'mbali mwa chigwembe. ***Dziwani kuti iyi ndinjira yapangozi chifukwa zipangizo zogwiritsidwa ntchito sizichedwa kowola.***

5.8 Zipangizo zofunika

- Matumba.
- Mchenga .
- Makasu.
- Vetiva, nthochi ndi zomera zina zoyenera monga nsenjere.

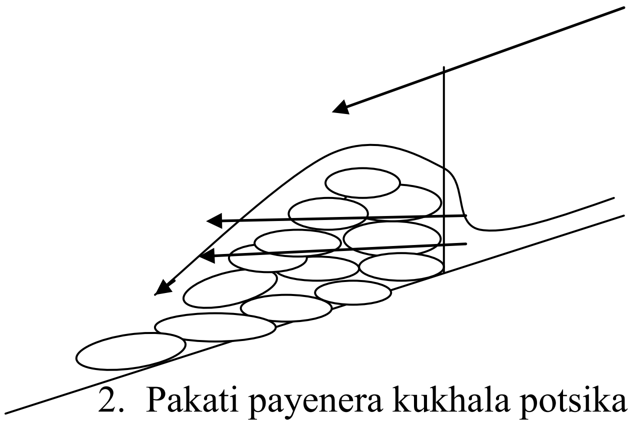
5.9 Kamangidwe

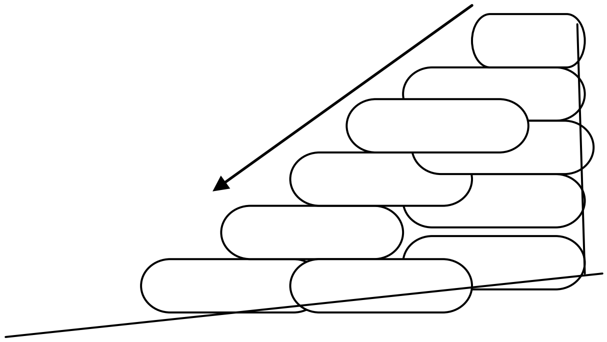


Matumba asanjidwe moti dothi lokokoloka lithe kugwidwa koma madzi adutse kuti asakumbe njira yina,

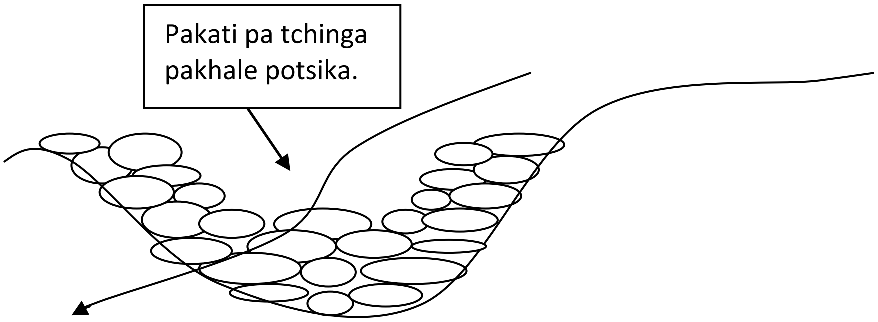
6.0 KUMBUKIRANI IZI

1. Miyala kapena Matumba ziyalidwe motsetserekera mbali yolowera madzi kuti madzi odutsa ayende pang'ono-pang'ono.

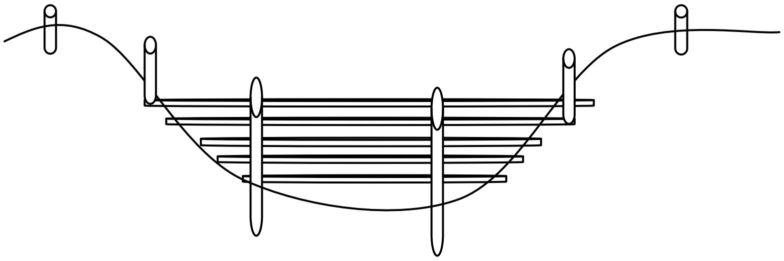


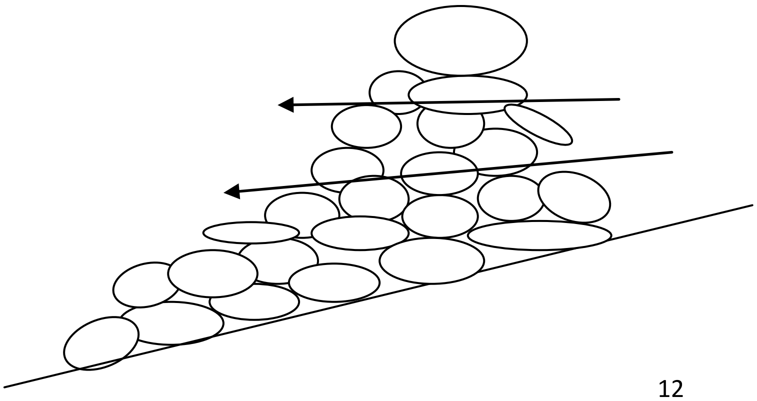


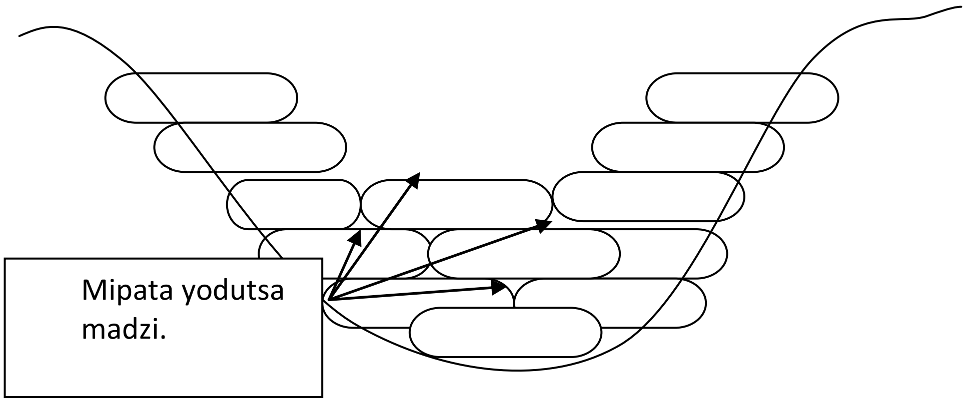
2. Pakati payenera kukhala potsika kuti madzi adzidutsa.



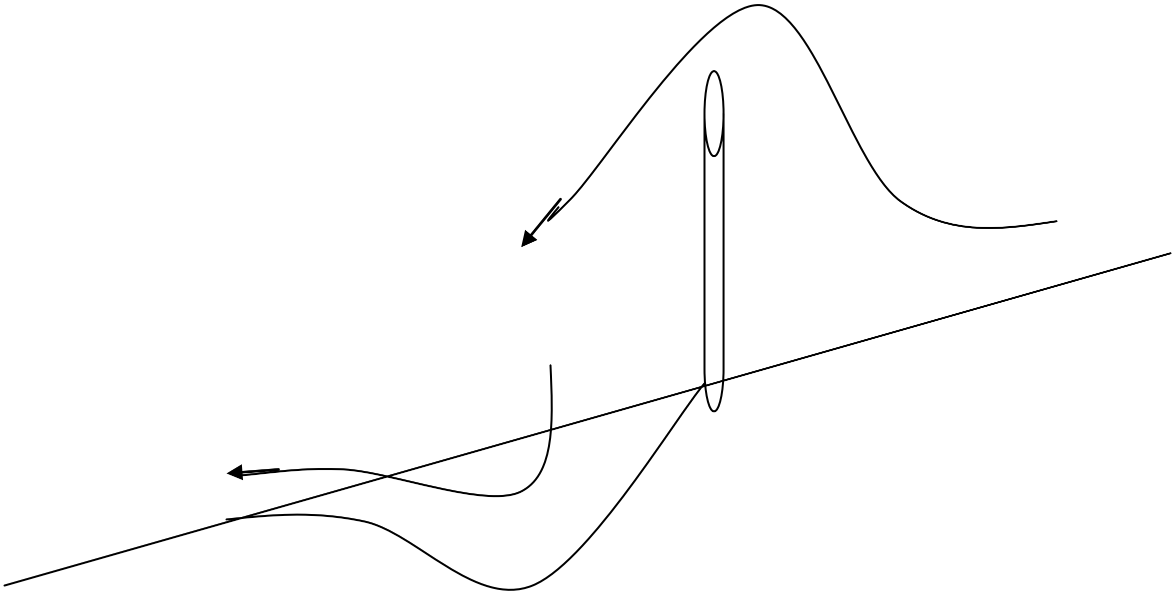
3. Mizengo, miyala, kapena matumba ziyikidwe moti madzi athe kudutsa.



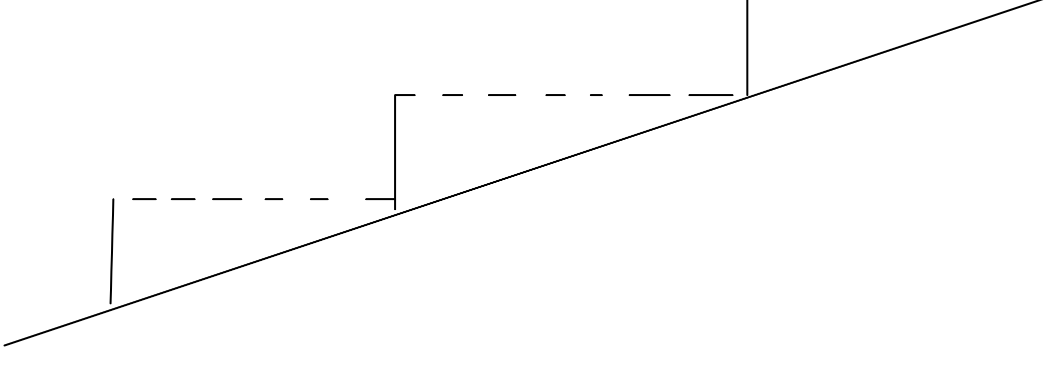


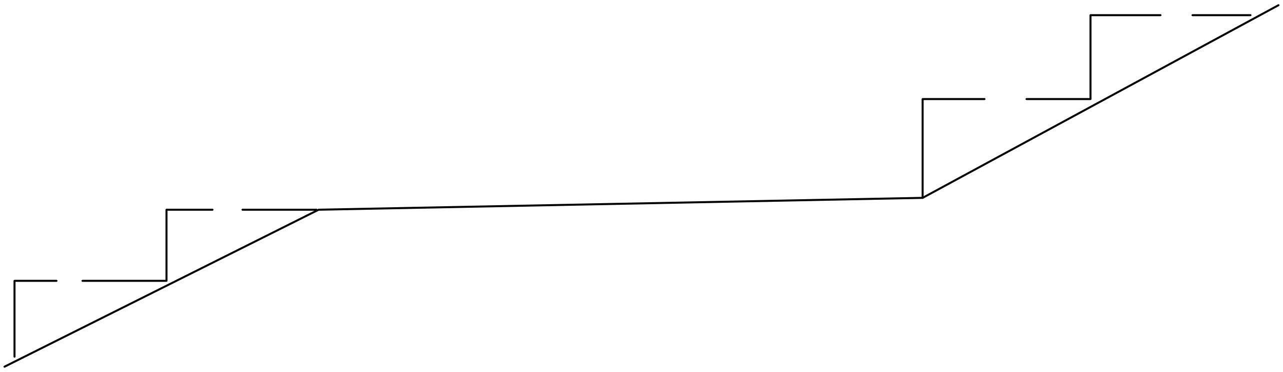


4. Pewani kutalikitsa kwambiri tchinga kupewa madzi odutsa pamwamba kuti angakumbe kutsogolo kwa tchinga lanu.



5. Matchinga iyikidwe molingana ndikukula kwa matsitso (monga 5m kapeni 10m kuchoka pa tchinga loyamba kukafika patchinga linzake)





7.0 Zomera zotchinga madzi

Udzu wa vetiva ndi mitengo zizibzalidwa ngati zitsamba zotchinga madzi m’chigwembe kuti zichepetse kuthamanga kwa madzi. Izi zimakolanso zinyalala ndi manyowa zomwe zimathandiza zomerazo.

7.1 Kubzala udzu wa vetiva

- Pangani tchinga la mitengo kapena miyala m’chigwembe (onani gawo la phunziro la kupanga matchinga).
- Bzalani udzu wa vetiva {10cm kuchokera paphando lililonse (mbande zisanu kapeni khumi paphando)} mopingasa mulifupi mwa chigwembe ndi pamwamba pa tchinga kuti mugwiritse ntchito dothi lotsalira. Bzalani vetivayo potengera kutsetsereka kwa chigwembe (mwachitsanzo, mamita asanu mpaka khumi (5-10m) kuyambira kumtunda kwa chigwembe). Bzalani ndi mvula yoyamba kuti zimere mwamsanga.
- Dulirani udzu pafupipafupi kuti uziphukira komanso kukula msanga. Udzu umamera ngati tchinga ndi lokhazikika.

8.0 Kukwezera njira za m'malire

Njira za malire a munda zimathandizira kukokoloka kwa nthaka ndi kupangitsa zigwembe. Kukwezera njira za malirewa kumachepetsa kuthamanga kwa madzi ndi kukokoloka kwa nthaka. Njirayi ndiyoyenera m'munda omwe munachita akalozera kapena omwe mulibe akalozera.

8.1 Ndondomeko zokwezera njira za malire a minda

- Ikani zizindikiro m'malo momwe muli njira ndi malire pogwiritsa ntchito zikhomo kuyambira kumtunda mpaka kumusi.
- Konzani njira yotalika mamita asanu (5m) mulitali mu mzere womwe waikidwa zikhomo pamwamba kupitirira mizere yomwe mwabzalapo mbewu. Pangani izi pokumba dothi kuchokera m'mikwasa koma osakumba kwambiri kuti mupangike zigwembe.
- Kwezerani njira ndi malire pofuna kuchepetsa njira zina zodutsa madzi.

9.0 Kasamalidwe ka nthaka ya m'mphepete mwa mtsinje

Nthaka ya m'phepete mwa mtsinje ndi imodzi mwa nthaka yomwe imaonongeka kwambiri m'dziko muno. Malowa akhala akulimidwa kwa nthawi yaitali chifukwa cha nthaka ya chonde yomwe imabwera ndi madzi osefukira. Ngakhale izi zili chonchi, nthaka ya m'mphepete mwa mtsinje ndi yosagwirana kwenikweni kotero ndikosavuta kuti nthakayi iwonongeke. Kuteteza malowa ndi kofunika kwambiri kuti mayendedwe a madzi asathamange ndiponso kuchepetsa vuto la kusefukira kwa madzi, kuwunjikana kwa mchenga, kukwiririka kwa nthaka ndi kusowa kwa malo olima.

9.1 Kuteteza nthaka ya m'mphepete mwa mtsinje

Kuteteza ndi njira yokhayo yodalirika yotetezera nthaka ya m'mphepete mwa mtsinje. Malo a m'mphepete mwa mitsinje sayenera kulimidwa koma azisiyidwa kuti pazimera za chilengedwe zomwe zimateteza nthakayi kusiyana ndi njira zina zotetezera nthaka zochita kupanga monga udzu, mitengo yodzalidwa ndi zinthu zina zomwe zili zoyenera kubzala m'malo amene zomera zalambulidwa pazifukwa za ulimi kapena zifukwa zina.

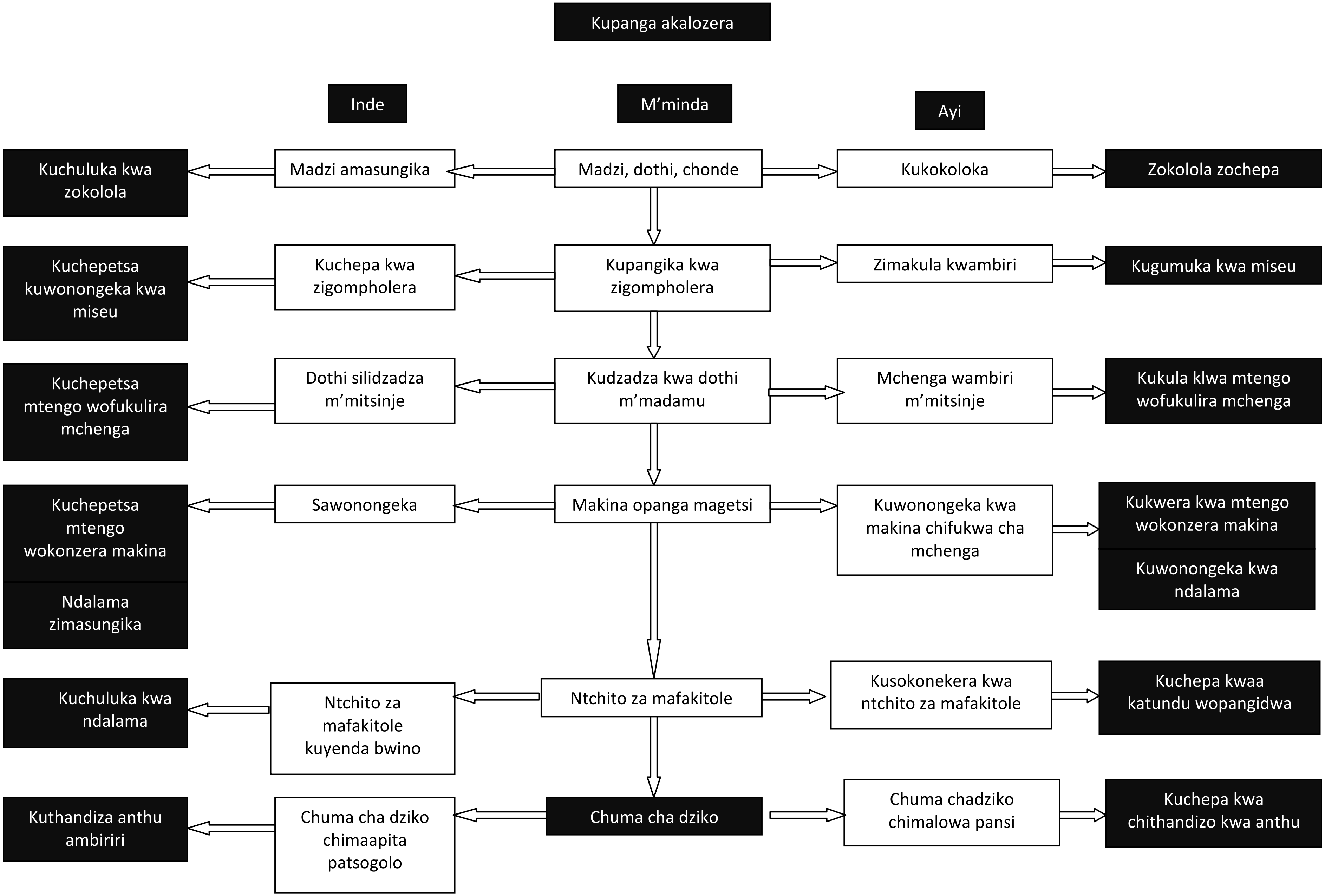
9.2 Njira zobzalira zomera m’mbali mwa mtsinje zili motere:

- Gawani timikwasa m’mphepete mwa mitsinje mikwasayo itenge pafupi-fupi mamita asanu (5m) mulifupi mbali zonse m’madambo ang’ono-ang’ono komanso mamita khumi mpaka makumi awiri (10-20m) m’mitsinje.
- **Kubzala udzu:** Bzalani udzu wa vetiva, nsenjere kapena nsungwi mbali zonse ziwiri za mtsinje. Udzu wa vetiva ukhonza kubzalidwa m’mizere m’mbali mwa mtsinje pa mpata wa mamita 0.45 mulitali ndi 0.45 mulifupi (0.45m x 0.45m). Nsenjere zibzalidwe pa mpata wa 0.2 mulitali ndi 0.2 mulifupi (0.2m x 0.2m) ndipo nsungwi ziyenera kubzalidwa pa mpata wa mita imodzi mulitali ndi mita imodzi mulifupi (1m x 1m).
- **Kubzala zitsamba:** Deliya ndi chimodzi mwa chitsamba chovomerezeka kubzalidwa pa mpata wa mamita 0.45 mulitali ndi 0.45 mulifupi (0.45m x 0.45m).
- **Kubzala mitengo:** Pali mitundu ya mitengo yambiri yovomerezeka yomwe ikhoza kubzalidwa mu mizere pa mulingo wa mamita awiri mbali zonse (2mx2m). Ina mwa mitengoyi ndi mthethe, mkunkhu, mingazolo, msangu, kachere, nkuyu, kankhande, mbawa, katope, nsikidzi ndi masawu.

Werengani ku gawo la zowonjezera →

- Zina mwa zithunzi zinatengedwa mu buku laW.T. Bunderson ndi anzake, Land care practices in Malawi, Publication No. 42 la March, 2002.

CHITSANZO CHAKUSIYANITSA



独立行政法人国際協力機構 (JICA)

マラウイ国
シレ川中流域における
農民による流域保全活動推進
プロジェクト

COVAMS アプローチ有効性分析
質問票調査報告書

2017 年 3 月

アイ・シー・ネット株式会社

目　次

添付資料

図 表 一 覧

略語表

CCO	Conservation Coordination Officer	普及員
COVAMS	Community Vitalization and Afforestation in Middle Shire	シレ川中流域における村落振興･森林復旧プロジェクト
LF	Lead Farmer	リードファーマー
SLF	Senior Lead Farmer	シニアリードファーマー
TST	Technical Support Team	技術支援チーム

I.　報告書の要約

COVAMS アプローチの有効性を分析することを目的とし、世帯別の質問票調査を実施した（以下、本調査）。調査世帯の選定には、プロジェクトが対象とするマラウイ国ブランタイヤ県、バラカ県、ムワンザ県、ネノ県の4県35,000世帯から多段抽出法を用い、760世帯（統計的に有意な規模）を抽出した。調査対象者には主に、3種の技術（育林、土壌保全、ガリコントロール）の2013年度から2015年度の3年間の年度別の実践率と実践状況を質問票に基づき尋ねた。

本調査で使用した質問票は、当案件で2014年に実施された全戸質問票調査の質問をもとに、カウンターパートと協議して作成した。調査に先立ち、各県および調査対象村でのオリエンテーション[1]、調査対象地から外れたプロジェクト対象村でのプリテストを実施した。本調査は2016年6月20日から7月22日まで、日本人専門家の監督のもと4名の調査員によって実施された。

調査結果の要約は以下のとおりである。

① COVAMS アプローチで導入した3種の技術とリードファーマー（LF）の認知度について、対象　村のほぼすべての世帯（99%以上）により認知されている。

② 3種の技術研修の参加率は、総じて1年目から80%を超え、2年目には90%を超えている。

③ 3種の技術研修ともに、住民はグループ単位で研修に参加、またはLFやシニアリードファーマー（SLF）によりグループ単位で研修が実施されている。

④ 技術の実践率は、3種の技術において1年目で50%を超えている。特に土壌保全技術とチェックダムの設置はプロジェクト開始前には1~2割であったが、プロジェクト開始1年目に7~8割の実践率を達成し、顕著なる増加がみられる。イノベーター理論[2]に基づきプロジェクトが目標とした「普及率50%」を、3種の技術の実践率において1年という短期間で達成している。

次に、各技術の実践状況を要約する。

⑤ 育林技術では、苗木生産・植林の実践率はプロジェクト開始後1年目で8割を超える。世帯単位での苗木生産の実践率は3年間で50%を超えることはなく、LFやSLFによる研修はグループ単位での苗木生産の実践率に対して、より強く影響した。2年間の1世帯当たりの苗木生産合計本数は67本、プロジェクト対象35,000世帯の推計値は233万本であった。2年間の1世帯当たりの植林合計本数は103本、プロジェクト対象35,000世帯の推計値は362万本であった。

⑥ 土壌保全技術では、等高線農法の4つの技術のいずれかを実践している世帯は、プロジェクト開始後2年目に9割を超えるが、4つそれぞれの技術の年度ごとの実践率は2~3割にとどまる。このことから技術の採用を少しずつ増やしていく傾向が見られた。2年間の1世帯当たりの等高線農法の適応面積合計は1.5エーカー（0.6ヘクタール）、プロジェクト対象35,000世帯の推計値は5.4万エーカー（約2.2万ヘクタール）であった。

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[1] 県でのオリエンテーションは日本人専門家によって、村でのオリエンテーションは村長とシニアリードファーマーによって開催された。

[2] 社会学者であるエベレット・M・ロジャースが提唱した、イノベーションの普及に関する理論。アイデアが普及・拡散する過程の採用者を5つのグループに分類した。各グループは採用順に①イノベーター全体の2.5%を構成（Innovators：革新者）、②アーリーアダプター13.5%（Early Adopters：初期採用者）、③アーリーマジョリティ34.0%（Early Majority：前期追随者）、④レイトマジョリティ34.0%（Late Majority：後期追随者）、⑤ラガード16.0%（Laggards：遅滞者）。

⑦ ガリコントロール技術では、チェックダムの設置率がプロジェクト開始後 1 年で 7 割弱に達している。1 年間の 1 世帯当たりのチェックダム設置個数は 5 か所であった。2 年間の 1 世帯当たりのチェックダムの設置合計数は 7 か所、プロジェクト対象 35,000 世帯の推計値は 25.1 万か所であった。

以上の結果から、COVAMS アプローチは短期間で 3 種の技術の実践率を高め、住民による技術の実践の効果が高く、一定の有効性が認められる。

II.　調査の目的

本調査は、COVAMS アプローチが農民による流域保全活動の促進にどのように貢献しているかを確認し、その成果を測ることを目的とする。

III.　調査の方法

本調査は、本プロジェクトが対象とするブランタイヤ県、バラカ県、ムワンザ県、ネノ県の 4 県において、2016 年 6 月 20 日から 7 月 22 日まで、質問票調査を用いて実施した。対象村落数は 230 カ村、対象世帯はおよそ 35,000 世帯におよぶ。このため、調査日数、コスト（移動時間、移動手段、調査員雇用日数）を勘案し、対象村を抽出したうえで対象世帯を抽出する「多段抽出法」を採用した。その結果、38 カ村の各村で 20 世帯ずつをランダム抽出し、合計 760 世帯を質問票調査の対象とした。

1.　調査対象村

調査対象村の一覧を次の表 1 と表 2 に示す。

表 1：県別の調査対象村の数とプロジェクト開始年

プロジェクト開始年 対象県	2013	2014	2015	合計
バラカ	1	4	2	7
ムワンザ	3	3	2	8
ネノ	2	6	0	8
ブランタイヤ	1	9	5	15
合計	7	22	9	38

表 2：調査対象村落一覧

県名	村名	プロジェクト開始年	全世帯数	調査対象世帯数
バラカ	Masenjere	2013	74	20
	Bamusi	2014	92	20
	Kambadya	2014	214	20
	Mkweya	2014	91	20
	Thamangira	2014	63	20
	Kwalakwata	2015	59	20
	Sami	2015	109	20
	小計			140
ムワンザ	Chikoleka	2013	225	20
	Kawiliza	2013	463	20
	Tsegulani	2013	232	20
	Kam'phirimo	2014	132	20
	Machilika	2014	155	20
	Stampa	2014	45	20
	Faiti	2015	583	20
	Ng'onzo	2015	194	20
	小計			160
ネノ	Mulauli	2013	141	20
	Chikungulu	2013	260	20
	Chasesa	2014	259	20
	Mwamdaza	2014	207	20
	Magaleta	2014	255	20
	Dzomodya	2014	342	20
	July	2014	26	20
	Godeni	2014	358	20
	小計			160
ブランタイヤ	Chande	2013	210	20
	Jolodani	2014	332	20
	Nakhwala	2014	375	20
	Kutchiri	2014	326	20
	Malenga	2014	503	20
	Jamali	2014	893	20
	Mkumba 1	2014	771	20
	Bota	2014	321	20
	Pindani	2014	140	20
	Wiliamu	2014	91	20
	Ngwaya 1	2015	103	20
	Somba	2015	406	20
	Kayesa	2015	454	20
	M'dala	2015	653	20
	Chombo	2015	319	20
	小計			300
総計				760

2. 調査の準備

(1) 世帯リストの準備

対象世帯の母集団を求めるために、プロジェクトのリードファーマーが戸別訪問で村内の全ての世帯主の名前を聞き取り、作成した世帯リストを用いた。同リードファーマーは、本プロジェクトが活動の対象とする村で、約 15 世帯に 1 名の割合で住民によって選出される。このため、1 名のリードファーマーが作成する世帯リストには、通常 15 世帯の世帯主の名前が記載されている。プロジェクトはこのリストを集めデータ化し、プロジェクトが対象としている全世帯のリストを作成した。

（2） 母集団とサンプル数の決定[3]

母集団に対するサンプル数は以下の計算式を用いて算出した。

$$\text{サンプル数}\quad n = \cfrac{\text{（母集団）}}{\cfrac{\text{推定の誤差の幅（0.05）}}{1.96} * \cfrac{\text{（母集団）-1}}{\text{母集団比率（1 - 母集団）}} + 1} + 1$$

この計算式における母集団に対応する最低サンプル数は以下の表に示される。

母集団	50	100	500	1,000	2,000	5,000	10,000	20,000	50,000	100,000	1,000,000
標本数	45	81	218	279	323	358	371	378	382	384	385

実施する質問票調査におけるサンプル数の検討にあたり、上表に示された単純ランダム抽出法で統計的に有効となる最低サンプルを算出した。加えて、多段抽出法を採用したことによるデザイン効果を考慮し、その効果係数を 2.0 と見積もった。単純ランダム抽出法でのサンプル数は 380 世帯ていどとなり、これにデザイン効果係数 2.0 を乗じると、760 世帯となる。このように多段抽出法によるデザイン効果や回答率に考慮し、最終サンプル数を 760 世帯と設定した。

（3） 対象村の選定

上述のとおり、760 世帯をサンプル数とし、1 村あたりのサンプル数は 20 世帯として配分した。最終的に、調査対象は 38 村、760 世帯とした。調査対象村の選定にあたっては、各地点が抽出される確率の大きさをその人口規模に比例させる「確率比例抽出法」を用い、世帯リストから世帯数に比例した確率で村を無作為に抽出した。世帯リストに記載された 228 村、33,518 世帯を分母として各村の世帯を割って得られる確率で対象村を選ぶことによって、世帯数が多い村ほど選ばれる確率が高くなる。このため、対象の抽出世帯が同じでも、村が選定される確率は世帯に比例するので、各世帯が最終的に抽出される確率は同じになる。選定した対象村を表 2 に示した。

（4） 調査対象候補世帯の抽出

上述の作業から選定された村の世帯リストから、乱数表を用いて 40 世帯をサンプル世帯として、ランダム抽出した。これは、必要とされるサンプル数である 20 世帯の倍にあたる 40 世帯を調査対象候補世帯とすることで、調査実施時に不在の世帯に備えるためである。同リスト上部の 20 世帯を優先世帯とし、リスト下部の 20 世帯を補完世帯とした。

（5） 調査員の配置

質問票調査の調査員として、首都リロングウエより 4 名の調査員を雇用した。全ての調査期間において、この 4 名が質問票調査とデータ入力を担当し、日本人専門家 1 名がその作業を監理した。日本人専門家は可能な限り現場の調査に同行し、進捗と品質の維持管理に努めた。

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[3] 参考文献：（1999）「農村社会調査手法の研究報告書（理論編）」, p.38, 国際協力事業団　農林水産開発調査部.

（6） 調査オリエンテーションの実施

質問票調査の実施に先立ち、対象村の村長、シニアリードファーマー（SLF）[4]、CCO（Conservation Coordination Officer：普及員）を対象に、日本人専門家によるオリエンテーションを開催した。このオリエンテーションには県森林局局長と TST（Technical Support Team：技術支援チーム）1 名も参加した。

ブランタイヤ県では 2 グループに分け 2 日間、その他の 3 県では各県 1 日のオリエンテーションを実施した。この際に、上述の作業により作成した調査対象候補世帯リストを配布し、調査の目的、実施方法、調査日時と場所を決定した。また SLF と村長が、村で同リスト記載の世帯を対象にオリエンテーションを実施し、調査目的や調査日時を事前に連絡し、確認してもらうようにした。また、このオリエンテーションに用いる資料を配布した。

（7） プリテストの実施

質問票調査を実施する前に、調査員に質問票調査の方法を説明するとともに、質問票に用いられる語句の共通理解を得るよう努めた。その後、プロジェクト対象村ではあるが、本調査の対象村ではないブランタイヤ県の一村落でプリテストを実施した。プリテストの目的は、調査票の不備のチェック、各調査員が質問票調査に慣れることと、質問や回答の選択肢に使用されている語句の共通理解を深めること、より実態に即した質問や回答の選択肢に改善するなど質問や回答の修正、である。

3. 質問票調査の実施

調査員は、対象村の指定された場所に赴き、村長と SLF が集めたリスト上の 20 世帯に対し、質問票（添付資料 1）に基づいて個別に聞き取りを実施する面接調査法を採用した。世帯主が不在の場合は、同一世帯内の構成員（子供を除く）への聞き取りを認めた。質問票調査の結果、38 村の 760 世帯から回答を得た。

4. 質問票における年度区分

質問票調査の年度区分は調査対象村のプロジェクト開始年に従って決定した。例えば 2013 年よりプロジェクトによる研修が実施された村では、2013 年度、2014 年度、2015 年度の 3 年間を調査対象期間として、質問票に基づき調査をした。

2013 年度は、リードファーマー（LF）が住民への研修を開始した 2013 年 7 月から、メイズの収穫が終了した 2014 年 6 月までと定義する。メイズの栽培は雨期の始まりによって前後するが、10 月～11 月に播種を開始し、翌年 5～6 月に収穫する。本プロジェクトは耕作期に合わせ、リードファーマーが適切な時期に住民へ研修を実施できるよう、LF の選定と育成（LF に対する研修）を 6 月頃から実施し、リードファーマーは住民への研修を 8 月頃から開始する。

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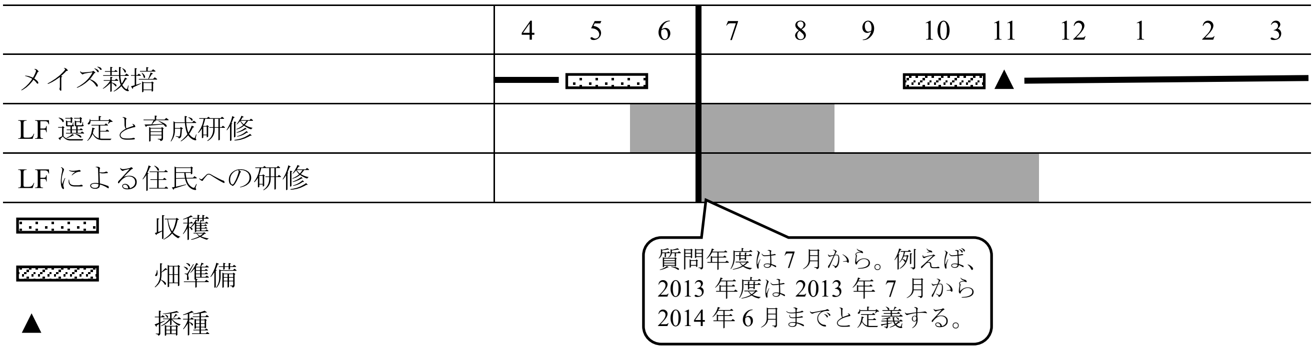
[4] リードファーマーを 1 年間経験した者から選出され、リードファーマーの管理、監督を担当し、CCO（普及員）の補佐的な役割を担う。1 村 1 名のシニアリードファーマーの配置が基本であるが、人口規模や面積の大きな村は 2~4 名のシニアリードファーマーが配置される場合もある。



質問年度は 7 月から。例えば、2013 年度は 2013 年 7 月から 2014 年 6 月までと定義する。

図 1：メイズの栽培暦と調査対象期間決定に考慮した COVAMS の活動

IV. 調査の限界

（1） 外部因子に係る情報の制限

時間と費用の制約から、質問票調査は技術の実践に関する質問を中心としたため、社会的身分や他援助機関の介入などの外部要因に係る情報に制限がある。質問票調査でえた限られた情報（世帯構成員数、民族、識字・非識字、教育年数など）を変数として扱うには、変数を割り出す要因が限られる。

（2） 経年変化のサンプルの代表性

本調査報告書では、年度別と経過年数別にデータを分析している。対象村へのプロジェクト開始後の経過年数（1、２、3 年目）のそれぞれのサンプルに、顕著な差異がないことを確認した。しかし先述のとおり、限られた情報（世帯構成員数、民族、識字・非識字、教育年数）のみにおいて、95%の信頼区間において統計的な差異がないことを確認するにとどまった。

（3） リコールバイアスの度合

本調査の質問では、年度別の技術の実践状況の確認のため同じ質問が繰り返される傾向が高い。このリコールバイアスを低くするため、最近の実践から過去の実践へ、つまり 2015 年年度、2014 年度、2013 年度、プロジェクト実施前の順に質問票を構成した。しかし、質問票の回答者が自分をよく見せようとして、リコール質問には実際と異なる回答をする傾向があれば、年毎の変化を説明する主要因が、リコール回答割合の変化に帰属されてしまう恐れがある。この度合は通常調査できるものではないため、本報告書ではリコールバイアスの変数をとらずに、分析する。

（4） 設問と回答の意図の相違

本調査は、質問票に従って調査員が調査対象者へ質問し、回答を調査員が記入する面接調査法を採用した。この手法は、類似の調査において一般的に使用されており、調査員が口頭で質問を説明するため、質問の誤解が起こりにくい、記入漏れが起こりにくい、複雑な質問が可能であるという利点が挙げられる一方で、調査員と対象者の理解が異なる場合がある。例えば、回答者が意図的に便益を過大または過少に評価する戦略的バイアス、回答者が調査員を喜ばせようとし

て意図的に良い数値を答える追従バイアスなどが挙げられる。質問票調査の前にプリテストを実施し、質問の順番や現状に即した選択肢の選定など質問文や回答選択肢を慎重に検討するとともに、質問票調査を始める挨拶の時点で調査の重要性を強調しありのままの回答が必要であることを説明、質問中には各質問の意図を調査員から回答者に十分に説明するように努めた。しかし、このようなバイアスをゼロとすることは、質問票調査では通常難しい。

V. 調査結果と分析

本調査報告書では、年度別と経過年数別にデータを分析した。まず年度による技術の実践状況を分析し、全体の傾向を把握する。年度により実践率に顕著な違いがみられた場合、降水量などの外部要因があると想定されたためである。さらに、調査対象村ごとにプロジェクトの介入年数が異なるため、経過年数別変化を分析する。経過年数変化分析にあたり、世帯構成員数、民族、識字・非識字、教育年数において、年度ごとのサンプルに顕著な差異がないことを確認し、分析を進めた。

1. 調査世帯の基礎情報

（1） 調査対象の民族構成

調査対象世帯の民族比を図 2 に示す。有効回答数 759 世帯のうち、ンゴニ族が 39.5%（300 世帯）ともっとも多く、ついでチェワ族 26.0%（197 世帯）、ヤオ族 15.2%（115 世帯）、ロンウェ族 14.1%（107 世帯）、マンガンジャ族 2.5%（19 世帯）となっている。少数回答として、セナ族、ベンバ族、チャワ族、ンセナ族、ニャンガ族、ニュングウェ族が含まれる。

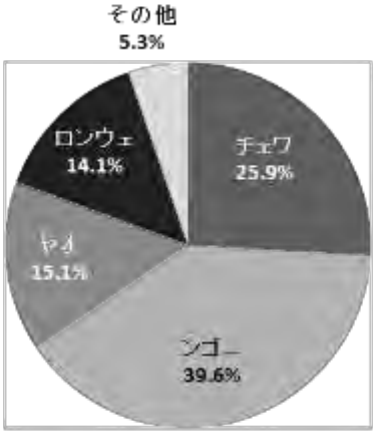


図 2：調査対象の世帯主の民族比

（2） 対象世帯の社会的立場

世帯主の男女比では男性 77.4%、女性 22.6%となり、男性の世帯主が多い。回答者の平均年齢は 43 歳（中央値 40）、1 世帯あたりの構成員数は平均 5.5 名（中央値 5）であった。

回答者が含まれる世帯の構成員に村長やリードファーマー（LF）などが含まれるかを問う社会的身分に関する質問（複数回答可）では、総回答数 760 世帯のうち、2.4%（18 世帯）は村長またはグループ村長を含み、5.2%（41 世帯）は農業省または本プロジェクトの LF もしくは SLF を含む。残る 92.3%（703 世帯）はそれらの立場にある構成員を含まない世帯である（表 3）。SLF または LF と回答した世帯のうち、本プロジェクトの SLF は 1 名（1 名のうち）、LF は 36 名（40 名のうち）であった。

表 3：調査対象の世帯主の社会的立場

	グループ村長	村長	SLF	LF	その他	合計
回答数	5	13	1	40	702	761
割合	0.7%	1.7%	0.1%	5.1%	92.4%	100.0%

（3） 世帯主の識字率

総回答者 760 名のうち、主要言語であるチェワ語のみを解する世帯主は 57.9%（586 世帯）であり、チェワ語と英語の両言語を解する世帯主は 33.2%（252 世帯）を占めた。また、非識字世帯主の割合は、17.0%（172 名）である。

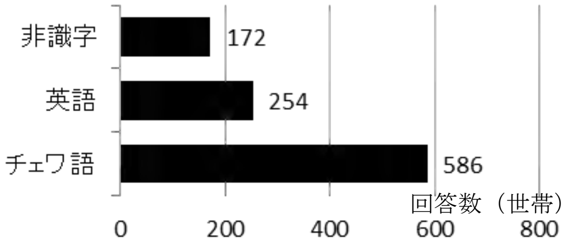


図 3：調査対象世帯の識字率

（4） 対象世帯の生業

対象世帯の主要な経済活動を複数回答で調査したところ、全回答 760 世帯のうち、農業が主な収入源となっている世帯が 55.3 % (521 世帯)、商業 24.1% (227 世帯)、賃金労働 (農繁期など不定期な畑仕事の手伝いで賃金を得る) 14.3%（135 世帯）となっている。約半数の世帯の主要収入源が農業であることは想像に難くないが、商業を主要な収入源とする世帯が 4 軒に 1 軒の割合であることは、本調査でのひとつの発見であった。

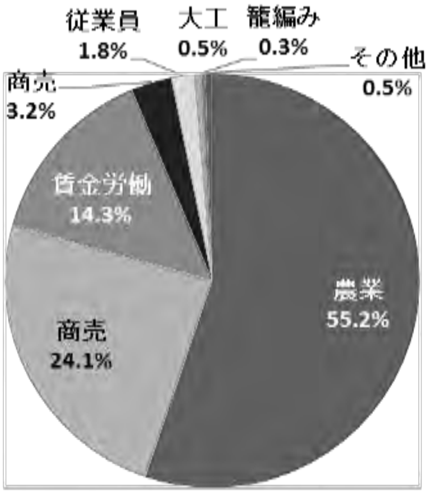


図 4：調査対象世帯の主な収入源

2. COVAMS アプローチにかかる技術の認知度

（1） 技術の認知度

始めに COVAMS プロジェクトを知っているか質問し、知っていると回答した 99.5%（755 世帯）に対して、技術の認知度を確認した。表 4 のとおりプロジェクト対象 4 県ごとに認知度を分析したところ、全ての県において技術は高く認知されている。また知っている技術の数を分析したところ、育林、土壌保全、ガリコントロールの 3 種の技術を知っていると回答した世帯は 99.5%（753 世帯）で圧倒的に多い。COVAMS アプローチで導入した 3 種の技術は、対象村のほぼすべての世帯により認知されている。

表 4：COVAMS アプローチで導入された技術の認知度

		育林	土壌保全	ガリコントロール	その他
バラカ	回答数	140	140	139	1
	（割合）	（100.0%）	（100.0%）	（99.3%）	（0.7%）

ムワンザ	回答数	160	160	160	0
	（割合）	（100.0%）	（100.0%）	（100%）	（0.0%）
ネノ	回答数	157	159	158	0
	（割合）	（98.7%）	（100.0%）	（99.4%）	（0.0%）
ブランタイヤ	回答数	296	296	296	0
	（割合）	（100.0%）	（100.0%）	（100.0%）	（0.0%）
	合計回答数	753	755	753	1
	（割合）	（99.7%）	（100.0%）	（99.7%）	（0.1%）

（2） リードファーマーの認知度

自身の Limana[5]で活動している COVAMS の LF の認知度を確認したところ、知っていると回答した世帯は、有効回答数 754 世帯の 99.7%（752 世帯）であった。質問表で COVAMS の LF と明記した理由は、対象とする同一村内に、COVAMS の LF とともに、農業省が各村に 1 名または技術課題ごとに複数名任命する LF や、NGO が任命する LF が混在するためである。県別にみると、バラカ県 100.0%（140 世帯）、ムワンザ県 99.4%（158 世帯）、ネノ県 99.4%（158 世帯）、ブランタイヤ県 100.0%（295 世帯）だった。本プロジェクトの対象村において、COVAMS の LF はほぼすべての村人に認知される存在となっている。

3. 研修の実施と参加の状況

（1） リードファーマーによる研修の実施状況

LF または SLF が含まれる世帯を対象に、彼らが 3 種の技術研修を実施したかどうかを実施年度別に確認した。例えば、本プロジェクトが 2013 年から当該村で研修を開始し、その年に住民によって COVAMS の LF として選出された場合は、2013 年度、2014 年度、2015 年度の各研修時期に彼らが研修を実施したかを質問した。

LF と SLF からの合計回答数は 92 世帯であり、その内訳は 2013 年度 4 世帯、2014 年度 38 世帯、2015 年度 50 世帯だった。その結果、2013 年度、2014 年度、2015 年度の全ての年度で育林、土壌保全、ガリコントロールの 3 研修を 100%実施しているとの回答を得た。

実施された研修の内容を把握するために、その研修が個人（もしくは単独世帯）を対象に実施されたものか、グループ（複数の参加者を集めて実施する形態）を対象に実施されたものか、その両方かを確認した。その結果を技術別、年度別にまとめたものが表 5 である。3 種の技術ともに、ほとんどの LF と SLF がグループを対象に研修を実施していることが判明した。COVAMS アプローチにおいては、LF 育成研修の際に、複数名を対象に研修を実施することようにCCO から LF に伝えており、これが LF により正しく理解されているためと考えられる。また個人対象の研修は、育林研修で実施されておらず、ガリコントロール研修で 5.6%（90 サンプルのうちの 5 件）の LF が実施していた。

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[5] 同族集団の単位。本プロジェクトでは Limana を研修単位として 1 名のリードファーマーを選出しており、Limana は平均的に 15 世帯ほどの大きさであると報告されている。

表 5：年度別の技術別の研修方法

	育林			土壌保全			ガリコントロール		
	個人	ｸﾞﾙｰﾌﾟ	両方	個人	ｸﾞﾙｰﾌﾟ	両方	個人	ｸﾞﾙｰﾌﾟ	両方
2013 年度	0	3	1	0	3	1	1	1	2
	0.0%	75.0%	25.0%	0.0%	75.0%	25.0%	25.0%	25.0%	50.0%
2014 年度	0	29	8	1	27	9	2	24	11
	0.0%	78.4%	21.6%	2.7%	73.0%	24.3%	5.4%	64.9%	29.7%
2015 年度	0	37	12	1	35	13	2	32	15
	0.0%	75.5%	24.5%	2.0%	71.4%	26.5%	4.1%	65.3%	30.6%
合計回答数	0	69	21	2	65	23	5	57	28
割合	0.0%	76.7%	23.3%	2.2%	72.2%	25.6%	5.6%	63.3%	31.1%

（2） 研修の参加状況

構成員に LF または SLF がいない世帯を対象として、3 種の研修への参加率を年度別に尋ねた。例えば当該村において、本プロジェクトの活動が 2013 年から開始された場合、2013 年度、2014 年度、2015 年度における研修の参加状況とその理由を尋ねた。

3 種の技術研修の参加率は、総じて 1 年目から 80%を超え、2 年目には 90%を超えている。1 年目から 2 年目の増加には総じて統計的な優位差がみられた（$P<0.01$）が、2 年目から 3 年目の変化では統計的差異はみられなかった（$P>0.1$）。研修参加率がこのように高いことから、3 種の技術において住民の関心は高いことが判明した。

1) 育林研修の参加状況

育林研修の研修形態別参加率の年度別変化を表 6 に示す。2013 年度には 76.3%、2014 年度で 82.8%、2015 年度で 89.5%の世帯が育林研修に参加しており、参加率は年々ほぼ同じ割合で増加している。表 5 に示した傾向と同様に、グループ単位で研修を受講する世帯が多い。

表 6：育林研修への参加率の年度別変化

		2013 年度	2014 年度	2015 年度
参加者数（有効回答数）		103（135）	447（540）	636（711）
	参加率	76.3%	82.8%	89.5%
研修形態	個人	2	11	30
		1.9%	2.5%	4.7%
	グループ	101	436	606
		98.1%	97.5%	95.3%

育林研修への参加率の経年別変化を表 7 に示す。本プロジェクトが活動を開始した初年度で 81.5%、2 年目に 90.3%（8.8%の増）、3 年目に 88.2%（2.2%の減）と変化している。1 年目から 2 年目の増加に統計的な有意差はある（$P<0.001$）が、2 年目から 3 年目の減少に統計的な有意差はみられない（$P>0.1$）。

初年度に 8 割、2 年目以降にほぼ 9 割の世帯が研修に参加していることから、村人の研修参加率は非常に高い。

表 7：育林研修への参加率の経過年数別変化

	1 年目	2 年目	3 年目
参加者数（有効回答数）	583（715）	484（536）	119（135）
参加率	81.5%	90.3%	88.2%
(95%CI)	(78.7~84.4)	(87.8~92.8)	(82.7~93.6)

2) 土壌保全研修の参加状況

土壌保全研修の研修形態別参加率の年度別変化を表 8 に示す。本プロジェクトが開始した 2013 年度で 83.6 %、2014 年度で 88.3%、2015 年度で 96.3%と、継続して増加している。また研修への参加方法は、前項の育林研修（表 5）と同様に、グループ単位で研修に参加する傾向にある。

表 8：土壌保全研修の研修形態別参加率の年度別変化

		2013 年度	2014 年度	2015 年度
参加者数（有効回答数）		112（134）	476（539）	685（711）
	参加率	83.6%	88.3%	96.3%
研修形態	個人	2	15	44
		1.8%	3.2%	6.4%
	グループ	110	461	641
		98.2%	96.9%	93.6%

土壌保全研修における参加率の経年変化を表 9 に示す。本プロジェクトの活動が開始した 1 年目で 88.8 %、2 年目に 95.1%（6.4%の増）、3 年目に 97.0%（1.9%の増）と、経年ごとに増加しているものの、2 年目から 3 年目への増加は頭打ちになっている。育林研修と同様に 1 年目から 2 年目の増加に統計的な有意差はある（P<0.001）が、2 年目から 3 年目の増加に統計的な有意差は見られない（P>0.1）。

表 9：土壌保全研修への参加率の経過年数別変化

	1 年目	2 年目	3 年目
参加者数（有効回答数）	631（711）	508（534）	131（135）
参加率	88.8%	95.1%	97.0%
(95%CI)	(86.4~91.1)	(93.3~97.0)	(94.2~99.9)

3) ガリコントロール研修の参加状況

ガリコントロール研修の参加率の年度別変化を表 10 に示す。本プロジェクトが活動を開始した 2013 年度で 82.8%、2014 年度で 85.4%、2015 年度で 95.1%と増加している。また他の研修と同じように、グループ単位で研修を受講する傾向が強い。

表 10：ガリコントロール研修への参加率の年度別変化

		2013 年度	2014 年度	2015 年度
参加者数（有効回答数）		111（134）	462（541）	676（711）
参加率		82.8%	85.4%	95.1%
研修形態	個人	3	12	38
		2.7%	2.6%	5.6%
	グループ	108	450	638
		97.3%	97.4%	94.4%

ガリコントロール研修における、参加率の経過年数別変化を表 11 に示す。本プロジェクトが活動を開始した 1 年目で 85.9%、2 年目に 94.0%（8.1%の増）、3 年目に 97.0%（3.0%の増）と漸増している。他の 2 種の技術の研修と同様に 1 年目から 2 年目の増加に統計的な有意差はある（P<0.001）が、2 年目から 3 年目の増加に統計的な有意差はない（P>0.1）。

表 11：ガリコントロール研修への参加率の経過年数別変化

	1 年目	2 年目	3 年目
参加者数（有効回答数）	611（711）	501（533）	130（134）
参加率	85.9%	94.0%	97.0%
(95%CI)	(83.3~88.4)	(92.0~96.0)	(94.1~99.9)

以上の結果から、COVAMS アプローチが実施するすべての研修で、1 年目に 8 割以上、2 年目に 9 割以上の対象世帯が研修に参加している。

4) 研修への参加理由

3 種の技術研修の参加理由を複数選択可能で回答した結果（3 年間の合計値）を図 5 に示す。参加動機は 3 種の技術研修で大きく異なる。育林研修では、「土地の保護」が 51.5%（710 世帯）で最も多く、次いで「一般的な能力向上」18.3%（252 世帯）、「技術への興味」17.3%（238 世帯）、「収量／収入の増加」10.4%（144 世帯）と続く。土壌保全研修では、「収量／収入の増加」が 72.2%（1,025 世帯）で最も多く、次いで「技術への興味」12.7%（180 世帯）、「一般的な能力向上」11.7%（166 世帯）と続く。ガリコントロール研修では、「土地の保護」が 70.6%（936 世帯）で最も多く、次いで「一般的な能力向上」11.6%（154 世帯）、「技術への興味」11.2%（149 世帯）、と続く。

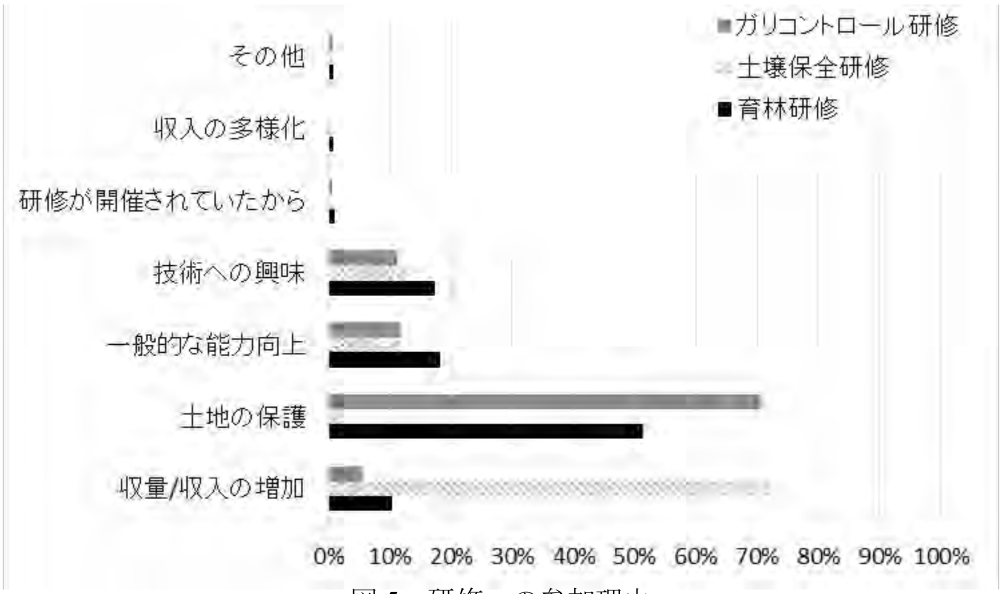


図 5：研修への参加理由

4. 技術の実践状況

（1） 植林の実践

1) 苗木生産の実践状況

本調査の結果から、本プロジェクト開始前に 60.8%であった苗木生産の実践率が、1 年目には 83.8%に上昇し、2 年目には 90%近い実践率がえられた。また、世帯単位での苗木生産活動に比べ、グループ単位で苗木を生産する傾向が強く、この傾向は本プロジェクトの開始後に更に強化される。このことから、LF や SLF による研修はグループでの苗木生産の実践率に、より強く影響していることが分かった。グループでの活動が促進された理由として、研修をとおして、農民自身の個の苗木生産に係る知識や技術が向上し、かつ育林の便益が理解されたことによって、県森林局やドナー、NGO などから支援を受けやすいグループ活動を、農民自身が選択した結果と推察される。

実践率と苗木生産本数はともに、本プロジェクト開始後の 1 年目から 2 年目の増加には統計的有意差が認められた。グループ単位での苗木の生産本数の 2 年目から 3 年目の減少には統計的有意差が認められ、世帯単位での苗木生産の 2 年目から 3 年目の減少には統計的有意差は認められなかった。

苗木生産の実践状況について、本プロジェクト開始後の経過年数別の変化を表 12 に示す。

本プロジェクトの開始前には 60.8%であった実践率が、本プロジェクトの活動を開始して 2 年目で 90%近くに達している。経年別にみると、本プロジェクト開始前に 60.8%（462 世帯）、開始後 1 年目で 83.8%（636 世帯）、2 年目 89.6%（519 世帯）、3 年目 90.7%（127 世帯）と徐々に増加している。統計的には、プロジェクト開始前からプロジェクト開始後 1 年目（P<0.001）、1 年目から 2 年目の増加には有意差がみられ（P<0.01）、2 年目から 3 年目の増加は有意差がない（P>0.1）。

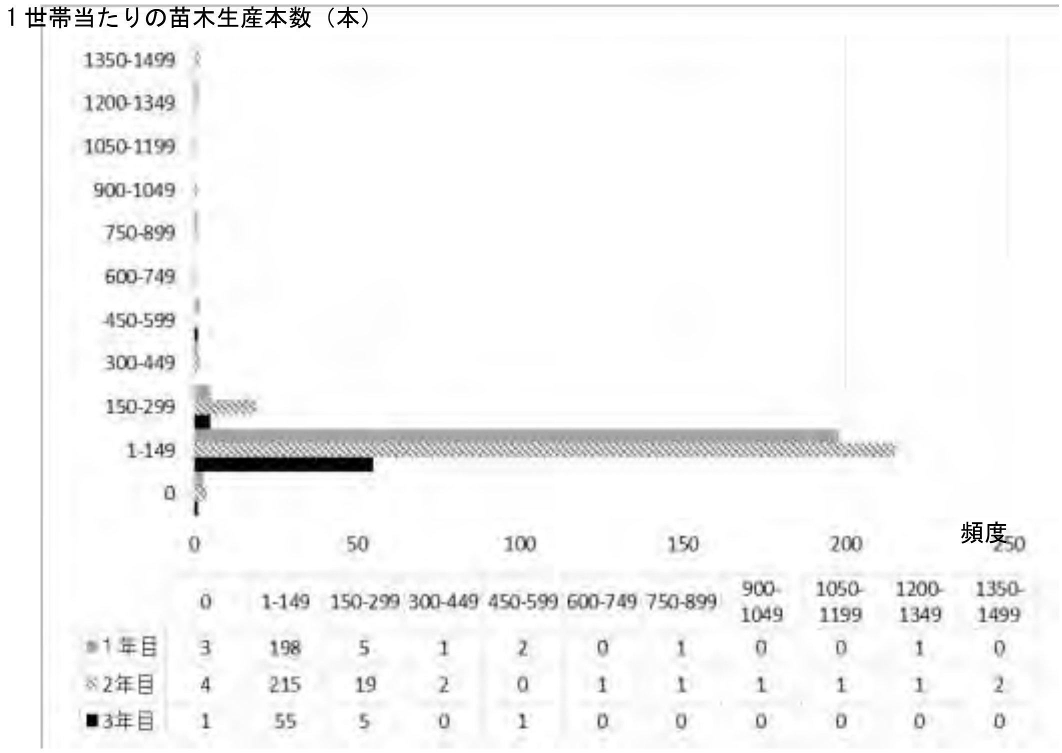
苗木を生産した世帯の実践単位は、グループが 3 年間平均で 5 割強、世帯は 2 割弱、その両方も 2 割弱であった。

表 12：苗木生産実践率のプロジェクト開始後の経過年数別変化

	開始前	1 年目	2 年目	3 年目	3 年間平均
実践率	60.8%	83.8%	89.6%	90.7%	86.7%
（95%CI）	(57.3~64.3)	(81.2~86.4)	(87.2~92.1)	(85.9~95.5)	
世帯での実践率	24.1%	13.6%	21.2%	27.9%	17.9%
（95%CI）	(21.5~27.7)	(11.1~16.0)	(17.9~24.6)	(20.4~35.3)	
グループでの実践率	35.5%	54.8%	48.0%	46.4%	51.4%
（95%CI）	(32.1~38.9)	(51.3~58.3)	(43.9~52.1)	(38.2~54.7)	
両方の単位での実践率	0.7%	15.4%	20.4%	16.4%	17.5%
（95%CI）	(0.1~1.2)	(12.8~18.0)	(17.1~23.7)	(10.3~22.6)	

次に苗木の生産本数を集計する。回答を得たサンプルのうち、世帯単位で苗木を生産した 522 世帯ののなかで 2,000 本以上と回答をした 2 世帯は、データ分析に影響を及ぼす可能性が高いため、これを除いた[6]。同様に、グループ単位で苗木を生産した 1,020 サンプルのうち 7,000 本以上と回答した 3 サンプルを除き、分析を進めた。

図 6 は、世帯単位で苗木を生産した世帯が、1 世帯当たり生産した苗木の平均本数の経年変化を示したヒストグラムである。1 年目に世帯あたり 50 本（中央値：20.0、95%CI：34〜66）、2 年目 87 本（中央値：32.5、95%CI：62〜111）、3 年目 62 本（中央値：30.0、95%CI：38〜85）を生産した。検定の結果、プロジェクト開始後 1 年目から 2 年目の苗木生産本数が同じであるという帰無仮説を棄却する十分な統計的証拠が存在し（P<0.05）、2 年目から 3 年目の苗木生産本数が同じであるという帰無仮説を棄却する統計的証拠は存在しない（P>0.1）という結果であった。



	0	1-149	150-299	300-449	450-599	600-749	750-899	900-1049	1050-1199	1200-1349	1350-1499
▨1 年目	3	198	5	1	2	0	1	0	0	1	0
▨2年目	4	215	19	2	0	1	1	1	1	1	2
■3年目	1	55	5	0	1	0	0	0	0	0	0

図 6：苗木生産の世帯あたり平均本数の経過年数別変化

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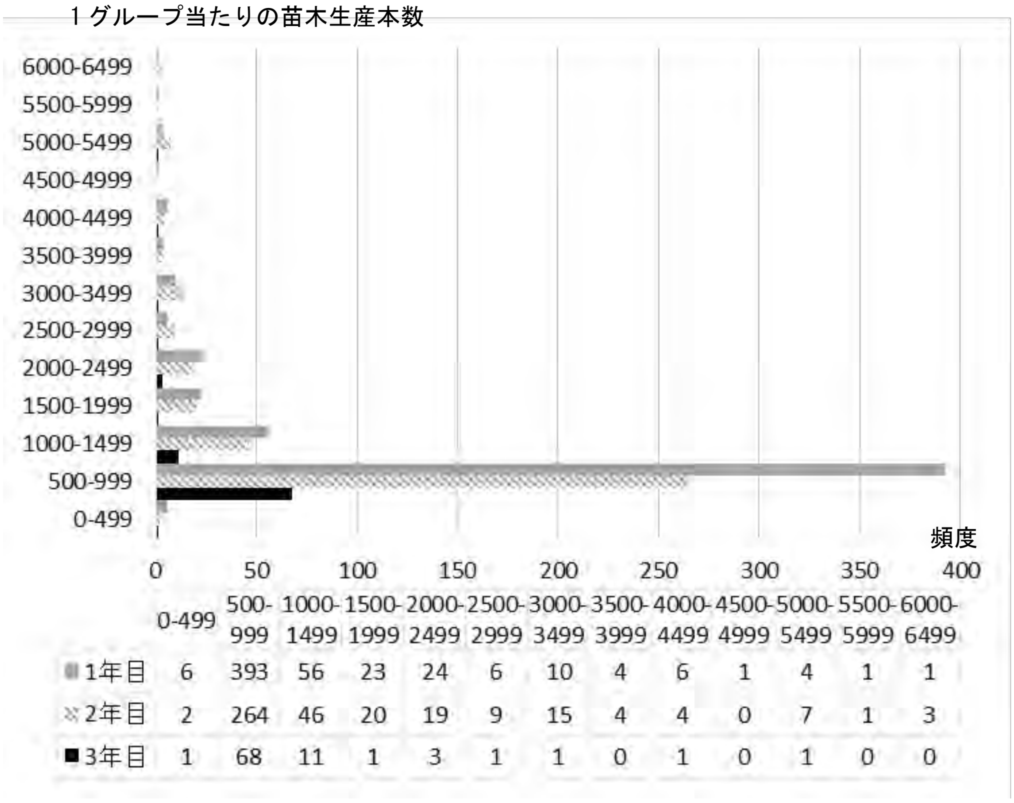
[6] 外れ値の検定には、スミルノフ・グラブス検定を用いた。

図 7 は、グループで苗木を生産した世帯が、1 グループ当たり生産した苗木の平均本数の経年変化を示したヒストグラムである。グループあたり苗木の生産本数は、1 年目に 578 本（中央値：200.0、95%CI：499～657）、2 年目 774 本（中央値：300.0、95%CI：687～939）、3 年目 433 本（中央値：100.0、95%CI：255～609）である。検定を行った結果、プロジェクト開始後 1 年目から 2 年目、2 年目から 3 年目の苗木生産本数が同じであるという帰無仮説を棄却する十分な統計的証拠が存在した（$P<0.05$）。

苗木を生産したグループの大きさを村、Limana、グループの 3 単位に区分して、どの単位で苗木を生産したかを質問した。3 年間の平均比率は、村が 12.8%（平均 106 世帯）、Limana が 38.9%（平均 31 世帯）、グループが 48.4%（平均 30 世帯）であった。質問票では 3 単位に区分して調査したが、データが示すように Limana とグループに属する世帯数はほぼ同数であり、質問票調査においてもグループと Limana の違いを尋ねる調査対象者が多かったことから、両単位を混同した調査対象者が多いと考えられる。このため、苗木生産本数の推計にあたり、本報告書では村と Limana/グループの 2 つカテゴリーを苗木生産グループと捉え、算出する。



	0-499	500-999	1000-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-4499	4500-4999	5000-5499	5500-5999	6000-6499
▨ 1年目	6	393	56	23	24	6	10	4	6	1	4	1	1
▧ 2年目	2	264	46	20	19	9	15	4	4	0	7	1	3
■ 3年目	1	68	11	1	3	1	1	0	1	0	1	0	0

図 7：苗木生産のグループあたり平均本数の経年変化

本プロジェクト開始後の 2 年間で対象地の 35,000 世帯が生産した苗木の本数を、実践率と生産本数から推計した結果を表 13 に示す。2 年間の累計数を算出する理由は、本プロジェクト開始後 1 年目から 2 年目の増加には個人及びグループ単位での苗木生産本数と実践率に統計的差異が認められるが 2 年目から 3 年目の実践率および苗木の生産本数の増減には統計的差異が認められないためである。グループでの実践は、既述のとおり村と Limana/グループの 2 単位に分類して分析をした。この結果、2 年間で生産された苗木の合計本数は約 233 万本（95%CI：

1,612,781~3,142,479）、2 年間の 1 世帯当たり苗木生産の合計本数は 67 本（95%CI：46~90）であった。

表 13：対象 35,000 世帯が生産した苗木本数の経過年数別変化

		1 年目	2 年目	合計
世帯単位	（合計）	439,250	1,053,570	1,492,820
	（95%CI）	(264,800~646,800)	(672,000~1,480,185)	(936,880~2,126,985)
村単位	（合計）	14,853	18,581	33,434
（106 世帯／ｸﾞﾙｰﾌﾟ）	（95%CI）	(12,148~17,799)	(14,812~22,706)	(26,960~40,505)
Limana/グループ単位	（合計）	357,515	447,252	804,767
（30 世帯／ｸﾞﾙｰﾌﾟ）	（95%CI）	(292,406~428,437)	(356,535~546,552)	(648,941~974,989)
合計	（合計）	811,618	1,519,403	2,331,021
	（95%CI）	(568,734~1,093,036)	(1,044,047~2,049,443)	(1,612,781~3,142,479)

2) 植林の実践状況

植林の実践率のプロジェクト開始後の経過年数変化について、1 年目で実践率が 8 割を超え、世帯単位での実践率は 6 割、グループ単位での実践率は 4~5 割である。統計的には本プロジェクト開始 1 年目の増加のみ有意差がみられた。

世帯で植林する場合には、菜園や畑の周辺など個人の土地へ植える傾向が強く（8 割強）、植林地や河川敷への植林率は低い。また、グループで苗木を生産した世帯の 5~6 割が植林地や河川敷、山などにグループ単位で植林し、同世帯の 4 割ほどがメンバー間で苗木を分配して世帯単位で植林している。村やグループなどで植林する場合には、7 割以上の世帯が植林地へ植林していることが判明した。

植林の実践状況について、本プロジェクト開始後の経過年数別の変化を表 14 に示す。

プロジェクト開始前に 65.2%（495 世帯）だったのが、本プロジェクトの開始後、世帯単位では 1 年目に 63.2%（480 世帯）、2 年目 68.7%（398 世帯）、3 年目 64.3%（90 世帯）の世帯がそれぞれ植林している。グループ単位の植林では、1 年目に 48.2%（366 世帯）、2 年目 50.4%（292 世帯）、3 年目 45.7 %（64 世帯）である。世帯およびグループの両単位で植林を実践した世帯があるため、2 つの実践率の合計が 100%とはならない。植林の実践率のプロジェクト開始後の経過年数変化について、統計的にはプロジェクト開始前から開始後 1 年目にかけての増加には有意差がみられ（P<0.001）、その後 1 年目~3 年目の変化には有意差がみられない。世帯単位、グループ単位のプロジェクト開始後 1～3 年目には、統計的な有意差がみられない。

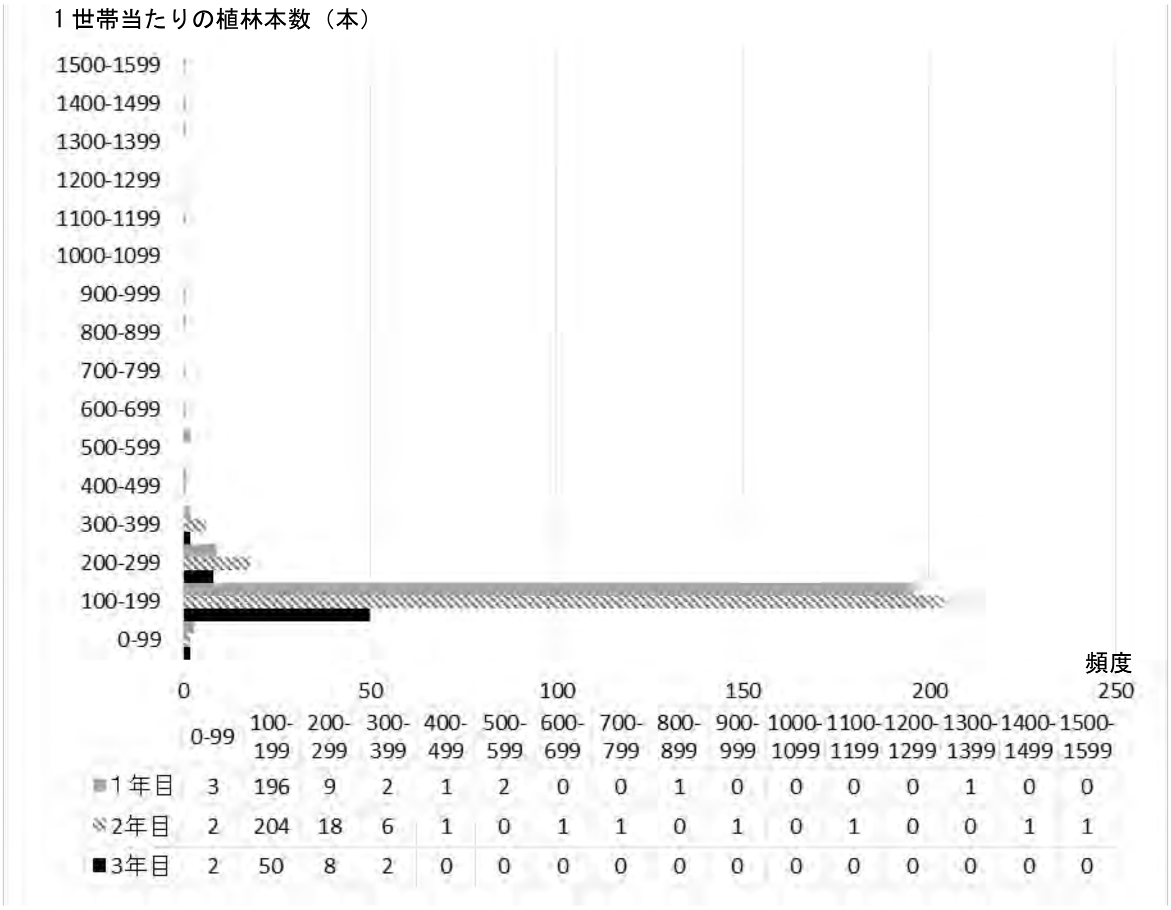
表 14：植林実践率の経年変化

	開始前	1 年目	2 年目	3 年目
実践率	65.2%	84.6%	88.3%	87.9%
（95%CI）	(61.8~68.6)	(82.0~87.2)	(85.6~90.9)	(82.4~93.3)
世帯での実践率	N.A	63.2%	68.7%	64.3%
（95%CI）		(59.8~66.7)	(65.0~72.5)	(56.3~72.2)
グループでの実践率	N.A	48.2%	50.4%	45.7%
（95%CI）		(44.7~51.8)	(46.4~54.5)	(37.5~54.0)

次に植林したと回答した世帯に対して、世帯・グループ単位での植林本数を質問した。

世帯単位で植林したと回答した 237 世帯のサンプルのうち、2,000 本以上と回答をした 1 サンプルついては、データ分析に影響を及ぼす可能性が高いため、これを除いた。

図 8 は、世帯単位で植林を実践した世帯の 1 世帯当たりの平均植林本数の経過年数別の変化を示した。世帯単位での植林の平均本数は、本プロジェクトの活動開始 1 年目で 50 本（中央値：20.0、95%CI：34～65）、2 年目 77 本（中央値：30.0、95%CI：54～98）、3 年目 34 本（中央値：20.0、95%CI：34～65）である。検定を行った結果、1 年目、2 年目、3 年目の植林本数には統計的な有意差は認められなかった（P>0.1）。



	0-99	100-199	200-299	300-399	400-499	500-599	600-699	700-799	800-899	900-999	1000-1099	1100-1199	1200-1299	1300-1399	1400-1499	1500-1599
▒1年目	3	196	9	2	1	2	0	0	1	0	0	0	0	1	0	0
▨2年目	2	204	18	6	1	0	1	1	0	1	0	1	0	0	1	1
■3年目	2	50	8	2	0	0	0	0	0	0	0	0	0	0	0	0

図 8：世帯単位での平均植林本数の経年変化

世帯単位で植林する場所の経過年数別変化を示したのが表 15 である。経過年数による植林場所の大きな変化は見られないが、家屋敷への植林は年々減少している。3 年間平均では、「菜園・畑周辺」が一番多く 53.2%（合計 602 世帯）、次いで、「家屋敷」32.9%（合計 375 世帯）、「植林地」8.2%（合計 93 世帯）、「河川敷」5.8%（合計 66 世帯）である。

表 15：世帯単位での植林場所の経過年数別変化

		1 年目	2 年目	3 年目	3 年平均
菜園・畑周辺		52.7%	51.6%	63.0%	53.2%
	平均本数	23 本	45 本	39 本	34 本
家屋敷		35.1%	31.9%	25.9%	32.9%
	平均本数	24 本	33 本	27 本	28 本
植林地		7.7%	9.4%	4.6%	8.2%
	平均本数	80 本	63 本	44 本	70 本
河川敷		4.5%	7.1%	6.5%	5.8%
	平均本数	28 本	59 本	12 本	42 本

グループ単位で苗木を生産した世帯がどのように苗木を使用したか質問したところ、3 年間平均では 72.1%（722 世帯）がグループ単位で植林し、56.9%（570 世帯）が苗木をグループメンバーで分配し、0.3%（3 世帯）が販売したと回答した（表 16）。プロジェクト開始後 1～3 年目の変化には統計的な有意差は見られない。

参考として、1 年目にグループで植林しかつグループで苗木を分配した回答の割合は 27.1%、2 年目は 32.5%、3 年目は 28.6%である。

植林をグループで実践した世帯の 1 グループあたり平均植林本数の経過年数別変化では、1 年目にグループあたり 554 本（中央値：200.0、95%CI：485～622）、2 年目 725 本（中央値：270.0、95%CI：624～825）、3 年目 413 本（中央値：100.0、95%CI：160～562）である。3 年間平均は 611 本であった。検定を行った結果、プロジェクト開始後 1 年目から 2 年目、2 年目から 3 年目の植林本数が同じであるという帰無仮説を棄却する強い統計的証拠が存在した（P<0.01）。一方で、グループでの植林の実践率では、本プロジェクト活動を開始した 1 年目、2 年目、3 年目のあいだに統計的差異は認められない。グループ単位での植林本数では、2 年目が 1 年目に比べ増加する（P<0.01）ものの、3 年目には減少する（P<0.01）という結果が示された。

表 16：グループで生産した苗木の使用方法の経年変化

		1 年目	2 年目	3 年目	3 年平均
グループで植林		69.7%	75.8%	75.3%	72.1%
	(95%CI)	(66.1~84.5)	(71.6~80.1)	(65.8~73.6)	
	平均本数	554 本	725 本	413 本	611 本
	(95%CI)	(485~622)	(624~825)	(160~562)	
グループメンバーで分配		58.9%	56.4%	51.8%	56.9%
	平均本数	338 本	438 本	231 本	368 本
販売		0.4%	0.3%	0.0%	0.3%
	平均本数	460 本	1,900 本	0 本	940 本

グループ単位で植林する場所の経過年数別変化を示したのが表 17 である。

その結果によれば、経過年数による植林場所に大きな変化は見られない。3 年間平均では、「植林地」が一番多く 70.5%（合計 555 世帯）、次いで「河川敷」19.3%（合計 152 世帯）、「山」8.2%（合計 60 世帯）、「その他（菜園・畑周辺、井戸周辺、家屋敷、お墓など）」2.5%（合計 20 世帯）であった。

表 17：グループ単位での植林場所の経過年数別変化

		1 年目	2 年目	3 年目	3 年平均
植林地		72.6%	67.6%	72.5%	70.5%
	平均本数	494 本	572 本	344 本	512 本
	(95%CI)	(414~573)	(477~667)	(186~500)	
河川敷		18.9%	20.2%	17.4%	19.3%
	平均本数	519 本	872 本	427 本	665 本
	(95%CI)	(474~564)	(804~940)	(361~491)	
山		7.2%	8.3%	7.2%	7.6%
	平均本数	660 本	922 本	1,047 本	810 本
その他		1.3%	4.0%	2.9%	1.3%

本プロジェクト開始後の 2 年間で、対象地の 35,000 世帯が世帯およびグループで植林した本数を、実践率と生産本数から推計した結果を表 18 に示す。2 年間の累計数を算出する理由は、世帯単位の植林実践においてプロジェクト開始後 2 年目から 3 年目の実践率の増加には統計的有意差は認められず、植林の平均本数はデータを取った 3 年間のうちで 2 年目が最大となるためである。またグループ単位での植林実践において、3 年間の実践率に統計的有意差はみられず、植林本数は世帯単位での植林本数と同様に 2 年目が最大となる。

この結果、2 年間に対象地域の 35,000 世帯が植林した推定本数は、世帯単位の植林で 295 万本、グループ単位で 67 万本、合計約 362 万本（95%CI：2,476,185~4,821,877）となる。2 年間の 1 世帯当たりの植林本数は 84 本（95%CI：55~114)、グループによる植林本数は 19 本（95%CI：15~23）であった。2 年間の植林本数の世帯単位とグループ単位の合計を植林場所ごとにみると、多い順に「菜園・畑周辺」約 82.5 万本、「植林地」約 76 万本、「家屋敷」約 41.5 万本、「河川敷」約 23 万本、「山」5.2 万本である。

表 18：対象 35,000 世帯による植林本数の経年変化

		1 年目	2 年目	合計
世帯による植林本数	(合計)	1,109,087	1,840,508	2,949,595
	(95%CI)	(711,620~1,517,425)	(1,228,500~2,486,750)	(1,940,120~4,004,175)
グループによる植林本数	(合計)	283,059	387,284	643,605
	(95%CI)	(220,387~327,631)	(294,296~457,455)	(514,683~785,086)
【世帯による植林場所と植林本数の合計】				
菜園・畑周辺		272,113	553,502	825,615
家屋敷		178,118	238,430	416,548
植林地		143,576	150,366	293,942
河川敷		23,307	75,741	99,048
【グループによる植林場所と植林本数の合計】				
植林地		205,598	261,742	467,340
河川敷		53,571	78,167	131,739
山		20,270	31,978	52,248

3) 直播と天然更新の実践状況

表 19 に示すように、苗木を生産したと答えた世帯の 3~4 割が直播を実践し、4~5 割ほどが天然更新を実践しており、その割合は軽微ではあるが年々増加している。

表 19：直播と天然更新の実践率の経過年数別変化

	1 年目	2 年目	3 年目
【世帯単位】			
直播	31.3%	39.9%	46.0%
天然更新	45.7%	57.1%	56.5%
【グループ単位】			
直播（共有地）	27.0%	29.4%	31.1%
直播（その他）	0.2%	0.8%	0.0%
天然更新	34.6%	41.7%	40.0%

4) 実践しなかった理由

本プロジェクト実施前に苗木生産や植林を実践しなかった理由で一番多いのは、「技術を知らない」が 70%以上であったが、本プロジェクト開始後は「不在」、「多忙」、「材料がない」などが主な理由として挙げられ、「技術を知らなかった」という理由は聞かれなかった。この結果から、LF による住民への研修によって、住民が育林技術を実践するために必要な知識と技術が伝達されたと考えられる。

図 9 に示すように、本プロジェクト開始前に苗木を生産しなかった理由として、70.2%（228 世帯）が「技術を知らない」と回答している。ついで、「興味がない」14.2%（46 世帯）、「重要性を知らなかった」6.8%（22 世帯）、「意欲がない」1.5%（5 世帯）、「既に植わっている」0.9%（3 世帯）となる。

一方、本プロジェクト開始後に苗木生産をしなかった理由は、回答数の多い順に 22.7%（46 世帯）が「不在」であり、ついで、「忙しい」19.2%（39 世帯）、「興味がない」17.2%（35 世帯）、「種やポットなどの材料がない」11.3%（23 世帯）であった。少数意見ではあるが、「メンバーではない」、「選ばれなかった」との回答が 1.5%（3 世帯）あった。これらは、COVAMS アプローチが推進する、全ての住民を対象とする原則に反した回答であり、LF の育成研修ではこの点を注意して伝える必要がある。

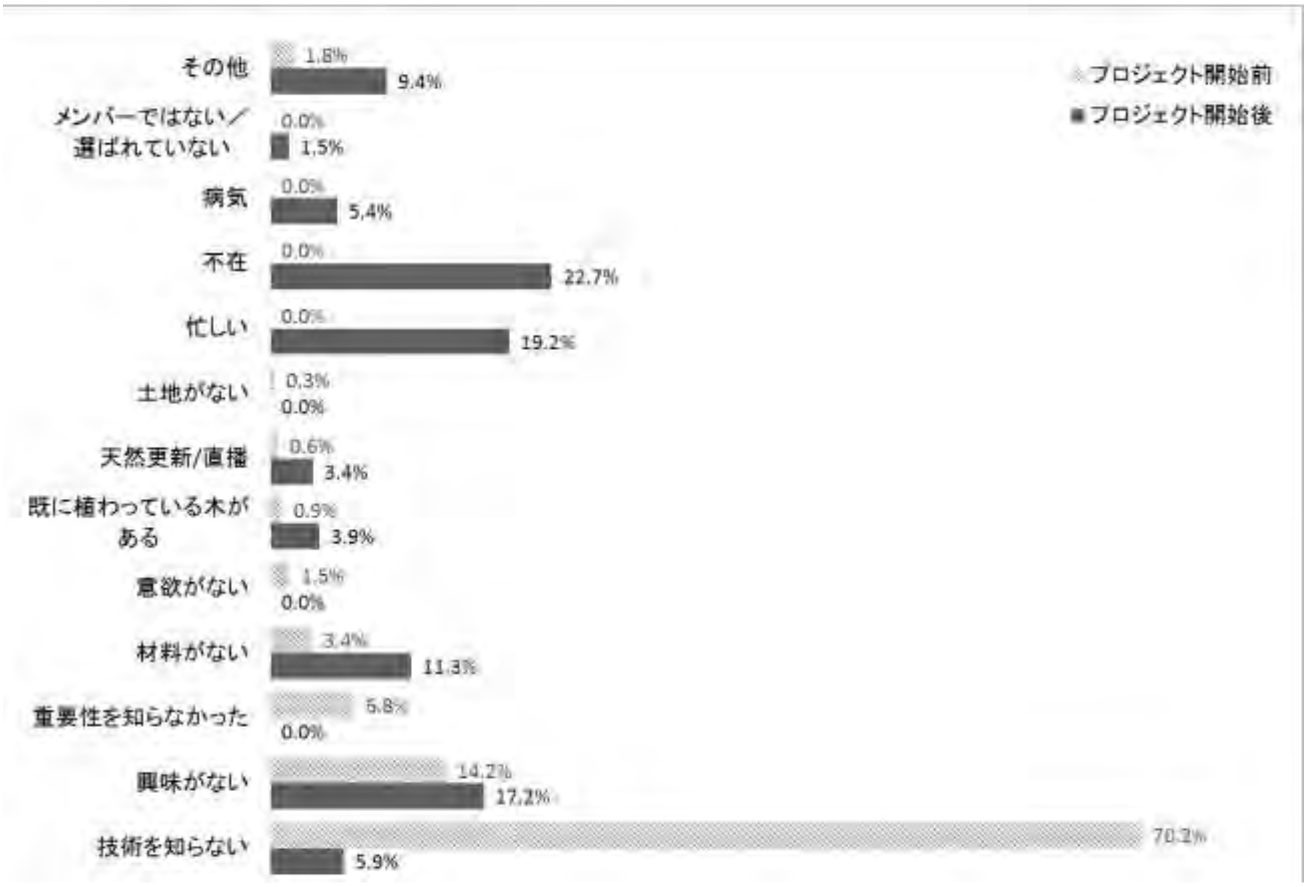


図 9：苗木生産をしなかった理由

続いて、本プロジェクト開始前に植林しなかった理由を図 10 に示す。76.0%（215 世帯）が「技術を知らない」で、ついで「興味がない」13.4%（38 世帯）、「重要性を知らなかった」5.7%（16 世帯）、「意欲がない」1.8%（5 世帯）、「既に植わっている」1.4%（4 世帯）であった。一方、本プロジェクト開始後に植林を実施しなかった理由は、「苗木がない」25.3%（72 世帯）、「枯死」、「グループからの苗の未配布などにより苗を準備できなかった」24.9%（53 世帯）、「忙しい」18.3%（39 世帯）、「不在」13.6%（29 世帯）などが挙げられている。

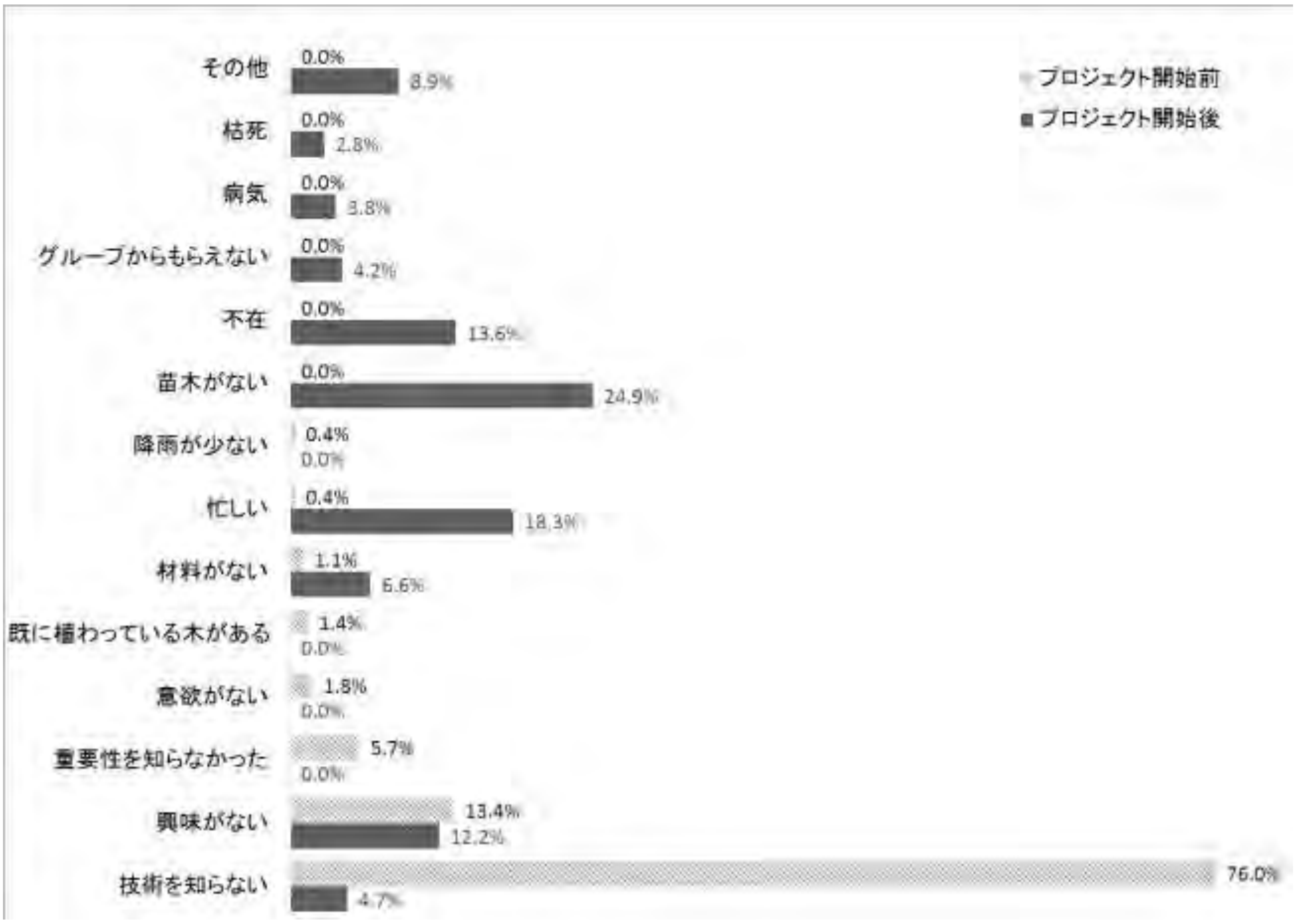


図 10：植林をしなかった理由

5) 情報の入手先

苗木生産または植林の技術を実践している世帯に対し、技術を教えてもらった先、すなわち情報の入手先を尋ねた。「COVAMS の LF」からが 55.6%（689 世帯）と最も多く、ついで「CCO（普及員）」が 19.6%（243 世帯）、「村長またはグループ村長」で 5.6%（69 世帯）となっている（図 11）。本プロジェクトの LF が住民への情報網として十分に理解されていることが判明した。

本質問の目的は、本プロジェクト実施期間中に LF や SLF による研修や啓発活動を補足し、育林の技術普及を加速させるような情報網を農民が持っているかを調べることにあったが、これらの情報網を補足できるような情報入手先はなかった。

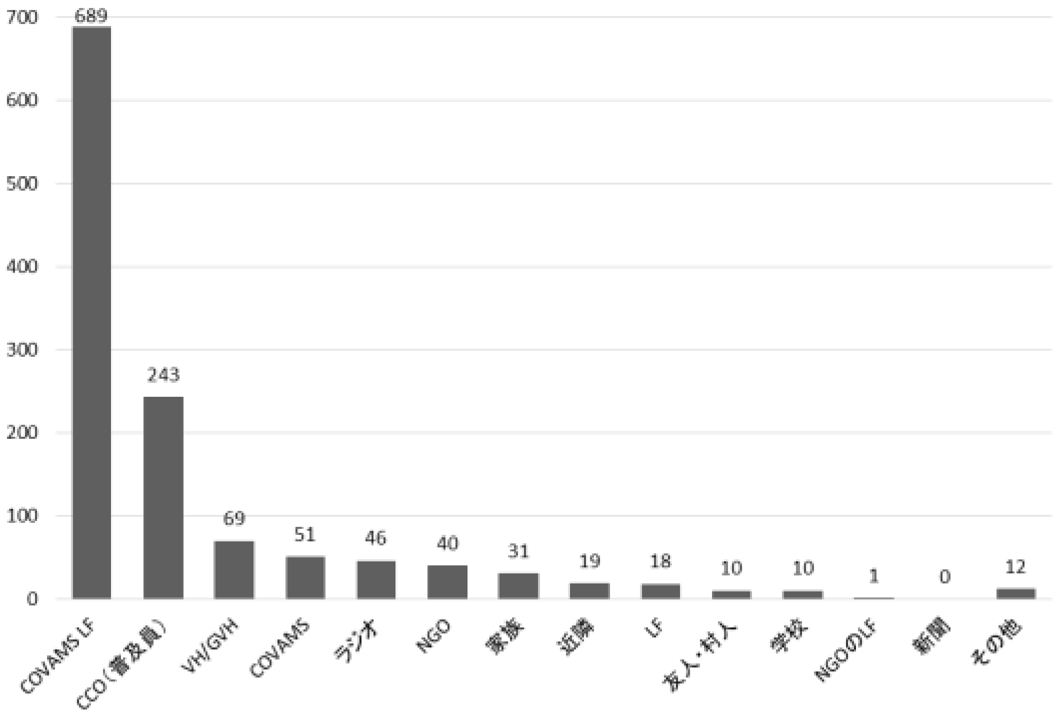


図 11：育林技術を実践する住民が情報を入手する対象または媒体

（2） 土壌保全技術の実践

1) 等高線農法の実践状況

本調査の結果から、等高線農法に含まれる 4 技術（下述）のいずれかを実践している世帯は、本プロジェクト開始後 2 年目に 90%を超え、3 年目には 95%以上の世帯が実践している。本プロジェクト開始前の実践率が 25%であるから、本プロジェクトによる活動を開始したことにより、実践率が顕著に増加している。等高線畝立（Contour ridging）、ボックス・リッジ（Box ridge）、スワレ（Swale）、永年植物などを等高線マーカーとして等高線上に植えること（以下、等高線マーカー）（Hedge row）の 4 種の技術の各実践率は、高い順にボックス・リッジ 29.6%、等高線畝立 28. 1 %、スワレ 24.6%、等高線マーカー17.7%であった。またそれらの実践にあたっては、適用する技術の数や面積を毎年少しずつ増やす傾向があることが判明した。

土壌保全技術の実践率と、畝幅 90cm 以上と回答をした世帯を除いた場合の実践率の経過年数別の変化を、表 20 に示す。技術を実践した世帯に対して、等高線農法の畝幅 80cm 以下、85cm、90cm のそれぞれの栽培面積を尋ねた。ここで、3 つの畝幅で区分した理由は、等高線農法の理解度を図るためである。90cm 以上の畝幅による土壌保全技術の実践者を除くのは、LF が同技術を正しく指導できていないか、農家が正しく理解していない可能性があるからである。マラウイ農業省は畝幅 75cm を推奨しているが、農地の耕作権に関わる種々の問題[7]や、化学肥料や種子など農業資材に要する費用が多くなることを考慮し、本プロジェクトでは 85cm までの畝幅を許容している。90cm の畝幅は、慣行農法が採用する畝幅と同じであり、LF の指導が不適切か、農家の

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[7] 不耕作地の所有権が認められないため、耕作面積を大きくするために畝幅を広くする、耕作者は使用人であるため、土地所有者に聞かないと分からないなどの理由から、技術が正確に伝わった場合でも、実践には結びつかない要因がある。

理解が足りない可能性がある。このため、本報告書では、畝幅 90cm 以上と回答した世帯を除いた実践率が、本プロジェクトの活動で土壌保全技術を実践する世帯と考える。

畝幅 90cm 以上と回答した世帯を除いた実践率は、本プロジェクトの活動開始前は 25.0%に過ぎないが、1 年目に 82.8%（95%CI : 80.0～85.4）、2 年目に 92.4%（95%CI : 90.5～94.3）、3 年目に 96.4%（95%CI : 95.1～97.7）と増加した（表 20）。本プロジェクトの活動がはじまった 1 年目と 2 年目の実践率の増加には統計的有意差があり（P<0.001）、3 年目の実践率の増加にも統計的な有意差が認められた（P<0.05）。

表 20：土壌保全技術の実践率の経年変化

	プロジェクト開始前	1 年目	2 年目	3 年目
実践者数（有効回答数）	190（760）	680（765）	564（580）	138（140）
実践率	25.0%	88.9%	97.2%	98.6%
（95%CI）	(21.9~28.1)	(86.6~91.0)	(95.9~98.6)	(96.6~100.5)
畝幅 90cm 以上と回答した世帯を除いた実践率				
実践者数（有効回答数）	120（760）	633（765）	536（580）	135（140）
実践率	15.8%	82.8%	92.4%	96.4%
（95%CI）	(13.2~18.4)	(80.0~85.4)	(90.5~94.3)	(95.1~97.7)

畝幅の違いによる実践率の経過年数別変化を示したのが図 12 である。80cm の畝幅による等高線農法の実践者は、プロジェクト開始前は 60.3%（95%CI：13.2～18.4）であったが、年を重ねるごとに増加して、本プロジェクト開始後 3 年目で 95.7%（95%CI：92.2～99.1）となった。反対に、本プロジェクト開始前に 90cm 以上の畝幅で等高線農法を実践した世帯は 37.0%（95%CI：30.2～43.9）であったが、年を経るごとにその割合は減少し、3 年目で 2.2%（95%CI：-0.3～4.6）となった。

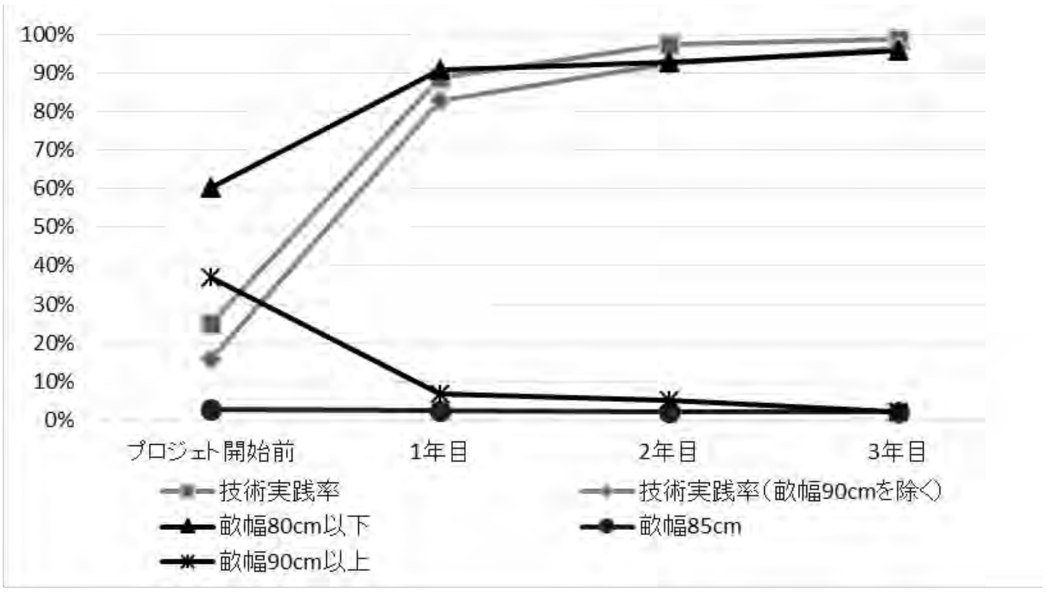

図 12：土壌保全技術と畝幅別等高線農法の実践率の経過年数別の変化

畝幅の違いによる等高線農法の適用面積は 0.8 エーカー[8]から 1.2 エーカー（3,238～4,856m^2）と統計的有意差は見られず、経過年数別変化においても同様である。

次に、等高線農法を実践する際の適用技術について尋ねた。技術の内容は、等高線畝立（Contour ridging）、ボックス・リッジ（Box ridge）、スワレ（Swale）、等高線マーカー（Hedge row）の 4 種である。

ボックス・リッジは、畝間に 2m 間隔で、細長い畝を断ち切る縦の小山を設置する。この山の高さは畝と同じくらいの高さで、雨が降った時に等高線状（畝の方向）へ流出する表層土が、ボックス・リッジ間に溜まるため、土壌の流出を抑えることができる。また、降雨が畝間に溜まりゆっくりと植物に吸収される。スワレは、約 3.3m 間隔で設置される。等高線マーカーとなる畝（ベチベルなどを植える）に沿って、深さ 20～30cm、幅 40～60cm の細長い溝を掘る。雨が降った時に垂直方向（斜面傾斜に沿って）へ流出する土壌の流出を抑えることができる。

表 21 に示す技術の実践率は、本プロジェクトによる活動開始後の 3 年間平均で、高い順にボックス・リッジ 29.6%、等高線畝立 28. 1 %、スワレ 24.6%、等高線マーカー17.7%である。等高線マーカー用のベチベル草などは本プロジェクトでは配布していないが、県農業局が農民からの希望を基に配布している。このため、他の技術と比較して、資材を入手するために自主的に動く必要があることから、実践率が他と比べて低くなっているのではないかと考えられる。技術の実践数については、4 技術のすべてを一作期に同時に適応することは、労力や時間などの観点から難しいことが分かっている。このため、少しずつ採用数を増やしていくことを推奨しており、質問票調査の結果からも順に技術の適応数を増やしている現状が分かる（図 13）。

表 21：等高線農法における適用技術の経過年数別変化

技術		プロジェクト開始前	1 年目	2 年目	3 年目	3 年平均
等高線畝立	回答世帯数	129	582	483	127	1,192
	割合	34.6%	28.3%	27.7%	28.6%	28.09%
ボックス・リッジ	回答世帯数	125	625	513	118	1,257
	割合	33.5%	30.4%	29.4%	26.6%	29.62%
スワレ	回答世帯数	51	496	432	114	1,042
	割合	13.7%	24.1%	24.8%	25.7%	24.55%
等高線マーカー	回答世帯数	68	354	314	85	753
	割合	18.2%	17.2%	18.0%	19.1%	17.74%

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[8] 1 エーカーは 4,046.9m^2

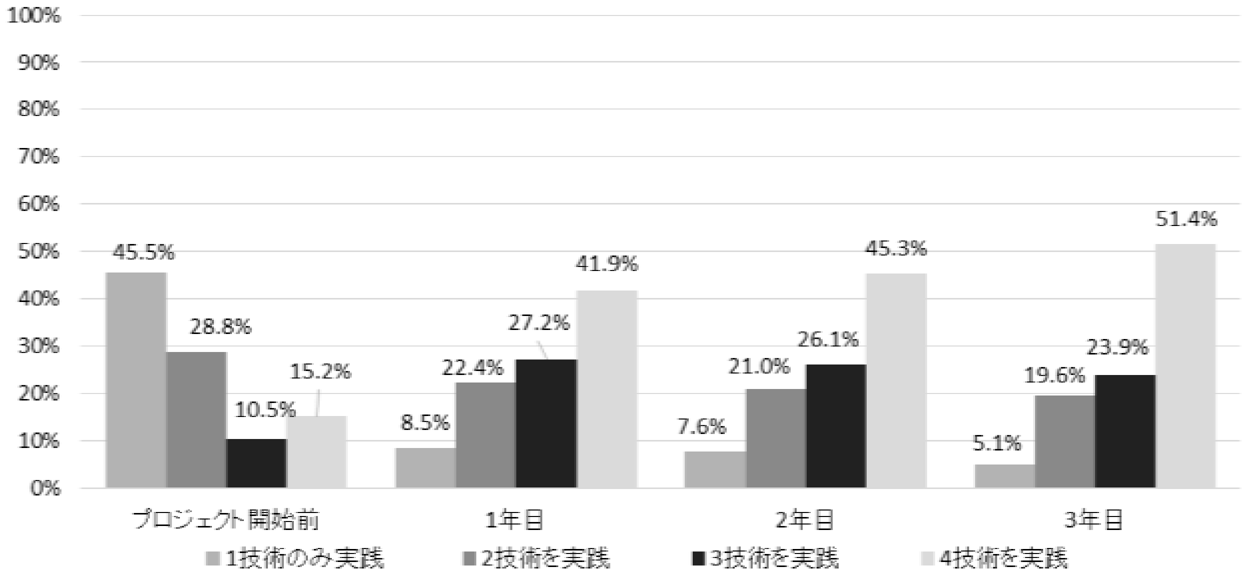

図 13：等高線農法の適応技術数の経過年数別変化

本プロジェクト対象地の 35,000 世帯が等高線農法を実践した面積を、実践率と農法適応面積から推計したものが表 22 である。

実践率と適用面積は畝幅 85cm 以下の合計値で算出した。この結果、1 年目の面積合計は 2.6 万エーカー、2 年目は累計 5.4 万エーカー、3 年目には累計 8.6 万エーカーであった。1 世帯当たりの等高線農法適用面積は 1 年目で 0.8 エーカー/世帯、2 年目には累計 1.5 エーカー/世帯、3 年目には累計 2.5 エーカー/世帯であった。

表 22：等高線農法の実践面積の経過年数別変化

		1 年目	2 年目	3 年目
合計		26,357 エーカー	27,891 エーカー	32,210 エーカー
	（95%CI）	(25,432~27,282)	(26,916~28,866)	(30,289~34,132)
累計			54,248 エーカー	86,458 エーカー
	（95%CI）		(52,348~56,148)	(82,637~90,280)
1 世帯当たりの適応面積		0.8 エーカー/世帯	1.5 エーカー/世帯	2.5 エーカー/世帯
	（95%CI）	(0.7~0.8)	(1.5~1.6)	(2.4~2.6)

2) 堆厩肥の導入

土壌保全技術を実践していると回答した世帯を対象に、堆厩肥を圃場に投入しているかどうかを尋ねた。堆厩肥を投入していると答えた世帯は本プロジェクト開始後の 3 年間合計で 88.8%（1,320 世帯）、投入平均圃場面積は 0.71 エーカー/世帯（中央値 0.5）だった。本プロジェクトの開始前には、20.1%（153 世帯）が実践し、投入平均圃場面積は 0.78 エーカー/世帯（中央値 0.5）であったから、本プロジェクトの開始前後で、技術を導入する世帯の平均圃場面積に大きな変化はない。

堆厩肥を投入した世帯の本プロジェクト開始後の経過年数別変化を表 23 に示す。上述のように、堆厩肥の投入平均圃場面積に大きな変化はなかったものの、本プロジェクト開始後に堆厩肥

を投入した世帯の割合が大きく増加しており、プロジェクト開始前から1年目、1年目から2年目の増加には統計的有意差がみられる（P<0.001）。一方で、2年目から3年目にかけての変化には、統計的有意差は見られなかった（P>0.1）。

表23：堆厩肥を投入した世帯の経過年数別変化

	プロジェクト開始前	1年目	2年目	3年目	3年平均
堆厩肥の導入の世帯率	20.1%	84.1%	94.5%	94.3%	95.0%
（95%CI）	(17.3~23.0)	(81.5~86.7)	(92.8~96.5)	(90.4~98.1)	

3) 情報の入手先

土壌保全技術を実践している世帯の情報入手先を確認した。植林と同様に、「COVAMS の LF」が 68.2%（692 世帯）と最も多く、次いで「CCO（普及員）」が 16.8%（170 世帯）であった。続いて、「COVAMS」が 5.3%（54 世帯）、「ラジオ」2.1%（21 世帯）である。植林では「村長またはグループ村長」が 5.6%（69 世帯）であったが、土壌保全技術では 2.1%（3 世帯）であった。育林技術と同様に、本プロジェクトの LF が住民への情報網として十分に活用されていることが判明した。

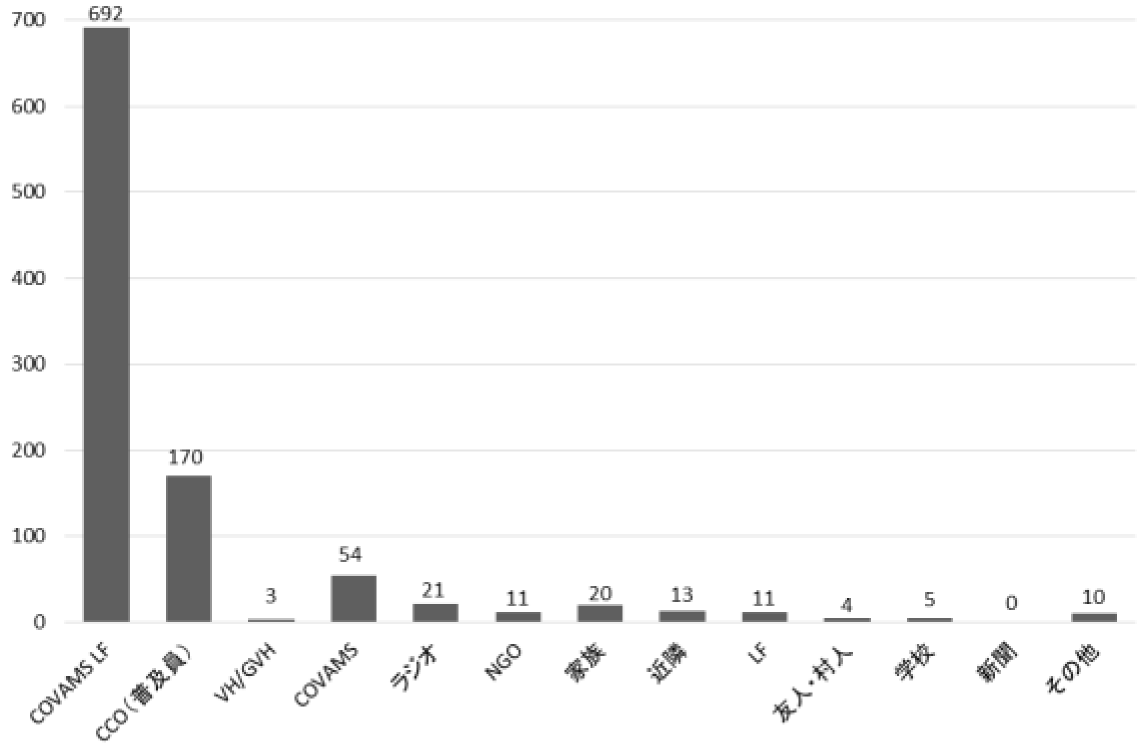

図14：土壌保全技術を実践する住民が情報を入手する媒体または対象

4) 活動の便益

土壌保全活動を実践する世帯を対象として、土壌保全活動の便益について調査し、複数回答を可として 1039 の回答を得た。収量の増加と土壌流出防止のグラフについて、それぞれ色の濃い順に「強くそう思う」、「中程度そう思う」、「少しそう思う」となっている。「収量の増加」を挙げ

た回答が 41.5%（548 回答）と最も多い。ついで多い回答は、その他の「土壌中の水分保持のため」で 26.8%（354 回答)、「土壌流失防止のため」21.4%（282 回答)、「土壌肥沃度の維持のため」8.9%（118 回答）であった（図 15)。

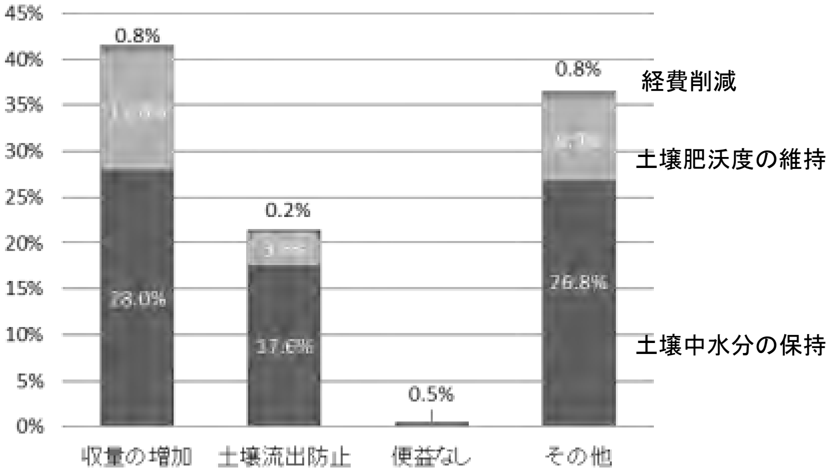

図 15：活動の便益

(3) ガリコントロールの実践

1) チェックダム設置の実践状況

ガリ（崩落地）コントロールの技術として、石や木など身近に手に入る資材を活用してチェックダムを設置する技術を研修している。チェックダムを設置したかどうかの質問に対する本プロジェクトの活動開始後の経年別変化を表 24 に示す。それによれば、本プロジェクト開始前で 8.9%、1 年目で 69.1%、2 年目に 69.0%、3 年目に 72.1%と変化した。他の技術と同様に、本プロジェクトの活動が開始して 1 年目で実践率は大きく増加し、統計的有意差がみられる（P<0.001）が、1～3 年目の変化には統計的有意差は見られない（P>0.1)。チェックダムの設置平均箇所数がプロジェクト開始後の経過年数によって変化するという帰無仮説を統計的証拠は存在しない。

表 24：チェックダム設置の実践率の経過年数別変化

	プロジェクト開始前	1 年目	2 年目	3 年目
実践率	8.9%	69.1%	69.0%	72.1%
（95%CI）	(6.8~10.8)	(65.8~72.4)	(65.2~72.7)	(64.7~79.6)

1 世帯当たりチェックダムの年間設置個数は、3 年間平均で 5.2 か所（中央値：4.0、95%CI：4.9～5.5）で、3 年間に設置したチェックダムの総数は、調査対象世帯 556 世帯の合計で 5,322 か所にのぼった。実践率と世帯あたり平均設置個数から、プロジェクト対象地の 35,000 世帯がチェックダムを設置した個数を推計したものが表 25 である。1 年目の設置合計数は 12.6 万か所、2 年目には累計 25.1 万か所、3 年目には累計 38.26 万か所であった。1 世帯当たりのチェッ

クダム設置個数は 1 年目で 3.6 か所/世帯、2 年目には累計 7.2 か所/世帯、3 年目には累計 10.9 か所/世帯であった。

表 25：チェックダム設置個数の経過年数別変化

		1 年目	2 年目	3 年目
合計		125,648 か所	125,442 か所	131,221 か所
	（95%CI）	(119,672~131,625)	(118,594~132,290)	(117,714~144,729)
累計			251,090 か所	382,311 か所
	（95%CI）		(238,266~263,915)	(355,980~408,644)
1 世帯当たりの適応数		3.6 か所/世帯	7.2 か所/世帯	10.9 か所/世帯
	（95%CI）	(3.4~3.8)	(6.8~7.5)	(10.2~11.7)

2) 実践しなかった理由

図 16 に示すように、本プロジェクト開始前にチェックダムを設置しなかった理由は、97.6%（676 世帯）が「技術が不十分だから」と回答している。本プロジェクト開始 1 年目に同回答は 20.8%（50）、2 年目に 6.3%（15）、3 年目に 4.7%（2）と年を追うごとに減少している。逆に「補修が必要なガリがない」、「急を要さない」との回答は年を追うごとに増加している。その他の理由のなかでは、「既に設置したガリを補修しているから」との回答が、その他全体の 37.7%を占めた。

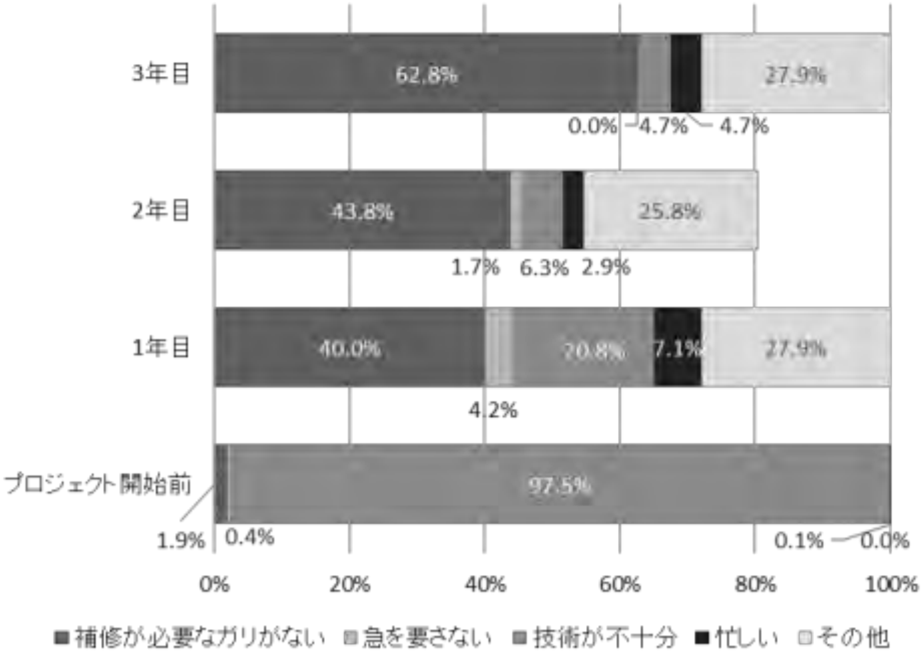

図 16：ガリコントロール技術を実践しなかった理由の経過年数別変化

3) 情報の入手先

ガリコントロール技術を実践した世帯に対し、情報の入手先を尋ねた。植林、土壌保全技術と同様に、「COVAMS の LF」が 80.4%（621 世帯）ともっとも多く、次いで「CCO（普及員）」8.9%（67 世帯）、「COVAMS」6.4%（49 世帯）であった。育林、土壌保全技術と比べて、LF を情報の

入手先と回答した世帯がより多い。本プロジェクトの LF が住民への情報網として十分に活用されている。

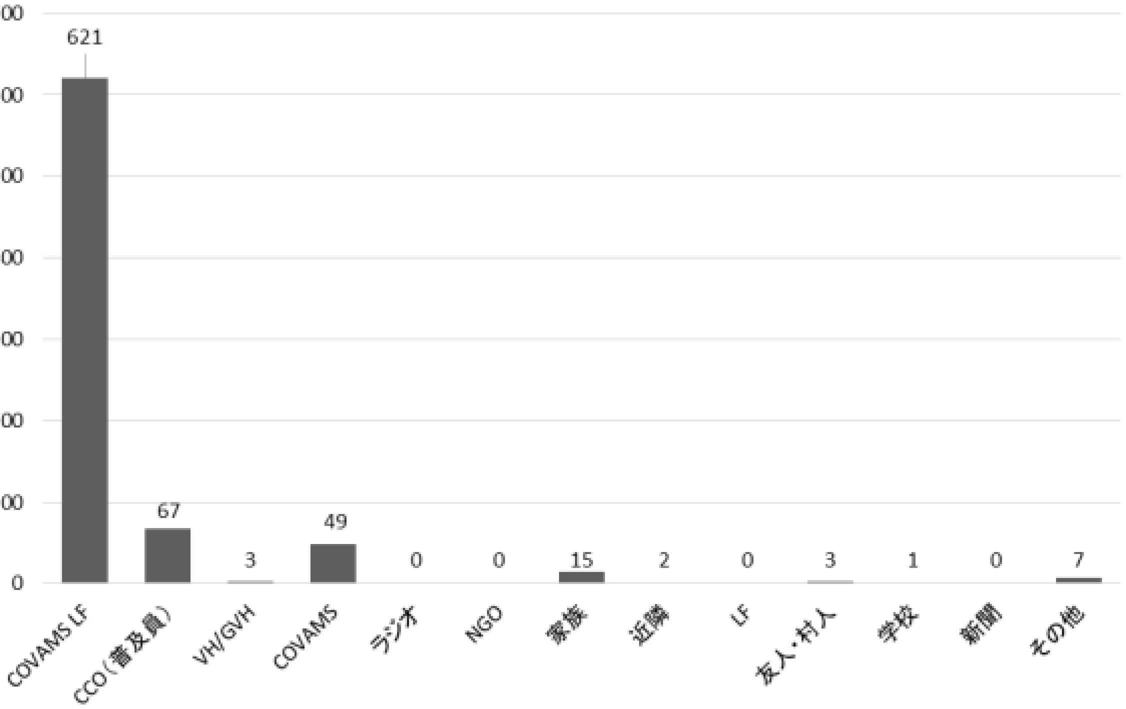

図 17：ガリコントロール技術を実践する住民が情報を入手する媒体または対象

4) 活動の便益

ガリコントロール技術を実践している世帯を対象として、ガリコントロールの便益について尋ねたところ、1,110 の回答を得た（複数回答可）（図 18）。収量増加と土壌流出防止のグラフについて、色の濃い順に「強くそう思う」、「中程度そう思う」、「少しそう思う」となっている。「土壌浸食の防止」を挙げた回答が 48.0%（533 回答）と最も多く、ついでその他の回答から「圃場の再生」19.5%（216 回答）、「水の流れるスピードを弱めるため」9.8%（109 回答）、「収量の増加」9.2%（101 回答）、「土壌肥沃度の維持」7.8%（87 回答）、「土壌水分の保持」5.0%（55 回答）であった。

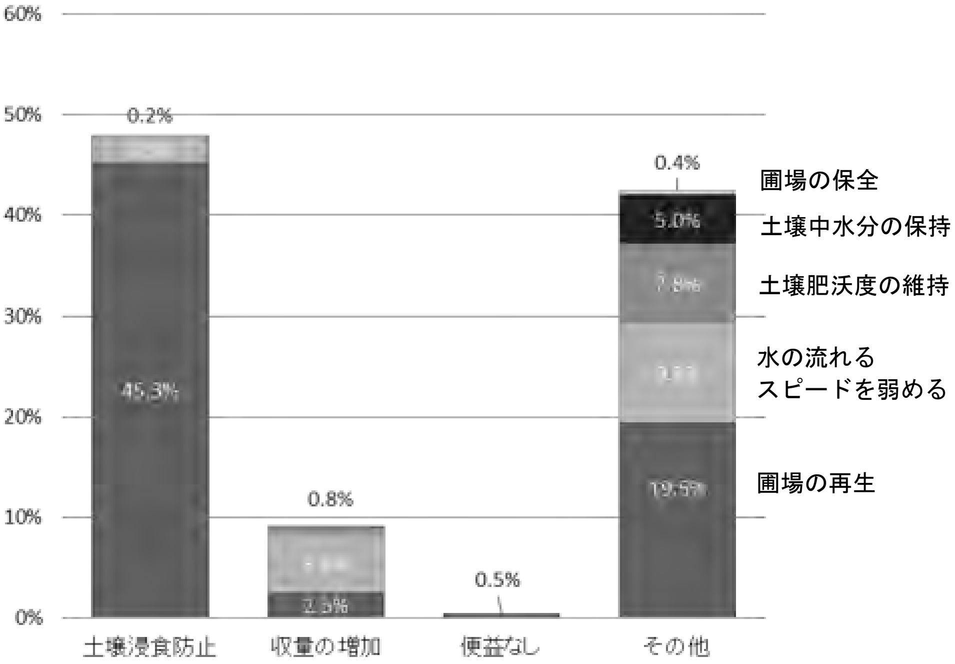

図 18：活動の便益

VI. COVAMS アプローチの有効性分析

1. 研修実施率・研修参加率とアプローチの有効性

本調査の結果、COVAMS アプローチを実施した対象地域において、LF による研修実施率は 100%であり、住民による研修の参加率は研修 2 年目で 90%以上に達していることが判明した。また各技術の情報入手先に関する質問でも LF が主な情報先と回答した世帯は、育林技術で 55.6%、土壌保全技術 68.2%、ガリコントロール技術 80.4%であり、LF や SLF から住民へ技術が均等に伝達されていることが検証された。その結果、COVAMS アプローチで根幹である「機会均等」が、ほぼ全ての住民に対して保証されていることが示された。

（1） 研修実施率

COVAMS アプローチが農民による流域保全活動の促進に資するアプローチなのか、研修実施率の観点から考察する。調査対象者に選定された LF または SLF が含まれる世帯を対象として、それらの LF（もしくは SLF）が住民に研修を実施したかを尋ねた。その結果、研修の実施率は 3 技術のすべてで 100%であり、実施方法としてはグループを対象とする研修を実施する傾向が強く、育林と土壌保全で 70%以上、ガリコントロールで 63.3%（表 5）であった。このことから、LF や SLF から住民に研修を通して技術が伝えられる機会が保証されていることが示された。3 技術の情報入手先を調査対象者に尋ねた結果を示す図 11、図 14、図 17 においても、LF が住民にとって 3 技術についての主要な情報入手先であることがわかる。

（2）研修参加率

LF と SLF を含まない調査対象世帯に対して質問した研修参加率の観点から考察する。

育林、土壌保全、ガリコントロールについての 3 研修への住民による参加率は、いずれも本プロジェクトの活動開始 2 年目に 90%以上に達している（表 26）。このことから、全ての住民に対する研修実施を目指す、COVAMS アプローチの中核的な考え方が実践されていることが検証された。

表 26：研修参加率の経年変化

	1 年目	2 年目	3 年目
育林研修の参加率	81.5%	90.3%	88.2%
土壌保全研修の参加率	88.8%	95.1%	97.0%
ガリコントロール研修の参加率	85.9%	94.0%	97.0%

2. 技術の実践率と COVAMS アプローチの有効性

農民による流域保全活動を促進する 3 技術の実践率が経過年別にどのように変化したのかを、表 27 に示した。

技術の実践率は、世帯単位の苗木生産を除き、全ての技術において COVAMS アプローチによる活動を開始した 1 年目で 50%を超えている。実践率の伸び率は本プロジェクトが活動を開始した 1 年目で最も高く、2 年目と 3 年目の実践率の変化には統計的な有意差が認められない。このことは、活動対象とする同一村での普及活動は、1 年目ですでに住民による実践率が確保されており、COVAMS アプローチの費用対効果を高めるためには、COVAMS アプローチの同一村での活動実施は 2 年間で終了し、新たな対象村へ移ることが適切であると結論づける。

なお、住民による技術の実践率の基準として 50%を設定した根拠については、以下のとおりである。

2015 年 4 月に執筆された「COVAMS II プロジェクト 中間評価　COVAMS アプローチの有効性分析」（以下、2015 年有効性分析調査報告書）に次の記載がある。

「各村における実践農家数の目標値を最大 50%とする。これは新技術の普及モデルにおける「Early Adapter」と「Early Majority」の領域の割合と同等である。残りの農家の実践普及には時間がかかると示されており、それらの農家に対する普及活動は当該アプローチの実施後にそれぞれの普及員が通常の普及活動で、時間をかけながら実施していくものとする。ただし 50%はあくまでも目安であり、この値が達成されなければ他の村に移動しないというものではない。」（「COVAMS プロジェクト 中間評価　COVAMS アプローチの有効性分析」2015 年 4 月）」

この考えは、社会学者のエヴェリット・ロジャースが 1962 年の書籍『Diffusion of Innovation』で提唱したイノベーション理論を基にしている。ロジャースは、「普及とはイノベーションが社会システムのメンバー間に時間をかけて特定のチャネルを介して伝達されるプロセスである」[9]と述べた。

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[9] 参考文献：エヴェリット・ロジャース（1990）『イノベーション普及学』青池愼一・宇野善康監訳,

本報告書においては、上記のイノベーション理論に基づいて執筆された2015年有効性分析調査報告書の目安を踏襲し、COVAMSアプローチの普及戦略とする。

（1）苗木生産と植林の実践率とアプローチの有効性

苗木生産の実践率は本プロジェクトの活動開始前に60.8%であったものが、本プロジェクト開始後1年目で83.8%に増加した。その内訳をみると、世帯単位での苗木生産が13.6%、グループ単位で54.8%、両単位で15.4%であった。植林の実践率は、本プロジェクト開始前に65.2%であったものが、本プロジェクト開始後1年目に84.6%に増加した。このことから、苗木生産と植林の実践率にCOVAMSアプローチは一定の効果を果たしたと言える。

本プロジェクトによる活動を開始して1年目から3年目までのあいだに、苗木生産と植林の実践率に統計的有意差は認められなかった。また、COVAMSアプローチによるLFやSLFによる研修は、グループ単位での苗木生産の実践率により強く影響を与えることが分かった。本プロジェクトによる活動の開始前から、苗木生産や植林の実践率が比較的高い背景としては、他のNGOや政府普及員によって定期的に啓発活動や植林キャンペーンが実施されてきたためであろう。

活動を実施した2年間で対象の35,000世帯が生産した苗木の合計本数は約233万本、同2年間の1世帯当たりの平均苗木生産本数は67本であった。同2年間の植林本数の合計は約362万本、2年間の1世帯当たりの植林本数は世帯単位で84本、グループ単位で19本であった。

2015年有効性分析調査報告書によると、「1名のLFを養成する費用は4県の中間値で約US$35[10]」とあり、1名のLFは15世帯を担当する。1名のLFは育林、土壌保全、ガリコントロールの3技術を担当するが、仮に育林技術のみとして算出した場合、同2年間で15世帯の農家が1,005本（67本×15世帯）の苗木を生産するのに要した費用はUS$35ドルであり、苗木100本あたりの生産コストはUS$3.5（K1,340~K1,390）である。同様の考え方で、同2年間で15世帯の農家が1,545本（(84+19）本×15世帯）を植林するのに要した費用がUS$35ドルなので、植林100本あたりのコストはUS$2.3（K874~K906）である。苗木生産コストと植林コストの観点から、COVAMSアプローチは一定の有効性があると言える。

一方で、同2年間に世帯単位とグループ単位の双方で植林された合計本数を場所ごとにみると、多い順に「菜園・畑周辺」82.5万本、「植林地」76万本、「家屋敷」41.5万本、「河川敷」23万本、「山」5.2万本となる。住民による主体的な植林を促すCOVAMSアプローチでは、住民の都合によって植林場所が決まるため、流域管理に有効な場所により多くの本数が確実に植林されるとは言えない。COVAMアプローチを通した住民参加による植林活動に加え、土地利用計画などの政策的な裏付けや予算措置、共有地植林の利益分配などが総合的に整理される必要がある。

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[10] 自動二輪車減価償却費、CCOとTSTへの燃料費、研修時の昼食代、マニュアル印刷費、研修用具費が含まれる。算出は現地通貨クワチャを用いて算出されており、K13,500~K14,000を当時のレートK400/US$で計算し、US$35と計算されている。

(2) 土壌保全技術の実践率とアプローチの有効性

土壌保全技術には等高線栽培と堆厩肥の導入を含んでおり、その実践率は本プロジェクトの活動開始後 1 年目に 8 割を超える。先に記載のとおり、等高線農法には 4 つの技術が含まれ、一作期にこれら全ての技術を実践することは難しいことから、すべての技術の実践には時間を必要とする。しかし表 15 と図 17 から、住民によるメイズの収量増加への経済的な期待から、土壌保全技術は活動の 1 年目から高い実践率を示したと説明できる。この事実から、COVAMS アプローチは土壌保全技術の普及に一定の有効性が認められた。

(3) ガリコントロールの実践率とアプローチの有効性

住民によるガリコントロール技術の実践率は、本プロジェクト開始前に 8.9%であったが、開始後 1 年目に 69.1%に増加し、3 年目に 70%を超えた。実践率の伸び率は他の技術を比較しても高い。そのいっぽうで技術の実践率が 7 割程度に留まっているのは、チェックダムを設置するには身近にある石や木などの材料を自分で集める必要があり、その調達に労力と時間がかかるためだと考えられる。図 16 に示したように、ガリコントロール技術を実践しなった理由で 1 番多いのは、プロジェクト実施前には「技術が不十分」（97.6%）であったのが、3 年目には「補修が必要なガリがない」（62.8%）に変化した。図 18 に示したように、ガリコントロールの便益は回答の多い順に「土壌浸食の防止（強くそう思う）」、「圃場の再生」、「水の流れるスピードを弱める」ためであることから、こうしたチェックダムを設置する便益は住民へ適切に理解されていると言える。

表 27：COVAMS アプローチによる 3 技術の実践率の経過年数別変化

	プロジェクト開始前	1 年目	2 年目	3 年目
苗木生産				
実践率	60.8%	83.8%	89.6%	90.7%
世帯での実践率	24.1%	13.6%	21.2%	27.9%
グループでの実践率	35.5%	54.8%	48.0%	46.4%
両単位での実践率	0.7%	15.4%	20.4%	16.4%
植林				
実践率	65.2%	84.6%	88.3%	87.9%
世帯での実践率	N.A	63.2%	68.7%	64.3%
グループでの実践率	N.A	48.2%	50.4%	45.7%
土壌保全技術				
等高線農法の実践率	15.8%	82.8%	92.4%	96.4%
堆厩肥の圃場投入実践率	20.1%	84.1%	94.5%	94.3%
チェックダム				
実践率	8.9%	69.1%	69.0%	72.1%

2013/2014

Questionnaire Survey for Impact Study on COVAMS Approach in 2016

Date : / / (DD/MM/YYYY)

Sample No :____________________________, Researcher : ____

Informant : ____(____),

District: Blantyre / Balaka / Mwanza / Neno, TA: ________________________, Village: __________________________,

Q1: Attribute

Please check attributes of the head of household.

A1. Gender	A2. Age	A3. No. of HH members	A4. Social stratum of the HH
1. Male, 2. Female	years old	1. persons (2.M , 3. F)	1. GVH, 2. VH, 3. SLF ( ) , 4. LF ( ), 5. Others( )

A5. Ethnic group	A6. Literate	A7. Education level
1. Chewa, 2. Ngoni, 3. Yawo, 4. Others (specify ______________)	1. Chichewa, 2. English, 3. Non	1. 0, 2. 1~3 years, 3. 4~6 years, 4. 7~10 years, 5 more than 10 years

A8. Main income resource of the HH	A9. Mobile phone	A10. Place to charge mobile phone	A11. Transportation property
1. Agriculture, 2. Employee, 3. Commerce 4. Others( )	1.Non, 2.TNM, 3.Airtel, 4.Others( )	1.Home, 2.Shop, 3.Other( )	1.Motor bike, 2.Bicycle, 3.Cattle carriage(ox cart), 4.Others ( )

Q2. Popularity level of COVAMS

Do you know COVAMS Project?	B1	1. Yes 2. No

What COVAMS activities do you know?	B2	1.Tree growing, 2. Soil conservation, 3. Gully control, 4. Others ( )

Do you know COVAMS LF of your Limana?	B3	1. Yes 2. No

Q3. Implementation of training (If you are COVAMS LF or SLF)

When were you assigned as LF and SLF? Did you implement the trainings to your fellow farmers?

Season	Assignment		Implementation of training					
			Tree growing		Soil conservation		Gully control	
2015/16	C1	1. LF 2. SLF	C2	1. Yes 2. No 3. Don't know	C3	1. Yes 2. No 3. Don't know	C4	1. Yes 2. No 3. Don't know
2014/15	C5	1. LF 2. SLF	C6	1. Yes 2. No 3. Don't know	C7	1. Yes 2. No 3. Don't know	C8	1. Yes 2. No 3. Don't know
2013/14	C9	1. LF 2. SLF	C10	1. Yes 2. No 3. Don't know	C11	1. Yes 2. No 3. Don't know	C12	1. Yes 2. No 3. Don't know

↓ if Yes

How do you conduct the training?

Season	Tree growing		Soil conservation		Gully control	
2015/16	C13	1. Individually 2. Group 3. Both 4. Don't know	C14	1. Individually 2. Group 3. Both 4. Don't know	C15	1. Individually 2. Group 3. Both 4. Don't know
2014/15	C16	1. Individually 2. Group 3. Both 4. Don't know	C17	1. Individually 2. Group 3. Both 4. Don't know	C18	1. Individually 2. Group 3. Both 4. Don't know
2013/14	C19	1. Individually 2. Group 3. Both 4. Don't know	C20	1. Individually 2. Group 3. Both 4. Don't know	C21	1. Individually 2. Group 3. Both 4. Don't know

2013/2014

Q4. Participation of trainings (If you are not COVAMS LF nor SLF)

Did you attend training courses provided by LFs organized in COVAMS II

Season	Tree growing				Soil conservation				Gully control			
2015/16	D1	1. Yes	D2	Reason ( )	D5	1. Yes	D6	Reason ( )	D9	1. Yes	D10	Reason ( )
		2. No	D3	Reason ( )		2. No	D7	Reason ( )		2. No	D11	Reason ( )
	D4	if Yes 1. Individually 2. Group			D8	if Yes 1. Individually 2. Group			D12	if Yes 1. Individually 2. Group		

Reason to attend: 1. Capacity development in general, 2. Interested to the technique, 3. The training is conducted, 4. To increase a productivity/income 5. To protect the land, 6. To diversify the income 7. Others (specify)

Reason NOT to attend: 1. COVAMS approach hadn't started, 2. Had mastered the technique, 3. Did not know there was a training, 4. Not interested, 5. Too busy to attend, 6. Others (specify)

2014/15	D13	1. Yes	D14	Reason ( )	D17	1. Yes	D18	Reason ( )	D21	1. Yes	D22	Reason ( )
		2. No	D15	Reason ( )		2. No	D19	Reason ( )		2. No	D23	Reason ( )
	D16	if Yes 1. Individually 2. Group			D20	if Yes 1. Individually 2. Group			D24	if Yes 1. Individually 2. Group		

2013/14	D25	1. Yes	D26	Reason ( )	D29	1. Yes	D30	Reason ( )	D33	1. Yes	D34	Reason ( )
		2. No	D27	Reason ( )		2. No	D31	Reason ( )		2. No	D35	Reason ( )
	D28	if Yes 1. Individually 2. Group			D32	if Yes 1. Individually 2. Group			D36	if Yes 1. Individually 2. Group		

Q5. Practice of tree growing

Q5-1 Practice in 2015/2016 (tree growing)

1. Did you raise seedlings?	E1	1. Yes, by individual	2. Yes, by group	3. Both	4. No	E2	Reason ( )

Reason NOT to produce: 1. Not interested, 2. Don't know the techniques, 3. Don't have materials (seed, pot, etc.), 4. Too busy, 5. Others (specify)

How many seedlings did you raise?	E3	( ) seedlings
How did you use them?	E4	1. Planting: ( ) seedlings 2. Selling: ( ) seedlings, 3. Donating: ( ) seedlings

if the answer of E1 is 1, 3 or 4

2. Did you plant seedlings?	E5	1. Yes	2. No	E6	Reason ( )

Reason NOT to plant: 1. Not interested, 2. Don't know the techniques, 3. No land, 4. Too busy, 5. Others (specify)

How did you get the seedlings?	E7	1. Produced by yourself 2. Purchased 3. Donated 4. Others (specify)

Where and how many did you plant seedlings?	E8	1.Woodlot ( ) seedlings	2. Garden ( ) seedlings	3. Homestead ( ) seedlings	4. River bank ( ) seedlings

3. Did you make direct sowing?	E9 1. Yes 2. No	Where and how many?	E10	1. Woodlot ( ) stations	2.Garden ( ) stations	3. Homestead ( ) stations	4.River bank ( ) stations

4.Did you make natural regeneration?	E11	1. Yes	2. No	E12	if Yes ( )Ac

2013/2014

if the answer of E1 is 2 or 3

What category of group?	E13	1. Village 2. Limana 3. Group	No. of members?	E14	( ) persons

How many seedlings did you raise?	E15	( ) seedlings
How did you use them?	E16	1. Sold to outsider: ( ) seedlings 2. Shared by group: ( ) seedlings 3. Planted as community: ( )seedlings
Where did you plant as community ?	E17	1. Woodlot: ( ) seedlings 2. River bank: ( ) seedlings
Did you make direct sowing?	E18	1. Yes ( ) stations in communal land 2. Yes ( ) stations in other land 3. No

Did you make natural regenerations in communal land?	E19	1. Yes 2. No		
	E20	if Yes ( ) lands	E21	Total: ( ) Ac

Q5-2. Practice in 2014/15 (tree growing)

1. Did you raise seedlings?	E22	1. Yes, by individual	2. Yes, by group	3. Both	4. No	E23	Reason ( )

Reason NOT to produce: 1. Not interested, 2. Don't know the techniques, 3. Don't have materials (seed, pot, etc.), 4. Too busy, 5. Others (specify)

How many seedlings did you raise?	E24	( ) seedlings
How did you use them?	E25	1. Planting ( ) seedlings 2. Selling ( ) seedlings, 3. Donating ( ) seedlings

if the answer of E22 is 1, 3 or 4

2.Did you plant seedlings?	E26	1. Yes	2. No	E27	Reason ( )

Reason NOT to plant: 1. Not interested, 2. Don't know the techniques, 3. No land, 4. Too busy, 5. Others (specify)

How did you get the seedlings?	E28	1. Producing by yourself 2. Purchasing 3. Donating 4. Others (specify)

Where and how many did you plant seedlings?	E29	1. Woodlot ( ) seedlings	2. Garden ( ) seedlings	3. Homestead ( ) seedlings	4. River bank ( ) seedlings

3.Did you make direct sowing?	E30 1. Yes 2. No	Where and how many?	E31	1. Woodlot ( ) stations	2.Garden ( ) stations	3. Homestead ( ) stations	4.River bank ( ) stations

4.Did you make natural regeneration?	E32	1. Yes 2. No	E33	if Yes ( )Ac

if the answer of E22 is 2 or 3

What category of group?	E34	1. Village 2. Limana 3. Group	No. of members?	E35	( ) persons

How many seedlings did you raise?	E36	( ) seedlings
How did you use them?	E37	1. Sold to outsider: ( ) seedlings 2. Shared by group: ( ) seedlings 3. Planted as community: ( )seedlings
Where did you plant as community ?	E38	1. Woodlot: ( ) seedlings 2. River bank: ( ) seedlings 3. Others (specify) ( )seedlings

2013/2014

Did you make direct sowing?	E39	1. Yes ( ) stations in communal land 2. Yes ( ) stations in other land 3. No

Did you make natural regenerations in communal land?	E40	1. Yes 2. No			
	E41	if Yes ( ) lands		E42	( ) Ac

Q5-3. Practice in 2013/14 (tree growing)

1. Did you raise seedlings?	E43	1. Yes, by individual	2. Yes, by group	3. Both	4. No	E44	Reason ( )

__Reason NOT to produce:__ 1. Not interested, 2. Don’t know the techniques, 3. Don’t have materials (seed, pot, etc.), 4. Too busy, 5. Others (specify)

How many seedlings did you raise?	E45	( ) seedlings
How did you use them?	E46	1. Planting ( ) seedlings 2. Selling ( ) seedlings, 3. Donating ( ) seedlings

if the answer of E43 is 1, 3 or 4

2.Did you plant seedlings?	E47	1. Yes	2. No	E48	Reason ( )

__Reason NOT to plant:__ 1. Not interested, 2. Don’t know the techniques, 3. No land, 4. Too busy, 5. Others (specify)

How did you get the seedlings?	E49	1. Producing by yourself 2. Purchasing 3. Donating 4. Others (specify)

Where and how many did you plant seedlings?	E50	1. Woodlot ( ) seedlings	2. Garden ( ) seedlings	3. Homestead ( ) seedlings	4. River bank ( ) seedlings

3.Did you make direct sowing?	E51 1. Yes 2. No	Where and how many?	E52	1. Woodlot ( ) stations	2.Garden ( ) stations	3. Homestead ( ) stations	4.River bank ( ) stations

4. Did you make natural regeneration?	E53	1. Yes	2. No	E54	if Yes ( )Ac

if the answer of E1 is 2 or 3

What category of group?	E55	1. Village 2. Limana 3. Group	No. of members?	E56	( ) persons

How many seedlings did you raise?	E57	( ) seedlings			
How did you use them?	E58	1. Sold to outsider: ( ) seedlings 2. Shared by group: ( ) seedlings 3. Planted as community: ( )seedlings			
Where did you plant as community ?	E59	1. Woodlot: ( ) seedlings 2. River bank: ( ) seedlings			
Did you make direct sowing?	E60	1. Yes ( ) stations in communal land 2. Yes ( ) stations in other land 3. No			
Did you make natural regenerations in communal land?	E61	1. Yes 2. No			
	E62	if Yes ( ) lands	E63	( ) Ac	

2013/2014

Q5-4. Practice before COVAMS II

Did you raise seedlings?	E64	1. Yes, by individual, 2. Yes, by group, 3. Both, 4. No
	E65	if No, Reason ( )

Reason NOT to produce: 1. Not interested, 2. Didn't know the techniques, 3. Didn't have materials (seed, pot, etc.), 4. Too busy, 5. Others (specify)

Did you plant seedlings?	E66	1. Yes 2. No	E67	Reason ( )

Reason NOT to plant: 1. Not interested, 2. Didn't know the techniques, 3. No land, 4. Too busy, 5. Others (specify)

Q5-5. Information channel (tree growing) if the informant practiced the technique (multiple choice)

How did you learn the technique?/ Who did you teach the technique?	E68	1. Radio 2. Newspaper 3. Family 4. Neighbour 5. COVAMS 6. COVAMS LF 7. LF 8. Others (specify)

Q6. Practice of soil conservation

Q6-1. Practice in 2015/16 (soil conservation)

1. Did you practice soil conservation techniques?	F1	1.Yes	2.No

How wide is your conserved area?	F2	1. less than 80 cm: ( ) ac,
		2. 85cm: ( ) ac,
		3. more than 90cm: ( )ac

What kinds of technique did you use?	F3	1. Contour ridging, 2. Box ridge, 3. Swale, 4. Hedge row

Did you apply manure?	F4	1. Yes ( )ac , 2. No

2. Did you apply fertilizer?	F5	1. Yes ( )ac , 2. No

3. How many bags of maize did you harvest in your farm land where practiced the technique?	F6	( ) bags	F7	( ) kg/bag	F8	( ) kg	F9	( ) ac	F10	( ) kg/ac

Q6-2. Practice in 2014/15 (soil conservation)

1.Did you practice soil conservation techniques?	F11	1.Yes	2.No

How wide is your conserved area?	F12	1. less than 80 cm: ( )ac,
		2, 85cm: ( ) ac,
		3. more than 90cm: ( )ac

What kinds of technique did you use?	F13	1. Contour ridging, 2. Box ridge, 3. Swale, 4. Hedge row

2013/2014

Did you apply manure?	F14	1. Yes ( )ac , 2. No

2. Did you apply fertilizer?	F15	1. Yes ( )ac , 2. No

3. How many bags of maize did you harvest in your farm land where practiced the technique?	F16	( ) bags	F17	( ) kg/bag	F18	( ) kg	F19	( ) ac	F20	( ) kg/ac

Q6-3. Practice in 2013/14 (soil conservation)

Did you practice soil conservation techniques?	F21	1.Yes	2.No

How wide is your conserved area?	F22	1. less than 80 cm: ( )ac,
		2. 85cm: ( ) ac,
		3. more than 90cm: ( )ac

What kinds of technique did you use?	F23	1. Contour ridging, 2. Box ridge, 3. Swale, 4. Hedge row

Did you apply manure?	F24	1. Yes ( )ac 2. No

2. Did you apply fertilizer?	F25	1. Yes ( )ac 2. No

3. How many bags of maize did you harvest in your farm land where practiced the technique?	F26	( ) bags	F27	( ) kg/bag	F28	( ) kg	F29	( ) ac	F30	( ) kg/ac

Q6-4. Practice before COVAMS II (soil conservation)

1. Did you practice soil conservation techniques?	F31	1.Yes	2.No

How wide is your conserved area?	F32	1. less than 80 cm: ( )ac,
		2, 85cm: ( ) ac,
		3. more than 90cm: ( )ac

What kinds of technique did you use?	F33	1. Contour ridging, 2. Box ridge, 3. Swale, 4. Hedge row

Did you apply manure?	F34	1. Yes ( )ac 2. No

2. Did you apply fertilizer?	F35	1. Yes ( )ac 2. No

3. How many bags of maize did you harvest in your farm land where practiced the technique?	F36	( ) bags	F37	( ) kg/bag	F38	( ) kg	F39	( ) ac	F40	( ) kg/ac

Q6-5. Information channel (soil conservation) if the informant practiced the technique (multiple choice)

How did you learn the technique?/ Who did you teach the technique?	F41	1. Radio 2. Newspaper 3. Family 4. Neighbour 5. COVAMS 6. COVAMS LF 7. LF 8. Others (specify)

Q6-6. Benefit (soil conservation)

What benefit(s) have you obtained by practicing soil conservation technique? (Multiple choice)

F42: Benefit							
1	Increased the yield drastically	3	Increased the yield a little	5	Stopped soil erosion to some extent	7	Other (specify) ( )
2	Increased the yield to some extent	4	Stopped soil erosion drastically	6	Stopped soil erosion a little	8	No benefit obtained

Q7. Practice of gully control

Q7-1 Practice in 2015/16 (gully control)

Did you construct check dam?	G1	1.Yes	2.No	G2	Reason ( )

Reason NOT to practice: 1. No gulley to be rehabilitated, 2. Still not urgent 3. Technique insufficient, 4. Too busy to practice, 5. Others (specify)

How many place?	G3	( ) places

What distance between check dams?	G4	( ) m, ( ) m, ( ) m

Q7-2. Practice in 2014/15 (gully control)

Did you construct check dam?	G5	1.Yes	2.No	G6	Reason ( )

Reason NOT to practice: 1. No gulley to be rehabilitated, 2. Still not urgent 3. Technique insufficient, 4. Too busy to practice, 5. Others (specify)

How many place?	G7	( ) places

What distance between check dams?	G8	( ) m, ( ) m, ( ) m

Q7-3. Practice in 2013/14 (gully control)

Did you construct check dam?	G9	1.Yes	2.No	G10	Reason ( )

Reason NOT to practice: 1. No gulley to be rehabilitated, 2. Still not urgent

3. Don’t know the technique, 4. Too busy to practice, 5. Others (specify)

How many place?	G11	( ) places

What distance between check dams?	G12	( ) m, ( ) m, ( ) m

Q7-4. Practice before COVAMS II (gully control)

Did you construct check dam?	G13	1.Yes, 2.No	G14	Reason ( )

<u>Reason NOT to practice:</u> 1. No gulley to be rehabilitated, 2. Still not urgent 3. Don’t know the technique, 4. Too busy to practice, 5. Others (specify)

Q7-5. Information channel (gully control) if the informant practiced the technique (multiple choice)

How did you learn the technique?/ Who did you teach the technique?	G15	1. Radio 2. Newspaper 3. Family 4. Neighbour 5. COVAMS 6. COVAMS LF 7. LF 8. Others (specify)

Q7-6. Benefit

What benefit(s) have you obtained by practicing gulley control? (Multiple choice)

G16: Benefit							
1	Stopped soil erosion drastically	3	Stopped soil erosion a little extent	5	Increased the yield to some extent	7	Other (specify) ( )
2	Stopped soil erosion to some extent	4	Increased the yield drastically	6	Increased the yield a little	8	No benefit obtained

Japan International Cooperation Agency (JICA)

Republic of Malawi
Project for Promoting Catchment Management Activities in Middle Shire

HOUSEHOLD SURVEY REPORT

Analysis of the Effectiveness of the COVAMS Approach

March 2017

IC Net Limited

Contents

Appendix

List of Tables and Figures

Abbreviations

Acronym	Term in Full
CCO	Conservation Coordination Officer
COVAMS	Project for Community Vitalization and Afforestation in Middle Shire
MOAIWD	Ministry of Agriculture, Irrigation and Water Development
LF	Lead Farmer
SLF	Senior Lead Farmer
ToT	Training of Trainers
TST	Technical Support Team

I. Executive Summary

The project conducted a household survey to analyze the effectiveness of the COVAMS approach. In total, 760[1] households were surveyed, and these were randomly selected from 35,000 households in the four target districts of Balaka, Blantyre, Mwanza, and Neno by employing the stratified multistage sampling method. The survey respondents provided answers relating to their practice of three techniques—tree growing, soil conservation, and gully reclamation—for each year from 2013 to 2015.

The project developed the questionnaire with counterparts, and it was used for all household surveys conducted as part of the project in 2014. The project also carried out orientation sessions[2] at the district and village levels. The questionnaire was pre-tested in a non-targeted village prior to the main survey of the villages targeted by the project. The survey was carried out by four researchers under the supervision of Japanese experts from June 20 to July 22, 2016.

The following summarizes the results of the survey.

i) **The three (3) techniques** introduced by the COVAMS approach and the Lead Farmer (LF) **were recognized by almost every (more than 99%) household surveyed**.

ii) **The participation rate in the training on the three techniques exceeded 80%** from the first year of intervention and over 90% in the second year.

iii) The villagers participated in the training courses as a group, and the LFs and Senior Lead Farmer (SLFs) organized the training courses as a group.

iv) **The practice rate for the three techniques exceeded 50% in the first year of intervention**. For instance, the soil conservation technique and building check dams were rapidly adopted from as low as 10–20% before the project intervention to 70–80% in the first year of intervention. This means that the practice rate of all three techniques exceeded the target of the 50% threshold based on the “Diffusion of Innovation”[3] theory within the first year of intervention.

The practice of each technique is summarized below.

v) For the tree growing technique, **the practice rate for seedling production and tree planting exceeded 80%** in the first year of intervention. Seedling production in household units had never exceeded 50%; therefore, the training provided by the LF and SLF emphasized seedling production by group more strongly than by household and by both units (group and household). An estimated 67 seedlings per household were produced over the two years. The total production by the targeted 35,000 households was estimated as 2.33 million.

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[1] The number of households surveyed is a statistically significant number.

[2] At the district level, the project Japanese expert facilitated the session for the district officers, village heads, and senior lead farmer (SLF). At the village level, the village head and SLF conducted the session.

[3] Everett M. Rogers, a professor of rural sociology, popularized the theory in his book “Diffusion of Innovations.” Rogers categorizes adopters into five groups in the process of the spread/diffusion of a new idea. The groups ordered from the earliest adopters are as follows: i) Innovator (2.5%), ii) Early Adopters (13.5%), iii) Early Majority (34.0%), iv) Late Majority (34.0%), and v) Laggards (16.0%).

The number of trees planted over the two years is estimated at 103 per household, and the 35,000 targeted households planted 3.62 million trees.

vi) **The households practicing one of the four techniques on contour farming** such as contour ridging, swale, box ridges, and hedgerows **exceeded 90%** in the second year of the intervention. The practice rate for each of the four contour farming techniques was limited to 20–30% annually. This indicates that new techniques were gradually adopted. Single households practiced contour farming on 1.5 acres (i.e., 0.6 hectares) over a two-year period. The total area covered by the targeted 35,000 households is estimated as 54,000 acres (i.e., 22,000 hectares).

vii) **The practice rate of gully reclamation techniques** (i.e., building check dams) **exceeded 70%** in the first year. A single household built an average of five check dams annually, and seven check dams per household were built over the initial two-year period. The total number of check dams built by the 35,000 households over the two-year intervention period is estimated as 251,000.

The results summarized above demonstrate the effectiveness of the COVAMS approach with regard to the increasing practice rate of the three techniques, indicating a high level of penetration by the farmers.

II. Purpose of the survey

The survey aimed to measure the effectiveness and outcomes of the COVAMS approach for promoting Catchment Management through Famers Activities (CMFA).

III. Survey method

The survey was conducted in the four target districts of Balaka, Blantyre, Mwanza, and Neno from June 20 to July 22, 2016 through a questionnaire (see Attachment 1). The total number of target households in the target districts was approximately 35,000 in 230 villages, meaning that the population was large and scattered across entire villages. Therefore, the project employed stratified multistage sampling to ensure economic and operational efficiency in terms of the duration and cost of the survey (travel time and methods of transportation from one village to another, as well as the cost of employing the researchers). The project first sampled 38 villages in the 4 districts and then 20 households within the selected villages. The total number of target respondents was 760 households.

1. Target village

Tables 1 and 2 list the target villages for the survey.

Table 1: Number of Target Villages and Launch Year in Each District

Project launch year Target district	2013	2014	2015	Total
Balaka	1	4	2	7
Mwanza	3	3	2	8
Neno	2	6	0	8
Blantyre	1	9	5	15
Total	7	22	9	38

Table 2: List of Villages Surveyed

District	Village	Launch year of the project	Number of H/H	Number of H/H surveyed
Balaka	Masenjere	2013	74	20
	Bamusi	2014	92	20
	Kambadya	2014	214	20
	Mkweya	2014	91	20
	Thamangira	2014	63	20
	Kwalakwata	2015	59	20
	Sami	2015	109	20
		Sub-total		140
Mwanza	Chikoleka	2013	225	20
	Kawiliza	2013	463	20
	Tsegulani	2013	232	20
	Kam'phirimo	2014	132	20
	Machilika	2014	155	20
	Stampa	2014	45	20
	Faiti	2015	583	20
	Ng'onzo	2015	194	20
		Sub-total		160
Neno	Mulauli	2013	141	20
	Chikungulu	2013	260	20
	Chasesa	2014	259	20
	Mwamdaza	2014	207	20
	Magaleta	2014	255	20
	Dzomodya	2014	342	20
	July	2014	26	20
	Godeni	2014	358	20
		Sub-total		160
Blantyre	Chande	2013	210	20
	Jolodani	2014	332	20
	Nakhwala	2014	375	20
	Kutchiri	2014	326	20
	Malenga	2014	503	20
	Jamali	2014	893	20
	Mkumba 1	2014	771	20
	Bota	2014	321	20
	Pindani	2014	140	20
	Wiliamu	2014	91	20
	Ngwaya 1	2015	103	20
	Somba	2015	406	20
	Kayesa	2015	454	20
	M'dala	2015	653	20
	Chombo	2015	319	20
		Sub-total		300
	Total			760

2. Preparation of survey

（1） Preparation of household list

The population size was based on lists of household heads in the target village, which were compiled by the project LFs through a door-to-door visit. The villagers selected one LF for every 15 people in each of the target villages. This means that the list compiled by one LF included 15 household heads. The project collated all the lists and constructed a database of all household heads to represent the population size in the target districts.

（2） Deciding on sample size based on population size[4]

Based on the population size, the sample size was calculated using the following formula:

$$\textit{Sample size}\ (\mathrm{n}) = \frac{\textit{population size}}{\dfrac{\textit{margin of error}\ (0.05)}{1.96} * \dfrac{\textit{population size} - 1}{\textit{Ratio of the population size}\ (1 - \textit{population size})} + 1} + 1$$

According to the above formula, the table below shows the minimum sample size for the population size:

Population size	50	100	500	1,000	2,000	5,000	10,000	20,000	50,000	100,000	1,000,000
Sample size	45	81	218	279	323	358	371	378	382	384	385

To measure the sample size for the household survey, the minimum sample size was determined based on the above table. The sample size is statistically effective for random sampling. Moreover, in stratified multistage sampling, a design effect is estimated at 2.0. First, through random sampling, the sample size was calculated as 380 responses and then multiplied by 2.0 to equilibrate design efficiency at 760 responses. Finally, the sample size was determined as 760 households based on the design effect under stratified multistage sampling and the number of responses collected in the survey.

（3） Selection of target villages

As mentioned above, the total sample included 760 households, and the respondents per village was 20 households. This means that 38 villages were surveyed and the total sample size targeted 760 respondents. To sample the villages, varying probability sampling was employed so that units were selected with a probability proportional to the given measure of sample size. The villages to be surveyed were randomly selected with a probability proportional to the number of households as per the household list. A larger village population had a higher probability, because the villages were selected based on probability, which is obtained by dividing the number of households in 1 village by the total 33,518 households in 228 villages as a parameter. An equal number of households were selected from each village among the 38 to ensure an equal probability for the whole population. Table 2 lists the selected villages.

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[4] REFERENCE: JICA (1999). *Survey Report on the Method of Rural Society Survey*, Page 38, Survey Department of Agriculture and Aquaculture Development.

（4） Sampling of target households

Using a table of random numbers, 40 households were randomly selected from the household list of target villages chosen through the procedure described above. The sample size was doubled so that 40 households were selected to cover any deficiency caused by absence on the date of the survey. Finally, 20 households shown in the first part of the list were designated as prioritized households, while the remaining 20 in the second half were supplemental households.

（5） Allocation of researchers

The project employed four researchers recruited from Lilongwe, the national capital. For the duration of the survey, the four researchers were charged with conducting the survey according to the questionnaire and inputting responses into the computer under the supervision of one Japanese expert. The Japanese expert accompanied the researcher as often as possible to manage progress and the quality of the survey.

（6） Orientation workshop for the survey

The Japanese expert held an orientation workshop at the district level for the village heads of the target villages, the SLF[5], and the Conservation Coordination Officer (CCO). The District Forestry Officer and one member of staff from the Technical Support Team (TST) assisted in the workshop. For Blantyre district, the target villages were divided into two groups, and the one-day orientation was conducted twice, while a one-day workshop was held in each of the other three districts.

At the workshop, the target household lists prepared through the process described above were distributed, the purpose of the survey and survey method explained, and how the date, time, and venue for the survey was decided for each target village was described. Furthermore, the village head and the SLF received guidance on conducting the orientation workshop for the target households at the village level. This workshop aimed to share the purpose, date, time, and venue. At the same time, handouts for the orientation at the village were delivered.

（7） Pre-test

Before administering the questionnaire to the target household, the Japanese expert explained how to conduct the questionnaire in the field and reached a consensus on the words used in the questionnaire including words translated into the Chewa language. Then, the field pre-test was conducted at one village in Blantyre district, where the project target village is located, but which was not a village targeted by the survey. The field pre-test aimed to facilitate familiarity with the questionnaire survey, enhance a consensus on the wording of the questions and responses, and check and improve the questions and responses according to the real answers collected in the field.

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[5] The SLF selected the project LF, who had one year of experience with the project. He/she assisted the CCO in managing and supervising the activities of the LFs. While one SLF was selected from one village, two to four LFs were assigned in terms of the population size and covered area.

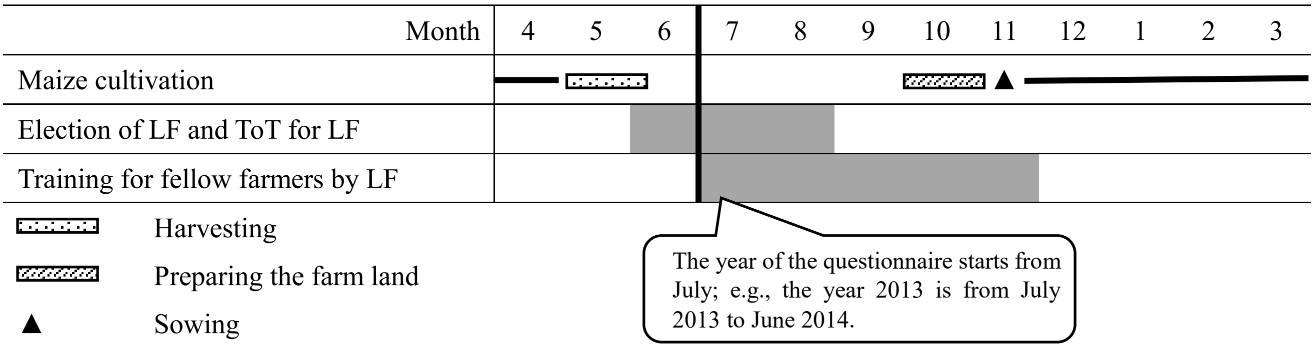
3. Implementation of the household survey

The researchers visited the venue designated by the target village and filled in the questionnaire (see Attachment 1) by conducting a personal interview survey with 20 respondents assembled by the village head and SLF(s) according to the household list. When the household head was absent, one member from the same household (excepting children) received the questionnaire. Through the survey, 760 responses from 38 villages were collected.

4. Determination of the period of years covered

The period of years covered in the survey was determined according to the launch year of the project in the target village. For instance, in a village where the project was launched in 2013, responses to the questionnaire were for three years, namely 2013, 2014, and 2015.

For 2013, the year begins from the month of July, when the LF conducted training for fellow farmers, and ends in June 2014, when maize is harvested. While the cultivation period of maize varies according to when the rain period starts, the sowing period begins in November and the harvest is from May to June the following year. The project held an election and training for the LF from June, so that he could train fellow farmers from August in accordance with the cultivation calendar.



Harvesting
Preparing the farm land
▲ Sowing

The year of the questionnaire starts from July; e.g., the year 2013 is from July 2013 to June 2014.

Figure 1: COVAMS Activities According to the Maize Cultivation Calendar and Determination of the Year

IV. Survey limitations

（1） Limited information on external factors

The questionnaire focused mainly on the adoption of techniques because of restricted costs and time constraints. Therefore, information on external factors such as social status and intervention by other aid organizations was limited. Accordingly, collected data were analyzed using variables such as number of household members, ethnic group, literacy level, and education level.

（2） Average results for years elapsed

The household report presents the outcomes of the analysis by year and number of years elapsed. The responses from respondents do not noticeably vary over the years (1st, 2nd, and 3rd year) from the inaugural year of the project. The population was verified according to whether there is a statistically significant difference based on the limited information at the 95% confidence interval, because as mentioned, the information collected on external factors was limited.

（3） Degree of recall bias

The survey questions tended to be repeated to test the annual performance of the adoption of the techniques. To reduce recall bias, the questionnaire was designed in reverse chronological order in the order of the year: 2015, 2014, 2013, and the year before the project, in other words, from recent practice to practice in the past. If respondents intend to respond in a self-serving manner, they provide a different response characterized by egocentric bias; thus, there is the risk that any variation could be attributed to the proportion of the number of recall-based questions. The tests on the data for the report are not considered variables of recall bias because the degree of bias could not be verified.

（4） Difference in meaning between question and response

The study employed a personal interview survey wherein a researcher interviews a respondent according to the questionnaire and fills in the responses. The advantages of a face-to-face interview conducted by a researcher include preventing misunderstanding the questionnaire, preventing the omission of responses, and collecting responses to complicated questions. For example, when a respondent has a different understanding than the researcher, there is a tendency to overestimate the benefits of strategic bias, and based on obsequiousness bias, alter responses in the direction they perceive the researcher desires.

The pre-test tested the questions and responses in terms of the structure of the questionnaire, order of questions, and content of close-ended questions before conducting the actual survey. In addition, before the survey was conducted in each village, and before the questionnaire interview with each respondent, the researchers explained the necessity of conveying the actual situation. The researchers sufficiently explained the meanings of the questions to each respondent. However, it is not common that a survey is free from bias.

V. Survey results and analysis

The survey analyzed the data by year and number of years elapsed. First, adoption of the techniques in each fiscal year was examined by analyzing the data to determine the general tendency of variations. If a significant annual difference was identified, it was assumed that this difference was caused by external factors in the questionnaire including precipitation. Next, adoption was analyzed according to the number of years elapsed, because the target villages had different project intervention periods. Before data analysis, it was verified that there was no significant difference in responses with regard to the number of household members, ethnic group, literacy level, and education level.

1. Household attributes

（1）Ethnic group of the household head

Figure 2 shows the ethnic groups of the household heads. Of the 759 valid responses, the highest percentage of household heads were *Ngoni* (39.5%: 300 HHs), followed by *Chewa* (26.0%: 197 HHs), *Yao* (15.2%: 115 HHs), *Lonwe* (14.1%: 107 HHs), and *Maganja* (2.5%: 19 HHs). The responses indicated that fewer household heads were of the following groups: *Sena, Benbam Chawa, Nsena, Nyanga,* and *Nyunguwe*.

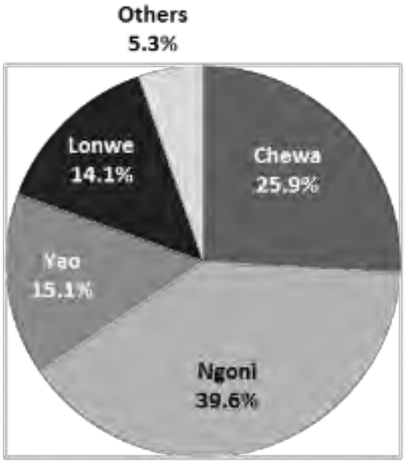


Figure 2: Ethnic Group of Household Head

（2）Social stratum of the household head

As for the ratio of male and female household heads, the number of male-headed households (77.4%) was higher than that of female-headed households (22.6%). The average age of respondents was 43 years (median: 40), and the average household size was 5.5 people (median: 5).

Regarding the village head and/or LF of the respondent's household, 2.4% (18 HHs) of households included the group village head or village head. Furthermore, the ratio of inclusion of the LF assigned by the project or the Ministry of Agriculture, Irrigation, and Water Development (MOAIWD) or SLF was 5.2% (41 HHs), while the other was 92.3% (703 HHs). Of the 41 responses that included the SLF or LF as household members, the number of project SLFs was 1 of 1 and project LFs was 36 out of 40.

Table 3: Social Stratum of Household Head

	Group village head	Village head	SLF	LF	Others	Total
Respondents	5	13	1	40	702	761
Percentage	0.7%	1.7%	0.1%	5.1%	92.4%	100.0%

（3）Literacy level of the household head

Of the 760 responses, 57.9% (586 HHs) of household heads can read and write only Chichewa, while 33.2% (252 HHs) can read and write both Chichewa and English. The percentage of household heads who are illiterate was 17.0% (172 HHs).

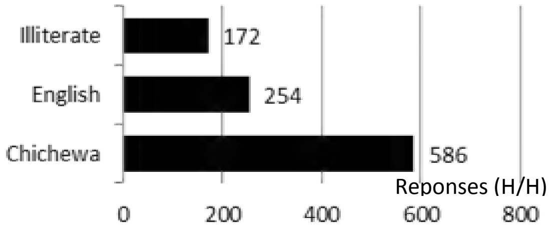


Figure 3: Literacy of Household Head

（4） Main income generation activities of the household

The main income generation activities (IGAs) were studied through a survey that allowed respondents to choose more than one answer. Of the 760 responses, 55.3% (521 HHs) of the respondents engage in agriculture, 24.1% (227 HHs) in commerce, and 14.3% (135 HHs) in casual labor such as temporary employment to assist cultivation and harvest.

It was supposed that most households engaged in agriculture. However, it was good to find that about a quarter of the households engaged in commerce as a main income resource.

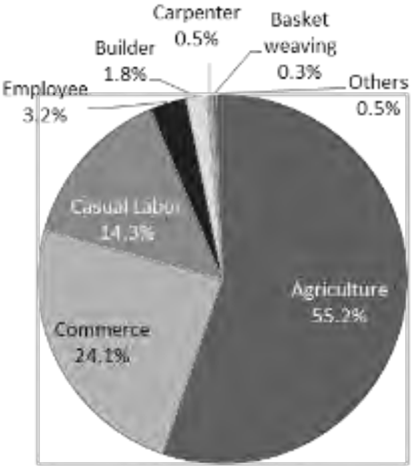


Figure 4: Main IGAs of Household

2. Visibility of techniques introduced by the COVAMS approach

（1） Visibility of techniques

First, respondents were asked if they knew about the COVAMS project. The 99.5% (755 HHs) who answered "yes" confirmed their awareness of the techniques. Table 4 presents the visibility of each technique in each district. The table indicates that the techniques are well known in all four districts. Moreover, analyzing the number of recognized techniques clarified that most respondents (99.5%: 753 HHs) recognize three of the techniques.

The three techniques introduced through the COVAMS approach were well known by most households in the target villages.

Table 4: Visibility of the Techniques Introduced through the COVAMS Approach

		Tree growing	Soil conservation	Gully reclamation	Others
Balaka	Responses	140	140	139	1
	(ratio)	(100.0%)	(100.0%)	(99.3%)	(0.7%)
Mwanza	Responses	160	160	160	0
	(ratio)	(100.0%)	(100.0%)	(100.0%)	(0.0%）
Neno	Responses	157	159	158	0
	(ratio)	(98.7%)	(100.0%)	(99.4%)	(0.0%)
Blantyre	Responses	296	296	296	0
	(ratio)	(100.0%)	(100.0%)	(100.0%)	(0.0%)
	Total response number	753	755	753	1
	(ratio)	(99.7%)	(100.0%)	(99.7%)	(0.1%)

（2） Visibility of the LF

The visibility of the COVAMS LF working at the Limana[6] was investigated. Of the 745 valid responses, 99.7% (752 HHs) responded "yes." It was clarified that this question specifically pertained to the COVAMS LF, because the MOAIWD also assigned Agriculture LF(s) for each technical subject, and some LF(s) were

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[6] Unit of family members. The project defines "Limana" as one training unit, and selected one LF from one Limana. The average size of a Limana is 15 households.

assigned by an NGO in the target village. The proportion of COVAMS LF(s) in each district was 100.0% (140 HHs) in Balaka, 99.4% (158 HHs) in Mwanza, 99.4% (158 HHs) in Neno, and 100.0% (295 HHs) in Blantyre.

The COVAMS LF(s) were well known by most households in the target villages.

3. Training and participation

（1） Training by the LF

The trend for training courses on the three techniques was examined for each year. Respondents included households in which LF(s) or SLF(s) were family members. If the project was launched in the village in 2013 and the COVAMS LF was elected in the same year, respondents who received training from the LF in 2013, 2014, and 2015 were included in the study.

In total, 92 responses from the LF and SLF were received: 4 HHs in 2013, 38 HHs in 2014, and 50 HHs in 2015. Furthermore, 100% of the respondents conducted training courses on the three techniques in 2013, 2014, and 2015.

The training unit was identified as individual (individual household), group (multiple members assembled to attend the training), and both. Table 5 provides the results according to technique and year. No individual training was conducted for tree growing, although 5.6% (5 of 90) of respondents received individual training on gully control.

Most LF(s) and SLF(s) conducted group training. The project instructed the LF through the CCO that for the COVAMS approach, group training should be conducted. It was confirmed that the LF(s) followed the instructions appropriately.

Table 5: Training Courses by Year

	Tree growing			Soil conservation			Gully control		
	Individual	Group	Both	Individual	Group	Both	Individual	Group	Both
FY 2013	0	3	1	0	3	1	1	1	2
	0.0%	75.0%	25.0%	0.0%	75.0%	25.0%	25.0%	25.0%	50.0%
FY 2014	0	29	8	1	27	9	2	24	11
	0.0%	78.4%	21.6%	2.7%	73.0%	24.3%	5.4%	64.9%	29.7%
FY 2015	0	37	12	1	35	13	2	32	15
	0.0%	75.5%	24.5%	2.0%	71.4%	26.5%	4.1%	65.3%	30.6%
Total respondents	0	69	21	2	65	23	5	57	28
Ratio	0.0%	76.7%	23.3%	2.2%	72.2%	25.6%	5.6%	63.3%	31.1%

（2） Participation

The tendency in participation in the training courses on the three techniques was investigated for each year with respondents excluding households with LF(s) or SLF(s) as family members. If the project was launched in the village in 2013, respondents who attended the training in 2013, 2014, and 2015 were included.

The rate of participation in the training on the three techniques was more than 80% in the first year and exceeded 90% in the second year. The increase from the first to second year differs significantly (P<0.01), while the variation from the second to third year does not differ significantly (P>0.1).

The high participation rate indicates that the three techniques introduced through COVAMS retained a high level of interest from the farmers.

1) Participation in training on tree growing

Table 6 presents the participation rate for the training on tree growing by fiscal year. The participation rate gradually increased at a stable rate: 76.3% in 2013, 82.8% in 2014, and 89.5% in 2015. Most households attended the training, similar to the tendency shown in Table 5.

Table 6: Participation in Training on Tree Growing by Fiscal Year

		FY 2013	FY 2014	FY 2015
Number of participants (Valid respondents)		103 (135)	447 (540)	636 (711)
	Participation rate	76.3%	82.8%	89.5%
Training unit	Individual	2	11	30
		1.9%	2.5%	4.7%
	Group	101	436	606
		98.1%	97.5%	95.3%

Table 7 shows the participation rate for training on tree growing training by years elapsed. The participation rate for the first year was 81.5%, for the second year 90.3% (8.8% increase), and for the third year 88.2% (2.2% decrease). The increase from the first to second year shows a significant difference (P<0.001), while the decrease from the second to third year shows no significant difference (P>0.1).

In total, 80% of respondents attended the training in the first year, and 90% in the second year, indicating a high level of participation.

Table 7: Participation in Training on Tree Growing by Years Elapsed

	1st year	2nd year	3rd year
Number of participants (Valid respondents)	583 (715)	484 (536)	119 (135)
Participation rate	81.5%	90.3%	88.2%
(95% CI)	(78.7–84.4)	(87.8–92.8)	(82.7–93.6)

2) Participation in training on soil conservation

Table 8 presents the participation rate for training on soil conservation by fiscal year. The participation rate gradually increased from 83.6% in 2013, to 88.3% in 2014, and 96.3% in 2015. Most households attended the training, similar to the tendency shown for the training on tree growing in Table 7.

Table 8: Participation in Training on Soil Conservation by Fiscal Year

		FY 2013	FY 2014	FY 2015
Number of participants (Valid respondents)		112 (134)	476 (539)	685 (711)
Participation rate		83.6%	88.3%	96.3%
Training unit	Individual	2	15	44
		1.8%	3.2%	6.4%
	Group	110	461	641
		98.2%	96.9%	93.6%

Table 9 shows the participation rate for training on soil conservation by years elapsed. The participation rate gradually increased, although the rate of increase from the second to third year was quite slow: the first year was 88.8%, the second 95.1% (6.4% increase), and the third was 97.0% (1.9% increase). The increase from the first to the second year shows a significant difference (P<0.001), while the increase from the second to third year shows no significant difference (P>0.1).

Table 9: Participation in Training on Soil Conservation by Years Elapsed

	1st year	2nd year	3rd year
Number of participants (Valid respondents)	631（711）	508（534）	131（135）
Participation rate	88.8%	95.1%	97.0%
(95% CI)	(86.4–91.1)	(93.3–97.0)	(94.2–99.9)

3) Participation in training on gully control

Table 10 presents the participation rate for training on gully control by fiscal year. The participation rate gradually increased from 82.8% in 2013, to 85.4% in 2014, and 95.1% in 2015. Most households attended the training, similar to the tendencies in the other two training courses, as described in the previous sections.

Table 10: Participation in Training on Gully Control by Fiscal Year

		FY 2013	FY 2014	FY 2015
Number of participants (Valid respondents)		111（134）	462（541）	676（711）
Participation rate		82.8%	85.4%	95.1%
Training unit	Individual	3	12	38
		2.7%	2.6%	5.6%
	Group	108	450	638
		97.3%	97.4%	94.4%

Table 11 shows the participation rate for training on gully control by years elapsed. The participation rate gradually increased from 85.9% in the first year, to 94.0% (8.1% increase) in the second year, and 97.0% (3.0% increase) in the third year. Similar to the other two types of training, the increase from the first to second year shows a significant difference (P<0.001), while the increase from the second to third year shows no significant difference (P>0.1).

Table 11: Participation in Training on Gully Control by Years Elapsed

	1st year	2nd year	3rd year
Number of participants (Valid respondents)	611 (711)	501 (533)	130 (134)
Participation rate	85.9%	94.0%	97.0%
(95% CI)	(83.3–88.4)	(92.0–96.0)	(94.1–99.9)

Based on the results above, 80% of the target households in the first year and 90% in the second year attended all three training courses introduced through the COVAMS approach.

4) Reasons for attending the training

Based on a survey that allowed the respondents to choose more than one answer, Figure 5 shows the reasons for attending the training courses on each of the three techniques. The reasons provided for attending are provided for each technique. The main reason for attending training on tree growing was “to protect the land” (51.5%: 710 HHs), followed by “capacity development in general” (18.3%: 252 HHs), “interested in the technique” (17.3%: 238 HHs), and “to increase productivity/income” (10.4%: 144 HHs). The main reason for attending training on soil conservation was “to increase productivity/income” (72.2%: 1,025 HHs), followed by being “interested in the technique” (12.7%: 180 HHs), and “capacity development in general” (11.7%: 166 HHs). The main reason for attending training on gully control was “to protect the land” (70.6%: 936 HHs), followed by “capacity development in general” (11.6%: 154 HHs), and being “interested in the technique” (11.2%: 149 HHs).

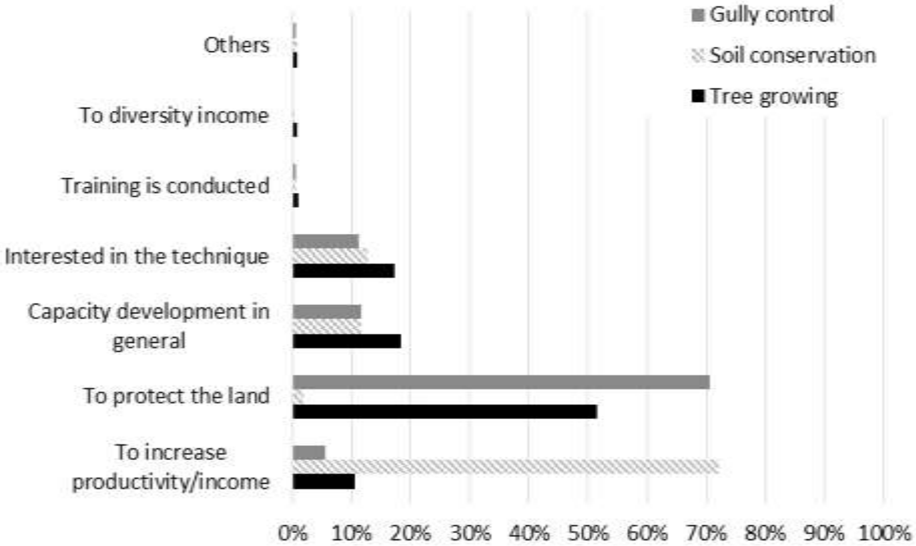


Figure 5: Reasons for Attending the Training

4. Adoption of techniques

（1） Adoption of the tree growing technique

1) Adoption of seedling production

According to the survey results, the rate of adoption of the seedling production technique increased from 60.8% before the project to 83.8% in the first year and to approximately 90% in the second year. Respondents intended to produce more seedlings by group than by household, and this trend was reinforced by the project intervention. It was shown that training by the LF and SLF affected seedling production by group. The reason for encouraging group activities is that farmers improve their knowledge on and techniques for tree growing individually and/or deepen their understanding of the benefits. The farmers then select the activities that more easily receive support from such sources as the District Forestry Office, donors, and NGOs.

The participation rate was more than 80% in the first year and exceeded 90% in the second year. The increase from the first to second year shows a significant difference (P<0.01), while the increase from the second to third year shows no significant difference (P>0.1).

Regarding the adoption rate and number of seedlings produced, the increase from before the project was launched to the first year, and from the first to second year shows a significant difference. The decreasing number of seedlings produced by group from the second to third year differs significantly, while the decreasing number of seedlings produced by household from the second to third year demonstrated no significant difference.

Table 12 shows the rate of seedling production by years elapsed. The adoption rate was 60.8% before the project, and reached approximately 90% in the second year. The rate increased gradually from 83.8% (636 HHs) in the first year, to 89.6% (519 HHs) in the second year, and 90.7% (127 HHs) in the third year. The increase from before the launch of the project to the first year (P<0.001) and from the first to the second year (P<0.01) demonstrated a significant difference, while the increase from the second to third year showed no significant difference (P>0.1).

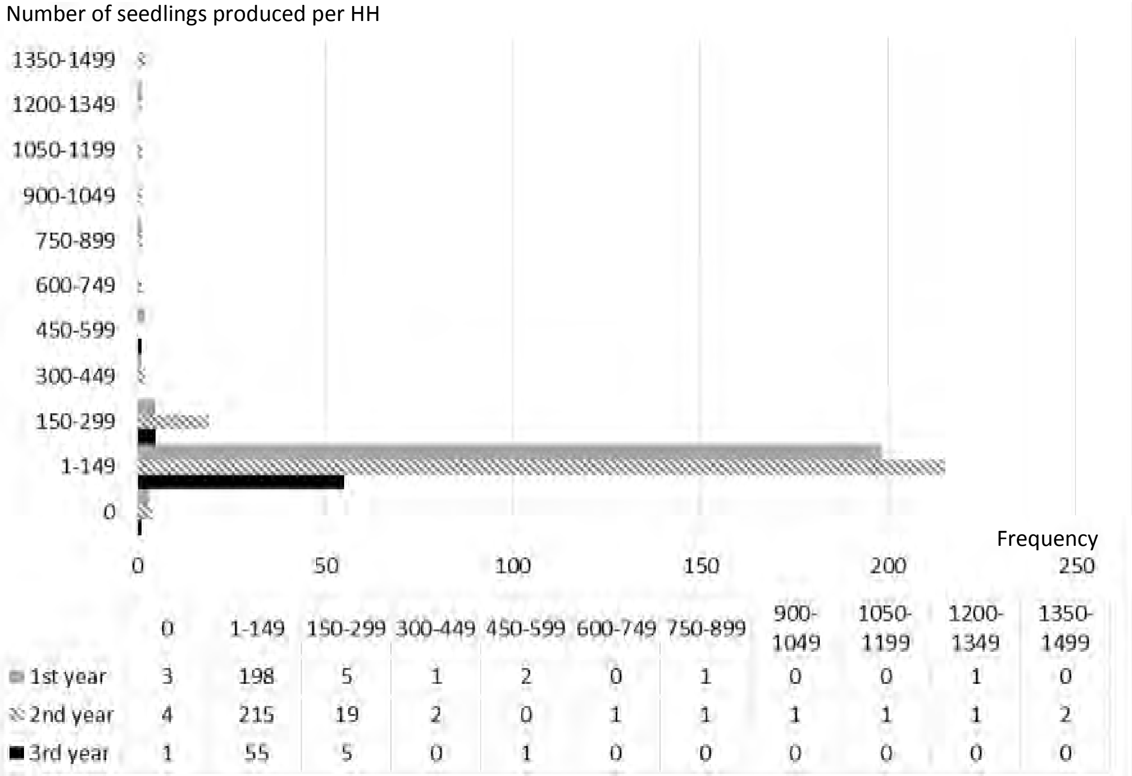
For the proportion of seedling production by unit, the group produced slightly more than 50% of the seedlings, while the units per household and by both household and group were slightly less than 20%.

Table 12: Adoption Rate of Seedling Production by Years Elapsed

	Before	1st year	2nd year	3rd year	Av. 3 years
Adoption rate	60.8%	83.8%	89.6%	90.7%	86.7%
(95% CI)	(57.3–64.3)	(81.2–86.4)	(87.2–92.1)	(85.9–95.5)	
Adoption rate by HH	24.1%	13.6%	21.2%	27.9%	17.9%
(95% CI)	(21.5–27.7)	(11.1–16.0)	(17.9–24.6)	(20.4–35.3)	
Adoption rate by group	35.5%	54.8%	48.0%	46.4%	51.4%
(95% CI)	(32.1–38.9)	(51.3–58.3)	(43.9–52.1)	(38.2–54.7)	
Adoption rate by both	0.7%	15.4%	20.4%	16.4%	17.5%
(95% CI)	(0.1–1.2)	(12.8–18.0)	(17.1–23.7)	(10.3–22.6)	

The number of seedlings produced was investigated. Within the sample of responses, 2 of the 522 responses that indicated producing more than 2,000 seedlings by household were omitted from the study, because these numbers were not consistent with other observations[7]. Similarly, 3 of the 1,020 responses that indicated producing more than 7,000 seedlings by group were omitted.

Table 6 presents a histogram showing the average number of seedlings produced per household by years elapsed. The average number of seedlings produced per household was 50 (medium: 20.0, 95% CI: 34–66) in the first year, 87 (medium: 32.5, 95% CI: 62–111) in the second year, and 62 (medium: 30.0, 95% CI: 38–85) in the third year. There is strong evidence ($P<0.05$) against the null hypothesis that the number of seedlings produced in the first year is the same as that in the second year. In addition, there is no evidence ($P>0.1$) against the null hypothesis that the number of seedlings produced in the second year is the same as that in the third year.



	0	1-149	150-299	300-449	450-599	600-749	750-899	900-1049	1050-1199	1200-1349	1350-1499
▒ 1st year	3	198	5	1	2	0	1	0	0	1	0
▨ 2nd year	4	215	19	2	0	1	1	1	1	1	2
■ 3rd year	1	55	5	0	1	0	0	0	0	0	0

Figure 6: Average Number of Seedlings Produced per Household by Years Elapsed

Figure 7 presents a histogram showing the average number of seedlings produced per group by years elapsed. The number of seedlings produced per group was 578 (medium: 200.0, 95% CI: 499–657) in the first year, 774 (medium: 300.0, 95% CI: 687–939) in the second year, and 433 (medium: 100.0, 95% CI: 255–609) in the third year. There was strong evidence ($P<0.05$) against the null hypothesis that the number of seedlings produced in the first year is the same as that in the second year, and the number in the second year is the same as that in the third year.

The questionnaire addressed the unit producing the seedlings such as a village, Limana, and group. The average proportions for the three years were 12.8% (Av. 106 HHs) for village, 38.9% (Av. 31 HHs) for

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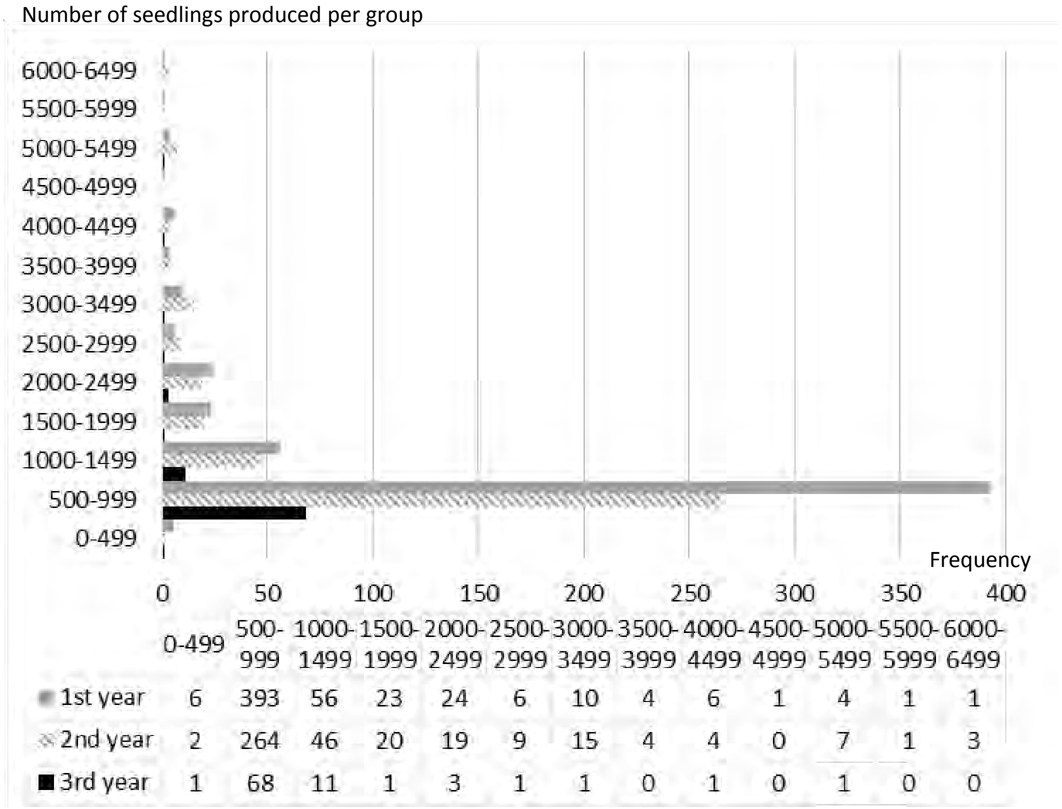
[7] The Smirnov-Grubbs test was used to test for outliers.

Limana, and 48.4% (Av. 30 HHs) for group. While the questionnaire categorizes the units into three groups, the results above indicate that the number of Limana and group households are the same. Because of the many respondents who questioned the differences between the group and Limana during the survey, it was assumed that respondents confused the Limana and group. For this reason, the number of seedlings produced was estimated under the condition that the unit for seedling production was categorized as two groups, namely the village and Limana/group in the responses.



	0-499	500-999	1000-1499	1500-1999	2000-2499	2500-2999	3000-3499	3500-3999	4000-4499	4500-4999	5000-5499	5500-5999	6000-6499
▪ 1st year	6	393	56	23	24	6	10	4	6	1	4	1	1
▨ 2nd year	2	264	46	20	19	9	15	4	4	0	7	1	3
■ 3rd year	1	68	11	1	3	1	1	0	1	0	1	0	0

Figure 7: Average Number of Seedlings Produced per Group by Years Elapsed

Table 13 estimates the number of seedlings produced by the 35,000 households in the target districts over the initial two years of intervention based on the adoption rate and number of seedlings produced. Estimating the two years of intervention is justified, because there is a significant difference in the increase in the adoption rate and number of seedlings produced from the first to second year, but no significant difference in the adoption rate and number of seedlings produced from the second to third year. The number of seedlings produced by group was estimated according to the two group categories, namely the village and Limana/group, as mentioned above.

It was estimated that the total number of seedlings produced over the two years of intervention in all target districts was approximately 2.33 million seedlings (95% CI: 1,612,781–3,142,479), and that the total number of seedlings produced per household over the two years was 67 (95% CI: 46–90).

Table 13: Estimated Number of Seedlings Produced by the 35,000 Households by Years Elapsed

		1st year	2nd year	Total
by Household	Total	439,250	1,053,570	1,492,820
	(95% CI)	(264,800–646,800)	(672,000–1,480,185)	(936,880–2,126,985)
by Village (106 HHs/group)	Total (95% CI)	14,853 (12,148–17,799)	18,581 (14,812–22,706)	33,434 (26,960–40,505)
by Limana/ by group (30 HHs/group)	Total (95% CI)	357,515 (292,406–428,437)	447,252 (356,535–546,552)	804,767 (648,941–974,989)
Total	Total	811,618	1,519,403	2,331,021
	(95% CI)	(568,734–1,093,036)	(1,044,047–2,049,443)	(1,612,781–3,142,479)

2) Adoption of tree planting

The adoption rate of tree planting exceeded 80% in the first year, approximately 60% by household and 40–50% by group. A statistical comparison indicates a significant difference only in the increase from before the project was launched to the first year.

Regarding tree planting by household, more than 80% of respondents planted the seedlings in a garden or homestead, meaning that fewer respondents planted on a woodlot or riverbank.

For tree planting by group, 50–60% of households planted the seedlings on a woodlot, riverbank, or mountain area, and approximately 40% of these households shared the seedlings grown by the group and planted them by household. When households planted by group or with village members, more than 70% planted the seedlings on a woodlot.

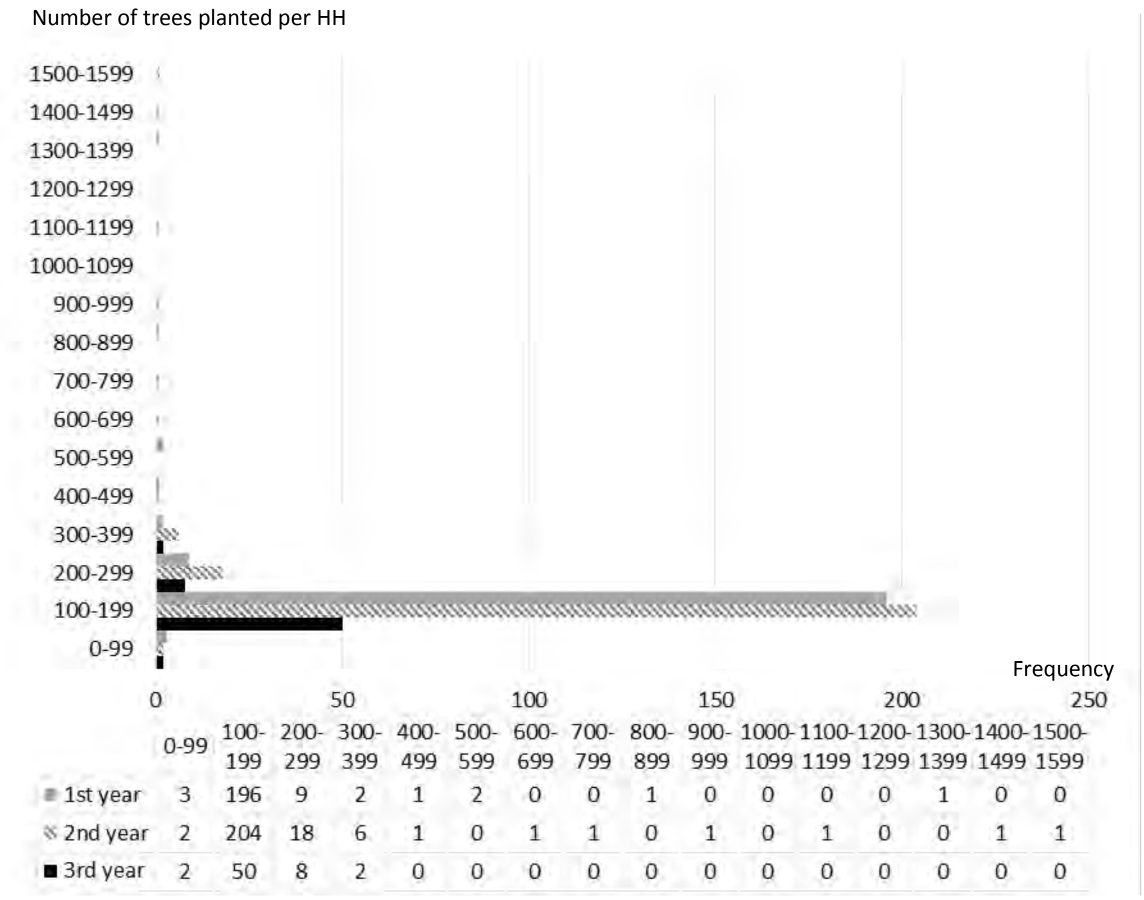
Table 14 shows the rate of tree planting by years elapsed. Before the project, the adoption rate was 65.2% (495 HHs). During the project intervention, the adoption rate of tree planting by household in the first year was 63.2% (480 HHs), 68.7% (398 HHs) in the second year, and 64.3% (90 HHs) in the third year. On the other hand, the adoption rate by group in the first year was 48.2% (366 HHs), 50.4% (292 HHs) in the second year, and 45.7% (64 HHs) in the third year. The sum of the adoption rates by household and by group is not equivalent to 100%, because several households planted the trees through both units, namely by household and by group. The increase demonstrates a significant difference from before the project to the first year (P<0.001), while variations from the first to second year and from the second to third year show no significant difference. At the same time, no significant differences were found between the adoption rate of tree planting by households and by group from the first to third year.

Table 14: Adoption Rate of Tree Planting by Years Elapsed

	Before	1st year	2nd year	3rd year
Adoption rate	65.2%	84.6%	88.3%	87.9%
(95% CI)	(61.8–68.6)	(82.0–87.2)	(85.6–90.9)	(82.4–93.3)
Adoption rate by HH	N.A	63.2%	68.7%	64.3%
(95% CI)		(59.8–66.7)	(65.0–72.5)	(56.3–72.2)
Adoption rate by group	N.A	48.2%	50.4%	45.7%
(95% CI)		(44.7–51.8)	(46.4–54.5)	(37.5–54.0)

Households that planted trees were targeted to determine the number of trees planted. Within the sample of responses, 1 who planted more than 2,000 trees by household was omitted from the study, as the number was not consistent with other observations.

Figure 8 presents a histogram showing the average number of trees planted per household by years elapsed. The average number of trees planted per household was 50 (medium: 20.0, 95% CI: 34–65) in the first year, 77 (medium: 30.0, 95% CI: 54–98) in the second year, and 34 (medium: 20.0, 95% CI: 34–65) in the third year. There is no evidence against the null hypothesis that the number of seedlings produced in the first year is the same as that in the second year, and the second year is the same as the third year (P>0.1).



	0-99	100-199	200-299	300-399	400-499	500-599	600-699	700-799	800-899	900-999	1000-1099	1100-1199	1200-1299	1300-1399	1400-1499	1500-1599
▨ 1st year	3	196	9	2	1	2	0	0	1	0	0	0	0	1	0	0
▧ 2nd year	2	204	18	6	1	0	1	1	0	1	0	1	0	0	1	1
■ 3rd year	2	50	8	2	0	0	0	0	0	0	0	0	0	0	0	0

Figure 8: Average Number of Trees Planted per Household by Years Elapsed

Table 15 shows the areas in which trees were planted per household and the number of trees planted by years elapsed. There is no significant difference for the area planted by elapsed years. The proportion of trees planted on a homestead gradually decreased. Averaged over the three years, the areas planted in descending order (from most planted to least planted) were the “garden” (53.2%: 602 HHs), “homestead” (32.9%: 375 HHs), “woodlot” (8.2%: 93 HHs), and “riverbank” (5.8%: 66 HHs).

Table 15: Planted Areas per Household by Years Elapsed

		1st year	2nd year	3rd year	Av. 3 years
Garden		52.7%	51.6%	63.0%	53.2%
	Av. number	23	45	39	34
Homestead		35.1%	31.9%	25.9%	32.9%
	Av. number	24	33	27	28
Woodlot		7.7%	9.4%	4.6%	8.2%
	Av. number	80	63	44	70
Riverbank		4.5%	7.1%	6.5%	5.8%
	Av. number	28	59	12	42

Households that produced the seedlings by group were targeted to determine the use of the seedlings. On average over the three years, 72.1% (722 HHs) planted the trees by group, 56.9 % (570 HHs) shared the seedlings among group members, and 0.3% (3 HHs) sold the seedlings (see Table 16). There was no significant difference from the first to second year and from the second to third year.

As reference, the proportion of respondents who planted the trees by group and shared the seedlings by group in the first year was 27.1%, 32.5% in the second year, and 28.6% in the third year.

Households who planted trees by group were targeted to determine through the years elapsed the average number of trees planted by group. The number of trees planted by group in the first year was 554 (medium: 200.0, 95% CI: 485–622), 725 (medium: 270.0, 95% CI: 624–825) in the second year, and 413 (medium: 100.0, 95% CI: 160–562) in the third year. The average number of trees planted by group in the three years was 611.

There is strong evidence (P<0.01) against the null hypothesis that the number of seedlings produced in the first year is the same as that in the second year, and the number in the second year is the same as that in the third year. As mentioned on page 17, no significant differences were found from the first to second year and from the second to third year. The number of trees planted by group increased from the first to second year (P<0.01), but decreased from the second to third year (P<0.01).

Table 16: Use of Seedlings Produced by Group by Years Elapsed

		1st year	2nd year	3rd year	Av. 3 years
Planting by group		69.7%	75.8%	75.3%	72.1%
	(95% CI)	(66.1–84.5)	(71.6–80.1)	(65.8–73.6)	
	Av. number	554	725	413	611
	(95% CI)	(485–622)	(624–825)	(160–562)	
Shared by group members		58.9%	56.4%	51.8%	56.9%
	Av. number	338	438	231	368
Sold		0.4%	0.3%	0.0%	0.3%
	Av. number	460	1,900	0	940

Table 17 shows the places where the trees were planted by group and the number of trees planted by elapsed years. There was no significant difference in the number of the planted areas by elapsed years. With regard to the planted areas during the average of the three years, the following was observed; “Woodlot” (70.5%: 555 HHs), “River bank” (19.3%: 152 HHs), “Mountain” (8.2%: 60 HHs) and “Others (including Garden, Borehole, Homestead and Cemetery)” (2.5%: 20 HHs).

Table 17: Planted Area by Group by Years Elapsed

		1st year	2nd year	3rd year	Av. 3 years
Woodlot		72.6%	67.6%	72.5%	70.5%
	Av. number	494	572	344	512
	(95% CI)	(414–573)	(477–667)	(186–500)	
River bank		18.9%	20.2%	17.4%	19.3%
	Av. number	519	872	427	665
	(95% CI)	(474–564)	(804–940)	(361–491)	
Mountain		7.2%	8.3%	7.2%	7.6%
	Av. number	660	922	1,047	810
Others		1.3%	4.0%	2.9%	1.3%

Table 18 makes an estimate of the number of trees planted by the 35,000 households in the target districts over the initial two years of the intervention of the adoption rate and the number of trees planted. The justification to estimate by the two year interaction was as follows: with regard to adaptation by household, there was no significant difference in the increase of the adoption rate from the second year to the third year and the average number of trees planted peaked during the second year and during the three years of the intervention. Moreover, concerning adoption by group, there were no significant differences in the adoption rate of tree planting during the three years and the number of trees planted peaked during the second year as was also the case with the number of trees planted by household.

It is estimated that the total number of trees planted over the two years of the intervention in the entire target district was approximately 3.62 million trees (95% CI: 2,476,185–4,821,877); 2.95 million trees by household and 0.67 million trees by group. The total number of trees planted per household over the two years was 84 (95% CI: 55–114) and the number by group was 19 (95% CI: 15–23). With regard to the total number of trees planted in the planted area, the following was observed; “Garden” 0.825 million, “Woodlot” 0.76 million, “Homestead” 0.415 million, “River bank” 0.23 million and “Mountain” 0.052 million.

Table 18: Estimated Number of Trees Planted by the 35,000 Households by Years Elapsed

		1st year	2nd year	Total
Number by HH	(Total)	1,109,087	1,840,508	2,949,595
	(95% CI)	(711,620–1,517,425)	(1,228,500–2,486,750)	(1,940,120–4,004,175)
	(Total)	283,059	387,284	643,605
Number by group	(95% CI)	(220,387–327,631)	(294,296–457,455)	(514,683–785,086)
【Number of trees planted by HH in the planted area】				
Garden		272,113	553,502	825,615
Homestead		178,118	238,430	416,548
Woodlot		143,576	150,366	293,942
River bank		23,307	75,741	99,048
【Number of trees planted by group by planted area】				
Woodlot		205,598	261,742	467,340
River bank		53,571	78,167	131,739
Mountain		20,270	31,978	52,248

3) Adoption of direct sowing and natural regeneration

Table 19 shows that 30-40% of the respondents who produced the seedlings practiced direct sowing and 40-50% practiced natural regeneration. The adoption rate edged upwards.

Table 19: Adoption Rate of Direct Sowing and Natural Regeneration by Years Elapsed

	1st year	2nd year	3rd year
【by household】			
Direct sowing	31.3%	39.9%	46.0%
Natural regeneration	45.7%	57.1%	56.5%
【by group】			
Direct sowing (communal land)	27.0%	29.4%	31.1%
Direct sowing (others)	0.2%	0.8%	0.0%
Natural regeneration	34.6%	41.7%	40.0%

4) Reasons for not adopting the techniques

Before the project intervention, the main reason given for not producing the seedlings was “Didn’t know the techniques” (more than 70%). After the project intervention, “Absence,” “Too busy,” “Didn’t have the materials (including seeds and pots)” were cited as the main reasons and “Didn’t know the techniques” was not recorded. From these results, it may be presumed that the training courses held by the LF transfers sufficiently increased the knowledge and the techniques of the fellow farmers in the practices of growing trees.

Table 9 presents the reasons for not producing seedlings prior to the project. The most frequently cited reason was “Didn’t know the techniques” (70.2%: 228 HHs), followed by “Not interested” (14.2%: 46 HHs), “Don't know the importance” (6.8%: 22 HHs), “No motivation” (1.5%: 5 HHs) and “Have natural trees” (0.9%: 3 HHs).

After the project intervention, the most frequently cited reason given were “Absence” (22.7%: 46 HHs), “Too busy” (19.2%: 39 HHs), “Not interested” (17.2%: 35 HHs), and “Didn’t have the materials” (11.3%: 23 HHs). The major dissenting reasons were “Not a member” and “Not selected,” which were 1.5% (3 HHs). These reasons go against the main principle of the COVAMS approach of being "Open to everyone."[8] In the training for the LF, the trainer should convey the principle carefully.

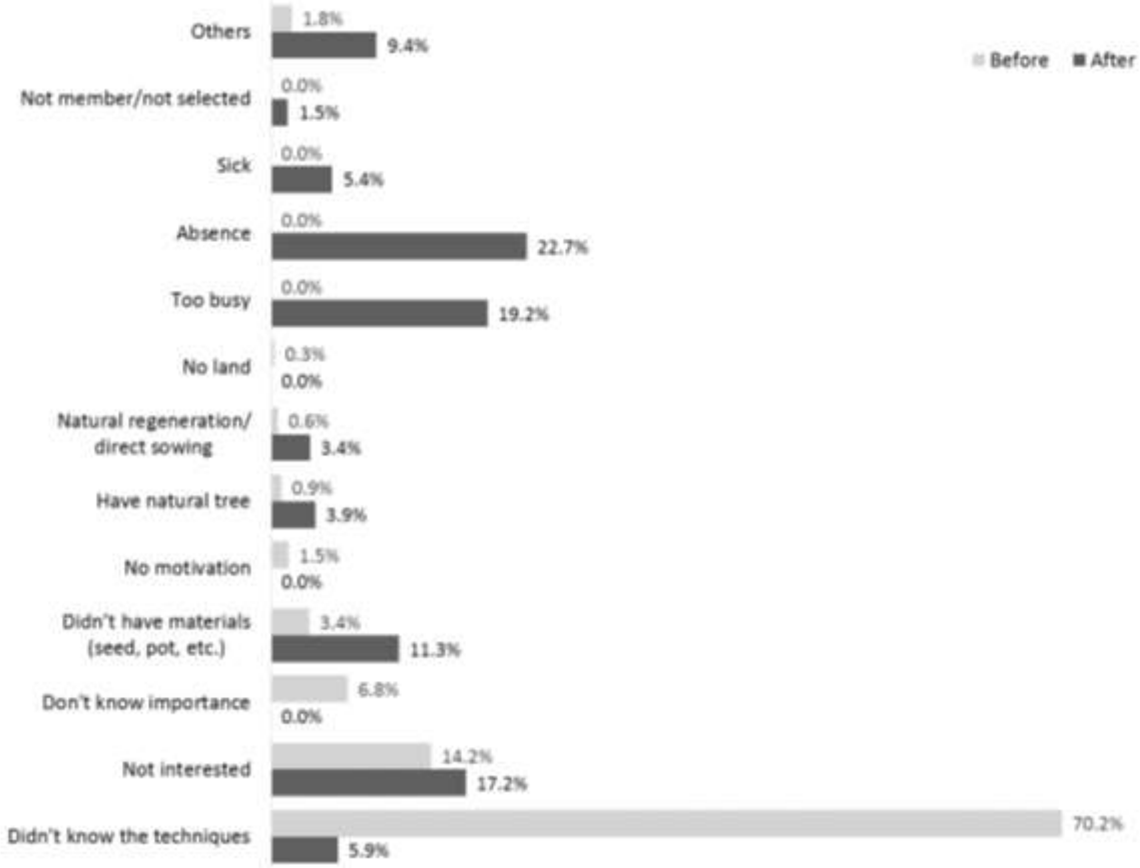


Figure 9: Reasons for Not Producing Seedlings

Table 10 presents the reasons for not planting trees before the project. The most frequently cited reason was "Didn't know the techniques" (76.0%: 215 HHs), followed by "Not interested" (13.4%: 38 HHs), "Don't know the importance" (5.7%: 16 HHs), "No motivation" (1.8%: 5 HHs), and "Have natural trees" (1.4%: 4 HHs).

After the project intervention, the most frequently cited reasons given were "No seedlings" (25.3%: 72 HHs), "Seedlings died" and "The seedlings were not shared by the group" (24.9%: 53 HHs), "Too busy" (18.3%: 39 HHs), and "Absence" (13.6%: 29 HHs).

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[8] The five principles of the COVAMS approach are "Meet the inhabitants' needs," "Use local instructors and resources," "Take place within a village," "Open to everyone" and "Can be repeated in order to encourage many inhabitants to participate."

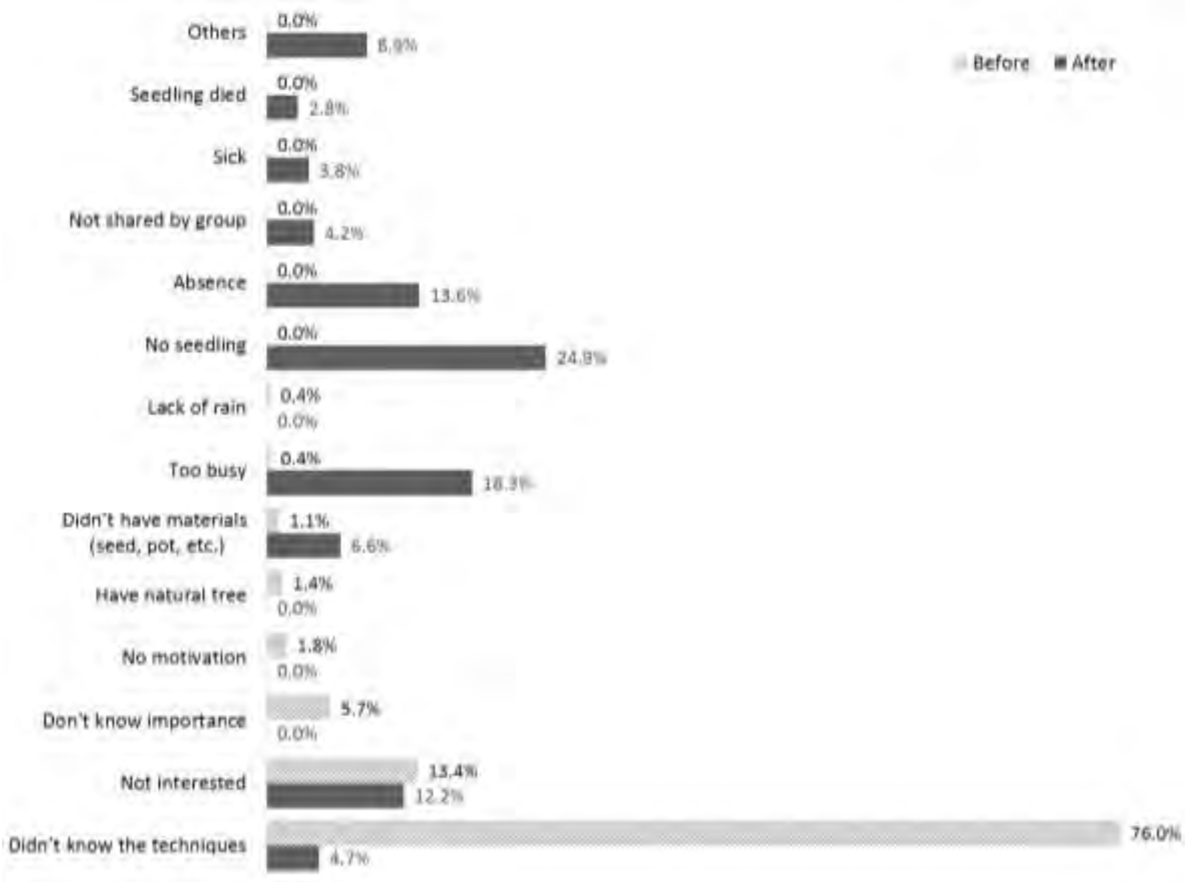

Figure 10: Reasons for Not Planting Trees

5) Information source on tree growing techniques

The households who produced seedlings and/or planted trees were the targets for the study of the information sources, in other words the sources for learning the techniques. As shown in Figure 11, the most prominent sources given were “COVAMS LF” (55.6%: 689 HHs), “CCO” (19.6%: 243 HHs), and “Village head/ Group village head” (5.6%: 69 HHs). It was found that the respondents were aware of the COVAMS LF as an information source for inhabitants.

The questionnaire was designed to study if a supplemental channel existed among farmers aside from the training courses and the sensitization activities conducted by the LF and SLF. Moreover, it was designed to determine if it would be possible to accelerate the extension of the tree growing techniques. However, no additional channels were discovered.

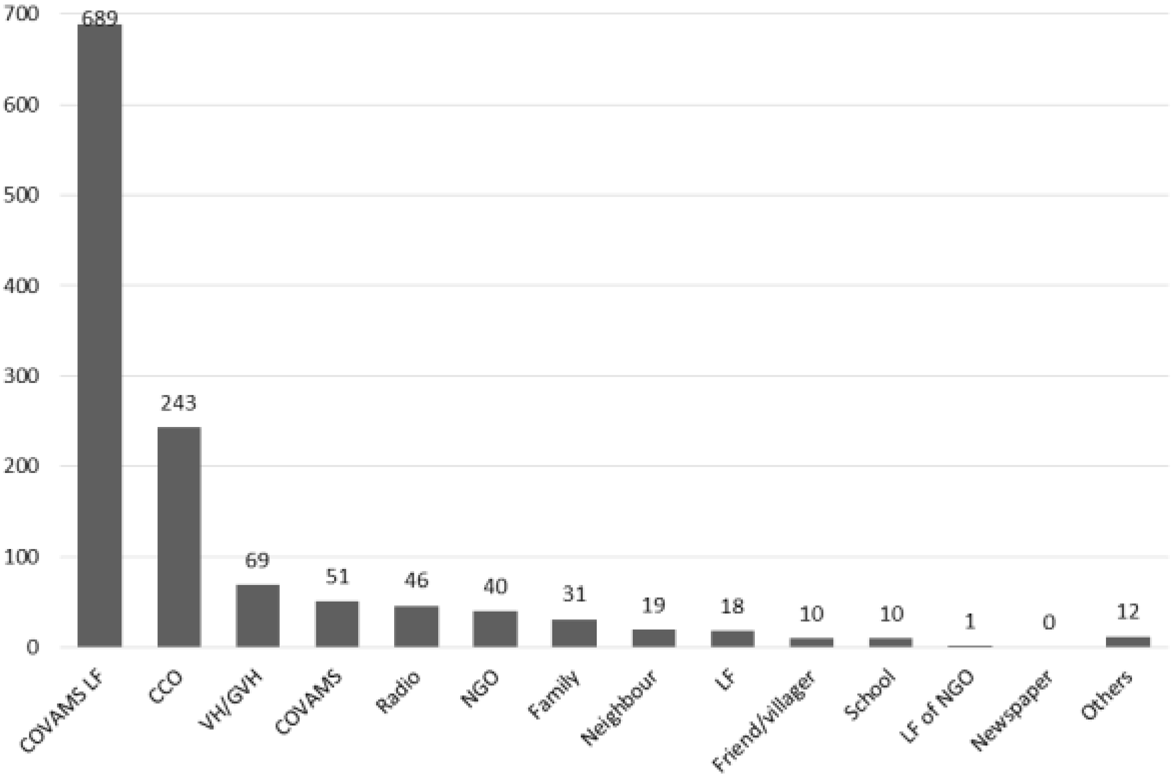

Figure 11: Information Sources of the Households That Practiced Tree Growing

（2） Adoption of soil conservation techniques

1) Adoption of contour farming

More than 90% of households practiced one or more of the four techniques (mentioned below) used for contour farming by the second year of the project intervention. In the third year, more than 95% of households practiced one or more of the techniques. It was found that the adoption rate increased markedly as a result of project intervention because about 25% of households practiced the techniques prior to the project.

With regard to the adoption rates of the four techniques, namely contour ridging, box ridges, swale, and hedge row, the adoption rates are as follows in descending order: box ridges 29.6%, contour ridging 28.1%, swale 24.6% and hedge row 17.7%. To increase the adoption of the techniques year after year, the households tended to increase the area and/or the number of the techniques practiced gradually.

Table 20 shows the tendency of the adoption rate for the soil conservation techniques and the adoption rate excluding the respondents who made a contour ridge with a ridge width of more than 90 cm by elapsed years. The households who were targeted for the study area practiced the techniques of contour farming with a ridge width of less than 80 cm, 85 cm and 90 cm. The widths of the contour ridging on the questionnaire were divided into three groups based on the level of understanding in regards to contour farming. The adoption rate excluding the respondents who made a ridge with more than a 90 cm width was analyzed because it was surmised that LF did not teach the techniques to fellow farmers properly and/or the farmer did not understand the technique completely. Although the MOAIWD endorses contour farming with a 75 cm ridge width, the project tolerated up to an 85 cm ridge width in consideration of several problems faced by the landowners and leaseholders[9] and because of the cost increases of agricultural materials including chemical fertilizers and seeds. It was surmised that the technical guide of the LF to the farmers was not appropriate and/or the understanding of the farmers was poor because the 90 cm width is the same as the width used in traditional farming. Thus, this report regards the adoption rate of soil conservation as the rate excluding the respondents whose answers were the 90 cm ridge width.

The adoption rate excluding the respondents whose answers were more than a 90 cm ridge width was 25.0% prior to the project intervention. Then, as shown in Table 20, the rate increased slightly: 82.8% (95% CI: 80.0–85.4) in the first year, 92.4% (95% CI: 90.5–94.3) in the second year, and 96.4% (95% CI: 95.1–97.7) in the third year. The increase showed a significant difference from the first year to the second year (P<0.001) and from the second year to the third year (P<0.05).

Table 20: Adoption Rate of Soil Conservation Techniques by Years Elapsed

	Before	1st year	2nd year	3rd year
Respondents (Total respondents)	190 (760)	680 (765)	564 (580)	138 (140)
Adoption rate	25.0%	88.9%	97.2%	98.6%
(95% CI)	(21.9–28.1)	(86.6–91.0)	(95.9–98.6)	(96.6–100.5)
Adoption rate minus the respondents whose answers were more than a 90 cm ridge width				
Respondents (Total respondents)	120 (760)	633 (765)	536 (580)	135 (140)
Adoption rate	15.8%	82.8%	92.4%	96.4%
(95% CI)	(13.2–18.4)	(80.0–85.4)	(90.5–94.3)	(95.1–97.7)

Figure 12 presents the adoption rate with differences in ridge width by elapsed years. The households who practiced contour farming with an 80 cm ridge width scored 60.3% (95% CI: 13.2–18.4) before the project. The adoption rate increased year after year and it was 95.7% (95% CI: 92.2–99.1) in the third year. On the other hand, the households who practiced contour farming with a ridge width greater than 90 cm scored 37.0% (95% CI: 30.2–43.9). The adoption rate decreased year after year, and it was 2.2% (95% CI: -0.3–4.6) in the third year.

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[9] There are several reasons why the recognition of the techniques did not lead to their practice. For instance, there is an incentive to make a wider ridge in order to broaden the cultivating area because land ownership for non-cultivated areas is not authorized; the farmer who is a sharecropper does not know if he/she can change the ridge width without asking a landowner.

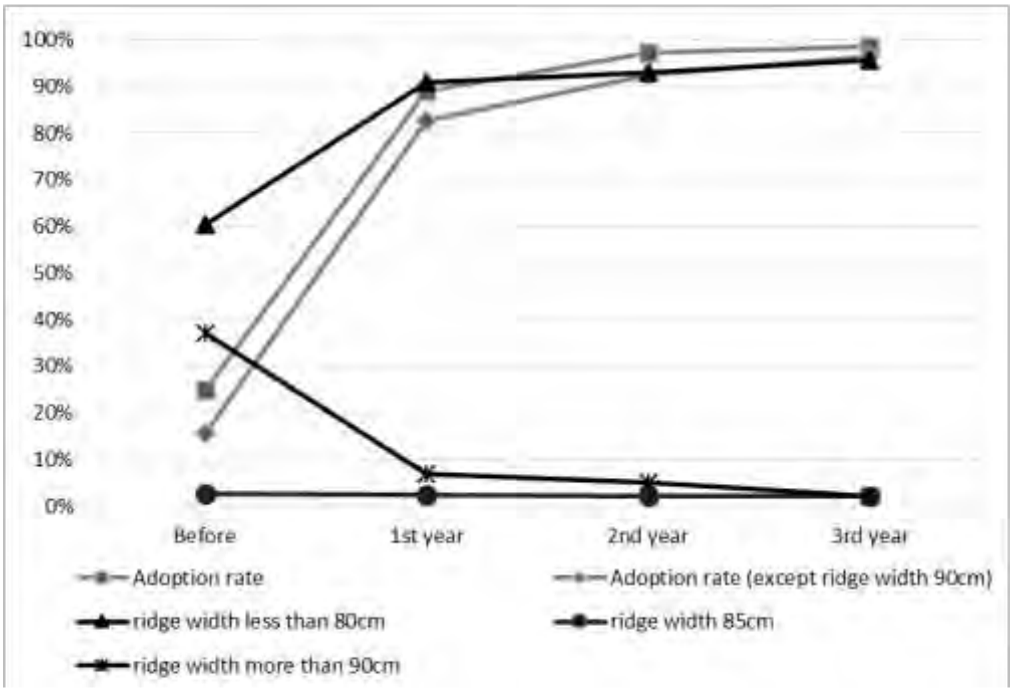

Figure 12: Adoption Rate of Soil Conservation Techniques and Contour Farming by Ridge Width by Years Elapsed

There were no statistically significant differences in the area from 0.8 acre[10] to 1.2 acres (3,238–4,856m^2) for cultivation with contour farming and of the tendency by elapsed years.

The techniques adopted for the practice of contour farming were studied. There are four techniques: contour ridging, box ridges, swale, and hedge row.

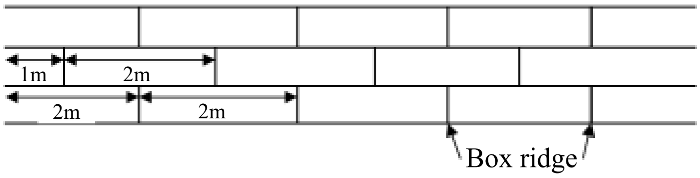

Figure 13: Making Box Ridges

Figure 13 shows a design for box ridges which make walls between the planting ridges with a space of 2 meters each. The height of the walls is nearly equal with the one of ridges. The box ridges restrict soil erosion caused by rainfall because the surface soil that runs out on the contour (along the ridges) is kept in the ridges. Moreover, rain is absorbed slowly by the plants because the water is kept within the ridges.

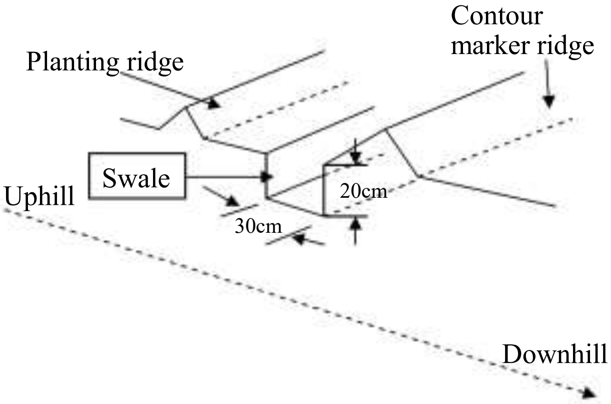

Figure 14: Swale Construction

Figure 14 presents a design referred to as a swale, which is made with spaces of about 3.3 meters each. A swale should be constructed along

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[10] One acre measures 4,046.9m^2.

the contour marker ridges such as with Vetiver grass with a depth of 20 to 30 cm and 40 cm and 60 cm in width. The swale restricts soil erosion in the vertical direction (with an inclination slope) caused by rainfall.

Table 21 shows the adoption rate of the techniques used for soil conservation over the average of the three years. In descending order, box ridges scored 29.6%, contour ridging 28.1%, swale 24.6% and hedge row 17.7%.

The project did not provide the plants for the hedge row (for contour marker ridges) such as Vetiver grass, but the district agriculture department distributes them upon request by the farmers. It is presumed that the adoption rate of this technique was lower than the ones of the others because the farmers needed to procure the materials more voluntarily than was the case with the others.

With regard to the number of the techniques adopted, it is difficult for farmers to practice all the four techniques in one season because of time and labor limitations. It is recommended that the number of the techniques practiced increase year after year. In addition, it is clear that the farmers increase the number of techniques gradually (Figure 15).

Table 21: Adoption Rate of the Four Techniques for Contour Farming by Years Elapsed

Technique		Before	1st year	2nd year	3rd year	Av. 3 years
Contour ridging	Respondents	129	582	483	127	1,192
	Rate	34.6%	28.3%	27.7%	28.6%	28.09%
Box ridges	Respondents	125	625	513	118	1,257
	Rate	33.5%	30.4%	29.4%	26.6%	29.62%
Swale	Respondents	51	496	432	114	1,042
	Rate	13.7%	24.1%	24.8%	25.7%	24.55%
Hedge row	Respondents	68	354	314	85	753
	Rate	18.2%	17.2%	18.0%	19.1%	17.74%

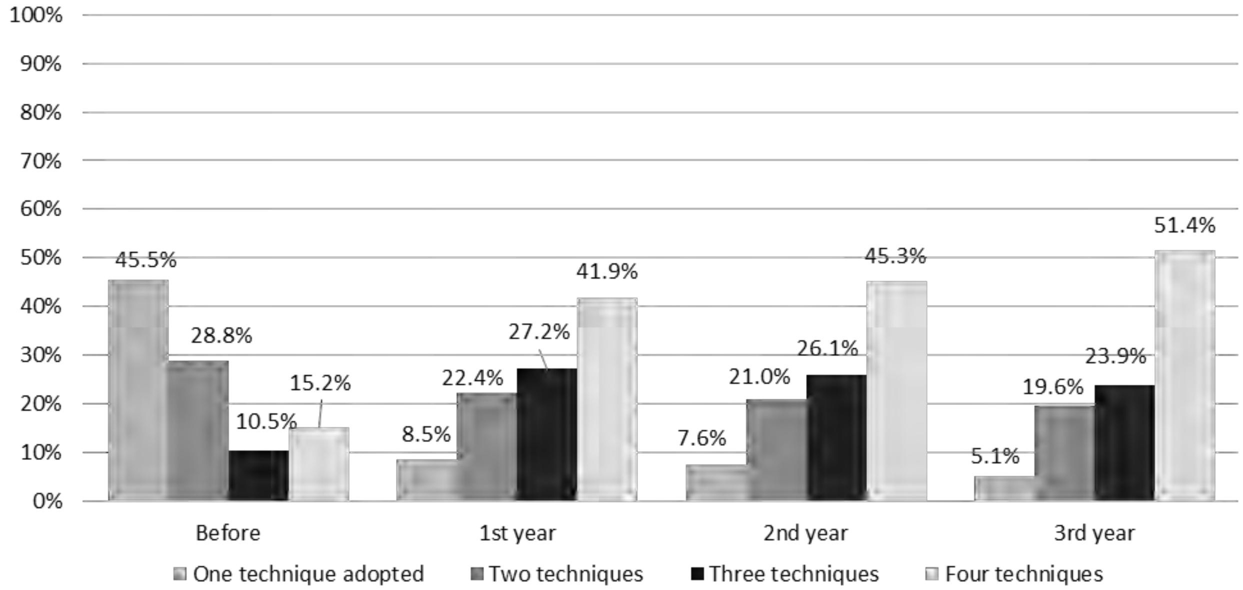

Figure 15: Number of Techniques Adopted by Years Elapsed

Table 22 shows an estimate of the area where contour farming was adopted by the 35,000 households that comprised the entire target district with regard to the adoption rate and the area in which the techniques were adopted. The adoption rate and the adoption area were calculated using the total area which had ridge widths less than 85 cm. The total area estimated in the first year was 26 thousand acres, the area accumulated over the first two years was 54 thousand acres, and the area accumulated over three years was 86 thousand acres. The adoption area per one household was 0.8 acre/HH during the first year, 1.5 acres/HH in the second year, and 2.5 acres in the third year.

Table 22: Area of Contour Farming by Years Elapsed

		1st year	2nd year	3rd year
Total		26,357 acres	27,891 acres	32,210 acres
	(95% CI)	(25,432–27,282)	(26,916–28,866)	(30,289–34,132)
Accumulation			54,248 acres	86,458 acres
	(95% CI)		(52,348–56,148)	(82,637–90,280)
Area adopted per HH		0.8 acres/HH	1.5 acres/HH	2.5 acres/HH
	(95% CI)	(0.7–0.8)	(1.5–1.6)	(2.4–2.6)

2) Application of manure

The households that practiced soil conservation were targeted for the study of the application of manure by elapsed years.

Over the average of the three years of the project intervention, the respondents who applied manure accounted for 88.8% (1,320 HHs) and the adoption area was 0.71 acre/HH (median: 0.5). There was no significant difference in the average area of manure adopted per household between the time before and after the project intervention: before the project, the average size of the adoption area was 0.78 acre/HH (median: 0.5) with 20.1% (153 HHs) of the participants applying manure.

Table 23 shows the proportion of households who applied manure by elapsed years. As mentioned above, there was no significant difference in the average area of manure adopted per household between the time before and after the project intervention. However, the adoption rate increased dramatically after the project intervention. The increases before the project to the first year and from the first year to the second year show a strong significant difference (P<0.001) while the decrease from the second to third year shows no significant difference (P>0.1).

Table 23: Adoption Rate of Manure Application by Years Elapsed

	Before the project	1st year	2nd year	3rd year	Av. 3years
Adoption rate	20.1%	84.1%	94.5%	94.3%	95.0%
（95% CI）	(17.3–23.0)	(81.5–86.7)	(92.8–96.5)	(90.4–98.1)	

3) Information source on soil conservation techniques

The households that practiced soil conservation were targeted for the study on the information source related to soil conservation techniques. As was the case with tree growing, the most prominent sources were “COVAMS LF” (68.2%: 692 HHs) and “CCO” (16.8%: 170 HHs). Next, “COVAMS” was 5.3% (54 HHs) and "Radio" was 2.1% (21 HHs). In tree growing, "Village head/ Group village head" measured 5.6% (69 HHs) of tree growing, while the source amounted to 2.1% (3 HHs) in soil conservation. In the same way as afforestation techniques, it was found that the COVAMS LF was used fully as the information source for the population.

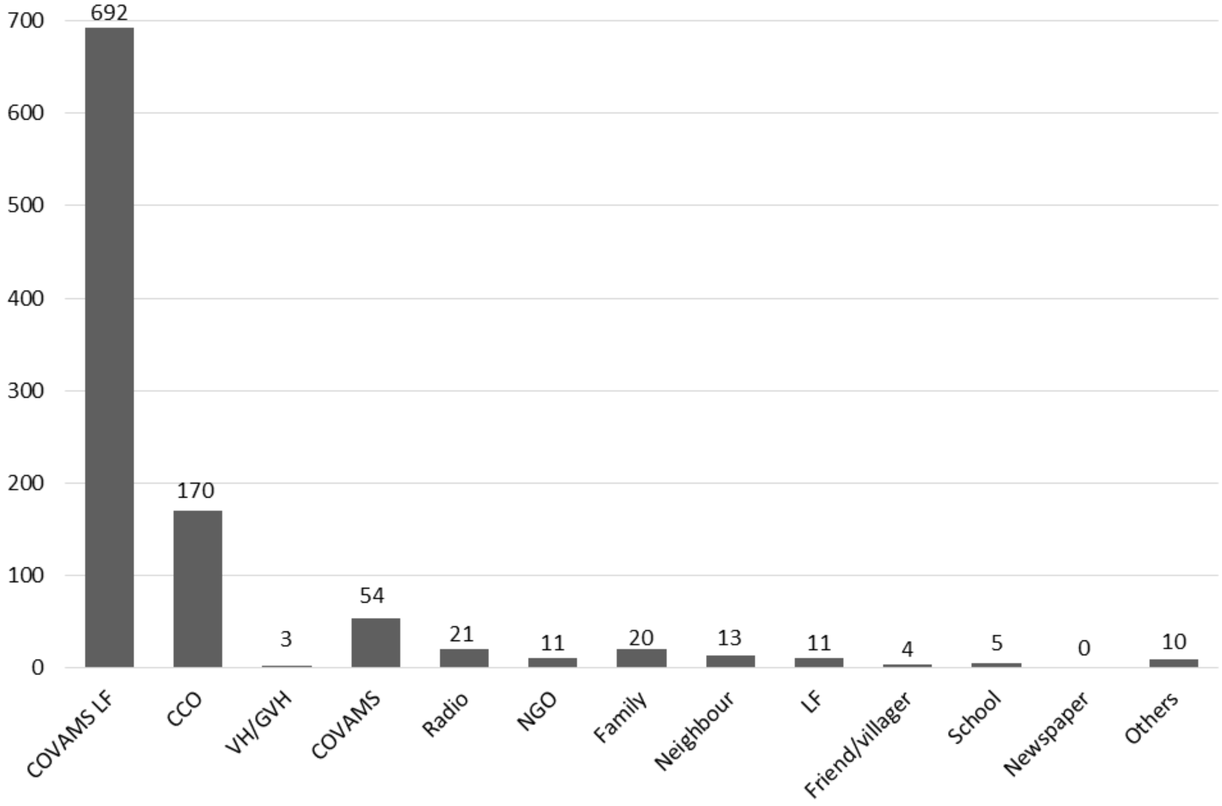

Figure 16: Information Sources of Households That Practice Soil Conservation

4) Benefits of soil conservation

The households that practice soil conservation were targeted for the study on the benefits that the respondents obtained by practicing soil conservation techniques. Through a questionnaire that allowed the respondents to choose more than one answer to each question, a total of 1,039 responses were collected.

In Figure 17, the two bar charts on the extreme left show an increase in yield and the prevention of soil erosion, while the darker shade of the same color on the charts presents the order of "drastically," "to some extent," and "a little." The most prominent respondent was "Increased the yield" (41.5%: 548 HHs), followed by "Conserve the moisture" (26.8%: 354 HHs), "Stopped soil erosion" (21.4%: 282 HHs), and "Restore soil fertility" (8.9%: 118 HHs).

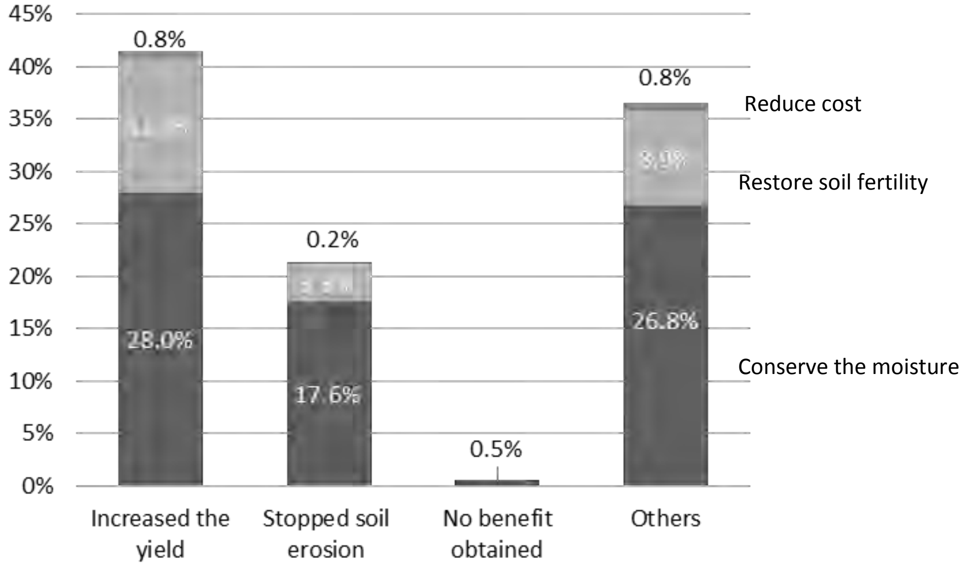

Figure 17: Benefits of Soil Conservation

（3） Adoption of gully control techniques

1) Adoption of check dam construction

The project introduced techniques for constructing small-scale check dams for gully control using readily available materials including stones and timber.

Table 24 presents the tendency towards the adoption rate for check dam construction by elapsed years. The adoption rate before the project intervention scored 8.9%, 69.1% in the first year, 69.0% in the second year, and 72.1% in the third year. As is the case with the other techniques, the increase from before the project to the first year shows a significant difference (P<0.001) while there is no significant difference in the adoption rate from the first to second year and from the second to third year (P>0.1). There is no evidence against the null hypothesis that the number of check dams constructed will vary year after year.

Table 24: Adoption Rate of Check Dam Construction by Years Elapsed

	Before	1st year	2nd year	3rd year
Adoption rate	8.9%	69.1%	69.0%	72.1%
(95% CI)	(6.8–10.8)	(65.8–72.4)	(65.2–72.7)	(64.7–79.6)

The average number of dams during the three years was 5.2 (median: 4.0, 95% CI: 4.9–5.5) and the total number of check dams constructed during the three years of the project intervention was 5,322 made by 556 targeted households.

Table 25 shows an estimation of the number of check dams constructed by the 35,000 households in the entire target district on the basis of the adoption rate and the average number of the dams per household.

The number estimated in the first year was 125.6 thousand, the number accumulated in the second year was 251 thousand, and 382.6 thousand in the third year. The number of check dams per household was 3.6/HH in the first year, 7.2/HH in the second year, and 10.9/HH in the third year.

Table 25: Area of Check Dam Construction by Years Elapsed

		1st year	2nd year	3rd year
Total		125,648	125,442	131,221
	(95% CI)	(119,672–131,625)	(118,594–132,290)	(117,714–144,729)
Cumulative total		-	251,090	382,311
	(95% CI)	-	(238,266–263,915)	(355,980–408,644)
Area adopted per HH		3.6/HHs	7.2/HHs	10.9/HHs
	(95% CI)	(3.4–3.8)	(6.8–7.5)	(10.2–11.7)

2) Reasons for not adopting gully control techniques

Figure 18 presents the reasons cited for not constructing check dams before the project. The most prominent reason was "Didn't know the techniques" (97.6%: 228 HHs). The proportion of the reason above gradually decreased year after year from 20.8% (50 HHs) in the first year of the intervention to 6.3% (15 HHs) in the second year, and down to 4.7% (2 HHs) in the third year. On the other hand, the proportion of the reasons "No gully to be rehabilitated" and "Still not urgent" increased year after year. In the responses in "Others," "Maintain the previous ones" accounted for 37.7%.

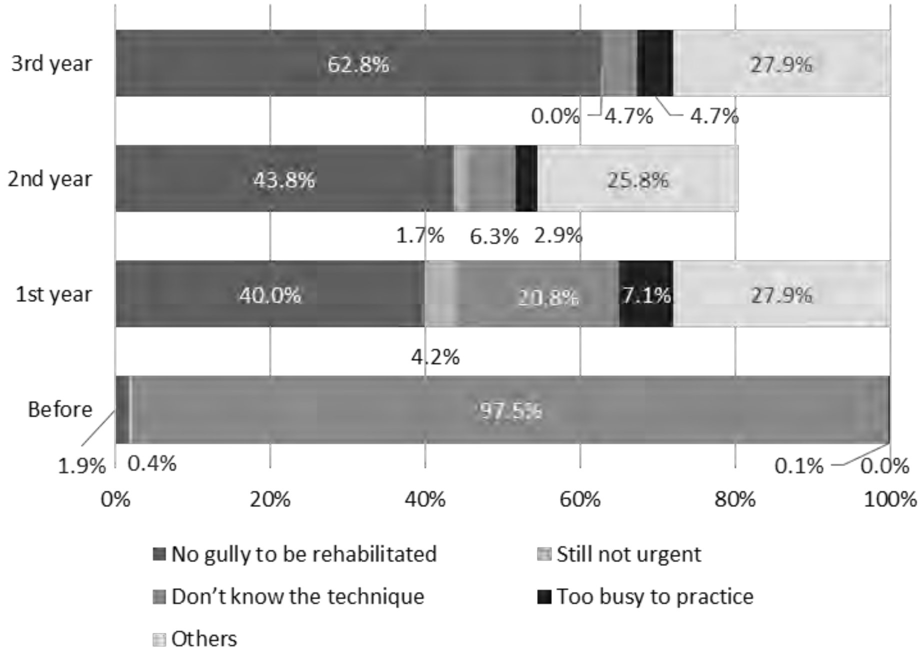

Figure 18: Reasons for Not Constructing the Check Dams by Years Elapsed

3) Information source on gully control techniques

The households that constructed the check dams were targeted for the study on the information sources for gully control techniques. The most prominent source given was "COVAMS LF" (80.4%: 621 HHs) as was shown in the cases of tree growing and soil conservation, followed by “CCO” (8.9%: 67 HHs) and “COVAMS” (6.4%: 49 HHs). The number of respondents who answered “LF” as information source was higher than in the other techniques of tree growing and soil conservation. The COVAMS LFs were fully used as a source of information for the inhabitants.

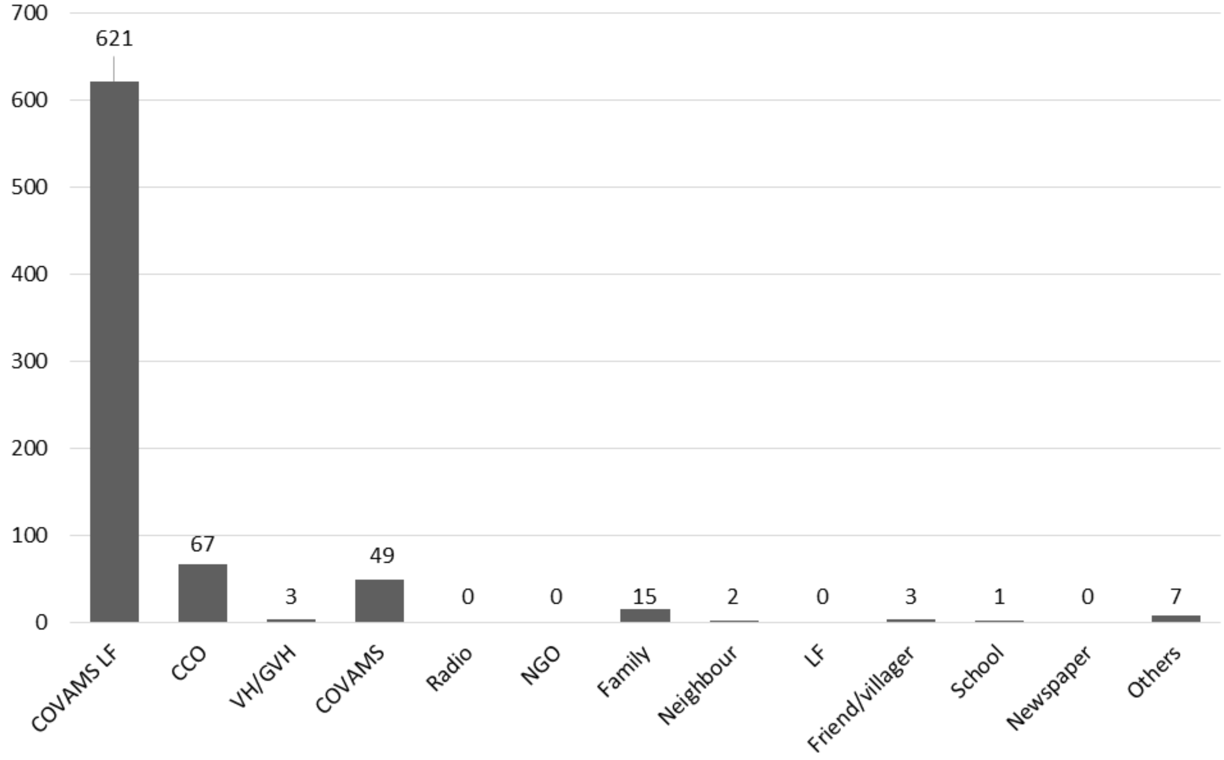

Figure 19: Information Sources of Households That Practice Gully Control

4) Benefits of gully control

The households that practiced gully control techniques were targeted for the study on the benefits that the respondent obtained by the construction of check dams. Through a questionnaire that allowed the respondents to choose more than one answer to each question, a total of 1,110 responses were collected as shown in Figure 20.

In Figure 20, the two bar charts on the extreme left show the prevention of soil erosion and the increase in yield while the darker shade of the same color on the charts represents the order of factors described as “drastically,” “to some extent,” and “a little.” The most prominent response was “Stopped soil erosion” (48.0%: 533 HHs), followed by “Land recreation” (19.5%: 216 HHs). In “Others,” “Reduces speed of running water” accounted for 9.8% (109 HHs), “Increased the yield” 9.2% (101 HHs), “Conserve/maintain fertility” 7.8% (87 HHs), and “Conserves moisture” 5.0% (55 HHs).

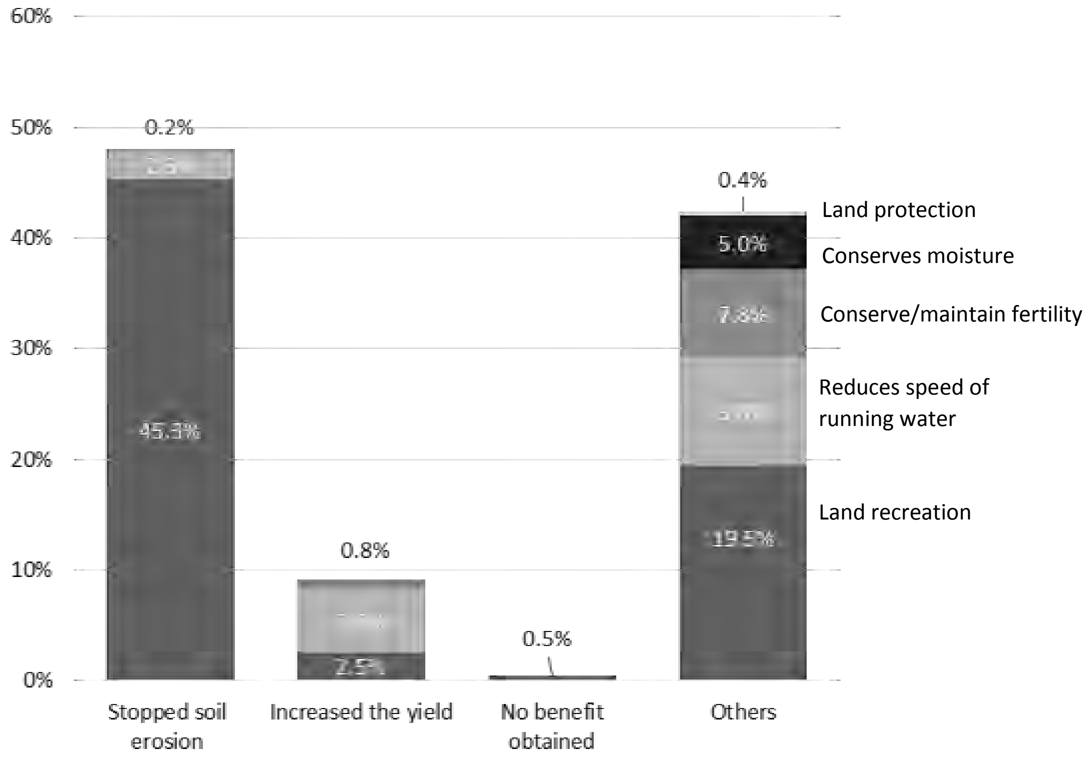

Figure 20: Benefits of Gully Control

VI. Analysis of the effectiveness of the COVAMS approach

I. Effectiveness of the approach for the rate of training conducted and for participation

In the target area where the COVAMS approach was carried out, the rate of the training conducted by the LF was 100% and the rate of the training participation measures was more than 90% over the two years of the intervention. With regard to the information source for each technique, the respondents who gave the answer that the LF was the most prominent source scored 55.6% for tree growing techniques, 68.2% for soil conservation techniques, and 80.4% for gully control techniques. It was verified that the techniques were transferred equally to the inhabitants by the LF and/or SLF. This indicates that one pillar of the COVAMS approach“Open to everyone” was verified.

（1） Rate of training conducted

With regard to the rate of the training conducted, it was considered whether the COVAMS approach enhanced Catchment Management through Farmers Activities (CMFAs). The households who included a LF or a SLF as selected by the target inhabitants of the project were targeted for the study if the LF or the SLF conducted the training courses for their fellow farmers. The rate of the training conducted was 100% for all three techniques. It was more likely that the training was conducted per group as a training unit: namely, more than 70% for tree growing and soil conservation and 63.3% for gully control (Table 5). The opportunity to transfer the techniques through the training from LF or SLF to the farmers was achieved. The major information sources for the three techniques for the farmers was LF as is shown in Table 11, 16 and 19, which present the responses regarding the information sources of the three techniques.

（2）Rate of participation in the training

With regard to the participation rate in the training by households who did not include an LF or SLF, the effectiveness of the approach was considered.

As shown in Table 26, the rate of participation in the training by the farmers for the three techniques, namely tree growing, soil conservation, and gully control, reached more than 90% over the first two years of the project intervention. Therefore, it is fair to say that the core pillar of the COVAMS approach was realized; the training was intended to be open to everyone.

Table 26: Rate of Participation in Training by Years Elapsed

	1st year	2nd year	3rd year
Rate of participation in the training for tree growing	81.5%	90.3%	88.2%
Rate of participation in the training for soil conservation	88.8%	95.1%	97.0%
Rate of participation in the training for gully control	85.9%	94.0%	97.0%

2. Effectiveness of the approach for practicing techniques

Table 27 shows the tendency of the three techniques practiced for enhancing CMFAs by elapsed years.

The adoption rates of the three techniques excluding seedling production per household scored more than 50% in the first year of the project intervention. The increase in the adaption rate was the highest in the first year, and there were no significant differences in variation from the second to third years. It was concluded that, for enhancing the cost-effectiveness of the COVAMS approach, it is preferable that the project intervenes in the same village over a two-year period and then shifts to another village after the second year of the intervention because the high adoption rates are maintained by the farmers after the first year.

The reasons for this are explained below and why the adoption rate for practicing techniques using a milestone by farmers was set at 50%. The following is mentioned in the working paper No. 4, namely “Analysis of the COVAMS approach in its effectiveness” (hereinafter the “working paper”), which was drafted in April 2015.

The “diffusion model of innovation” tells us that certain people will adopt new things without much effort put forth for dissemination by the extension staff. These individuals are categorized as “Innovators.” Following the innovators, there are other groups of people who will try to adopt earlier than the majority with some external effort from dissemination, and they are categorized as the “Early Adopters” and “Early Majority.” The people in these categories may be found in villages with a rate of about 50% generally. The other remaining 50% of the people will take some time to adopt the new measure. Therefore, the COVAMS approach targets those people (potential farmers) who are relatively quick to adopt new things in order to achieve the desired impact, especially in the practice of techniques. (Analysis of the COVAMS approach in its effectiveness, 2015, pp. 2)

The explanation above is based on the theory of "Diffusion of Innovation" that Everett M. Rogers, a professor of rural sociology, popularized in his book *Diffusion of Innovations* in 1962. Rogers (1962, pp.5) argues that "Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system." This report follows the milestone stated in the working report in 2015 on the basis of "Diffusion of Innovation" for studying the extension strategies of the COVAMS approach.

（1） Effectiveness of the approach on the basis of the adoption rate of seedling production and tree planting

The adoption rate of seedling production was 60.8% before the project, and the rate for the first year increased to 83.8%. With regard to the categorization of seedling production, the adoption rate for seedling production per household during the first year was 13.6%, the rate per group was 54.8% and the rate for both was 15.4%. The adoption rate for tree planting was 65.2% before the project, and the rate for the first year increased to 84.6%. Both results show that the COVAMS approach improved the adoption rates for seedling production and tree planting.

After the project intervention, there were no significant differences in the adoption rates for seedling production and tree planting over the three year period. Moreover, it was discovered that the training provided by the LF and SLF emphasized seedling production by group more strongly than by household or by both. It was surmised that the sensitization activities and campaigns for tree planting that were provided occasionally by the NGOs and governmental extension staff drove the high adoption rates of seedling production and tree planting prior to the project intervention.

The total number of seedlings produced by the targeted 35 thousand households was estimated to be 2.33 million in total; the number of seedlings produced over the two year period was estimated to be 67 per household. The total number of trees planted by the targeted 35 thousand households was estimated to be 3.62 million; the number of trees planted was estimated to be 84 per household and 19 per group.

The working report in 2015 (p.1) states that "The cost of nurturing the LFs per LF was determined to be around US$ 35 with an exchange rate of K 400."[11] One LF was assigned to 15 fellow households. Although one LF had charge of the three techniques, namely tree growing, soil conservation and gully control, the following stipulates that one LF is responsible for one technique: tree growing. Under one LF with 15 households, to produce 1,005 seedlings[12] over the course of two years, the cost would be US$ 35. Additionally, the cost for producing 100 seedlings is US$ 3.50 (K 1,340–K 1,390). In the same

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[11] The depreciation cost of motor bikes, fuel for CCOs and the TST, lunch allowances for LFs, the production cost of manuals, training materials and stationery are included in the cost of nurturing LFs. All components are calculated on a local currency basis; divide K 13,500–K 14,000 by K400/US$ (April 2015) to get US$ 35.

[12] 67 seedlings x 15 HHs

manner, planting 1,545 trees[13] over the first two years costs US$ 35 and the cost for planting 100 trees is US$ 2.30 (K 874–K 906).

Based on the costs simulated above for producing the seedlings and for planting the tress, the COVAMS approach has shown its effectiveness.

On the other hand, with regard to the planted area, the number of tree planted by household and by group for two years was studied. They are listed in descending order: “Garden” 0.825 million, “Woodlot” 0.76 million, “Homestead” 0.415 million, “River bank” 0.23 million, and “Mountain” 0.052 million.

The planted area was chosen by the farmers. It was not possible to verify whether a greater number of trees were planted in the effective areas selected by the farmers for catchment management because the COVAMS approach respects the principle of enhancing tree planting through the voluntary activities of the farmers. It is necessary to reflect comprehensively on various elements including the following: policies such as a land management plan, the budget to supplement the farmers’ activities, and the benefit of sharing the communal afforestation land, as well as tree planting efforts by the farmers through the COVAMS approach.

（2） Effectiveness of the approach on the basis of the adoption rate of soil conservation

The soil conservation techniques included contour farming and manure application. The adoption rate reached more than 80% in the first year of the project intervention. As mentioned above, contour faming included the aforementioned four techniques and some seasons were spent adopting the four techniques year by year because it was difficult for farmers to practice the four techniques at once during a single season in the first year. However, Table 15 and Figure 17 indicate that an economic interest in yield increases facilitated a high adoption rate for soil conservation in the first year. The results above show that the COVAMS approach enhanced the dissemination of soil conservation techniques.

（3） Effectiveness of the approach on the basis of the adoption rate of gully control

The adoption rate of gully control techniques was 8.9% before the start of the project. It increased to 69.1% in the first year and reached more than 70% by the third year. The increased rate of gully control was the highest of the three techniques, whereas the adoption rate stayed at approximately 70%. The probable reason for the lowest adoption rate was that it demanded more time and effort to collect the materials such as stones and timber for constructing the check dams. According to Figure 18, the most prominent reason for not constructing the check dams was “Don’t know the techniques” (97.6%) before the project and then “No gully to be rehabilitated” (62.8%) in the third year.

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[13] 84 trees (planted by household) +19 trees (planted by group) x 15 HHs

In Figure 20, the responses given for the benefits of gully control in descending order showed “Stopped soil erosion drastically,” “Land recreation” and “Reduces the speed of running water.” The benefits of constructing the check dams were thoroughly recognized by the farmers.

Table 27: Rate of Three Techniques Practiced through COVAMS Approach by Years Elapsed

	Before project	1st year	2nd year	3rd year
Seedling production				
Adoption Rate	60.8%	83.8%	89.6%	90.7%
Adoption by HH	24.1%	13.6%	21.2%	27.9%
Adoption by group	35.5%	54.8%	48.0%	46.4%
Adoption by both	0.7%	15.4%	20.4%	16.4%
Tree planting				
Adoption Rate	65.2%	84.6%	88.3%	87.9%
Adoption by HH	N.A	63.2%	68.7%	64.3%
Adoption by group	N.A	48.2%	50.4%	45.7%
Soil conservation				
Adoption rate of contour ridging	15.8%	82.8%	92.4%	96.4%
Adoption rate of manure application	20.1%	84.1%	94.5%	94.3%
Gully control				
Adoption rate of check dam construction	8.9%	69.1%	69.0%	72.1%

2013/2014

Questionnaire Survey for Impact Study on COVAMS Approach in 2016

Date :   /   /   (DD/MM/YYYY)

Sample No :____________________________, Researcher : ____

Informant : ____(____),

District: Blantyre / Balaka / Mwanza / Neno, TA: _________________________, Village: __________________________,

Q1: Attribute

Please check attributes of the head of household.

A1. Gender	A2. Age	A3. No. of HH members	A4. Social stratum of the HH
1. Male, 2. Female	years old	1. persons (2.M , 3. F)	1. GVH, 2. VH, 3. SLF ( ) , 4. LF ( ), 5. Others( )

A5. Ethnic group	A6. Literate	A7. Education level
1. Chewa, 2. Ngoni, 3. Yawo, 4. Others (specify ______________)	1. Chichewa, 2. English, 3. Non	1. 0, 2. 1~3 years, 3. 4~6 years, 4. 7~10 years, 5 more than 10 years

A8. Main income resource of the HH	A9. Mobile phone	A10. Place to charge mobile phone	A11. Transportation property
1. Agriculture, 2. Employee, 3. Commerce 4. Others( )	1.Non, 2.TNM, 3.Airtel, 4.Others( )	1.Home, 2.Shop, 3.Other( )	1.Motor bike, 2.Bicycle, 3.Cattle carriage(ox cart), 4.Others ( )

Q2. Popularity level of COVAMS

Do you know COVAMS Project?	B1	1. Yes 2. No

What COVAMS activities do you know?	B2	1.Tree growing, 2. Soil conservation, 3. Gully control, 4. Others ( )

Do you know COVAMS LF of your Limana?	B3	1. Yes 2. No

Q3. Implementation of training (If you are COVAMS LF or SLF)

When were you assigned as LF and SLF? Did you implement the trainings to your fellow farmers?

Season	Assignment		Implementation of training					
			Tree growing		Soil conservation		Gully control	
2015/16	C1	1. LF 2. SLF	C2	1. Yes 2. No 3. Don't know	C3	1. Yes 2. No 3. Don't know	C4	1. Yes 2. No 3. Don't know
2014/15	C5	1. LF 2. SLF	C6	1. Yes 2. No 3. Don't know	C7	1. Yes 2. No 3. Don't know	C8	1. Yes 2. No 3. Don't know
2013/14	C9	1. LF 2. SLF	C10	1. Yes 2. No 3. Don't know	C11	1. Yes 2. No 3. Don't know	C12	1. Yes 2. No 3. Don't know

if Yes

How do you conduct the training?

Season	Tree growing		Soil conservation		Gully control	
2015/16	C13	1. Individually 2. Group 3. Both 4. Don't know	C14	1. Individually 2. Group 3. Both 4. Don't know	C15	1. Individually 2. Group 3. Both 4. Don't know
2014/15	C16	1. Individually 2. Group 3. Both 4. Don't know	C17	1. Individually 2. Group 3. Both 4. Don't know	C18	1. Individually 2. Group 3. Both 4. Don't know
2013/14	C19	1. Individually 2. Group 3. Both 4. Don't know	C20	1. Individually 2. Group 3. Both 4. Don't know	C21	1. Individually 2. Group 3. Both 4. Don't know

2013/2014

Q4. Participation of trainings (If you are not COVAMS LF nor SLF)

Did you attend training courses provided by LFs organized in COVAMS II

Season	Tree growing				Soil conservation				Gully control			
2015/16	D1	1. Yes	D2	Reason ( )	D5	1. Yes	D6	Reason ( )	D9	1. Yes	D10	Reason ( )
		2. No	D3	Reason ( )		2. No	D7	Reason ( )		2. No	D11	Reason ( )
	D4	if Yes	1. Individually	2. Group	D8	if Yes	1. Individually	2. Group	D12	if Yes	1. Individually	2. Group

Reason to attend: 1. Capacity development in general, 2. Interested to the technique, 3. The training is conducted, 4. To increase a productivity/income 5. To protect the land, 6. To diversify the income 7. Others (specify)

Reason NOT to attend: 1. COVAMS approach hadn't started, 2. Had mastered the technique, 3. Did not know there was a training, 4. Not interested, 5. Too busy to attend, 6. Others (specify)

2014/15	D13	1. Yes	D14	Reason ( )	D17	1. Yes	D18	Reason ( )	D21	1. Yes	D22	Reason ( )
		2. No	D15	Reason ( )		2. No	D19	Reason ( )		2. No	D23	Reason ( )
	D16	if Yes	1. Individually	2. Group	D20	if Yes	1. Individually	2. Group	D24	if Yes	1. Individually	2. Group

2013/14	D25	1. Yes	D26	Reason ( )	D29	1. Yes	D30	Reason ( )	D33	1. Yes	D34	Reason ( )
		2. No	D27	Reason ( )		2. No	D31	Reason ( )		2. No	D35	Reason ( )
	D28	if Yes	1. Individually	2. Group	D32	if Yes	1. Individually	2. Group	D36	if Yes	1. Individually	2. Group

Q5. Practice of tree growing

Q5-1 Practice in 2015/2016 (tree growing)

1. Did you raise seedlings?	E1	1. Yes, by individual	2. Yes, by group	3. Both	4. No	E2	Reason ( )

Reason NOT to produce: 1. Not interested, 2. Don't know the techniques, 3. Don't have materials (seed, pot, etc.), 4. Too busy, 5. Others (specify)

How many seedlings did you raise?	E3	( ) seedlings
How did you use them?	E4	1. Planting: ( ) seedlings 2. Selling: ( ) seedlings, 3. Donating: ( ) seedlings

if the answer of E1 is 1, 3 or 4

2. Did you plant seedlings?	E5	1. Yes	2. No	E6	Reason ( )

Reason NOT to plant: 1. Not interested, 2. Don't know the techniques, 3. No land, 4. Too busy, 5. Others (specify)

How did you get the seedlings?	E7	1. Produced by yourself 2. Purchased 3. Donated 4. Others (specify)

Where and how many did you plant seedlings?	E8	1.Woodlot ( ) seedlings	2. Garden ( ) seedlings	3. Homestead ( ) seedlings	4. River bank ( ) seedlings

3. Did you make direct sowing?	E9 1. Yes 2. No	Where and how many?	E10	1. Woodlot ( ) stations	2.Garden ( ) stations	3. Homestead ( ) stations	4.River bank ( ) stations

4.Did you make natural regeneration?	E11	1. Yes	2. No	E12	if Yes ( )Ac

2013/2014

if the answer of E1 is 2 or 3

What category of group?	E13	1. Village 2. Limana 3. Group	No. of members?	E14	( ) persons

How many seedlings did you raise?	E15	( ) seedlings		
How did you use them?	E16	1. Sold to outsider: ( ) seedlings 2. Shared by group: ( ) seedlings 3. Planted as community: ( )seedlings		
Where did you plant as community ?	E17	1. Woodlot: ( ) seedlings 2. River bank: ( ) seedlings		
Did you make direct sowing?	E18	1. Yes ( ) stations in communal land 2. Yes ( ) stations in other land 3. No		
Did you make natural regenerations in communal land?	E19	1. Yes 2. No		
	E20	if Yes ( ) lands	E21	Total: ( ) Ac

Q5-2. Practice in 2014/15 (tree growing)

1. Did you raise seedlings?	E22	1. Yes, by individual	2. Yes, by group	3. Both	4. No	E23	Reason ( )

Reason NOT to produce: 1. Not interested, 2. Don't know the techniques, 3. Don't have materials (seed, pot, etc.), 4. Too busy, 5. Others (specify)

How many seedlings did you raise?	E24	( ) seedlings
How did you use them?	E25	1. Planting ( ) seedlings 2. Selling ( ) seedlings, 3. Donating ( ) seedlings

if the answer of E22 is 1, 3 or 4

2.Did you plant seedlings?	E26	1. Yes	2. No	E27	Reason ( )

Reason NOT to plant: 1. Not interested, 2. Don't know the techniques, 3. No land, 4. Too busy, 5. Others (specify)

How did you get the seedlings?	E28	1. Producing by yourself 2. Purchasing 3. Donating 4. Others (specify)

Where and how many did you plant seedlings?	E29	1. Woodlot ( ) seedlings	2. Garden ( ) seedlings	3. Homestead ( ) seedlings	4. River bank ( ) seedlings

3.Did you make direct sowing?	E30 1. Yes 2. No	Where and how many?	E31	1. Woodlot ( ) stations	2.Garden ( ) stations	3. Homestead ( ) stations	4.River bank ( ) stations

4.Did you make natural regeneration?	E32	1. Yes	2. No	E33	if Yes ( )Ac

if the answer of E22 is 2 or 3

What category of group?	E34	1. Village 2. Limana 3. Group	No. of members?	E35	( ) persons

How many seedlings did you raise?	E36	( ) seedlings
How did you use them?	E37	1. Sold to outsider: ( ) seedlings 2. Shared by group: ( ) seedlings 3. Planted as community: ( )seedlings
Where did you plant as community ?	E38	1. Woodlot: ( ) seedlings 2. River bank: ( ) seedlings 3. Others (specify) ( )seedlings

2013/2014

Did you make direct sowing?	E39	1. Yes ( ) stations in communal land 2. Yes ( ) stations in other land 3. No			
Did you make natural regenerations in communal land?	E40	1. Yes 2. No			
	E41	if Yes ( ) lands	E42	( ) Ac	

Q5-3. Practice in 2013/14 (tree growing)

1. Did you raise seedlings?	E43	1. Yes, by individual	2. Yes, by group	3. Both	4. No	E44	Reason ( )

Reason NOT to produce: 1. Not interested, 2. Don't know the techniques, 3. Don't have materials (seed, pot, etc.), 4. Too busy, 5. Others (specify)

How many seedlings did you raise?	E45	( ) seedlings
How did you use them?	E46	1. Planting ( ) seedlings 2. Selling ( ) seedlings, 3. Donating ( ) seedlings

if the answer of E43 is 1, 3 or 4

2.Did you plant seedlings?	E47	1. Yes	2. No	E48	Reason ( )

Reason NOT to plant: 1. Not interested, 2. Don't know the techniques, 3. No land, 4. Too busy, 5. Others (specify)

How did you get the seedlings?	E49	1. Producing by yourself 2. Purchasing 3. Donating 4. Others (specify)

Where and how many did you plant seedlings?	E50	1. Woodlot ( ) seedlings	2. Garden ( ) seedlings	3. Homestead ( ) seedlings	4. River bank ( ) seedlings

3.Did you make direct sowing?	E51 1. Yes 2. No	Where and how many?	E52	1. Woodlot ( ) stations	2.Garden ( ) stations	3. Homestead ( ) stations	4.River bank ( ) stations

4. Did you make natural regeneration?	E53	1. Yes 2. No	E54	if Yes ( )Ac	

if the answer of E1 is 2 or 3

What category of group?	E55	1. Village 2. Limana 3. Group	No. of members?	E56	( ) persons

How many seedlings did you raise?	E57	( ) seedlings		
How did you use them?	E58	1. Sold to outsider: ( ) seedlings 2. Shared by group: ( ) seedlings 3. Planted as community: ( )seedlings		
Where did you plant as community ?	E59	1. Woodlot: ( ) seedlings 2. River bank: ( ) seedlings		
Did you make direct sowing?	E60	1. Yes ( ) stations in communal land 2. Yes ( ) stations in other land 3. No		
Did you make natural regenerations in communal land?	E61	1. Yes 2. No		
	E62	if Yes ( ) lands	E63	( ) Ac

2013/2014

Q5-4. Practice before COVAMS II

Did you raise seedlings?	E64	1. Yes, by individual, 2. Yes, by group, 3. Both, 4. No
	E65	if No, Reason ( )

Reason NOT to produce: 1. Not interested, 2. Didn't know the techniques, 3. Didn't have materials (seed, pot, etc.), 4. Too busy, 5. Others (specify)

Did you plant seedlings?	E66	1. Yes 2. No	E67	Reason ( )

Reason NOT to plant: 1. Not interested, 2. Didn't know the techniques, 3. No land, 4. Too busy, 5. Others (specify)

Q5-5. Information channel (tree growing) if the informant practiced the technique (multiple choice)

How did you learn the technique?/ Who did you teach the technique?	E68	1. Radio 2. Newspaper 3. Family 4. Neighbour 5. COVAMS 6. COVAMS LF 7. LF 8. Others (specify)

Q6. Practice of soil conservation

Q6-1. Practice in 2015/16 (soil conservation)

1. Did you practice soil conservation techniques?	F1	1.Yes	2.No

How wide is your conserved area?	F2	1. less than 80 cm: ( ) ac,
		2. 85cm: ( ) ac,
		3. more than 90cm: ( )ac

What kinds of technique did you use?	F3	1. Contour ridging, 2. Box ridge, 3. Swale, 4. Hedge row

Did you apply manure?	F4	1. Yes ( )ac , 2. No

2. Did you apply fertilizer?	F5	1. Yes ( )ac , 2. No

3. How many bags of maize did you harvest in your farm land where practiced the technique?	F6	( ) bags	F7	( ) kg/bag	F8	( ) kg	F9	( ) ac	F10	( ) kg/ac

Q6-2. Practice in 2014/15 (soil conservation)

1.Did you practice soil conservation techniques?	F11	1.Yes	2.No

How wide is your conserved area?	F12	1. less than 80 cm: ( )ac,
		2, 85cm: ( ) ac,
		3. more than 90cm: ( )ac

What kinds of technique did you use?	F13	1. Contour ridging, 2. Box ridge, 3. Swale, 4. Hedge row

2013/2014

Did you apply manure?	F14	1. Yes ( )ac , 2. No

2. Did you apply fertilizer?	F15	1. Yes ( )ac , 2. No

3. How many bags of maize did you harvest in your farm land where practiced the technique?	F16	( ) bags	F17	( ) kg/bag	F18	( ) kg	F19	( ) ac	F20	( ) kg/ac

Q6-3. Practice in 2013/14 (soil conservation)

Did you practice soil conservation techniques?	F21	1.Yes	2.No

How wide is your conserved area?	F22	1. less than 80 cm: ( )ac,
		2. 85cm: ( ) ac,
		3. more than 90cm: ( )ac

What kinds of technique did you use?	F23	1. Contour ridging, 2. Box ridge, 3. Swale, 4. Hedge row

Did you apply manure?	F24	1. Yes ( )ac 2. No

2. Did you apply fertilizer?	F25	1. Yes ( )ac 2. No

3. How many bags of maize did you harvest in your farm land where practiced the technique?	F26	( ) bags	F27	( ) kg/bag	F28	( ) kg	F29	( ) ac	F30	( ) kg/ac

Q6-4. Practice before COVAMS II (soil conservation)

1. Did you practice soil conservation techniques?	F31	1.Yes	2.No

How wide is your conserved area?	F32	1. less than 80 cm: ( )ac,
		2, 85cm: ( ) ac,
		3. more than 90cm: ( )ac

What kinds of technique did you use?	F33	1. Contour ridging, 2. Box ridge, 3. Swale, 4. Hedge row

Did you apply manure?	F34	1. Yes ( )ac 2. No

2. Did you apply fertilizer?	F35	1. Yes ( )ac 2. No

3. How many bags of maize did you harvest in your farm land where practiced the technique?	F36	( ) bags	F37	( ) kg/bag	F38	( ) kg	F39	( ) ac	F40	( ) kg/ac

Q6-5. Information channel (soil conservation) if the informant practiced the technique (multiple choice)

How did you learn the technique?/ Who did you teach the technique?	F41	1. Radio 2. Newspaper 3. Family 4. Neighbour 5. COVAMS 6. COVAMS LF 7. LF 8. Others (specify)

Q6-6. Benefit (soil conservation)

What benefit(s) have you obtained by practicing soil conservation technique? (Multiple choice)

F42: Benefit							
1	Increased the yield drastically	3	Increased the yield a little	5	Stopped soil erosion to some extent	7	Other (specify) ( )
2	Increased the yield to some extent	4	Stopped soil erosion drastically	6	Stopped soil erosion a little	8	No benefit obtained

Q7. Practice of gully control

Q7-1 Practice in 2015/16 (gully control)

Did you construct check dam?	G1	1.Yes	2.No	G2	Reason ( )

Reason NOT to practice: 1. No gulley to be rehabilitated, 2. Still not urgent 3. Technique insufficient, 4. Too busy to practice, 5. Others (specify)

How many place?	G3	( ) places

What distance between check dams?	G4	( ) m, ( ) m, ( ) m

Q7-2. Practice in 2014/15 (gully control)

Did you construct check dam?	G5	1.Yes	2.No	G6	Reason ( )

Reason NOT to practice: 1. No gulley to be rehabilitated, 2. Still not urgent 3. Technique insufficient, 4. Too busy to practice, 5. Others (specify)

How many place?	G7	( ) places

What distance between check dams?	G8	( ) m, ( ) m, ( ) m

Q7-3. Practice in 2013/14 (gully control)

Did you construct check dam?	G9	1.Yes	2.No	G10	Reason ( )

Reason NOT to practice: 1. No gulley to be rehabilitated, 2. Still not urgent

3. Don't know the technique, 4. Too busy to practice, 5. Others (specify)

How many place?	G11	( ) places

What distance between check dams?	G12	( ) m, ( ) m, ( ) m

Q7-4. Practice before COVAMS II (gully control)

Did you construct check dam?	G13	1.Yes, 2.No	G14	Reason ( )

Reason NOT to practice: 1. No gulley to be rehabilitated, 2. Still not urgent 3. Don't know the technique, 4. Too busy to practice, 5. Others (specify)

Q7-5. Information channel (gully control) if the informant practiced the technique (multiple choice)

How did you learn the technique?/ Who did you teach the technique?	G15	1. Radio 2. Newspaper 3. Family 4. Neighbour 5. COVAMS 6. COVAMS LF 7. LF 8. Others (specify)

Q7-6. Benefit

What benefit(s) have you obtained by practicing gulley control? (Multiple choice)

G16: Benefit							
1	Stopped soil erosion drastically	3	Stopped soil erosion a little extent	5	Increased the yield to some extent	7	Other (specify) ( )
2	Stopped soil erosion to some extent	4	Increased the yield drastically	6	Increased the yield a little	8	No benefit obtained

COVAMS Ⅱ

Working Paper

No. 1

COVAMS Approach

Its feature and utilization

October 2013

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1. Introduction

This paper is aiming at giving proper perception on COVAMS approach to the stakeholders of COVAMS 2 project and those who are interested in the said approach.

COVAMS approach has a feature that is effective for a campaign to extend "Conservation Practice" among the farmers in the entire Middle Shire catchment area. The approach allows having many farmers[1] who practice conservation technologies and rapid extension of target villages with relatively low operation cost[2]. Moreover, the approach addresses cross cutting issues of catchment conservation.

The practice by many farmers is achieved with a principle of "Provision of equal opportunity for every farmer". The farmers who practice conservation technologies during two year intervention period will experience tangible benefit such as increase of harvest of maize, stopping development of gullies. Simultaneously, practice of tree growing which is usually paid less attention by farmers is accelerated by the benefits mentioned above. The rapid extension with low operation cost is realized by concentrating resources on the side of implementer of training, and promoting farmer's spontaneous action.

Accordingly, the COVAMS approach can be used as an entry point of promoting catchment conservation activities. Moreover, its operation system can be utilized continuously to promote other technologies even after the two year intervention. Therefore, as subsequent interventions are implemented in order to conserve the Middle Shire area thoroughly, the developed operation system in the village will assist farmers effectively and efficiently.

2. COVAMS Approach

2.1 Definition of COVAMS Approach

COVAMS approach can be defined as:

An extension methodology with a package of specified catchment conservation oriented technologies that aims at turning a large number of farmers into practice of catchment conservation activities through providing equal opportunity of learning for the respective villagers, and allows rapid expansion of target area with relatively low

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[1] About 50% of entire households of a village in three years of intervention practiced the promoted technologies with COVAMS approach under COVAMS project (2007 ~2012).

[2] The operation cost of the COVAMS approach was about MK1,460 per household in 2010 /2011 of operation year.

operation cost.

2.2 Mechanism of the approach

- Provision of training for villagers with a principle that equal opportunity of learning should be provided for every villager.
  There are two purposes with the provision of equal opportunity. One is to build good relationship between the villagers and the extension service provider; the other is to access to as many farmers as possible in order to maximize the number of practicing farmers of the intended technologies within a limited period. The more participants of the training, the more you obtain practicing farmers.
  However, the decision making of participation and practicing is on the farmers. So the approach has no control over the participation and practice part.

- Easy access to the training
  The approach utilizes village human resources as a trainer named Lead Farmer (LF). Any villagers are able to participate in the training since the LFs conduct the training in their right spot of respective villages.
  Additionally, multiple numbers of LFs like one LF for every 20 to 25 households are nurtured in a village, and simultaneously, the LFs are **elected by households** in the group. These strategies made the training venue very reachable for every villager. Moreover, as the LFs are from the same village as the villagers, they will be able to **repeat the same training** for those who missed the training.

- Optimal combination of technologies addressing cross-cutting issues of catchment conservation
  The package of technologies of COVAMS approach addresses cross-cutting issues of catchment conservation. Soil erosion control technologies such as contour ridging planting method for maize growing, manure making and gully control method are agriculture oriented and tree growing technologies are forestry oriented. Usually, farmers pay less attention to tree growing activity but they commit themselves even in tree growing activity because of the combination of short term benefit realizing technologies of soil erosion control, especially contour ridging and manure making. In this sense, the combination of those technologies of the package is optimal to achieve the purpose of the approach.

- Provision of TOT

The LFs are provided technical training to be the trainer (TOT). The contents of the training are quite simple and practical but enough to teach their fellow farmers. The TOT is conducted by an extension officer who is also trained in all the fields of the TOT so that the quality of the LFs as a trainer assured. The quality of the LFs is assured not only by what is mentioned above but also by election. According to a study in psychology[3], in a smaller group, people can identify eligible person to the position and the person who is identified will have strong commitment to the given role.

- 2 year intervention
  The intervention period by the extension organ for a village is for two years only. During the two years, the LFs will earn confidence in teaching the technologies with technical assistance from the extension officer and since they are going to remain in the same village, it is assumed that the village can be weaned from the intervention after two years.

- One extension officer assigning system
  One extension officer will be able to take care of about 10 villages at a time as the officer is equipped with all the required knowledge on the technologies, doesn't matter which department the officer belongs to. Hence it makes the operation cost effective. At the same time, the cost for nurturing the LFs is only for the lunch allowance during the TOT for them.

2.3 Silent Feature

COVAMS approach has a silent feature that allows other technologies easier to be disseminated.

The key point of COVAMS approach is to build a good relationship between farmers and extension service provider. With the equal opportunity for training participation and introduction of short term benefit technologies will contribute to make a good relationship. Once the good relationship is built, the farmers will have more curiosity on what extension officers are bringing into the village. Hence dissemination of subsequent technologies will be easier.

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[3] Drive; Daniel D. Pink, 2011 (This can also refer to Identity Theory of McCall and Simons)

3. Utilization of the approach

To achieve catchment conservation of Middle Shire area requires continuous integrated intervention. However, considering the situation of the area, there is no more grace period for preparing the integrated one. Rather, it is necessary to get immediate action that triggers reducing degradation of resources in the area even though it won't give a comprehensive result. It would be wise to start with creating awareness that conservation practice will give farmers benefits, and COVAMS approach has a great potential to realize it along with tangible results by implementing above mechanism.

- Selection of technologies through needs survey

  There might be some options on the technologies which contribute to the intended issues. In that case, ideal technologies should be selected through simple needs survey so that higher practicing rate will be achieved.

  - ➢ Inclusion of highly fascinating subjects

    The subjects will depend on what the extension service provider wants to disseminate and be practiced by farmers. Urgent matter and simple technologies will be suitable and possible to choose. Moreover, short term benefiting technologies should be included.

- Layered operation

  The number of subjects of COVAMS approach is limited with an intention of rapid expansion of target area in order to cover whole area of Middle Shire so that as many farmers as possible will be encouraged to start practice of the introduced technologies. Moreover, with the practicing of those technologies by 30 to 50% of entire households in Middle Shire area will make a great impact to create awareness that practicing such technologies will bring them good benefit.

  However, it is obvious that the catchment conservation won't be achieved only with those technologies. Hence more subsequent intervention will be necessary. In this sense, the operation system which COVAMS approach developed can be utilized by any extension service providers for issues such that villagers can handle by themselves using village human resources. The villagers should prioritize the necessary interventions, and extension service providers will carry out a few of those with the operation system and continue the intervention in such a way as to coat a cake with icing.

COVAMS Ⅱ

Working Paper

No. 2

Modification in allocation of LF

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1. Summary

The aim of this paper is to explain the intentions and reasons for the modification on the allocation of LFs to each village under COVAMS 2 project.

The number of LFs in a village has been increased under the project for Promoting Catchment Management Activities in Middle Shire (hereafter COVAMS 2 project). Furthermore, the demarcation of areas to elect LFs of a village is modified from clan to a group artificially made.

The modification of allocation of LFs is still under trial. The intention of the increase is to reduce the workload of the LFs compare to that of COVAMS project as they are going to work on voluntary basis in conducting trainings for their fellow farmers. The final decision will be made by analyzing the performance of the LFs within the project period.

2. Background

Conducting training by LF should be assured for villagers under COVAMS approach. The assurance shall be extended to equal opportunity on participation in training for all the villagers of a target village. The assurance of equal opportunity is realized by repeating the same training for those who missed it at the village. With these assurances, COVAMS approach will be able to seize large number of farmers who practice the technologies of the provided training. In order to achieve the assurances, "conducting training" was handled as a realm of project activity; hence the project provided payment of trainer's fee for the LFs. Although the trainer's fee was quite minimal, the COVAMS project achieved a very high performance.

However, COVAMS 2 project is advised of no payment of trainer's fee to the LFs so as to adhere to the government policy of Malawi, especially with the Ministry of Agriculture. Ministry of Agriculture has been established LF concept earlier, and came up with a policy that LF should work on voluntary basis without remuneration. Nonetheless, an assessment study on the LF concept found that it is not effective without any incentives for the LFs. In order to fill this gap, the ministry encourages provision of incentives in kind for LFs to rise up their motivation to work.

This adherence to the government policy would bring the approach a crucial and substantial change in the operation of training. One crucial point is that there will be no means of control over the LFs in conducting training without remuneration. An incentive in kind might work like remuneration, but the question is "what is the difference between cash and in kind?" At the same time, the incentive in kind will make the operation be costly with its purchase and distribution cost. Hence the COVAMS 2 project decided to observe the LFs sticking to their voluntarism. In short, the implementation of training has been plucked out from the operation of the approach and left it to the goodwill of the LFs, in other words, no more assurance but expectations. Now the challenge for the project is to pursue how to encourage the LFs to conduct training without the remuneration.

As one of the solutions to the challenge, COVAMS 2 project decided to try to increase the number of LFs in a village so that the workload of each LF will be reduced. Furthermore, the risk of no training at all in a village would be reduced in a sense that there will be some LFs who have a strong willingness to volunteer for their fellow villagers among the large number of LFs of the village. The way to decide the number of LF in a village however, is still under trial. The project is going to find the best way as the operation goes on.

3. Transition of allocation of the LF in a village

3.1 COVAMS project

The number of LFs in a village under COVAMS project was basically five (5). The composition of the LFs was two (2) for Soil erosion control, two (2) for Tree growing, and one (1) for Gully control, although these numbers were flexible depends on the size of the village. The LFs were trained in their respective subject only.

3.2 Plan before commencement of COVAMS 2

The strategy of COVAMS 2 in the allocation of LFs was to nurture two LFs (a male and a female) in each clan of a village. Another modification is on the number of subject for a LF. Each LF will be trained in all subjects of the three.

The model case of a village whose size is 100 households and there are 5 clans.
In this case, the number of LFs is 10 (5 females and 5 males). This figures out that each LF will have 10 households only which need to be taken care of. With 10 LFs in the village, the least number of trainings to be conducted for each subject will be 10. The burden of a LF will be three times of trainings to conduct.

It was thought that these numbers will be able to reduce the workload of the LFs.

Simultaneously, smaller group makes easier to plan the training accommodating all the households' conditions and opinions. This, somehow, would be able to assure the equal opportunity for everyone, too.

However, there was a concern that the perception of "Clan" by villagers was not uniformed. There would be a case that a village claims unrealistic number of clans compare to its size of the village.

3.3 Actual operation in 2013 of COVAMS 2

The determination factor of the allocation of LFs for a village has been changed to "village size basis" from "Clan basis". This change was caused by the variety of sizes of clan in the target villages as well as unrealistic large number of LFs required, which may cause difficulty to institutionalize the approach into government policy.

The average sizes of a clan at the beginning of the project were shown in table 1 below. Table 2 shows the number of villages that counts the number of households per LF less than nine (9).

Table 1

District	No. of villages	Total no. of H/H of the target villages	Total no. of clan of the target villages	Average of H/H of a clan	Expected No. of LFs
Blantyre	20	5,102	104	49	208
Balaka	20	1,696	144	12	288
Mwanza	25	2195	87	25	174
Neno	10*	2675	116	23	232
Total	70	11,668	451		902

Neno 10*：Initial number of village was 22 but there is no record of no. of households of some villages. Therefore, the number is the selected villages for the operation in 2013.

Table 2

District	No. of villages with less than 9 H/H per LF
Blantyre	2
Balaka	17
Mwanza	10
Neno	1
Total	30 villages

Those two tables were findings at the planning stage. The average number of households of a clan in Blantyre was twice higher than that of the plan before commencement of COVAMS 2, while Balaka's was half of that. With such situation, the project thought that it would be difficult to standardize the workload of the LFs with the allocation of LFs by clans. Moreover, the total number of LFs will be more than 900 for 70 villages. This number of LFs may not be realistic in terms of the cost to nurture LFs when it comes to institutionalization of the approach into government policy. Accordingly, the project decided to modify the system.

A suggestion was made by the DMT members that the allocation of LFs for each village will be determined by the size of a village by dividing the total number of households by 20 to 25, although the group can stick to the clan as much as possible. For instance, a village with 200 households will have 10 to 8 LFs. With this allocation system, the number of LFs will be the same or sometimes less than that of COVAMS project when the village size is less than 100. However, when the size becomes bigger, the number of LFs will be increased as the above example shows. Moreover, the number of LFs can be adjusted depends on the village situation in case the residents are scattered. This group size is almost the same size as the one of the department of Agriculture extension services. It was agreed by all the DMT members to go along with this suggestion.

With this adjustment of the allocation system, the actual number of LFs in total for the operation of 2013 becomes 350 as the table 3 shows.

Table3

District	No. of village	Total no. of H/H of the target villages	No. of Clans	No. of LFs	Average number of H/H for a LF
Blantyre	10	2,372	47	100	24
Balaka	20	1,696	144	70	24
Mwanza	10	1,314	38	63	21
Neno	10	2,675	116	115	23
Total	50	8,057	345	348	

As the table 3 shows, the number of households per LF has been contained in a small range.

The project will have to observe carefully if this size of households for a LF will work or need to be reduced.

Working Paper

No. 3

Additional analysis on Baseline survey result of COVAMS II project

Dec. 2014

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1 Demographic characteristic

➢There might be a tendency that male headed household is almost twice more than that of female in Mwanza and Neno districts.

2 Source of family income

➢25% of the people sell Maize in most districts except Balaka district.

➢Other crops and piece work are the major income of the households in all the disitrcts.

➢Charcoal selling shared 20% in Neno and Balaka distircts while other distircts have almost none.

➢The farmers of Mwanza seem to be able to live on with their crops selling, since maize and other crops are the major source of their income. Or, the situation of Mwanza could be that the farmers have little oppeorunity in piece work so then they are inevitably not engaging in piece work, and being compelled to live with little income from the crops.

3 Tree growing

Individual activity

➢More than 80% of the farmers have no woodlot.

➢Of those who have woodlot, the area of the woodlot is mostly less than 0.25ha.

➢It means that there is no reason to expect them to plant many trees as individual.

➢In fact, most farmers of those who planted had just planted less than 50 seedlings each year no matter where the places are.

➢Natural regeneration method has more potential to pervade the practice among the farmers, especially Neno and Balaka since around 50% of the farmers have some land with the method.

(Number of people planted from 2010 to 2012)

Table 1: Planting tree

		Blantyre	Mwanza	Neno	Balaka
Woodlot	Most	8	19	7	21
	Least	5	18	4	12
Homestead	Most	15	13	15	30
	Least	4	3	4	25
Garden boundary	Most	6	5	3	6
	Least	3	3	2	2
Total	Most	29	37	25	57
	Least	12	24	10	39
Percent against total interviewees	Most	0.22	0.25	0.17	0.39
	Least	0.09	0.16	0.07	0.27

➢Homestead is the most place farmers planted seedlings in all the district in a range between 13 to 30 which mode is 15 farmers, while woodlot became the second place. While around 80% of the farmers have no woodlot, it is natural for them to plant trees at their homestead. This result explains why less than 50 seedlings were planted in a year.

➢Garden boundary is the least place where farmers plant trees.

➢The percentage of the farmers who plant trees is around 20% except Balaka which has almost 40% at most if the farmers who planted trees in all the three sites are different households.

➢Considering the situation, it is better to recommend to raise seedlings individually rather than making a community nursery since they need only 50 seedlings or less in a year. This way, it becomes more manageable in raising seedling.

➢Another way of planting trees is direct sowing. Suppose the survival rate is as low as 20% with the direct sowing, just sow 250 seeds would be enough to grow 50 trees in a year. It is significant to encourage the farmers to deal with this direct sowing method.

➢In that sense, it maybe be considerable that the training in tree growing should start from direct sowing and natural regeneration method and then finally goes to planting seedling method.

Table 2 : Survival rate	Average of 3 years	Blantyre	Mwanza	Neno	Balaka
Woodlot	> 50%	31%	13.3%	58.8%	16.5%
Homestead	> 50%	12.7%	27.5%	47.8%	7.1%
Garden boundary	> 50%	18.1%	38.3%	66.6%	11.1%
Garden	> 50%	8.3%	27.4%	20.8%	88.9%
Regeneration	> 50%	46.8%	26%	76.9%	73%

➢According to the result of survival rate, the knowledge the farmers have on tree management seems not to be adequate. In fact very few farmers got the survival rate more than 50% in most district except Neno.

➢This is explainable with the result of management practice. Very few farmers do after care of the planted trees except weeding. But considering rampant burning of grass causing severe damage to planted trees, even weeding is doubtful if it is done effectively.

➢It could be that they don't plant the trees in good timing, and that could also be the causes of poor survival rate of planted trees in woodlot and homestead except Neno district.

➢The experience of the very low survival rate by farmers could contribute to the tendency of low practicing rate since they could feel that they wasted a lot of time to raise seedlings.

➢The result of natural regeneration may explain well why farmers have a place for the same method. Probably it is easy for them and get good result.

➢The reason why the survival rate at homestead is low could be blamed to animals around the house. Knowledge on protection of planted trees at homestead may be necessary.

Communal activity

➢Table 3 is a rough interpretation in the number of villages which have communal woodlot and woodland for natural regeneration including no both woodlot and woodland from question 1.2.

Table 3 :

Communal land for tree growing		Blantyre	Mwanza	Neno	Balaka
Village Woodlot	None	4	7	6	8
	1	4	3	3	12
Village Natural regeneration woodland	None	4	8	6	15
	1	4	2	3	5

Possible no. of villages without communal land	2 20%	5 50%	4 40%	3 15%

* If a village have both village woodlot and village natural regeneration woodland, the percentage of the village which has no communal land may increase.

Table 4 : Existence of River bank

		Blantyre	Mwanza	Neno	Balaka
Village river bank	None	4	7	9	16
	Exist	6 60%	3 30%	1 10%	4 20%

Table 5 : Area of communal area for tree growing

		Blantyre	Mwanza	Neno	Balaka
Village Woodlot	<1ha	88%	100%	82%	100%
	>1, <5ha	8%	0	10%	0
	>5ha	0	0	8%	0
Village Natural regeneration woodland	<1ha	43%	97%	13%	62%
	>1, <5ha	13%	3%	18%	38%
	>5ha	44%	0	69%	0
Village River bank	<1ha	81%	100%	33%	29%
	>1, <5ha	1%		56%	67%
	>5ha	18%		11%	4%

* Of the village woodlot, 88%, 65%, and 77% of Blantyre, Mwanza and Neno respectively are less than 0.25ha.

➢Majority of Communal woodlot is quite small in most villages. This will support that encouragement of individual raising seedlings could be more effective.

➢To increase tree coverage in the areas, it is necessary to encourage planting trees more in a garden with Agroforestry.

➢Most important thing is that each district ought to have own plan where to target to plant trees and which method they should encourage to the farmers.

➢The participation in communal tree planting and maintenance work was not that many within the range of 15% to 20% except Balaka. In Balaka more than 50% of the people participated in the communal work in tree. So it may be better to learn how come Balaka farmers decided to participated in the communal work.

➢Low percentage of particpation in communal work is usually caused by no clear benefit for the particpants if they will be able to access to the trees in the future.

➢The spieces of the planted trees is in a range of 4 to 6. Neno district seems to be the least number of spieces while Balaka people using many tree spieces propotionally.

➢Balaka however, planting Blue gum is the most popular variety despite the district is the driest district among the 4 districts.

➢At least 7 spieces of trees can be found in the natural regeneration site in all the district. Balaka district seems to be the richest district in tree spieces.

4 Soil erosion control

Cultivation area

➢The mode of the area for maize growing is in a range of 0.25 to 0.49ha in most of the districts except Neno.

➢The percentage of the cultivation area of the range 0.25 to 0.49 shares 41%, 32.6%, 26%, and 36.6% for Blantyre, Mwanza, Neno, and Balaka respectively.

➢The cultivation area of less than 0.25ha also shares quite significant percentage with 31.1%, 22.9%, and 14.1% for Blantyre, Mwanza, and Balaka respectively.

➢The two ranges (less than 0.24ha and 0.25 to 0.49ha) of the cultivation area becomes more than 50% except Neno and especially the share reaches 72% in Blantyre, while Neno counts 37%.

➢The farmers in Neno cultivate relatively larger area for maize since the mode is more than 1ha.

➢This means that to increase maize production should be interpreted as to increase yield since they don't have extra cultivation area.

Harvest

Table 6: Mode in the number of bags harvested of Maize

	Blantyre		Mwanza	
Year	Bags	Ratio	Bags	Ratio
2010	5 to 6	23.5%	20 to 30	17.6%
2011	7 to 8	17.6%	9 to 10	17.5%
2012	5 to 6	25.8%	7 to 8	17.9%

	Neno			Balaka	
Year	Bags		Ratio	Bags	Ratio
2010	3 to 4	20 to 30	15.9%	5 to 6	16.2%
2011	7 to 8	20 to 30	12.0%	7 to 8	14.0%
2012	20 to 30		16.2%	7 to 8	27.7%

Table 7: Ratio of number of bags harvested by claster

		Blantyre	Mwanza	Neno	Balaka
Year	Bags	Ratio	Ratio	Ratio	Ratio
2010	<10	68.8%	45.5%	43%	51.5%
	10 to 19	23.5%	25%	27%	27.2%
	>20	7.5%	25.7%	25.2%	11.7%
2011	<10	73.2%	49.6%	49.9%	47.4%
	10 to 19	23.6%	32.1%	27.8%	37.9%
	>20	3.3%	17.6%	20.4%	14%
2012	<10	67.8%	56.5%	42.8%	67.7%
	10 to 19	25.8%	24.3%	29.6%	23%
	>20	6.4%	17.2%	26.7%	8.4%

➢The mode in production is found in a range of 6 to 9 bags of 50kg in Blantyre, Mwanza and Balaka with lowest of Blantyre and highest of Mwanza. It seems the production is affected by the climate. The target areas of Blantyre and Balaka are relatively dry so the production is constantly low while the climate of the target area of Mwanza seemed to keep on changing.

➢Meanwhile, Neno produces more with more than 20bags in the mode. This seems to be because of larger area of cultivation. Apparently those who cultivate small area produces almost the same quantity as other districts.

➢Generally, households which produce less than 10 bags of mazie counts around 50% in all the districts, especially Blantyre district reaches to about 70% chronically. Estimated Maize annual consumption per especially Blantyre district reaches to about 70% chronically. Estimated Maize annual consumption per capita in Malawi is reported in a range between 150kg to 180kg. It means that in a family, they need about 580kg to 730kg of maize annually assuming 4 members in a family. This means that about 50% of families were unable to produce required amount of Maize for their family.

Table 8: Relation between harvest and cultivation area in yield (2012)

Production (kg)		75	175	275	375	475	525	625
Yield(t) / ha		0.3t	0.7t	1.1t	1.5t	1.9t	2.2t	2.6t
District	Area							
Blantyre	0.24ha	9.5%	11.9%	23.8%	26.2%	11.9%	9.5%	2.4%
Mwanza	0.24ha	10.7%	10.7%	17.9%	10.7%	17.9%	3.6%	0
Neno	0.24ha	9.1%	27.3%	9.1%	27.3%	27.3%	0	0
Balaka	0.24ha	7.1%	14.3%	28.6%	14.3%	21.4%	0	7.1%

Production		725	825	925	1250	1750	2250
Yield (t) / ha		3t	3.4t	3.8t	5.2t	7.3t	9.3t
District	Area						
Blantyre	0.24ha	2.4%	0	2.4%	0	0	0
Mwanza	0.24ha	3.6%	7.1%	0	17.9%	0	0
Neno	0.24ha	0	0	0	0	0	0
Balaka	0.24ha	0	0	0	0	0	7.1%

Production (kg)		75	175	275	375	475	525	625
Yield(t) / ha		0.08t	0.2t	0.3t	0.4t	0.5t	0.58t	0.7t
District	Area							
Blantyre	0.9ha	0	10%	50%	20%	0	0	0
Mwanza	0.9ha	0	0	18.2%	9.1%	0	9.1%	9.1%
Neno	0.9ha	0	0	7.7%	0	7.7%	0	23.1%
Balaka	0.9ha	0	0	4.8%	28.6%	19%	9.5%	14.3%

Production		725	825	925	1250	1750	2250
Yield (t) / ha		0.8t	0.9t	1t	1.4t	1.9t	2.5t
District	Area						
Blantyre	0.9ha	10%	0	0	10%	0	0
Mwanza	0.9ha	9.10%	0	0	36.4%	9.1%	0
Neno	0.9ha	0	15.4%	15.4%	23.1%	7.7%	0
Balaka	0.9ha	9.5%	4.8%	4.8%	4.8%	0	0

➢It is obvious that those who cultivated smaller area got higher productivity than those of wider area cultivation. Those who got yield less than 1t shares 21% in Blantyre, Mwanza and Balaka under the cultivation of less than 0.24ha while Neno got 36%. On the other hand, the share of less than 1t in o.9ha reaches 90% in Blantyre and Balaka, while Mwanza and Neno reaches 54%.

➢The mode in yield is around 1.5t for less than 0.24ha of cultivation in all the districts and the percentag accumulates about 60% in the range beteen 1t to 2t, while it is around 0.3t to 0.4t and 1t to 1.5t for 0.9ha in Blantyre, Balaka and Mwanza, Neno respectively.

➢It is noteworthy that there are several households whose yield went beyond 3t which gives 15bags from less than 0.24ha. This fact gives that o.24ha is not that small to produce the required amount of maize for a family. In that sense, those who cultivate around 1ha with the yield of 0.3t or 0.4t should be encouraged to scale down so that they will be able to save the labour and resources and invest them in other thing.

Table9: Comparison in maize yield bwtween countour ridging and / or manure practiced ony and average of the yield of both none practiced and practiced farmers (plenary) in 2012

Mwanza

Area cultivated	Contour	Plenary	Share
b	3,463	1,764	22%
c	2,027		
d	885		
e	805	1,103	22%
f	697		

Blantyre

	Contour	Plenary	Share
b	2,038	1431	11%
c	1,468		
d	1,395		
e	500	434	3%
f	515		

Neno

	Contour	Plenary	Share
b	2,031	985	22%
c	2,660		
d	1,693		
e	893	673	9%
f	925		

Balaka

	Contour	Plenary	Share
b	1,666	1,246	4%
c	1,528		
d	1,235		
e	669	602	15%
f	762		

*share: This is the ratio of farmers who practice contour ridging and / or manure application against the total number of farmers in the same category of the area cultivated.

*Plenary: This is the average of the maize product of all the farmers including those who practiced contour ridging and /or manure application who cultivated maize in 2012.
*Contour: This is the average of maize product of those who practiced contour ridging and / or manure in 2012.

*Average of maize production: For the calculation, middle values were used in the area and production of each segment except b and f in the area, and n for the production. E.g.
Area: b=0.24ha, c=0.37ha, d=0.62ha, f=1.2ha
Production: b=1.5bags with 50kg of weight, n=45bags

➢ Apparently higher yield is observed in contour ridgged and / or manure applied field than none practice field. The gap between the practiced and none practiced should be a little more than the one in the table since the plenary one includes practiced yield of contour ridging and manure applied fields.

➢ The difference between the practiced and planary at "b" of the cultivated area is quite significant. It was 1.38-fold more yield of practiced fields in average in Blantyre and Balaka districts, and 2wice more of the practiced than plenary fields. The gap between the practiced and plenay in average of all the districts is 1.69- fold more with practiced fields.

➢The gap between the practiced and plenary becomes smaller as the cultivated area grows wider. It is infered that the farmers who cultivate wider area exercised poor field management like late weeding, lack of fertilizer as well as cultivation of small area for contour ridging and / or manure application practice so the advantage of the yield of the practiced field was diminished by the yield of none practiced area.

➢ It is apparent that poor field management will start when farmers reached to 0.75ha or more of cultivation area.

➢ Suppose the required amount of maize for a family of 4 members is 580kg annually , it seems that it is possible to produce enough maize with around 0.24ha of cultivation area by practicing contour ridges, manure application and probably with fertilizer because its production reaches 2t which count about 10 bags of maize of 50kg from the same area in three districts.

Table 10: Sales of production (%)
Maize

	Blantyre	Mwanza	Neno	Balaka	Total average
Average of 3	15.6%	23.1%	14.9%	8.9%	15.6%

Table 11: Quantity of maize sales on average of 3 years

No. of bags	Blantyre	Mwanza	Neno	Balaka	Average
less than 1	33.7%	48.5%	40.0%	22.7%	36.2%
1 to 2					
3 to 4	47.9%	45.5%	24.6%	51.1%	42.3%
5 to 6					
7 to 8	18.4%	6.0%	35.4%	26.1%	21.5%
9 to 10					
11 or more					

Table 12: Application of fertilizers (%)

	Type	Quantity	Blantyre	Mwanza	Neno	Balaka
Average in 3 years	Basal	None	64.0%	63.0%	51.0%	22.0%
		Less than 1	32.0%	36.0%	46.0%	58.0%
	Top	None	63.0%	63.0%	49.0%	9.0%
		Less than 1	33.0%	35.0%	48.0%	51.0%

➢ Only 15.6% of the farmers of the four distircts could exchange their maize with money although this doesn’t mean that they had extra maize. It can be analysed from the tables of 10, 11, 12 that it is not contributing for purchasing fertilizers but supporting livelihoods since most of them could sell not many.

➢ Considering the point that they may be able to produce enough maize with 0.24ha and suppose they have a cultivation area of 0.5ha on average, it is possible that they will be able to sell more maize or produce other cash crops by learning proper or effective farm management.

➢ In this sense, to demonstrate how to earn money within their reach may be a good help for the farmers together with provisioin of training for effective farm management.

➢ Balaka farmers had got some support from inputs providing organizations so they could apply fertilizers.

COVAMS Ⅱ

Working Paper

No.　4

Analysis of COVAMS approach in its effectiveness

(Draft)

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The project for Promoting Catchment Management Activity in Middle Shire

（COVAMS　Ⅱ）

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1. Summary

The concept of COVAMS approach is ought to be “Speedy”, “Effective”, and “Inexpensive” when one think of incorporation of the approach into the district plan for catchment conservation of Shire River. “Speedy” in terms of expansion of the target villages, “Effective” in terms of practicing rate by farmers of the disseminated techniques, and “Inexpensive” in terms of cost in the operation but this can be translated into “High value” in terms of cost effectiveness.

“Speedy” was somehow proven in comparison with 2013 and 2014 planting season operation in the number of villages. It was only 50 villages in total of Blantyre, Mwanza, Balaka, and Neno districts in 2013 and the number was increased to 171 villages in 2014, while the number of extension staff involved in the operation was 20 in total of the four districts in 2013 and increased to 25 in 2014. The average of number of village for an extension staff was 6.8.

“Effective” can be considered as satisfactory. COVAMS approach promotes three important techniques for catchment conservation, which are “Tree growing”, “Contour ridging”, and “Gully repairing”. The practice rate against the total number of households (25,836 households) in the 171 villages in tree growing was 29%, and contour ridging was 27% in average of the four districts although gully repairing was 14% in 2014 /2015 planting season. Considering about 70% of the total villages (121 villages) were for the first year of the intervention, the practicing rate was quite satisfactory.

“Inexpensive” or “High value” is also considered as achieved from the view point of cost effectiveness. COVAMS approach employs LF system for the dissemination of the three techniques. The cost of nurturing LFs per LF was figured out around US$35 with the exchange rate of K400. It aggregates to the total cost of US$59,675 for 1,705 LFs of the four districts. It looks a bit costly but when you look at the number of farmers practicing contour ridging, it was found not that costly. It was figured out that it costs about US$3 only in order to manipulate a farmer with 0.19ha of contour ridging, which is the average of the cultivated area with contour ridges per practicing farmer.

The COVAMS project which was implemented from 2007 to 2012 found out through

"Economic impact survey of COVAMS approach" that the value of benefit from practicing contour ridging of 0.25ha would be US$11 to US$82. The amounts were calculated out with the value of Nitrogen which was contained in the soil conserved in the garden due to contour ridging together with other soil protection techniques such as box ridges and swale. The value was translated into monetary form reflecting the commercial price of Urea fertilizer. Therefore, the value of the practiced area per farmer in 2014 / 2015 planting season would be about US$9 to US$62 by adjusting the area to 0.19ha. In short, the return of the investment was in a range of 2.5-fold to 17.7-fold.

2. The core of COVAMS Approach

The core aim of COVAMS approach is to provide and **assure equal opportunities of participation in training to all the farmers** in a village. This will promote large number of farmers to participate in the training and realizes maximization of practice by potential farmers within the short period of intervention which is for two years basically. In short, **the frame work of the approach is to provide the training to farmers** and the participation in the training by the farmers and their practice of the techniques are an outcome or impact. However, it is important to achieve an impressive impact. In order to achieve the impressive impact in the area, COVAMS approach takes a strategy of rapid increase of the number of target villages.

"Diffusion model of innovation" tells that there are certain people who will adopt new things without much effort for dissemination by extension staff. Those are categorized as "Innovators". Following the innovators, there are other groups of people who will try to adopt earlier than majority with some external effort for the dissemination, and they are categorized as "Early adopters" and "Early majority". Those people in the categories may be found in a village with a rate of 50% generally. Another remaining 50% of the people will take time to adopt it. Therefore COVAMS approach target at those people (potential farmer) who are relatively easy to adopt new things for achieving the impact, especially in the practice of the techniques.

Current situation of dissemination of those techniques in villages in the area is analyzed poor. Meaning not many farmers have exposed to the techniques yet so far. The significance of the approach is to solve this poor dissemination situation by approaching to all the farmers in the villages with the provision of equal opportunity to participate in the training. By doing so, the information of the techniques will reach to all the potential farmers who may practice them subsequently. Hence the expectation of achievable practicing rate would be more or less 50% against the entire households of the villages. The 50% may be too ambitious, so it could be justified by aiming at the range between 30% and 50%.

It is not that impressive with the practicing rate of around 30% if it was targeted at a small number of villages. However, when it is aggregated from a great deal of villages, for example, 30% of the entire households in the middle Shire catchment area, it can be said that it is an impressive impact. COVAMS approach is trying to achieve this effect by rapid increase of the number of villages.

3. Extension system of COVAMS approach

COVAMS approach employs a system that utilizes human resources of villages as a trainer of the training, who is named Lead Farmer (LF). The number of LFs in a village is determined by the number of the entire households of the village. One LF is responsible to more or less 15 households in providing trainings and to conduct the training of all the three techniques, so the number of LFs in a village is calculated out with the following formula:

"Number of Households of a village" ÷16 (a LF + 15 members) = "Number of LFs"

However, the number of the LFs in a village can be flexible depending on the topographical situation of villages and social solidarity of a clan (Limana), since the group members belong to a clan in most cases.

COVAMS approach regulates rigidly that the LFs are to be chosen with an election by the group members. This process will work as one of the motivations of the LFs to work seriously since they will feel that the group members are respecting them as eligible person.

The participation in the training by the group member is thoroughly depends on their willingness. What the LFs can do is to disseminate the information of the training to all the members. There is no provision of start-up package for the participants to practice the techniques, although the approach recommends supplying some materials for conducting the trainings such as polythene tubes for raising tree seedlings, line levels, strings and nails for contour ridging, and Panga knives for check dam construction.

In order to encourage and motivate the LFs to conduct the trainings, the following things are provided to the LFs apart from the election mentioned above:

i. Practice based training of trainers (TOT)
ii. Lunch allowance when participated in TOT
iii. The training materials which were mentioned earlier
iv. Introduction meeting as LFs to the village community after completed the TOT in order to be recognized and respected
v. Provisional certificate after TOT and proper certificate after completion of the conditions to be a LF
vi. COVAMS T shirt
vii. Invitation to training for conducting field day

4. Result of COVAMS approach in 2014 / 2015 season

4.1 Achievement in the training by LFs

Table 1 shows the achievement in the training by LF of all the four districts in 2014 / 2015 planting season.

The result shows that about 80% of LFs have conducted training in Tree growing and Soil conservation (includes contour ridging, box ridges, swale techniques) while about 60% of LF have conducted Gully repairing. The reasons why the training in Gully repairing achieved lower ratio is inferred that LFs were busy with their preparation of gardens and planting maize since the timing of the training was around Nov. and Dec. 2014, and there was less needs from the farmers at the same time.

Under COVAMS project (2007 ~ 2012), the project experienced that about 10% of LFs dropped out. So it can be assumed about 90% of the LFs conducted the training, which slightly higher than that of current project. However, a condition to conduct training under COVAMS project was in contrast to the one of COVAMS II project. The LFs under COVAMS project received trainers' fee when they conducted trainings although the amount was very minimum like MK400 per training of a subject. Meanwhile, the LFs under COVAMS II project conduct the training on a voluntary basis. Considering the difference on the conditions, the result of 2014 / 2015 season in the number of LFs who conducted training was quite satisfactory and it can be assumed that the mechanism of motivation for the LFs was somehow effective.

Table 1: Number of target village, Number of LFs, number of training conducted, and number of participants in each district 2014 / 2015

District	No. of villa.	No. of house Holds (a)	No. of CCO	No. of LFs (b)	Training subject	No. of LFs conducted training (c)	Ratio of LFs conducted training (c)/(b)	No. of farmers (d)	Ratio of participation (d)/(a)
Blantyre	36	9,217	7	600	Tree	466	78%	3,402	37%
					Soil	489	82%	3,,356	36%
					Gully	382	64%	3601	39%
Balaka	60	4,466	6	300	Tree	248	83%	2,548	57%
					Soil	243	81%	2,410	54%
					Gully	202	67%	1,688	38%
Mwanza	37	4,586	6	310	Tree	283	91%	1,059	23%
					Soil	297	96%	1,184	26%
					Gully	229	74%	895	20%
Neno	38	7,567	6	495	Tree	341	69%	3,029	40%
					Soil	403	81%	3,400	45%
					Gully	261	53%	2,157	29%
Total	171	25,836	25	1,705	Tree	1,338	79%	10,038	39%
					Soil	1,432	84%	10,350	40%
					Gully	1,074	63%	8,341	32%

On the other hand, the ratio of farmers who participated in the trainings looks very low as comparing to the one of COVAMS project, which was more or less 80%. It was not that high (about 50%) in the early stage of COVAMS project, neither, but it made a sharp improvement with an introduction of Training Participation Card (TP card) which worked as invitation card for the farmers. TP card was distributed to all the households in a village. Because of this experience, COVAMS II project also introduced the TP card from the first year but it did not work as expected apparently. It is inferred that this result was attributed to inadequate interventions by the districts staff, especially by Conservation Coordinating Officers (CCOs). There is a clear tendency that farmers will be more serious or get involved themselves in activities when the village headman (VH) involves himself. Hence it is very crucial for CCOs to create an atmosphere that the VH involves himself into or at least gives support to the catchment management activity. The activities on this point by CCOs was probably not enough and not creative enough.

CCOs requested to involve the VH into TOT for the LFs. The project had no objections to the point that the VH would take an observation of TOT for the LFs. However, it is not possible for JICA to provide lunch allowances to him unless he is a LF. After JICA side gave the answer, CCOs did not come up with any other options on how to involve the VHs.

4.2 Cost effectiveness

Cost effectiveness was analyzed by comparing the cost of operation in 2014 / 2015 season to the benefit expected from the practice by the farmers, especially in the soil conservation.

Table 2: Cost for nurturing LFs

District	Depreciation of motor bikes	Lunch allowance for LFs	Production cost of manuals	Training materials	Stationeries	Fuel		Total
						CCO	DMT/TST	
Blantyre	K 325,926	K 2,826,400	K 191,014	K 1,464,600	K 340,454	K 605,990	K 534,240	K 6,288,624
Balaka	K 325,926	K 1,324,000	K 98,236	K 725,110	K 175,091	K 513,333	K 720,056	K 3,881,751
Mwanza	K 325,926	K 1,468,800	K 98,236	K 759,250	K 175,091	K 359,050	K 531,900	K 3,718,252
Neno	K 325,926	K 2,172,000	K 158,269	K 1,208,475	K 282,090	K 293,870	K 266,750	K 4,707,380
Total	K 1,303,704	K 7,791,200	K 545,755	K 4,157,435	K 972,725	K 1,772,243	K 2,052,946	K 18,596,008

Table 2 shows the cost of nurturing LFs in each district. The depreciation of motor bikes is for the CCOs who are key players to nurture the LFs. In order to calculate the cost only for the LFs' nurturing, three months depreciation cost which was the period required nurturing LFs in all the districts was included. The activities for nurturing LFs are basically sensitization meeting to TA, GVH, VH, and villagers, monitoring elections of LFs, TOT for LFs.

The vehicle of the districts procured by JICA was not included into the cost although the project appreciates the supervising activities by the management in each district, it was considered as major players for the nurturing activity. The lunch allowance for the LFs is for during TOT for them conducted by CCOs. The training materials are line levels, nails, strings, polythene tubes, and Panga knives, while the stationeries are pens and writing pads.

Table 3: Cost for nurturing LF, conducting training, and practicing techniques

districts	Cost for nurturing LFs		Cost for conducting training				Cost for practice	
	No. of LF	Cost per LF	No. of training	Cost per training	No. of farmers	Cost per farmer	No. of practicing farmer	Cost per farmer to practice a subject
Blantyre	600	K 10,481	1,337	K 5,321	10,359	K 687	7,446	K 1,038
Balaka	300	K 12,939	693	K 6,499	6,646	K 678	3,841	K 1,353
Mwanza	310	K 11,994	809	K 6,032	3,138	K 1,555	2,162	K 2,516
Neno	495	K 9,510	1,005	K 5,051	8,586	K 591	3,596	K 1,525
						25%	4,514	K 1,215
Total	1,705	K 10,907	3,844	K 5,612	28,729	K 751	17,045	K 1,399
						25%	17,963	K 1,328

Table 3 shows the cost per unit. The cost to nurture one LF was MK10,907 on average which was about US$27 (at the rate of MK400 / 1 US$). The cost for conducting a training by a LF was MK5,612 (US$14) on average, and the average cost for conducting training per farmer was MK751(US$2), while the cost which was required for a farmer to practice one subject was in a range of MK1,328 (US$3.2) to MK1,399 (US$3.5).

Meanwhile, the results of the practice in 2014 / 2015 planting season were indicated in the table no. 4 and no. 5. The data for the practice in soil conservation was collected through a survey conducted by LFs under supervision of CCOs. The survey was conducted with a method of self claiming by farmers in a period from Dec. 2014 to Feb. 2015. The data for tree growing and gully repairing were from the monitoring report that each district collects from CCOs.

- Soil conservation techniques

The numbers of households practiced in each technique of table 4 are overlapping many cases. The ratio of practice is calculated against the number of households which the data were collected. The practice ratio in Neno district is probably higher than it appears in the table because the data from the villages which CCOs reported during monthly meeting and their monthly report were not collected. If those villages' practicing farmers were added to this survey, it could be about 25% in contour ridging as a district. However, it does not improve the average of the contour ridging practice ratio of the four districts. The reason why the practice rate of swale is low should be due to difficulties of digging the ditches in terms of hard labour and unsureness of its effect.

Despite 70% of the total number of villages was under the first year of the intervention, it is quite significant that practicing ratio of contour ridging reached 27% on average. It can be expected to increase the practicing ratio in the following year with implementation of effective activity to promote more practice like Field day using the gardens which shows impeccable performance in maize growing. Hence it may be achievable to reach around 40% of practicing ratio in two years of intervention.

Table 4: The result of practice by the farmers in soil conservation techniques for maize growing in 2014 / 2015

District	Total no. of H/H	No. of villages data collected	No. of H/H data collected	Contour ridging		Box ridge		Swale		Manure application		Area practiced for contour (ha)	Area with manure (ha)
				No. of H/H practiced	Ratio	No. of H/H practiced	Ratio	No. of H/H practiced	Ratio	No. of H/H practiced	Ratio		
Blantyre	9,217	30	8,138	2,663	33%	2,946	36%	1,332	16%	2,771	34%	393	454
Balaka	4,466	60	4,420	1,412	32%	1,523	34%	762	17%	1,655	37%	299	343
Mwanza	4,586	36	4,388	781	18%	743	17%	492	11%	748	17%	108	80
Neno	7,567	23	5,008	973	19%	752	15%	460	9%	331	7%	303	79
Total	25,836	149	21,954	5,829	27%	5,964	27%	3,046	14%	5,505	25%	1,103	956

The average of the area conserved with contour ridging per farmer was 0.19ha and that of manure application was 0.17ha. It was reported and witnessed by each district that the difference on the performance of maize between the conserved gardens with above techniques and un-conserved gardens is tremendous.

At the same time, the erosion from the garden was mitigated with the conservation techniques. COVAMS project analyzed an economic impact of the conservation techniques (2012 Abe, Economic impact survey of COVMAS approach). According to the survey report, it was found that a farmer who cultivated 0.25ha for maize growing with the conservation techniques that COVAMS promoted would benefit between K3,150 to K22,238 (US$ 11 to US$82 at the exchange rate of 270 /Kwacha) when the volume of protected soil in the garden was converted into monetary form. The conversion was made with the commercial price of urea, calculating the volume of nitrogen contained in the protected soil.

Applying the same benefit of the 2012 to 2014 / 2015 planting season with 0.19ha of conserved area per farmer, the benefit the farmers would receive from the protected soil should be K2,394 to K16,900 (US$9 to US$62 at the same exchange rate of 2012). In short, the return of the investment which was US$3.5 per subject for a farmer to practice would be minimum of 2.5-fold to maximum of 17.7-fold. Therefore, it can be said that the cost-effectiveness was quite high in terms of soil conservation techniques.

Conserved garden with contour ridges, box ridges, Swale, and manure
Taller with dark green color

Un-conserved garden.
Height is lower and the color is light green

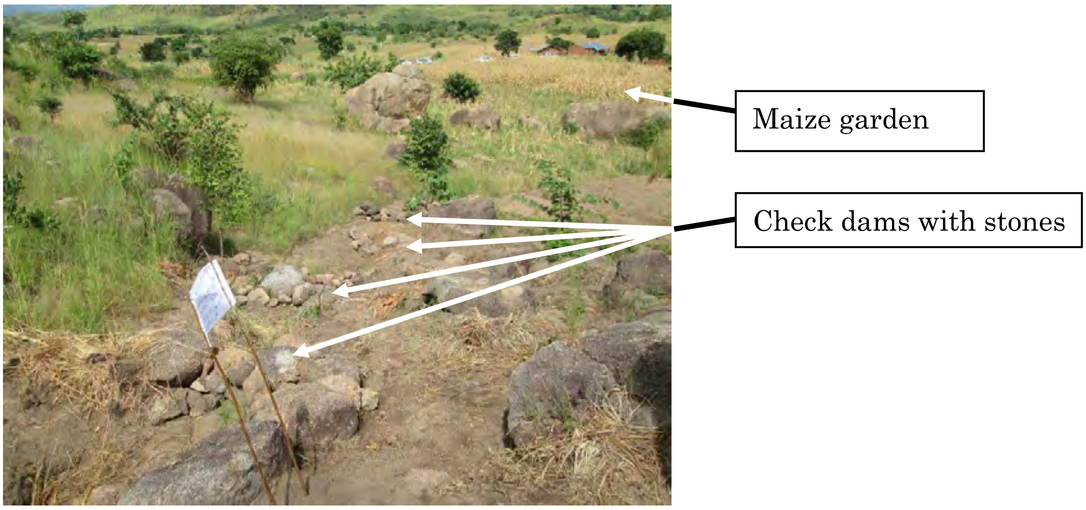
One of the field days conducted in Neno district in March. The participants could recognize the effectiveness of the techniques practiced.

Well-constructed Swale

<Blantyre district> One of the LFs' fields
Conserved garden (left), un-conserved garden with fertilizer (right)

- Gully repairing technique

It is not easy to assess the cost-effectiveness of small scale Gully repairing techniques. The technique is basically to prevent farming of large scale gully and reclamation of land which was damaged by gully erosion. One of the LFs said that she constructed several check dams from upper side of the field to down wards in order to prevent any damage in the garden which located lower area. She found that the current of runoff water at the time of heavy rain was still gentle at the lower area around the garden, so there was no damage in the garden. As such, the effect of the check dams is certain.



The mode of the practice ratio was 14%. This may be the true reflection of the practicing ratio in the gully repairing technique. The reason why the ration in this subject was lower than others would be because of inadequate awareness on the gully in gardens by farmers and also the fact that not all the gardens have gully.

The number of check dams would be almost the same number of farmers practiced this subject. The target gully under this subject is relatively small ones, and because of this, farmers won't construct check dams in collaboration but did it independently. Therefore, it can be inferred that the total number of check dams would be around 4,200.

Table 5: Result of practice in tree growing and gully repairing in 2014 / 2015

			Tree growing		Gully repairing		
District	Total no. of H/H	No. of H/H data collected (a)	No. of H/H practiced (b)	Ratio (b)/(a)	No. of H/H practiced(c)	Ratio (c)/(a)	
Blantyre	9,217	9,217	2,556	28%	2,227	24%	Report at JCCM
Balaka	4,466	4,466	1,809	41%	620	14%	Monthly monitoring result
Mwanza	4,586	4,586	734	16%	647	14%	Monthly monitoring result
Neno	7,567	6,043	1,925	25%	698	12%	Monthly monitoring result
Total	25,836	24,312	7,024	29%	4,192	17%	

- Tree growing

The average of the practicing ratio in tree growing was 29% in the four districts. Balaka district had the highest rate with 41%. This might be caused by less receiving rain falls in the area, and inadequacy of tree may be more serious problem for the people. The practice result includes "direct sowing method" apart from "seedling raising method". The project conducted a survey in tree growing from February to March 2015. With the survey, more detailed data will come out such as number of seedlings raised and planted, number of stations for direct sowing, and number of areas for natural regeneration method. The report hasn't compiled yet at this moment.

5. Conclusion

It appears that COVAMS approach is achieving its purpose with adequate result in provision of trainings for the farmers with LF system and practicing ratio of the catchment management techniques which COVAMS approach promotes. Moreover, the cost effectiveness of COAMS approach is proven very good in terms of soil conservation techniques although it is still necessary to look into that of tree growing. Additionally, the practicing results show that COVAMS approach is not so complicated in its operation, considering that most of districts' staff are new to the approach.

The only deficiency found was on the participation in the training by farmers. It did not reach to satisfactory. It could be because of ineffectiveness in creation of atmosphere through sensitization meeting or lack of ideas on effective involvement of the VH into the catchment management activities.

However, it is expected that the challenge of improving the participation of the farmers in the training will be achieved through implementation of more activities for the farmers to expose to the benefit and effectiveness of the techniques like field day. In fact field days have been conducted by LFs in most of the villages in all the four districts in February and March 2015 and the response of the participants was very positive according to the districts. Additionally the knowledge, understanding and skills in the techniques of most of the LFs seemed to be reached to satisfactory, seeing the way they practiced. This also will be a help to improve the practicing ratio by farmers, too.

COVAMS Ⅱ

Working Paper

No.　5

Result of practice survey in tree growing 2014

May 2015

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The project for Promoting Catchment Management Activity in Middle Shire
(COVAMS Ⅱ)
Forestry Department / Japan International Cooperation Agency

1. Summary

A practice survey in tree growing under COVAMS II project was conducted from February to March 2015. The survey revealed that about 9,600 households practiced the tree growing technique both seedlings planting and direct sowing methods. The figure is an aggregation of the number of households in both individual and group activity. The percentage of the above figure reaches to 37% of the entire number of households of the target villages in the four districts in 2014 /2015 season.

The number of seedlings out planted and stations by those households was about 297,000 and 86,000 for seedling and direct sowing respectively, which aggregates to about 384,000. The coverage of the area with these seedlings and stations is estimated as 153ha which is not so wide.

However, the cost-effectiveness of COVAMS approach in tree growing was found very good even with such result. The average benefit of a household who practiced from the above number of planted trees could be K5,940 after three years when the value of a tree interpreted into monetary form with a bundle of firewood. On the other hand, the project spent K1,399 for a household to practice a subject. The expenditure includes the cost for nurturing LFs, backstopping for the activities of the LFs and the farmers by the district staff, and depreciation of motorbikes. In short, the benefit from provision of training in tree growing can be 4.2-fold of its investment.

A clear lesson was learnt with this survey that individual activity should be more encouraged than group one. The number of seedlings raised and planted was far more than that of groups'. The average number of seedlings planted by an individual was 41. It is very small number but each district should aim at increasing the number of farmers and persuading them to sustain the practice, rather than trying to convince a farmer to increase the number of seedlings to plant.

An observation was made that natural regeneration method is widely practiced by even individuals although each area should be very small. Moreover, its coverage of area is far wider than seedlings planting. It means that the method has a big potential to contribute to the catchment conservation. However, there is a necessity to assess the appropriateness and effectiveness on what the farmers are doing for the site of natural regeneration method in order to make the training more effective.

2. Method of survey

The survey was conducted with two survey sheets by Lead Farmers (LF) in each village of all the districts. The period of the survey was from February to March 2015. One survey sheet is for collecting information of individual practice and the other is for group practice. The survey sheet for the group is able to collect the information of different mode of groups such as village, limana (clan), and smaller group which is composed of a few people like friends. The method of data collection was through interview by the LFs to each household who practiced tree growing and entered the information into the survey sheet for the individual. The data for group practice was entered by the LFs who know the situations. CCOs were the one who collected the survey sheets and they made a cross check before submission.

3. Result of survey

The result of the individual practice survey is shown in the table 1 and table 2. The total number of households who raised tree seedlings in the four districts was 5,600 and raised seedlings was about 390,000 seedlings in total. Out of 390,000 seedlings, about 244,000 were out planted by 5,911households which represents 23% of the total number of households of all the four districts. The number of seedlings out planted by a household was 41 seedlings on average. The increase of the number of households in out planting would be due to that some households were given some seedlings as a share of group nursery activity, provided by some other organization like NGOs and other projects, or purchased some seedlings and out planted by the farmers. The number of households (6,315, 24%) at the column of "planting" of usage should be including those who practiced direct sowing. The place out planted most was garden with 87,500 seedlings followed by homestead 76,400 seedlings and woodlot with 62,000 seedlings. The least place was river bank with 18,400 seedlings.

The number of households who tried the direct sowing method was only 2,585 in all the districts which are less than half of those who practiced seedling raising method. This figure represents about 10% of the entire households of the four districts. The total number of stations with this method was 73,000.

Natural regeneration method was practiced by 2,671households in the four districts which represents about 10% of entire households of all the districts. The total area practiced for this method was 1,156ac.

Table 1: Result of individual practice in total number

District	Total no. of seedlings / H/H	No. of seedlings raised	Usage (tick)		No. of trees planted				Direct sowing					Natural regeneratio	
					Indicate the No. of seedlings				Indicate the No. of stations						
Total no. of H/H			Planting	selling	Wood-lot	Garden	Home-stead	River bank	Wood-lot	Garden	Home-stead	River bank		Area	
Blantyre	Total no. of seedlings	139,945	95,209		24,403	32,416	28,710	9,680	7,535	8,047	8,874	1,811	26,267	234	ac
9,217	Total no. of H/H	2,190	2,253	288	763	1,555	1,658	494	405	573	779	170		667	H/H
					Number of H/H planted			2,201	Number of H/H practiced			996			
Balaka	Total no. of seedlings	94,245	48,084		11,791	14,954	19,056	2,283	7,604	10,942	10,461	2,895	31,902	418	ac
4,466	Total no. of H/H	1,294	1,836	110	468	945	1,259	185	392	642	732	208		998	H/H
					Number of H/H planted			1,583	Number of H/H practiced			1,024			
Mwanza	Total no. of seedlings	29,932	20,215		1,665	12,306	5,663	581	800	626	764	174	2,364	106	ac
4,586	Total no. of H/H	627	656	12	87	495	302	57	35	84	105	20		204	H/H
					Number of H/H planted			632	Number of H/H practiced			167			
Neno	Total no. of seedlings	125,333	80,954		24,238	27,829	22,982	5,905	2,623	3,873	4,592	1,471	12,559	399	ac
7,567	Total no. of H/H	1,489	1,570	101	434	888	985	304	125	201	211	84		802	H/H
					Number of H/H planted			1,495	Number of H/H practiced			398			
Total	Seedlings	389,455	244,462		62,097	87,505	76,411	18,449	18,562	23,488	24,691	6,351	73,092	1,156	ac
	H/H	5,600	6,315	511	1,752	3,883	4,204	1,040	957	1,500	1,827	482		2,671	H/H
Total no. of planted seedlings and stations of direct sowing			317,554		Number of H/H planted			5,911	Number of H/H practiced			2,585			

Table 2: The result of individual practice in percentage

District	Total no. of H/H	Practice rate in raising seedlings	Practice rate in planting / direct	selling	No. of trees planted				Direct sowing				Natural re-generation
					Indicate the No. of seedlings				Indicate the No. of stations				
	No. of villages				Wood-lot	Garden	Home-stead	River bank	Wood-lot	Garden	Home-stead	River bank	
Blantyre	9,217	24%	24%	3%	8%	17%	18%	5%	4%	6%	8%	2%	7%
	35			Total no. of H/H planted			2,201	24%	Direct practiced		996	11%	
Balaka	4,466	29%	41%	2%	10%	21%	28%	4%	9%	14%	16%	5%	22%
	48			Total no. of H/H planted			1,583	35%	Direct practiced		1,024	23%	
Mwanza	4,586	14%	14%	0%	2%	11%	7%	1%	1%	2%	2%	0.4%	4%
	35			Total no. of H/H planted			632	14%	Direct practiced		167	4%	
Neno	7,567	20%	21%	1%	6%	12%	13%	4%	2%	3%	3%	1%	11%
	35			Total no. of H/H planted			1,495	20%	Direct practiced		398	5%	
	G. Total	5,600	6,315	Total no. of H/H planted			5,911		Direct practiced		2,585		2,671
	25,836	22%	24%				23%				10%		10%

Table 3 shows the result of group activity in tree growing. About 94% (34) and 55% (33) against the entire villages had group practices in Blantyre (36villages) district and Balaka (60 villages) district respectively. In contrast, less than 2% of the entire villages had group practices in the same subject in the remaining two districts Neno and Mwanza.

The numbers of participants of “Limana” and “Group” are about 3,000 and 1,900 in Blantyre and Balaka respectively, while those of “Village” were about 900 for Blantyre and 1,500 for Balaka. About half of the seedlings produced were shared by the participants. Direct sowing method was also practiced by the groups for the communal purpose but it was not so many stations as compared to the seedling raising method. The numbers of communal land and the total area for natural re-generation method were 143 with 36.6ac and 207 with 29ac in Blantyre and Balaka respectively. The area for natural re-generation in Neno was 37ac by 4 villages.

Table 3: Result of practice in tree growing by group

District	No. of villages	Category of group (tick)			No. of LFs involved	Number of participants	No. of seedlings raised	Usage (number of seedlings by usage)			Place of planting as community		Direct sowing	Natural regeneration (Communal)	
		Village	Limana	Group				Sold to outsider	Shared by group members	Planted as community	Wood lot	River bank	No. of stations in communal	Number of land	Area
Blantyre	20	21			21	893	35,464	3,970	12,147	17,888	15	6	300	9	7.00 ac
	10	0	56		41	800	15,579	2,128	4,533	5,989	38	7	5,595	99	21.08 ac
	9	0		37	26	2,279	32,965	464	17,042	10,528	28	1	5,769	35	8.52 ac
total	**34**	**21**	**56**	**37**	**88**	**3,972**	**84,008**	**6,562**	**33,722**	**34,405**	**81**	**14**	**11,664**	**143**	**36.6 ac**
Balaka	24	30			30	1,476	31,687	0	13,930	10,200	25	5	1,000	30	19.7 ac
	15	0	32		32	499	6,138	525	4,720	825	4	10	295	174	8.15 ac
	5	0	0	17	17	1,395	5,597	0	5,028	570	17	1	53	3	1.3 ac
Total	**33**	**30**	**32**	**17**	**79**	**3,370**	**43,422**	**525**	**23,678**	**11,595**	**46**	**16**	**1,348**	**207**	**29.15 ac**
Mwanza	3	3			3	72	750	0	0	750	1	0	32	3	1.95 ac
	1		1		1	10	81	0	0	0	0	0	0	0	0 ac
															ac
Total	**4**	**3**	**1**	**0**	**4**	**82**	**831**	**0**	**0**	**750**	**1**	**0**	**32**	**3**	**1.95 ac**
Neno	4	4			4	134	6,720	0	150	6,470	3	0	0	3	36.5 ac
	2	0	2	0	2	0	103	0	80	0	0	0	0	1	0 ac
	3	0	0	3	3	12	693	0	400	14	3	0	219	0	0.75 ac
Total	**8**	**4**	**2**	**3**	**9**	**146**	**7,516**	**0**	**630**	**6,484**	**6**	**0**	**219**	**4**	**37.25** ac
G. Total	**79**	**58**	**91**	**57**	**180**	**7,570**	**135,777**	**7,087**	**58,030**	**53,234**	**134**	**30**	**13,263**	**357**	**104.95 ac**

Table 4 shows a comprehensive result of the four districts. The total numbers of households who practice tree growing were 6,315 for individual practice and 7,570 for group practice during the period. Part of the households who involved group practice could be over rapping with that of individual one. Hence, individual and group practice should not be summed up in order to figure out the total number of households who practiced tree growing. The maximum was calculated by summing up the larger number of households either individual or group except the one of natural regeneration in each district. The number of households of group practice was taken for Blantyre and Balaka, while that of individual practice was taken for Mwanza and Neno, and resulted with 9,568 households. This is a possible total number of households who practiced tree growing, and this represents about 37% of the entire households of the targeted villages in the four districts in the 2014 / 2015 planting season.

Table 4: Comprehensive result of the practice in tree growing

District	No. of H/H	Category of practice	No. of practicing H/H	Ratio of practice	No. of trees palnted		Total stations	Estimation of Area planted (spacing 2X2)		Natural regeneration		
					Seedlings	Direct sowing				No. of place	Area	
Blantyre	9,217	Individual	2,253	24%	95,209	26,267	121,476	48.6	ha	667	95	ha
		Group	3,972	43%	34,405	11,664	46,069	18.4	ha	143	15	ha
Balaka	4,466	Individual	1,836	41%	48,084	31,902	79,986	32.0	ha	998	169	ha
		Group	3,370	75%	11,595	1,348	12,943	5.2	ha	207	12	ha
Mwanza	4,586	Individual	656	14%	20,215	2,364	22,579	9.0	ha	204	43	ha
		Group	82	2%	750	32	782	0.3	ha	3	1	ha
Neno	7,567	Individual	1,570	21%	80,954	12,559	93,513	37.4	ha	802	162	ha
		Group	146	2%	6,484	219	6,703	2.7	ha	4	15	ha
G. Total	**25,836**	**Individual**	**6,315**	**24%**	**244,462**	**73,092**	**317,554**	**127.0**	**ha**	**2,671**	**469**	**ha**
		Group	**7,570**	**29%**	**53,234**	**13,263**	**66,497**	**26.6**	**ha**	**357**	**43**	**ha**
		Maximum	**9,568**	**37%**	**297,696**	**86,355**	**384,051**	**153.6**	**ha**	**3,028**	**511**	**ha**

The total number of tree seedlings planted with both individual and group practice was 297,696 and 86,355 stations with direct sowing, which aggregated to 384,051 in the four districts. When this result converted into an area, it becomes about 153ha assuming the planting spacing 2m x 2m.

The total number of places for the natural regeneration was 3,028 with 511ha. The area practiced by individuals is more than 10-fold of the one of groups.

4. Observations

The result of direct sowing indicates that people are still skeptical with the direct sowing method whether it is effective or not.

The result of group activities would support an idea that more people participate in the smaller group which they would feel more tangible or certain benefit.

Assuming the participants of group practice as practicing farmers, the result that 37% of the entire households in the four districts have practiced tree growing activity in the season was quite recommendable, although one district could achieve quite low percentage. This result indicates that the villagers have great concerns on their situations of trees or environment.

The total area of natural regeneration practiced by individuals was beyond our expectations although this result supports the result of baseline survey (conducted in 2013). The area covered by the natural regeneration was three times wider than that of seedlings planting and direct sowing methods.

The approach that forms a group for tree growing practice may not be always effective. The farmers in Mwanza and Neno districts seem to prefer practicing individually. As it was analyzed in the baseline survey analysis, each district should come up with own strategy on how to promote tree growing practice. However, when it comes to the number of seedlings raised by individuals, it is far better than that of by groups. In this sense, individual practice should be promoted more in all the districts so that the coverage with trees will be more significant. Moreover, it should not be expected that one individual raises many seedlings or many stations for direct sowing in one season since the average of seedlings planted by an individual was about 40. Rather it is necessary to encourage them to continue planting trees every year.

5. Cost-effectiveness

5.1 Method of measuring cost effectiveness

The previous project “COVAMS project” made an economic impact survey and it formulated how to interpret the planted trees into monetary form in its report (Abe, 2012, Economic impact survey of COVAMS approach). The formulation was that the value of a planted tree will be K200 (at the rate of K270 /US$ 1) after three years. This value was extracted from the transaction among the villagers on firewood. The volume of a bundle of firewood was estimated the same as the volume of a three year old tree.

Of course not all the planted trees will be used as firewood but others could be used as poles or timbers. The value of the trees will be changed by the purposes of usage but it is assumed that the value of firewood is the lowest. So the estimation should be recognized as the least value of the trees when it is firewood. With this method, it is possible to estimate not the current value but the future one after three years.

The survival rate used after out planting of seedlings and direct sowing in the above report was 50%. The value of a bundle of firewood K200 should be adjusted to the current value (the exchange rate of K400 / US$1 is used in COVAMS II Working paper No. 4). The value therefore should be settled as K296 (K400 x US$0.74)

The interpretation of the value of natural regeneration into monetary form was not established. Therefore, it was not included to this measurement of cost effectiveness.

5.2 Result of cost effectiveness in 2014 / 2015 planting season

The total number of seedlings planted and the stations of direct sowing was 384,051. The number of trees which will survive after three years should be estimated 192,025 (survival rate 50%). The value of the total trees planted in 2014 / 2015 season can be estimated therefore, K56,839,400 (192,025 x K296) after three years.

On the other hand, the project spent about K1,399[1] at most in order for a household to practice one subject (COVAMS II working paper No.4). The total number of households who practiced tree growing was 9,568 at maximum. Therefore the benefit on average per household will be K5,940 in three years' time. In other words, the benefit a household can receive is 4.2-fold of the cost[2]. This means that even if a group decided to conduct the training every year spending K1,399 per household, it pays back. Therefore, it can be said that the cost effectiveness of COVAMS approach in tree growing is very good or high.

6. Conclusion

The result of the experiment the previous project conducted with the direct sowing method was not bad. It depends on the conditions of the weather and soil type of the areas though; the survival rate was in a range of 50% to 20% after one dry season. If this result can apply everywhere, the direct sowing method can be encouraged more to

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[1] This cost was calculated as the total number of households who practiced tree growing was 7,024 in COVAMS II working paper No.4). However, after compilation of practice survey in tree growing in 2014 / 2015 season revealed that the total number of households was 9,568 at maximum. Therefore the cost for a household to practice a subject can be a little lower.

[2] Even if the value of a bundle of firewood has been maintained K200 up to date, the benefit of a household will be K4,013 (2.86-fold of the cost). Hence the cost effectiveness is still good.

practice. In order to do so, it is worth to establish more demonstration plot and have more field days for it so that people can expose themselves its effectiveness.

It seems that natural regeneration method should be more encouraged during the training because it can cover wider areas than seedling planting or direct sowing method. However, the project has not enough insight on how the farmers are managing and what tree species are being generated in the site of natural regeneration. Therefore, it will be necessary to collect data and assess it. Once it is assessed as an appropriate and effective method, it may be worth to consider shifting the focus of tree growing training from planting seedlings to natural regeneration method.

It was often observed that some of the participants in the group practice were joining the activity as just labourers. In this case, it is arguable if they should be counted as practicing farmers. In order to evaluate the degree of impact more accurately in tree growing, it may be necessary to come up with certain definition to identify the participants of group practice whether practicing farmers or just labourers.

After all, it can be said that COVAMS approach is very effective. The result shows that the farmers in Blantyre and Balaka districts seem to be very concerned about the situation of trees in their areas. The approach that provides equal opportunity to participate in the training encouraged their participation in the practice, although the number of tree seedlings including the number of stations of direct sowing was not satisfactory. Moreover, the cost effectiveness of the approach was found very good or high on its own.

COVAMS Ⅱ

Working Paper

No. 6

Study of characteristics of COVAMS approach in contrast with conventional approach

June 2015

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CDC International

The project for Promoting Catchment Management Activity in Middle Shire
(COVAMS Ⅱ)
Forestry department / Japan International Cooperation Agency

1. Objective of Study

study the characteristics of Lead Farmer (LF) system in COVAMS approach in contrast with conventional LF system – typically LF system which promoted by Ministry of Agriculture of Malawi to accelerate institutionalize of COVAMS approach in the target areas.

2. Method and subjects of study

2-1. Method

1. Investigation of existing documents[1]*
2. Interview and questionnaire (see attached Questionnaires)

2-2. Subjects (Respondents)

- RMT (Regional management team) 2person / TST (Technical support team) 6person
- CCO (Conservation coordinating officer) 22person
- LF (Lead farmers) / Practicing farmers 6person
- Japanese experts of COVAMS Ⅱ project 3person

2-2. Schedule

- May to June /2015

Date	Venue	Respondent (Number)	Method
15/May	Neno	TST member (5)	Questionnaire & group interview
21/May	Zalewa (Neno)	CCOs (22)	Questionnaire & group interview
22/May	Ligowe (Blantyre)	LF (LF*1(male), Farmer*1(Female))	Interview
2/Jun	Blantyre	RMT (2 male)	Questionnaire
5/Jun	Neno	LFs (3 (1 Male, 2 Female)) Farmers (3 Female)	Interview
8/Jun	Blantyre	TST (1 male)	E-mail
8/Jun	Blantyre	Senior LFs (3 (1 Male, 2 Female)) LF (1 Female) Farmers (2 (1 Male, 1 Female))	Interview

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[1] *It is very difficult to obtain document on LF system in the Ministry of Agriculture. Only `Lead Farmer Concept Guidelines (July, 2010)`is existed*

3. Profile of correspondents

- RMT (Regional management team)
  - Consist of person from district office of related department - Agriculture Dept., Forestry Dept., Community Development Dpt. They are also Counterpart personnel of COVAMS2 project.

- TST (Technical Support Team)
  - Organized by the project. Established in between District Management team (DMT) and Conservation Coordinating Officer (CCO). Consist of 19 people from targeted 4 districts. 6 people are corresponding to this study.

- CCO (Conservation coordinating officer)
  - 27 people are assigned in 4 districts. 22 people are corresponding to questionnaire. All of them are in a position to train Lead Farmers (LFs) as an extension staff. The name of post are different according to belonging offices e.g. AEDO (Area Extension Development Officer) in Agriculture Dept.
  - Details of 22 correspondent is; 9 from Agriculture Dept., 9 from Forestry Dept., and 4 from Community Development Dept.
  - All of them have participated to COVAMS training, and conduct training to LFs.
  - All of them have participated to training except COVAMS such as Business management, accounting, financial, women in development and so on from variety of organizations which includes UNICEF, FAO, ADB, etc.
  - 10 people out of 22 have received the training for technical transfer includes facilitation and/or communication technique. 6 of that 10 are participated to the facilitation training conducted by the project. The number of participants will be increase because training has provided to TST and CCOs by the project after the study period.

- Farmer
  - 14 Interviews have conducted in 3 villages in Blantyre and Neno district.
  - Details of 14 interviewees are; 5 of LF (incl. 3 female), 3 of Senior LF (incl. 2 female) and 6 of Practicing Farmer (incl. 5 female).
  - 7 of LF/SLF and 3 of practicing Farmer have experienced to participation of training except of COVAMS such as vegetable planting, irrigation, women in development and so on.

4. Summary of the results

- The major study items and results are as follows.

Item	LF system in Ministry of Agriculture	COVAMS approach
Flow	1. Hold of Sensitization meeting by extension officer 2. Select LF by election 3. ToT (Training of Trainers). Extension officer (AEDO) provides training to LF 4. Make `Work plan` in cooperation of AEDO, LF and local residents 5. LF teach technique to farmers 6. LF conduct monitoring under consultation of AEDO	･Basically same as MoA. ･However, there are some additional features e.g. TST (Technical Support Team), SLF(Senior Lead Farmer).
Sensitization Meeting	･N/A	･To standardize of meeting, visual aid (photo flip) are provided to CCO.
Selection of LF	･As a general rule, LF is selected by election however, in many cases LFs are appointed by local leader. (interviewed CCO)	･Election in village places as the next step of sensitization meeting. Elected LF is introduced to villagers and local leader.
Senior LF	･N/A	･Selected and certified among excellent LFs by recommendation of CCO.
Ration of LF: Farmers	･No regulation available	･Set at 1:15
TOT (training by CCO to LF)	･Conducted at out of village e.g. training center, university. ･Often, too theoretical (interviewed LF) ･1 LF for 1 field	･Taking place in village with local available materials. More practical training are provided.(interviewed farmer) ･Specific training for conservation practice such as contour ridging, gully control and tree growing (manure making also recommended) ･A trained LF teach all 3

		technologies
Technical transfer from LF to farmers	･Depends on LF	･The training is open for all. ･Can be repeated ･At least 1 LF is stationed in Limana[2]
Achievement	･N/A	･The number of practicing village is increasing from 50 in the year 2013 to 171 in 2014. The number of trained LF is currently 1705. ･About 80% of LF provide the training to farmers.
Consistency to local needs	･N/A	･Yield of Maize have been increasing remarkably.
Monitoring & Evaluation system	･Existing but not functioning	･Using standardized monitoring & evaluation format ･Organize and provide training to TST to strengthen monitoring, evaluation and planning capacity
Cost effectiveness	･N/A	･Cost for manipulate a farmer with 0.19ha of contour ridging is about USD$3-

5. Finding

- **Flow**
  - There are no significant differences on standard flow between COVAMS approach and conventional LF system which promoted by Department of Agricultural Extension Services based on `Lead Farmer Concept Guidelines (July, 2010)`.
  - However, there are some additional features e.g. TST (Technical Support Team）, SLF (Senior Lead Farmer) in COVAMS approach.

- **Lead Farmer**

  ＜Selection and assignment＞
  - Despite `*Lead Farmer Concept Guidelines*` stated that LF is selected by election, many of LFs are assigned by arbitrary appointment by village leader (or someone) in the conventional system. And there is no concrete rule for the number of farmer which should be taken charged by one single LF. It may causes to overlord to LF.

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[2] *A village is consist of some `Limana`s that is a colony united by mainly blood relative. LF is posted in each`Limana` in COVAMS approach.*

- In COVAMS approach, election of LF places as the next step of the sensitization meeting. And elected LF is introduced to the villagers at that time. These procedures make possible to build up mutual trust between LF and farmers. It motivates both LF and farmers, too

＜Mechanism＞

- Basically, one LF is take charge of one single field (or topic) in the LF system (or slimier system driven in the other departments) because it is operated in vertically divided administration. It is not efficient.
- A one trained LF teaches every 3 technologies – contour ridging, gully control and tree growing in COVAMS approach. It is efficient and functional.
- Senior LF (SLF) system could be one of peculiarities of COVAMS approach. SLF is selected among excellent LFs by recommendation of CCO to support CCOs. SLF trains farmers as a deputy of CCO often. A bicycle is lent to SLF. It is expected not only to reinforce functional autonomy of system but also to motivate both LFs and SLFs.

■ Training

＜TOT－CCO/AEDO to LFs＞

- In the conventional LF system, topics of the training are decided by AEDC(Area Extension Development Coordinator) based on investigation in the area.
- Training are conducted at out from village e.g. training center, university and so on. Systematic support after training seems not available in the conventional LF system.
- In COVAMS approach, TOT is taking place within a village with local available resources. They provide only specific training for conservation practice such as, contour ridging, gully control and tree growing. By these factors, the project succeeds to bring out positive feedback from farmers e.g. `COVAMS training in very practical and understandable`.

＜LF to Farmers＞

- As mention above, systematic support after training seems not available (or very limited) in the conventional LF system. Implementation of training is depending on capacity of each LF.
- In-village TOT enables to smooth and prompt shift to training by the LF to local farmers in COVAMS approach. In this stage, COVAMS approach has also some peculiarities. One is `open to everyone`, and another is `can be repeated`. At the training for farmers by LF, no criteria are set on the participants. It’s open for all. Everyone in the village can be participating. If someone could not participate, or if some of participant seems not understand fully, the training can be repeated. It seems that these characteristics of COVAMS approach such as in-village TOT with local available materials, specifically focused training and appropriate ration at LF to farmers, make possible to wider involvement of farmers and faster expansion of technique.

- **<u>Consistency with local needs</u>**
  - Almost of all CCOs / farmers mentioned about increasing of maize yield in questionnaire and/or in interview (not asked rate of increasing). It will be a typical example indicating consistency with local needs of COVAMS approach.
  - In COVAMS approach, both immediate benefit – increasing yield from contour ridging – and mid/long term benefit – expected utilization of wood from tree growing - are indicated clearly. Easy understanding for correlation between labor and benefit helps motivate the farmers.

- **<u>Monitoring & evaluation system</u>**
  - DADO (District Agriculture Development Officer) is mainly takes on a role of monitoring and evaluation however, it seems not functioning well because of lack of guidance.
  - To reinforce monitoring and evaluation system, in COVAMS approach, TST (Technical Support Team) has established newly under the DMT (District Management Team). Training for monitoring, evaluation and planning are also provided for them through inter-district TST meeting.

6. Characteristics of COVAMS approach

As a whole mechanism, there are no significant differences between conventional LF system and COVAMS approach. However, some peculiar characteristics are given into COVAMS approach to optimize for conservation practice. It can be said the COVAMS approach is a modified method based on conventional approach for faster, wider and more effective dissemination of conservation technologies.

It is thought that it leads to clear understanding for COVAMS approach to clarify characteristic, not differences. The followings are some of characteristics that found in this study. (Answers to following questions; “What is the difference between conventional approach and COVAMAS approach?” “Is COVAMS approach practical?” “Is the training matching with local needs?”) (`Farmer` is including LF, SLF and practicing farmer)

- **<u>Approach</u>**

・”Community base” (easy to participate) (CCO－2out of 22),(Farmer－5 out of 14)
・Open for all （CCO- 4/22）
・Can be repeated （CCO- 2/22）
・Utilize local available materials （CCO- 7/22）(Farmer-2/14）

- **<u>Mechanism / Operation</u>**

・LFs are well trained （CCO- 3/22）
・Motor cycle provided （CCO- 2/22）

・Variety of training contents （Farmer-1/14）
・Training is easy to understand （Farmer-4/14）
・Well-arranged manuals（easy to review at home） （Farmer-1/14）
・Planned operation （CCO- 1/22）

■ **Impact**

・Ownership of farmers （CCO- 8/22）
・Increased maize yield （CCO- 9/22）（Farmer - 14/14）
・Contribution to environmental protection（CCO- 3/22）
・Improved soil （CCO- 1/22）（Farmer-1/14）
・Increased cultivated land （Farmer-1/14）
・Increased tree （Farmer-1/14）

■ **Others comment**

・Training for planning / monitoring should be provide more （TST-3/6）
・Training for facilitation / teaching should be provide more
・Need per diem （CCO-5/22）（Farmer-1/14 ※LF）
・Need manual for manure making （CCO- 2/22）
・LF should be involved in decision making （CCO-1/22）
・Government should be commit more （CCO-1/22）
・Media exposure (PR) （CCO- 1/22）
・Establishment of demo-plot（CCO-1/22）
・Need raincoat （CCO/ Farmer ,1 each）
・Need rubber boots （CCO/ Farmer ,1 each）
・Need seed （CCO-1/22）

7. Observations

Increasing of maize yield by introduced technologies could be un-doubtful. In fact, all interviewee farmers mentioned concretely on that e.g. “I got enough harvest even in small field” “there were plenty of crops even after terrible rainy season” “technology makes cultivated land increase because gullies decreased” “I could find enough yield. My home is always filled up with smile” “I can send my children to school because we got enough yield”.

And many farmers also mentioned about farmer- to- farmer dissemination, such as “I have teach trained technology to neighboring farmers ” “I asked neighbors to join the training when they came to see my field” “I call LF to conduct training because neighbors seemed interested in new technologies” and so on. From this, it is thought that practicing area may spread more than we found in corrected data.

On the other hand, some farmers answer that contour ridging and gully control require more seed and fertilizer. It may indicate misunderstanding of the technologies. It should be considered how to control the quality of the training.

Both relationship between farmers and LF and/or SLF, farmers and CCO seemed satisfactory. It may cause 1. LF is selected by impartial election, 2.they knowing each other and knows their ability, 3. LF/SLF stationed in their village.

End of document

COVAMS Ⅱ

Working Paper

No.　7

Result of practice survey in Gully control 2014

Sept. 2015

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The project for Promoting Catchment Management Activity in Middle Shire
（COVAMS　Ⅱ）
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1. Summary

This paper gives the practice status of the famers in Gully technique in 2014 / 2015 planting season. The practice survey was conducted by LFs of COVAMS II project through interviewing the famers in their group. The number of farmers whose data were collected was 11,390 from all the four districts.

The number of households who participated in the gully control training aggregated 8,622 and out of it, 5,933 households constructed check dams during and after the training conducted by LFs. The practicing rate was about 23% against the entire households of all the four districts. The total number of check dams constructed went beyond 21,000. This result was beyond expectations of the project as 70% of the total villages were in the first year of the implementation of COVAMS approach.

More than 80% of those who constructed check dams with stones and brush wood evaluated the effectiveness of the check dam as effective. However, of those check dams constructed, around 60% were observed some malfunction like washed away and no deposition of soil because of heavy rains occurred in the season and inadequate knowledge of the farmers on how to construct check dam.

In order to encourage the farmers to continue the construction of check dams in the following season, the district staff especially Conservation Coordinating Officers (CCO) should give more information about the check dam on how to make it function during TOT for LFs.

2. Method of survey

The practice survey was conducted with a survey sheet by Lead Farmers in each village of all the districts. The period of the survey was from May to June 2015. The survey sheet was translated into Chewa so that LFs would understand well and collect right information. The survey sheet contained the following questions;
Q1: Participation in the training of Gully control, Q2: Practice of the technique, Q3: Number of check dams constructed, Q4: Materials used for the check dam construction, Q5: The effectiveness of the check dams, Q6: The reasons why the check dams were not effective if the answer of Q5 is “not good”.

The method of data collection was through interviews by the LFs to each household. Prior to the data collection by the LFs, CCOs explained the survey sheet to them, and they collected the survey sheet from the LFs.

3. Result of survey

The number of households whose data were collected was 11,390 households which represent about 44% of 25,838 total households of the four districts. The table 1 below shows all the numbers of households reflecting to the questions.

Table 1: The result of the practice survey in gully control

District	No. of samples	No. of farmers participated in training	No. of farmers practiced	No. of checkdams made	No. of h/h by materials			Effectiveness		Reasons	
					Stone	Brush wood	Sack	Good	Not good	Washed away	No soil collected
Neno	3,805	2,617	1,549	6,376	948	727	78	1,468	174	261	286
Blantyre	1,958	1,514	1,030	2,276	340	618	135	928	28	568	362
Balaka	2,295	1,861	1,315	3,699	479	828	110	1,127	208	712	431
Mwanza	3,332	2,630	2,039	9,011	1,587	1,007	171	2,000	68	193	1,127
Total	11,390	8,622	5,933	21,362	3,354	3,180	494	5,523	478	1,734	2,206

The number of households who participated in the gully control training of all the districts aggregated to 8,622 which shares 33% of the entire households. The most was Neno district and the least was Blantyre district. The number of households who constructed at least one check dam was 5,933 which shares about 23% of the entire households. The total number of check dam constructed by the famers who practiced in 2014 / 2015 season was 21, 362. This means that the average number of check dams constructed by a household became 3.6. The material used most was stone followed by brush wood and the least was empty sack. It was a surprise that such number of farmers used empty sack despite no provision of empty sacks by the project. About 93% of the households who practiced the check dam construction answered “Good” in the effectiveness of the check dams. However, so many of them experienced also malfunction of the check dams such as washed away and no deposition of eroded soil. The total number of households who experience such defect of the check dam aggregates 3,940 which shares 66% of the practiced households.

Table2: Effectiveness and reasons not effective by material

District	No. of h/h said Effective by material			Reasons not good					
				Stone		Brush wood		Sack	
	Stone	Wood	Sack	Washed	No soil	Washed	No soil	Washed	No soil
Neno (7,567)	846	657	65	106	173	153	151	28	26
	0.89	0.90	0.83	0.11	0.18	0.21	0.21	0.36	0.33
Blantyre (9,217)	315	556	101	161	142	398	207	45	59
	0.93	0.90	0.75	0.47	0.42	0.64	0.33	0.33	0.44
Balaka (4,468)	421	683	90	176	223	468	208	42	40
	0.88	0.82	0.82	0.37	0.37	0.57	0.25	0.38	0.36
Mwanza (4,586)	1,085	667	75	77	579	66	292	8	58
	0.68	0.66	0.44	0.05	0.36	0.07	0.29	0.05	0.34
Average	0.85	0.82	0.71	0.25	0.33	0.37	0.27	0.28	0.37
				0.58		0.64		0.65	

More than 80% of those who constructed check dams with stones and brush wood and 70% of the people who used empty sacks answered “effective”. The check dams with stones and sacks show that no deposition of soil was more observed while brush wood shows the opposite.

4. Observations

According to the reports in gully practice made in February 2015 from all the districts, they showed that only 17% of the entire households practiced check dam construction. Comparing to that time, 6 points of practice rate was improved at the time this survey was conducted. The number of households who practiced in Blantyre reduced to more than half while other districts increased to two-fold or more, especially Mwanza district increased to three-fold. Because of this large increase, the reporter had to confirm whether or not that number makes sense to the CCOs of Mwanza district. According to them, they observed many farmers constructed check dams after February 2015, seeing the effectiveness of check dams during the rainy season.

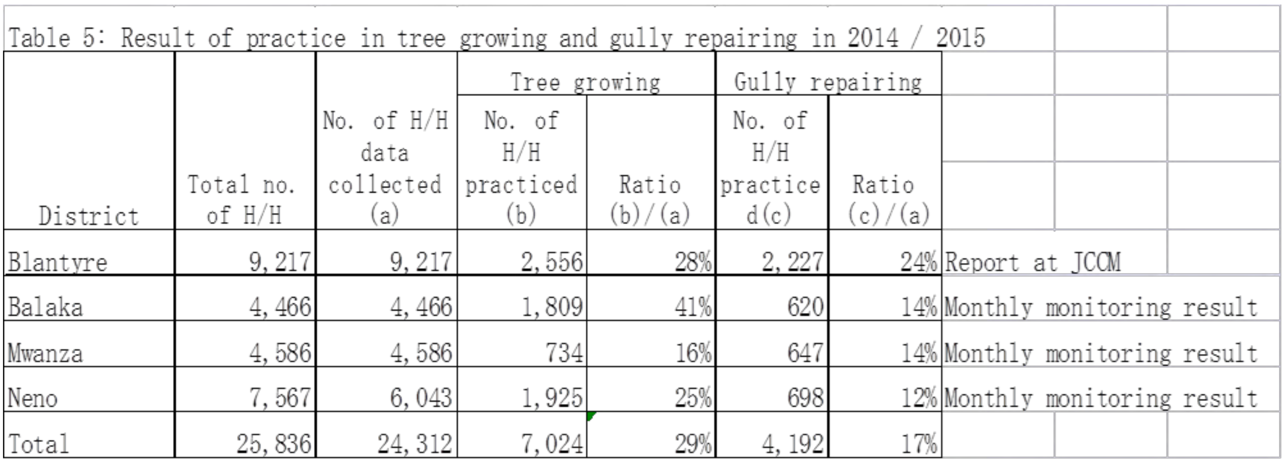


Table 5: Result of practice in tree growing and gully repairing in 2014 / 2015

District	Total no. of H/H	No. of H/H data collected (a)	Tree growing		Gully repairing		
			No. of H/H practiced (b)	Ratio (b)/(a)	No. of H/H practiced(c)	Ratio (c)/(a)	
Blantyre	9,217	9,217	2,556	28%	2,227	24%	Report at JCCM
Balaka	4,466	4,466	1,809	41%	620	14%	Monthly monitoring result
Mwanza	4,586	4,586	734	16%	647	14%	Monthly monitoring result
Neno	7,567	6,043	1,925	25%	698	12%	Monthly monitoring result
Total	25,836	24,312	7,024	29%	4,192	17%	

Source: COVAMS II working paper No.4 "Analysis of COVAMS approach in its effectiveness"

The rainfalls of 2014 / 2015 rainy season was unusual, especially it was exceptionally huge in the month of January 2015 in the target areas of COVAMS II project. This was probably caused a lot of washed away damage on the check dams they constructed. Moreover, the average number of check dams constructed by a household is too small to reduce the velocity of the downfall current in the gully; hence it probably caused the failure of depositing the eroded soil. The percentage of the check dams malfunctioned aggregated about 60% of the total number of check dams constructed. In other words, about 40% of the check dams functioned despite having such circumstance of the rainfalls. This percentage maybe demonstrated to the farmers the effectiveness of the check dam in depositing eroded soil and reduction of current velocity.

5. Conclusion

The number of households who practiced the gully control technique in 2014 / 2015 season is more than expectations at this stage that around 70% of villages were in their first year with COVAMS approach. This fact will mean that many farmers are aware of losing soil from their gardens as well as other premises around their property. It was unfortunate that a lot of check dams malfunctioned due to the heavy rain in the planting season. This may cause farmers to be discouraged to do it in the following season although many of them have said that Check dams were effective.

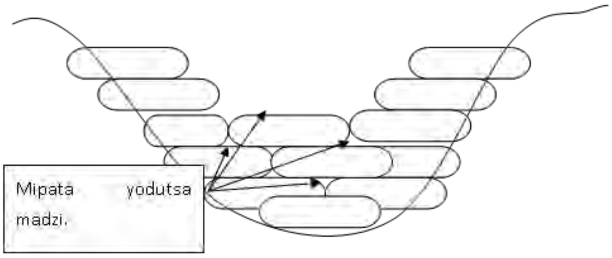
In order to encourage the farmers to continue practicing the gully control technique, CCOs ought to explain more details how to make check dam function during TOT for LFs and tell them to explain to the farmers during the training they conduct. The additional explanation should be as follows;

① Starting point of construction and the number of check dams

In order to reduce the current velocity in a gully, check dams should be made from the top side of the gully and increase the number of check dams. It will be very difficult to tell the distances between the check dams because it depends on the slope but at least it should be mentioned that the number of check dams matters in a gully.

② Securing water path

Most of the check dams constructed by the farmers had no water path at its center. This is wrong way of construction of check dam. At the center of a check dam, water path should be secured so that it may mitigate the flowing water to dig the bottom of the gully deeper at the check dam, especially with the materials of brush wood. The water path at the center will also prevent the flowing water to make diverted path of the same gully besides the check dam.



Source: Field manual in Gully control and reclamation (COVAMS II)

③ Appropriate height of check dam

It was observed during site visits that many of farmers made the check dams with the height of more than necessary. The appropriate height is lower than the depth of the gully as the drawing above shows. If the height of the check dam is higher than the ground level, the same diverted path will be developed as explained at the securing water path.

COVAMS Ⅱ

Working Paper

No. 8

Soil Loss Study for Woodlots

September 2015

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The project for Promoting Catchment Management Activity in Middle Shire
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List of contents

1. Introduction

In the planning stage of the COVAMS II project, soil conservation techniques used by COVAMS and COVAMS II project were thought that it is necessary to be verified their effectiveness through research. It was finally appeared in the project design matrix (PDM) as the output 3. The output 3 was described that “Effectiveness of the catchment management techniques of COVAMS is quantitatively verified by an action research”.

For this output 3 of the PDM a short term expert was dispatched in the year 2013 and the expert designed the research and set research sites in farming garden and tree cover area. There are three research items following the extension subjects of the COVAMS II project such as contour ridge technique, tree growing technique, and small scale gully control technique.

In this report, the result of research on tree growing techniques is explained. The research design mentioned that “the planted tree prevents soil erosion and increases infiltration rate so that it also has off-site effects of reducing siltation and flooding in the downstream catchment areas similarly to the contour ridge technique.” Four effects of tree planting technique were mentioned in the plan as 1) conserved soil fertility and providing wood products to farmers, 2) reducing deforestation, 3) reducing siltation in the downstream catchment, and 4) reducing flooding in the downstream catchment.

Among the four effects, the research design selected third effect “reducing siltation in the downstream catchment”, and the erosion pin was introduced as the research method. Since the research method is new in Malawi, only 9 sites were set for this research within Blantyre district as the trial implementation.

2 Objectives of the research on tree cover site

Action Research Plan explained hypothesis on the tree cover site as “the planted tree prevents soil erosion and increase infiltration rate so that it also has off-site effects of reducing siltation and flooding in the downstream catchment areas similarly to the contour ridging technique”.

Objective of the research is, therefore, to measure the changes of ground height under tree cover area and compare with the changes of bare land. It is expected to verify that tree cover area get less soil erosion than bare land.

3 Research method

Research design and plot setting were explained in the research plan and operation manual for soil loss study in woodlots.

Research plots were nine (9) sites in Blantyre district, each site has one tree cover area of 20 x 20 meters with 16 erosion pins and one bare land are of 20 x 20 meters with 16 erosion pins for comparison as showed figure 1 below.

Erosion pins were set 5 meters interval in the sites, there are total of 16 pins in one site. Height of pins was set 15 mm at the beginning of research. After the rainy season ground height at the erosion pin was measured from top of the erosion pin.

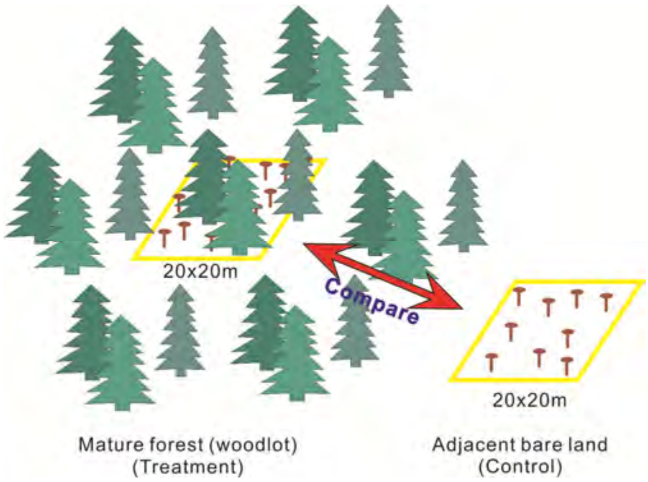


Figure 1. Measurements of Tree Planting Effect on Soil Loss

4 Result

4.1 2013/2014 season

In total nine (9) research sites were set in Blantyre district. In the course of observation, four (4) sites were suspended from research due to the distraction of bench mark and erosion pins, the conflict of ownership of the site, and cutting of trees in the research site.

After the rainy season, ground heights were measured in five (5) sites. During the measurement work, survey team noticed changes in the condition of the three (3) sites that ground was cultivated as farming garden and trees were harvested after rain. It was not possible to continue research at those three sites in next year.

Observation of five sites are as follows

a) Chigojo site shows erosion in both tree cover and bare land. Trees were harvested after the rain.

b) Mwasama site shows that bare land received deposit and survey team could not find 13 erosion pins. Tree cover site were cultivated as maize garden.

c) Thom-mbela site shows that soil deposit was observed in both tree cover and bare land. Land owner was harvesting trees.

d) Kavalo site shows that soil deposit was observed in bare land and survey team could not find four (4) pins. Tree cover site has very small change.

e) Mkolesya site shows little deposit in bare land and small erosion in tree cover site.

After observation it was noticed that there is not clear difference between tree cover area and bare land. Three sites showed bare land has more deposit of soil than tree cover area, one site showed deposit of soil both tree cover and bare land, and other site showed erosion in both tree cover and bare land.

Table 1 Summary of ground height

Ground height reading mm from top of erosion pin					
		Year	2013	2014	2015
Chigojo village, T/A Machinjiri		Pin No	P-G	P-G	
	Woodland plot	Average	-15	-20.25	
	Bare land	Average	-15	-21.63	
Mwasama village, T/A Makata		Pin No	P-G	P-G	
	Woodland Plot	Average	-15	-9.31	
	Bare land	Average	-15	24.33	
Thom-Mbela village, T/A Chiga		Pin No	P-G	P-G	
	Woodland Plot	Average	-15	-0.56	
	Bare land	Average	-15	-10.63	
Kavalo village, T/A Chigaru		Pin No	P-G	P-G	P-G
	Woodland Plot	Average	-15	-14.69	-13.53
	Bare land	Average	-15	24.00	-13.00
Mkolesya village, T/A Kapeni		Pin No	P-G	P-G	P-G
	Woodland Plot	Average	-15	-15.38	-15.53
	Bare land	Average	-15	-13.88	-8.28

4.2 2014/2015 season

Only two (2) sites remained for research.

a) Kavalo site shows that 15 erosion pins were lost in bare land and very small amount of deposit in tree cover area.

b) Mkolesya site shows tree cover site has very small change while bare land has deposit of soil.

5 Conclusion

Hypothesis “the planted tree prevents soil erosion and increase infiltration rate so that it also has off-site effects of reducing siltation and flooding in the downstream catchment areas similarly to the contour ridging technique” was not supported with this two-year observation.

6 Recommendations

The project research team on tree cover came out with following recommendations after observation in two years.

- Research is difficult in villages since trees are consumable resource for villagers. Research could be carried out by some research institutions within their premises to avoid destruction and disturbance to the research.
- Research plots should be separated from upper stream of the slope to avoid sedimentation in the research plots brought by runoff water. Separation ditch or banking is necessary.
- Changes of ground height are very small for measurement in short period. Very long term observation by the research institution is preferable.
- General understanding on function of forest cover is not questionable. Literature study could be useful than real research for extension project in terms of cost effectiveness.

Reference

1 Action Research Plan, COVAMS II, 2013

2 Operation Manual for Soil Loss Study in Woodlots, COVAMS II 2014

Annex

1 Initial setting 9 sites	9 pages
2 Rainfall 5 sites 2013/2014	
3 Rainfall 2 sites 2014/2015	
4 2013/2014 season data	
5 2014/2015 season data	
6 Operation schedule	2 pages

Annex 1 Initial Setting 1/9

Adam Community Planta Adam village, T/A Kuntaja

GPS Coordinate	705594	15°26'43.4"S	Elevation:	517 masl	Date of recording: #######
UTM 36S	8291496	34°54'57.9"E			Contact: Mbewe (FA Kuntaja 0888575584)
					Chirman:

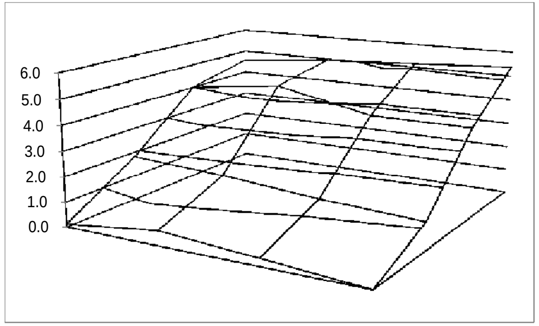
Pin Level Reading

Woodland Plot

Pin No	Slope-deg	Slope-%	level read	Level rea	Level (m)	Level (m)
1	7.0	12.3	1.252		1.4	4.586
2	4.0	7.0	0.914		1.738	4.924
3	8.8	15.5	0.689		1.963	5.149
4	12.5	22.2	0.458		2.194	5.380
5	16.0	28.7	1.826		0.826	4.012
6	1.0	1.7	1.361		1.291	4.477
7	34.5	68.7	2.149		0.503	3.689
8	27.3	51.6	2.168		0.484	3.670
9	19.4	35.2	4.030		-1.378	1.808
10	22.0	40.4	4.225		-1.573	1.613
11	23.2	42.9	4.527		-1.875	1.311
12	27.1	51.2	4.737		-2.085	1.101
13	26.2	49.2		4.360	-3.068	0.118
14	22.0	40.4		3.899	-2.607	0.579
15	19.5	35.4		4.165	-2.873	0.313
16	20.0	36.4		4.478	-3.186	0.000
		BM	2.652	1.292	BM=0	No16=0

Level condition

0.12	0.58	0.31	0.00
1.81	1.61	1.31	1.11
4.01	4.48	3.69	3.67
4.58	4.92	5.15	5.38
			No 16=0



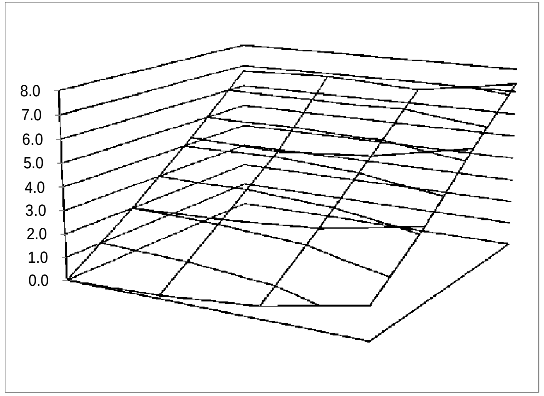
Highest pin position		Pin No 4	5.380	
Lowest pin position		Pin No 1ť	0.000	
Difference			5.380	
Distance x-directioı	15	y-directioı	15	
Distande		21.2	m	
Slope (%)		25.4	%	
Slope (degree)		14.2	degree	

Bare land

Pin No	Slope-deg	Slope-%	level read	Level rea	Level (m)	Level (m)
1	22.7	41.8	0.520		3.336	6.73
2	23.5	43.5	0.387		3.469	6.86
3	20.0	36.4	0.595		3.261	6.66
4	12.0	21.3	-0.094		3.950	7.34
5	20.2	36.8	2.980		0.876	4.27
6	27.2	51.4	3.087		0.769	4.16
7	14.0	24.9	2.743		1.113	4.51
8	15.9	28.5	1.878		1.978	5.37
9	20.0	36.4		2.336	-1.398	2.00
10	16.0	28.7		2.201	-1.263	2.13
11	18.7	33.8		1.900	-0.962	2.43
12	28.0	53.2		1.151	-0.213	3.18
13	13.8	24.6		4.332	-3.394	0.00
14	22.0	40.4		4.190	-3.252	0.14
15	4.0	7.0		3.811	-2.873	0.52
16	14.6	26.0		2.950	-2.012	1.38
		BM	3.856	0.938	BM=0	No13=0

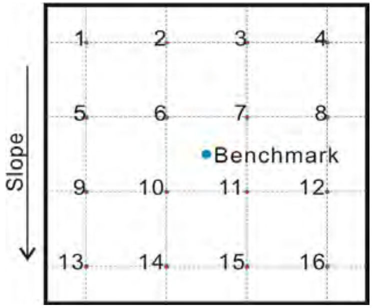
Level condition

0.00	0.14	0.52	1.38
2.00	2.13	2.43	3.18
4.27	4.16	4.51	5.37
6.73	6.86	6.66	7.34
			No 13=0



Highest pin position		Pin No 4	7.34	
Lowest pin position		Pin No 13	0.00	
Difference			7.34	
Distance x-directioı	15	y-direction	15	
Distande		21.2	m	
Slope (%)		34.6	%	
Slope (degree)		19.1	degree	

Position No.



Annex 1 Initial Setting 2/9

Namwili F.P. School

Mtambalika village, T/A Chigaru

GPS Coordinate 718313 15°40'48.3''S Elevation: 854 masl
UTM 36S 8265401 35°02'12.8''E

Date of recording: #######
Contact: Kalembwe Mkwati (FA Chigaru 0884602246)
Principal:

Pin Level Reading

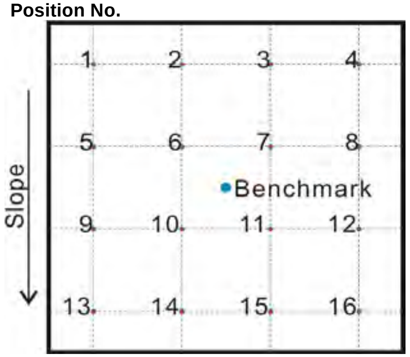
Woodland Plot

Pin No	Slope-deg	Slope-%	level read	Level reac	Level (m)	Level (m)
1	2.0	3.5	0.934		0.384	0.752
2	2.0	3.5	0.712		0.606	0.974
3	2.8	4.9	0.449		0.869	1.237
4	6.0	10.5	0.429		0.889	1.257
5	2.0	3.5	1.236		0.082	0.450
6	4.0	7.0	1.238		0.080	0.448
7	3.0	5.2	1.199		0.119	0.487
8	4.3	7.5	1.133		0.185	0.553
9	4.0	7.0	1.475		-0.157	0.211
10	2.1	3.7	1.472		-0.154	0.214
11	1.8	3.1	1.442		-0.124	0.244
12	0.5	0.9	1.390		-0.072	0.296
13	0.2	0.3	1.686		-0.368	0.000
14	4.0	7.0	1.668		-0.350	0.018
15	1.7	3.0	1.626		-0.308	0.060
16	3.7	6.5	1.548		-0.230	0.138
		BM	1.318		BM=0	No13=0

Bare land

Pin No	Slope-deg	Slope-%	level read	Level reac	Level (m)	Level (m)
1	1.2	2.1	1.499		-0.046	0.26
2	1.1	1.9	1.440		0.013	0.32
3	1.1	1.9	1.342		0.111	0.41
4	2.0	3.5	1.250		0.203	0.51
5	0.1	0.2	1.563		-0.110	0.19
6	0.2	0.3	1.401		0.052	0.36
7	0.2	0.3	1.380		0.073	0.38
8	1.8	3.1	1.298		0.155	0.46
9	3.0	5.2	1.511		-0.058	0.25
10	0.0	0.0	1.506		-0.053	0.25
11	0.7	1.2	1.456		-0.003	0.30
12	0.0	0.0	1.390		0.063	0.37
13	4.1	7.2	1.756		-0.303	0.00
14	2.2	3.8	1.588		-0.135	0.17
15	2.0	3.5	1.560		-0.107	0.20
16	1.2	2.1	1.524		-0.071	0.23
		BM	1.453		BM=0	No13=0

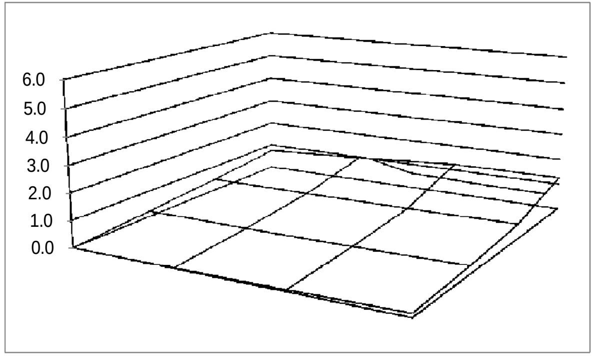
Position No.



Level condition

0.00	0.02	0.06	0.14
0.21	0.21	0.24	0.30
0.45	0.45	0.49	0.55
0.75	0.97	1.24	1.26

No 13=0



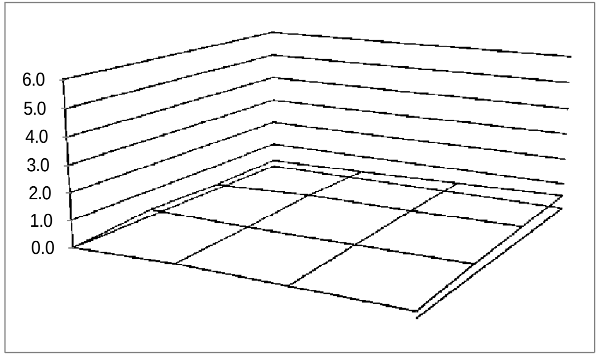
Highest pin position	Pin No 4	1.257
Lowest pin position	Pin No 13	0.000
Difference		1.257

Distance x-directior 15 y-directior 10
Distande 18.0 m
Slope (%) 7.0 %
Slope (degree) 4.0 degree

Level condition

0.00	0.17	0.20	0.23
0.25	0.25	0.30	0.37
0.19	0.36	0.38	0.46
0.26	0.32	0.41	0.51

No 13=0



Highest pin position	Pin No 4	0.51
Lowest pin position	Pin No 13	0.00
Difference		0.51

Distance x-directior 15 y-direction 10
Distande 18.0 m
Slope (%) 2.8 %
Slope (degree) 1.6 degree

Annex 1 Initial Setting 3/9

Lirangwe CDSS

Somba village, T/A Makata

GPS Coordinate 717341 15°30'54.9"S Elevation: 771 masl

UTM 36S 8283654 31°01'34.4"E

Date of recording: #######

Contact: Innoce Wandale (FA Lundu 0995451626)

Mr. S. Maseko (Headmaster, 099944791)

Pin Level Reading

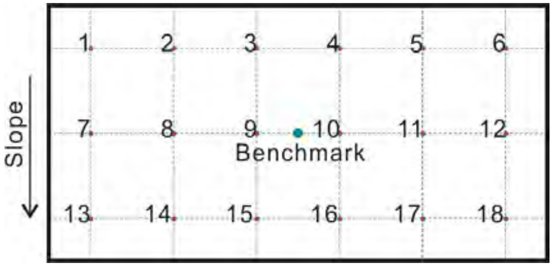
Woodland Plot

Pin No	Slope-de	Slope-%	level read	Level rea	Level (m)	Level (m)
1	2.0	3.5	1.022		-0.154	0.35
2	2.2	3.8	0.961		-0.093	0.41
3	7.8	13.7	0.795		0.073	0.58
4	2.6	4.5	0.654		0.214	0.72
5	3.0	5.2	0.746		0.122	0.63
6	1.5	2.6	0.643		0.225	0.73
7	1.5	2.6	1.309		-0.441	0.06
8	4.0	7.0	1.099		-0.231	0.27
9	0.5	0.9	0.968		-0.100	0.40
10	3.0	5.2	0.872		-0.004	0.50
11	0.2	0.3	0.960		-0.092	0.41
12	2.0	3.5	0.805		0.063	0.57
13	2.0	3.5	1.372		-0.504	0.00
14	1.7	3.0	1.283		-0.415	0.09
15	0.1	0.2	1.150		-0.282	0.22
16	0.6	1.0	1.118		-0.250	0.25
17	1.1	1.9	1.106		-0.238	0.27
18	2.2	3.8	0.896		-0.028	0.48
		BM	0.868		BM=0	No13=0

Bare land

Pin No	Slope-de	Slope-%	level read	Level rea	Level (m)	Level (m)
1	5.8	10.2	2.752		-0.099	0.40
2	5.8	10.2	2.609		0.044	0.54
3	3.4	5.9	2.486		0.167	0.66
4	0.5	0.9	2.419		0.234	0.73
5	0.5	0.9	2.291		0.362	0.86
6	2.0	3.5	2.128		0.525	1.02
7	1.0	1.7	3.020		-0.367	0.13
8	0.1	0.2	2.843		-0.190	0.31
9	4.5	7.9	2.761		-0.108	0.39
10	5.7	10.0	3.080		-0.427	0.07
11	5.0	8.7	2.298		0.355	0.85
12	0.0	0.0	2.223		0.430	0.93
13	2.0	3.5	3.148		-0.495	0.00
14	7.0	12.3	3.006		-0.353	0.14
15	3.5	6.1	2.870		-0.217	0.28
16	4.0	7.0	3.007		-0.354	0.14
17	3.0	5.2	2.555		0.098	0.59
18	0.0	0.0	2.664		-0.011	0.48
		BM	2.653		BM=0	No13=0

Position No.



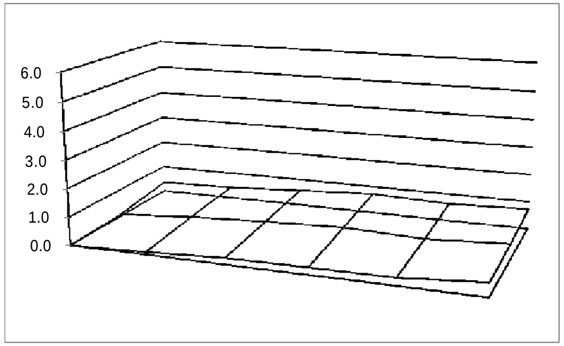
Level condition

0.00	0.09	0.22	0.25	0.27	0.48
0.06	0.27	0.40	0.50	0.41	0.57
0.35	0.41	0.58	0.72	0.63	0.73

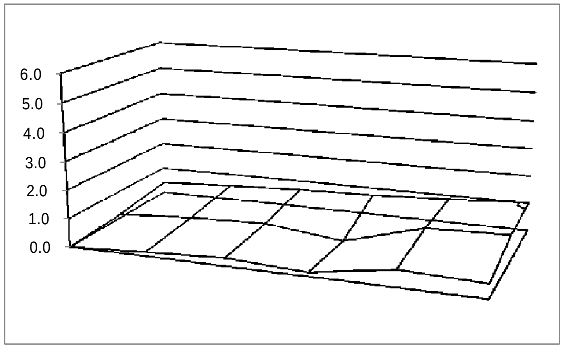
Level condition

0.00	0.14	0.28	0.14	0.59	0.48
0.13	0.31	0.39	0.07	0.85	0.93
0.40	0.54	0.66	0.73	0.86	1.02

No 13=0



No 13=0



Highest pin position	Pin No 6	0.73	
Lowest pin position	Pin No 1	0.00	
Difference		0.73	
Distance x-directio	25	y-directio	10
Distande	26.9	m	
Slope (%)	2.7	%	
Slope (degree)	1.6	degree	

Highest pin position	Pin No 6	1.02	
Lowest pin position	Pin No 13	0.00	
Difference		1.02	
Distance x-directio	25	y-direction	10
Distande	26.9	m	
Slope (%)	3.8	%	
Slope (degree)	2.2	degree	

Annex 1 Initial Setting 4/9

Saili VFA

Saili village, T/A Makata

GPS Coordinate 723605 15°38'20.0"S Elevation: 836 masl
UTM 36S 8269911 35°05'09.0"E

Date of recording: 2012/8/6
Contact: Glory Kalagho (FA Makata 0888006971)
Ester Moto (Forest Guard 0884495001)

Pin Level Reading

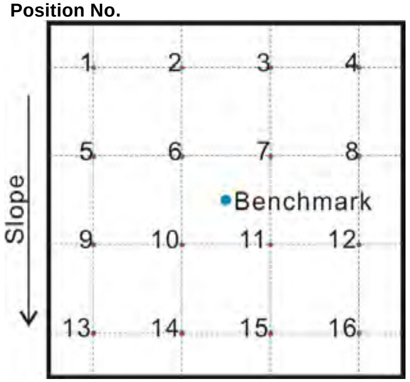
Woodlot

Pin No	Slope-deg	Slope-%	level read	Level reac	Level (m)	Level (m)
1	12.0	21.3	1.932		0.729	2.16
2	4.0	7.0	1.722		0.939	2.37
3	8.0	14.1	1.809		0.852	2.28
4	10.0	17.6	1.937		0.724	2.15
5	3.1	5.4	2.502		0.159	1.59
6	7.0	12.3	2.345		0.316	1.75
7	8.0	14.1	2.463		0.198	1.63
8	9.9	17.5	2.618		0.043	1.47
9	13.0	23.1	3.095		-0.434	1.00
10	11.5	20.3	2.990		-0.329	1.10
11	8.0	14.1	3.102		-0.441	0.99
12	2.0	3.5	3.314		-0.653	0.78
13	12.0	21.3	3.627		-0.966	0.46
14	11.0	19.4	3.772		-1.111	0.32
15	5.0	8.7	3.960		-1.299	0.13
16	13.0	23.1	4.090		-1.429	0.00
		BM	2.661		BM=0	No16=0

Bare land

Pin No	Slope-deg	Slope-%	level read	Level reac	Level (m)	Level (m)
1	10.0	17.6	0.400		1.455	3.45
2	11.9	21.1	1.280		0.575	2.57
3	2.0	3.5	1.632		0.223	2.22
4	7.0	12.3	1.678		0.177	2.17
5	6.0	10.5	0.588		1.267	3.26
6	7.9	13.9	1.425		0.430	2.43
7	5.0	8.7	2.100		-0.245	1.75
8	8.0	14.1	2.620		-0.765	1.23
9	13.5	24.0	0.800		1.055	3.05
10	5.0	8.7	1.670		0.185	2.18
11	8.0	14.1	2.180		-0.325	1.67
12	7.0	12.3	3.448		-1.593	0.40
13	10.0	17.6	0.945		0.910	2.91
14	3.3	5.8	1.782		0.073	2.07
15	19.5	35.4	2.520		-0.665	1.33
16	14.0	24.9	3.850		-1.995	0.00
		BM	1.855		BM=0	No16=0

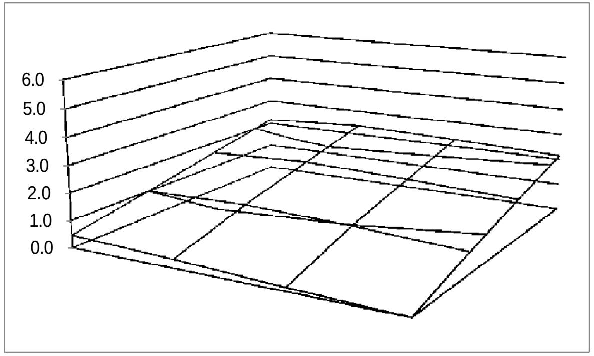
Position No.



Level condition

0.46	0.32	0.13	0.00
1.00	1.10	0.99	0.78
1.59	1.75	1.63	1.47
2.16	2.37	2.28	2.15

No 16=0



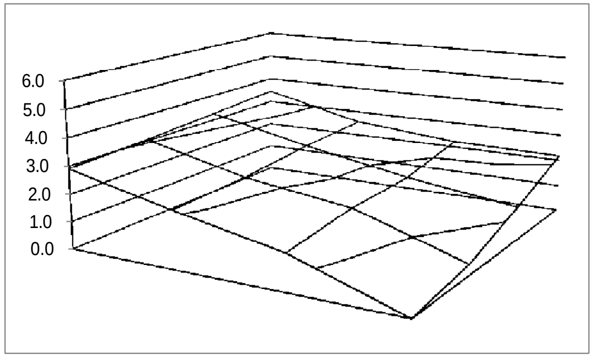
Highest pin position	Pin No 2	2.37
Lowest pin position	Pin No 16	0.00
Difference		2.37

Distance x-directior 10 y-directior 15
Distande 18.0 m
Slope (%) 13.1 %
Slope (degree) 7.5 degree

Level condition

2.91	2.07	1.33	0.00
3.05	2.18	1.67	0.40
3.26	2.43	1.75	1.23
3.45	2.57	2.22	2.17

No 16=0



Highest pin position	Pin No 2	3.45
Lowest pin position	Pin No 16	0.00
Difference		3.45

Distance x-directior 15 y-directior 15
Distande 21.2 m
Slope (%) 16.3 %
Slope (degree) 9.2 degree

Annex 1 Initial Setting 5/9

Fire Willy

Chigojo village, T/A Machinjiri

GPS Coordinate	723074	15°41'52.7"S	Elevation:	1049	masl
UTM 36S	8263376	35°04'53.3"E			

Date of recording: 2013/8/2 2013/8/5

Contact: Prisca Kulemeka (FA Machinjiri 0881218833)

Owner: Fire Willy (088516199)

Pin Level Reading

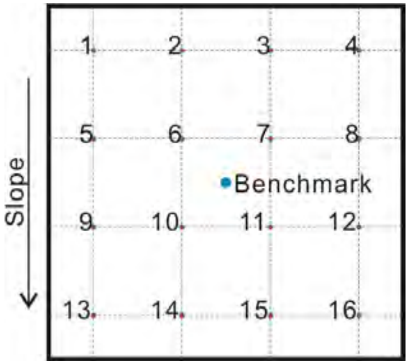
Woodlot

Pin No	Slope-deg	Slope-%	level read	Level read	Level (m)	Level (m)
1	0.0	0.0		1.740	2.694	4.78
2	21.0	38.4		2.233	2.201	4.28
3	19.2	34.8		2.004	2.430	4.51
4	17.2	31.0		1.657	2.777	4.86
5	16.8	30.2	0.637		1.031	3.11
6	16.0	28.7	0.880		0.788	2.87
7	12.0	21.3	0.527		1.141	3.22
8	18.1	32.7	0.271		1.397	3.48
9	13.5	24.0	2.283		-0.615	1.47
10	18.5	33.5	2.252		-0.584	1.50
11	15.0	26.8	2.087		-0.419	1.66
12	19.3	35.0	1.836		-0.168	1.91
13	22.7	41.8	3.521		-1.853	0.23
14	18.3	33.1	3.750		-2.082	0.00
15	12.1	21.4	3.325		-1.657	0.43
16	18.4	33.3	3.258		-1.590	0.49
		BM	1.668	4.434	BM=0	No14=0

Bare land

Pin No	Slope-deg	Slope-%	level read	Level read	Level (m)	Level (m)
1	3.5	6.1	0.300		2.749	5.74
2	4.0	7.0	0.880		2.169	5.16
3	8.1	14.2	1.010		2.039	5.03
4	12.0	21.3	1.035		2.014	5.00
5	6.5	11.4	1.572		1.477	4.47
6	11.0	19.4	1.848		1.201	4.19
7	9.8	17.3	2.166		0.883	3.87
8	18.8	34.0	2.550		0.499	3.49
9	1.6	2.8	2.542		0.507	3.50
10	15.7	28.1	2.928		0.121	3.11
11	11.5	20.3	3.680		-0.631	2.36
12	19.2	34.8	4.225		-1.176	1.81
13	17.3	31.1		3.030	-2.12	0.87
14	14.0	24.9		3.200	-2.29	0.70
15	22.0	40.4		3.360	-2.45	0.54
16	10.0	17.6		3.900	-2.99	0.00
		BM	3.049	0.91	BM=0	No16=0

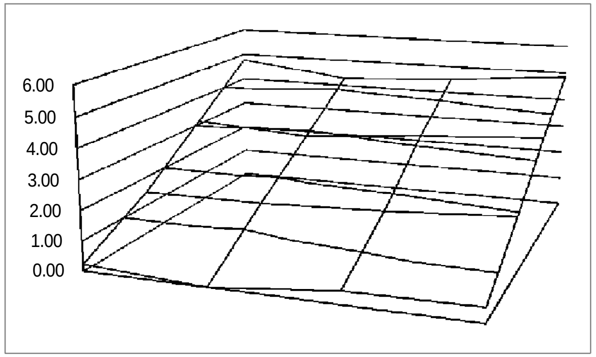
Position No.



Level condition

0.23	0.00	0.43	0.49
1.47	1.50	1.66	1.91
3.11	2.87	3.22	3.48
4.78	4.28	4.51	4.86

No 16=0

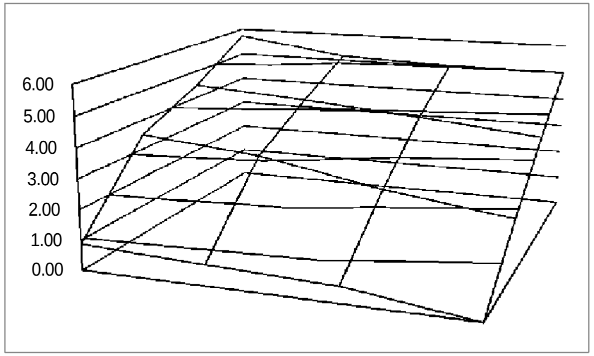


Highest pin position		Pin No 4	4.86
Lowest pin position		Pin No 14	0.00
Difference			4.86
Distance x-direction	10	y-direction	15
Distande		18.0 m	
Slope (%)		27.0 %	
Slope (degree)		15.1 degree	

Level condition

0.87	0.70	0.54	0.00
3.50	3.11	2.36	1.81
4.47	4.19	3.87	3.49
5.74	5.16	5.03	5.00

No 16=0



Highest pin position		Pin No 1	5.74
Lowest pin position		Pin No 16	0.00
Difference			5.74
Distance x-direction	15	y-direction	15
Distande		21.2 m	
Slope (%)		27.1 %	
Slope (degree)		15.1 degree	

Annex 1 Initial Setting 6/9

Alekazawo KUMPASA

Mwasama village, T/A Makata

GPS Coordinate	725591	15°32'44.6"S	Elevation:	776 masl	
UTM 36S	8280205	35°06'12.2"E			

Date of recording: #######

Contact: Glory Kalagho (FA Makata 0888006971)

Owner: Sister of the owner

Pin Level Reading

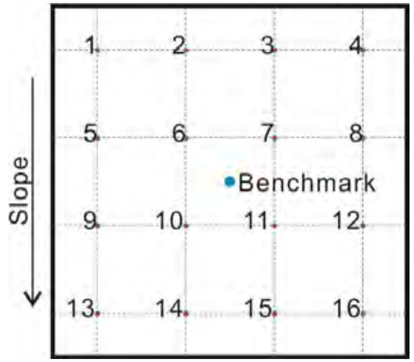
Woodland Plot

Pin No	Slope-de	Slope-%	level read	Level rea	Level (m)	Level (m)
1	2.3	4.0	0.770		0.792	2.06
2	9.1	16.0	0.881		0.681	1.95
3	2.4	4.2	1.087		0.475	1.74
4	5.4	9.5	1.369		0.193	1.46
5	4.0	7.0	1.195		0.367	1.63
6	15.8	28.3	1.308		0.254	1.52
7	0.0	0.0	1.460		0.102	1.37
8	9.3	16.4	1.623		-0.061	1.21
9	8.0	14.1	1.637		-0.075	1.19
10	1.0	1.7	1.811		-0.249	1.02
11	1.8	3.1	1.977		-0.415	0.85
12	5.7	10.0	2.227		-0.665	0.60
13	4.1	7.2	2.829		-1.267	0.00
14	8.3	14.6	2.604		-1.042	0.23
15	8.0	14.1	2.202		-0.640	0.63
16	9.2	16.2	2.140		-0.578	0.69
		BM	1.562		BM=0	No13=0

Bare land

Pin No	Slope-de	Slope-%	level read	Level rea	Level (m)	Level (m)
1	16.2	29.1	2.327		-0.110	1.01
2	4.5	7.8	1.773		0.444	1.57
3	3.9	6.9	1.318		0.899	2.02
4	2.0	3.5	0.471		1.746	2.87
5	5.0	8.7	2.957		-0.740	0.38
6	7.2	12.6	2.415		-0.198	0.93
7	16.1	28.9	1.933		0.284	1.41
8	1.6	2.8	1.300		0.917	2.04
9	22.6	41.6	3.340		-1.123	0.00
10	17.8	32.1	2.677		-0.460	0.66
11	13.9	24.7	2.091		0.126	1.25
12	6.0	10.5	1.461		0.756	1.88
13	2.3	4.0	3.116		-0.899	0.22
14	10.5	18.5	2.530		-0.313	0.81
15	5.2	9.1	2.090		0.127	1.25
16	14.4	25.7	1.442		0.775	1.90
		BM	2.217		BM=0	No9=0

Position No.

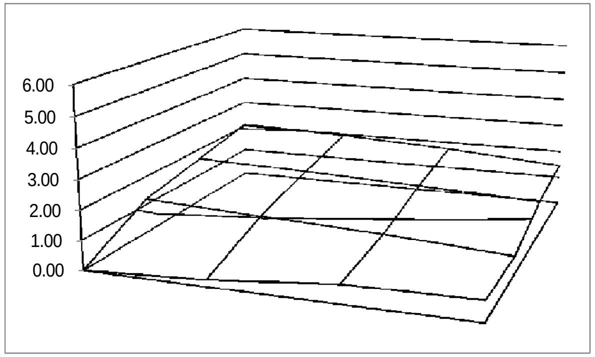


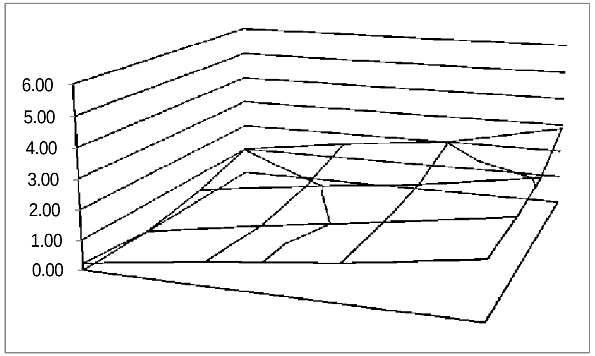
Level condition

0.00	0.23	0.63	0.69
1.19	1.02	0.85	0.60
1.63	1.52	1.37	1.21
2.06	1.95	1.74	1.46
			No 16=0

Level condition

0.22	0.81	1.25	1.90
0.00	0.66	1.25	1.88
0.38	0.93	1.41	2.04
1.01	1.57	2.02	2.87
			No 16=0





Highest pin position		Pin No 1		2.06
Lowest pin position		Pin No 13		0.00
Difference				2.06
Distance	x-directio	0	y-directio	15
Distande		15.0	m	
Slope (%)		13.7	%	
Slope (degree)		7.8	degree	

Highest pin position		Pin No 4		2.87
Lowest pin position		Pin No 9		0.00
Difference				2.87
Distance	x-directio	15	y-direction	10
Distande		18.0	m	
Slope (%)		15.9	%	
Slope (degree)		9.0	degree	

Annex 1 Initial Setting 7/9

Dyton CHINKONDA

Thom-Mbela village, T/A Chigaru

GPS Coordinate 707570 15°30'56.5"S Elevation: 531 masl
UTM 36S 8283696 34°56'06.5"E

Date of recording: #######
Contact: Kalembwe Mkwati (FA Chigaru 0884602246)
Owner:

Pin Level Reading

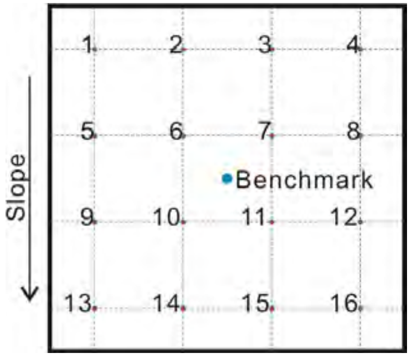
Woodland Plot

Pin No	Slope-deç	Slope-%	level read	Level reac	Level (m)	Level (m)
1	3.0	5.2	0.910		0.847	1.96
2	6.0	10.5	0.973		0.784	1.90
3	4.5	7.9	0.920		0.837	1.95
4	8.0	14.1	1.073		0.684	1.80
5	4.9	8.6	1.388		0.369	1.48
6	6.0	10.5	1.466		0.291	1.40
7	2.8	4.9	1.423		0.334	1.45
8	4.5	7.9	1.563		0.194	1.31
9	7.4	13.0	2.022		-0.265	0.85
10	0.3	0.5	2.009		-0.252	0.86
11	7.3	12.8	2.299		-0.542	0.57
12	4.1	7.2	1.986		-0.229	0.88
13	5.3	9.3	2.648		-0.891	0.22
14	6.1	10.7	2.641		-0.884	0.23
15	9.0	15.8	2.870		-1.113	0.00
16	1.8	3.1	2.866		-1.109	0.00
		BM	1.757		BM=0	No15=0

Bare land

Pin No	Slope-deç	Slope-%	level read	Level reac	Level (m)	Level (m)
1	5.3	9.3	1.629		20.306	0.94
2	4.0	7.0	1.788		20.147	0.79
3	1.8	3.1	1.761		20.174	0.81
4	0.0	0.0	1.864		20.071	0.71
5	4.0	7.0	1.872		20.063	0.70
6	5.8	10.2	2.033		19.902	0.54
7	4.4	7.7	2.108		19.827	0.47
8	4.4	7.7	2.156		19.779	0.42
9	3.4	5.9	2.213		19.722	0.36
10	4.6	8.0	2.337		19.598	0.24
11	2.2	3.8	2.296		19.639	0.28
12	2.0	3.5	2.341		19.594	0.23
13	4.3	7.5	2.434		19.501	0.14
14	2.0	3.5	2.566		19.369	0.01
15	9.0	15.8	2.372		19.563	0.20
16	4.0	7.0	2.574		19.361	0.00
		BM	21.935		BM=0	No16=0

Position No.

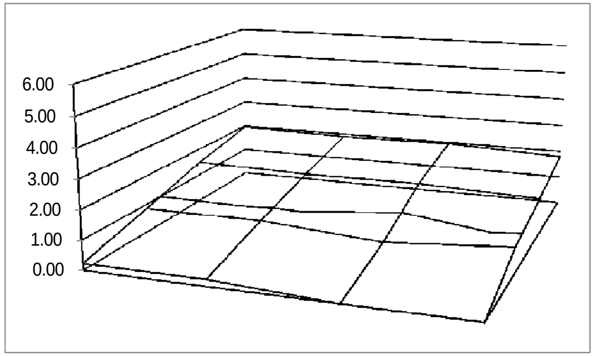


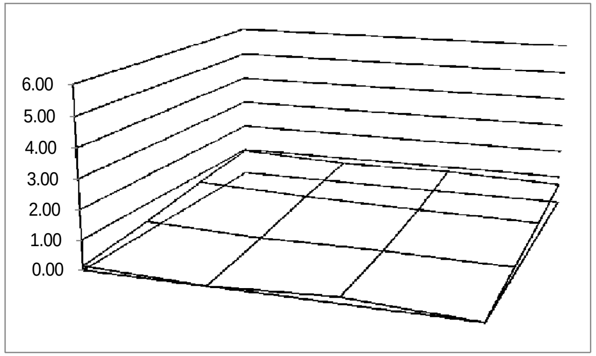
Level condition

0.22	0.23	0.00	0.00
0.85	0.86	0.57	0.88
1.48	1.40	1.45	1.31
1.96	1.90	1.95	1.80
			No 15=0

Level condition

0.14	0.01	0.20	0.00
0.36	0.24	0.28	0.23
0.70	0.54	0.47	0.42
0.94	0.79	0.81	0.71
			No 16=0





Highest pin position		Pin No 1	1.96	
Lowest pin position		Pin No 15	0.00	
Difference			1.96	
Distance	x-directior	10	y-directior	15
Distande		18.0	m	
Slope (%)		10.9	%	
Slope (degree)		6.2	degree	

Highest pin position		Pin No 4	0.94	
Lowest pin position		Pin No 9	0.00	
Difference			0.94	
Distance	x-directior	15	y-direction	15
Distande		21.2	m	
Slope (%)		4.5	%	
Slope (degree)		2.6	degree	

Annex 1 Initial Setting 8/9

Rufi Kamala

Kavalo village, T/A Chigaru

GPS Coordinate 715252 15°25'10.8"S Elevation: 745 masl

UTM 36S 8249255 35°00'20.9"E

Date of recording: #######

Contact: Kalembwe Mkwati (FA Chigaru 0884602246)

Owner:

Pin Level Reading

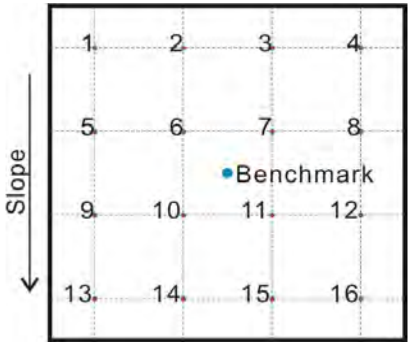
Woodland Plot

Pin No	Slope-deg	Slope-%	level read	Level rea	Level (m)	Level (m)
1	1.2	2.1	1.433		0.142	0.305
2	0.0	0.0	1.400		0.175	0.338
3	0.8	1.4	1.386		0.189	0.352
4	1.1	1.9	1.404		0.171	0.334
5	1.8	3.1	1.594		-0.019	0.144
6	0.1	0.2	1.602		-0.027	0.136
7	7.5	13.2	1.584		-0.009	0.154
8	2.0	3.5	1.548		0.027	0.190
9	4.0	7.0	1.698		-0.123	0.040
10	0.0	0.0	1.738		-0.163	0.000
11	2.5	4.4	1.616		-0.041	0.122
12	1.8	3.1	1.615		-0.040	0.123
13	2.0	3.5	1.710		-0.135	0.028
14	1.5	2.6	1.680		-0.105	0.058
15	3.3	5.8	1.575		0.000	0.163
16	3.0	5.2	1.632		-0.057	0.106
		BM1	1.575		BM=0	No10=0

Bare land

Pin No	Slope-deg	Slope-%	level read	Level rea	Level (m)	Level (m)
1	5.8	10.2	1.130		0.397	0.49
2	1.2	2.1	1.223		0.304	0.40
3	1.5	2.6	1.283		0.244	0.34
4	2.3	4.0	1.258		0.269	0.36
5	9.7	17.1	1.369		0.158	0.25
6	3.5	6.1	1.458		0.069	0.16
7	0.1	0.2	1.518		0.009	0.10
8	1.1	1.9	1.436		0.091	0.19
9	0.5	0.9	1.622		-0.095	0.00
10	2.0	3.5	1.451		0.076	0.17
11	0.0	0.0	1.489		0.038	0.13
12	4.3	7.5	1.520		0.007	0.10
13	0.3	0.5	1.569		-0.042	0.05
14	0.5	0.9	1.582		-0.055	0.04
15	3.2	5.6	1.553		-0.026	0.07
16	3.8	6.6	1.546		-0.019	0.08
		BM	1.527		BM=0	No9=0

Position No.



Level condition

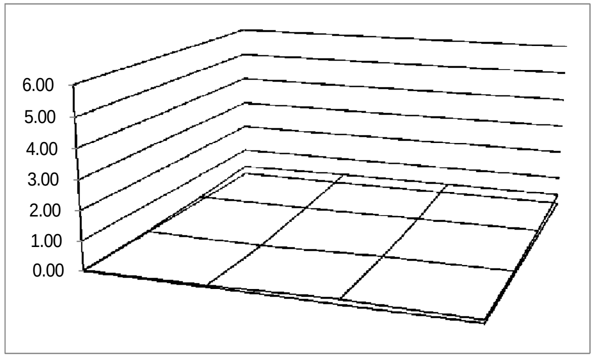
0.03	0.06	0.16	0.11
0.04	0.00	0.12	0.12
0.14	0.14	0.15	0.19
0.31	0.34	0.35	0.33

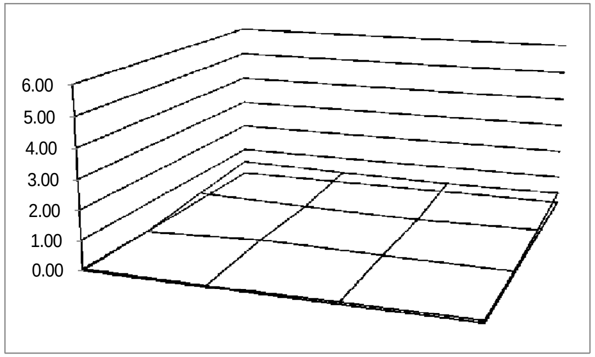
No 10=0

Level condition

0.05	0.04	0.07	0.08
0.00	0.17	0.13	0.10
0.25	0.16	0.10	0.19
0.49	0.40	0.34	0.36

No 9=0





Highest pin position		Pin No 3	0.352
Lowest pin position		Pin No 10	0.000
Difference			0.352
Distance x-directior	5	y-directior	10
Distande	11.2	m	
Slope (%)	3.1	%	
Slope (degree)	1.8	degree	

Highest pin position		Pin No 13	0.49
Lowest pin position		Pin No 9	0.00
Difference			0.49
Distance x-directior	10	y-direction	0
Distande	10.0	m	
Slope (%)	4.9	%	
Slope (degree)	2.8	degree	

Annex 1 Initial Setting 9/9

Nasangwe Forest Group Mkolesya village, T/A Kapeni

GPS Coordinate 715059 15°25'19.2"S Elevation: 509 masl Date of recording: #######
UTM 36S 8293999 35°00'14.6"E Contact: James Andiwoshi (FA Kapeni 0111981414)
Pin Level Reading Chirman: Maxell Sekeyani 0888877687 0999560361

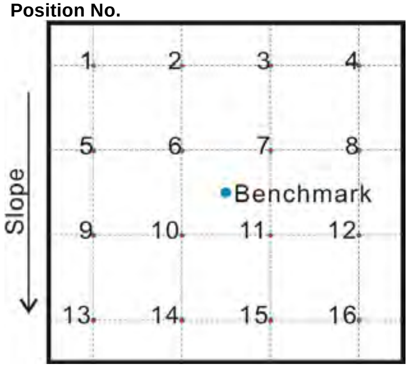
Woodland Plot

Pin No	Slope-deg	Slope-%	level read	Level read	Level (m)	Level (m)
1	11.8	20.9	0.304		2.624	5.139
2	23.1	42.7	0.341		2.587	5.102
3	20.0	36.4	0.410		2.518	5.033
4	21.9	40.2	0.288		2.640	5.155
5	8.5	14.9	2.500		0.428	2.943
6	5.7	10.0	2.174		0.754	3.269
7	27.8	52.7	2.083		0.845	3.360
8	4.2	7.3	2.215		0.713	3.228
9	18.0	32.5	3.954		-1.026	1.489
10	22.0	40.4	3.874		-0.946	1.569
11	2.0	3.5	3.729		-0.801	1.714
12	12.0	21.3	3.826		-0.898	1.617
13	21.3	39.0		3.060	-2.372	0.143
14	8.0	14.1		3.112	-2.424	0.091
15	6.2	10.9		3.078	-2.390	0.125
16	10.5	18.5		3.203	-2.515	0.000
		BM1	2.928	0.688	BM=0	No15=0

Bare land

Pin No	Slope-deg	Slope-%	level read	Level read	Level (m)	Level (m)
1	8.0	14.1	2.083		0.735	4.09
2	0.2	0.3	0.780		2.038	5.39
3	10.4	18.4	0.717		2.101	5.45
4	3.8	6.6	0.448		2.370	5.72
5	21.0	38.4	3.057		-0.239	3.11
6	15.8	28.3	2.181		0.637	3.99
7	0.0	0.0	2.233		0.585	3.94
8	4.8	8.4	1.984		0.834	4.19
9	16.0	28.7	3.621	3.621	-2.155	1.20
10	6.0	10.5		2.007	-0.541	2.81
11	2.7	4.7		2.217	-0.751	2.60
12	4.2	7.3		1.909	-0.443	2.91
13	6.9	12.1		4.818	-3.352	0.00
14	12.8	22.7		4.208	-2.742	0.61
15	10.5	18.5		3.648	-2.182	1.17
16	10.8	19.1		3.582	-2.116	1.24
		BM	2.818	1.466	BM=0	No16=0

Position No.

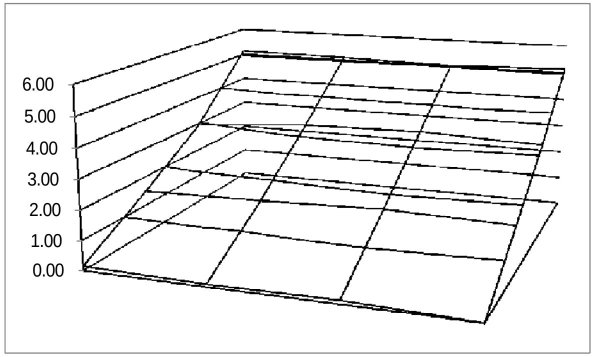


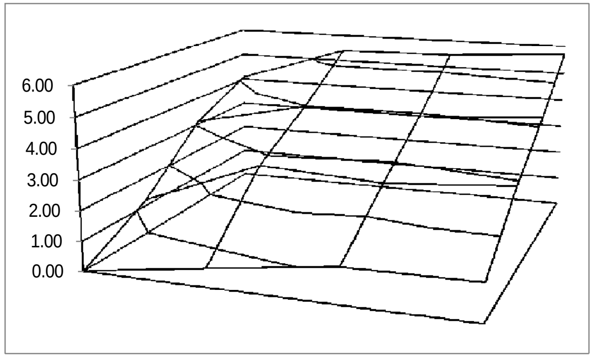
Level condition

0.14	0.09	0.13	0.00
1.49	1.57	1.71	1.62
2.94	3.27	3.36	3.23
5.14	5.10	5.03	5.16
			No 16=0

Level condition

13	0.00	0.61	1.17	1.24
9	1.20	2.81	2.60	2.91
5	3.11	3.99	3.94	4.19
1	4.09	5.39	5.45	5.72
				No 13=0





Highest pin position		Pin No 4	5.155	
Lowest pin position		Pin No 16	0.000	
Difference			5.155	
Distance	x-directior	0	y-directior	15
Distande		15.0	m	
Slope (%)		34.4	%	
Slope (degree)		19.0	degree	

Highest pin position		Pin No 4	5.72	
Lowest pin position		Pin No 13	0.00	
Difference			5.72	
Distance	x-directior	15	y-direction	15
Distande		21.2	m	
Slope (%)		27.0	%	
Slope (degree)		15.1	degree	

Annex 2 Rainfall record 2013/2014

Chigojo, TA Machinjiri

Year	2013		2014			
Date	Nover	Decer	Janua	Febru	March	April
1			20	2		
2			10	13		
3						
4			2	50		2
5	6			4		12
6			42			3
7				15		3
8				50	3	
9				52		
10						
11			16	13		3
12	6		2	2		
13			15			
14		18		40		
15		9	3		2	
16		14			2	
17		42		1	26	
18		13		3	15	
19		13			2	
20		80	1			
21			2	5		
22				5		
23	15			3		
24		22	1	5		
25			4	9		
26				9		
27		2	5	2		
28		2	30	2		
29	20		15			
30			4			
31			12			
Total	**47**	**215**	**184**	**285**	**50**	**23**
Acc.		**262**	**446**	**731**	**781**	**804**
Days	**4**	**10**	**17**	**20**	**6**	**5**
Acc.		**14**	**31**	**51**	**57**	**62**

Mwasama. TA Makata

Year	2013		2014			
Date	Nover	Decer	Janua	Febru	March	April
1		5		15	1	
2			15	15		
3		2	30	6		
4			7	4		
5	6		2			
6						5
7			25			7
8			7	24		1
9				5		
10			8	70		
11				22		
12			38	18		
13			10			
14		2	30	20		
15		15	3	100		
16				3	20	
17	2			9	11	
18		10			23	
19					5	
20	20	10			1	
21		2				
22			1	4		
23				7		
24			14	4		
25	3		4			
26		2	4	4		
27				1		
28		25	25			2
29	25		3			7
30		15	3			
31			20			
Total	**56**	**88**	**249**	**331**	**61**	**22**
Acc.		**144**	**393**	**724**	**785**	**807**
Days	**5**	**10**	**19**	**18**	**6**	**5**
Acc.		**15**	**34**	**52**	**58**	**63**

Tom Mbela, TA Chigaru

Year	2013		2014			
Date	Noven	Decen	Janua	Febru	March	April
1			24			
2		16	19	18		
3						
4	3		9			
5				5		
6			18		2	
7					36	
8					6	
9			10	88		
10			14	11		
11						
12				18		
13			8	5	7	
14						
15		12	18		18	
16				5		
17		18				
18						
19		15				
20	16				3	
21				4		
22	5					
23						
24				8		
25					39	
26				2	48	
27		22				
28	1		9	4		64
29						
30						
31		2	54			
Total	**25**	**85**	**183**	**168**	**159**	**64**
Acc.		**110**	**293**	**461**	**620**	**684**
Days	**4**	**6**	**10**	**11**	**8**	**1**
Acc.		**10**	**20**	**31**	**39**	**40**

Mkolesya, TA Kapeni

Year	2013		2014			
Date	Nover	Decer	Janua	Febru	March	April
1			30	7		
2			15	2		
3						
4	4		1	20		20
5						
6			50			
7				5	3	
8				15	4	
9				10		
10						
11	10		20	10		
12		1	5			
13			15			
14		5	5	45		
15		8	2	5	4	
16				10	20	
17		5			30	
18		15			30	
19	10					
20	1	90			5	
21			30			
22	15		10			
23			45	6		
24				4		
25		20	7			
26				15		
27		20	40	30		
28	5	5	5	10		
29		1	5			
30			7			
31		10	12			
Total	**45**	**180**	**304**	**194**	**96**	**20**
Acc.		**225**	**529**	**723**	**819**	**839**
Days	**6**	**11**	**18**	**15**	**7**	**1**
Acc.		**17**	**35**	**50**	**57**	**58**

Kavalo, TA Chigaru

Year	2013		2014			
Date	Nover	Decer	Janua	Febru	March	April
1		4	8	12		
2			39	20		
3						
4			5		1	
5		8			12	
6			3	8		2
7					3	
8				20	3	
9			95	80		
10				32		
11			4	3	4	
12		24	20			13
13		10	30	32	10	
14				25		
15		49	2	1		
16				5	15	
17		3				
18		1			60	
19						
20						
21				26		
22	17					
23	3		3	1		
24	2		7	1	24	
25		9			7	
26						
27		9	12			11
28			3	11		10
29			5			
30			20			
31			34			
Total	**22**	**117**	**290**	**277**	**139**	**36**
Acc.		**139**	**429**	**706**	**845**	**881**
Days	**3**	**9**	**16**	**15**	**10**	**4**
Acc.		**12**	**28**	**43**	**53**	**57**

Annex 3 Rainfall record 2014/2015

Mkolesya TA Kapnei

Year	2014		2015			
Date	Novem	Decem	Januar	Februa	March	April
1			1	15	2	
2				20	10	
3			10	30		
4			40	10		
5			20	5		
6	60		10	2		
7			1		5	
8			15			2
9		20	15	70		
10		15	60			
11		4	90	20		
12		10	120			
13			110			
14			30	10		
15		4		15	5	
16					20	40
17		2	20			60
18		40				2
19			10			
20				10		
21				30		
22		12	3	20	10	
23				2		
24					5	
25		4	30	60		
26						
27		30	20			
28		15	40		5	
29			30			
30		15	60			
31			20			
mm	**60**	**171**	**755**	**319**	**62**	**104**
Total mm		**231**	**986**	**1,305**	**1,367**	**1,471**
days	**1**	**12**	**22**	**15**	**8**	**4**
Total days		**13**	**35**	**50**	**58**	**62**

Kavalo, TA Chigaru

Year	2014		2015			
Date	Novem	Decem	Januar	Februa	March	April
1			30	5		
2				30		
3			16	44		
4			12			
5			8	26		
6			7	3		4
7			2		4	6
8		2	34			
9		15	11			
10		4				
11	2		29	55		
12			100			
13			36			
14	5	3		30		
15		13	2	10		4
16				2		12
17			32			10
18	3		2		10	8
19	2	9				3
20						8
21				1	9	
22		4		12	8	
23		3		9		
24		1		10	7	
25			8	38	6	
26					5	
27			11			
28			8		3	
29		18	12		4	
30		26	7			
31		16	60			
mm	**12**	**114**	**427**	**275**	**56**	**55**
Total mm		**126**	**553**	**828**	**884**	**939**
days	**4**	**12**	**20**	**14**	**9**	**8**
Total days		**16**	**36**	**50**	**59**	**67**

Annex 4 2013/2014 Data

Chigojo village, T/A Machinjiri

Pin Level Reading
Date of recording:
20130802 20140807

Woodland plot

Pin No	P-G	P-G
1	-15	-12
2	-15	-25
3	-15	-15
4	-15	-20
5	-15	-23
6	-15	-29
7	-15	-28
8	-15	-25
9	-15	-21
10	-15	-19
11	-15	-18
12	-15	-8
13	-15	-25
14	-15	-14
15	-15	-16
16	-15	-26
Total	-240	-324
Average	-15	-20.25

Bare land

Pin No	P-G	P-G
1	-15	-65
2	-15	-18
3	-15	-20
4	-15	-21
5	-15	-23
6	-15	-20
7	-15	-17
8	-15	-17
9	-15	-15
10	-15	-8
11	-15	-15
12	-15	-18
13	-15	-13
14	-15	-26
15	-15	-25
16	-15	-25
Total	-240	-346
Average	-15	-21.63

Mwasama village, T/A Makata

Pin Level Reading
Date of recording:
20130812 20140716

Woodland Plot

Pin No	P-G	P-G
1	-15	0
2	-15	0
3	-15	0
4	-15	-13
5	-15	0
6	-15	-15
7	-15	-18
8	-15	-18
9	-15	-14
10	-15	-11
11	-15	-14
12	-15	-15
13	-15	-9
14	-15	-4
15	-15	-5
16	-15	-13
Total	-240	-149
Average	-15	-9.31

Bare land

Pin No	P-G	P-G
1	-15	NA
2	-15	NA
3	-15	20
4	-15	23
5	-15	NA
6	-15	NA
7	-15	30
8	-15	NA
9	-15	NA
10	-15	NA
11	-15	NA
12	-15	NA
13	-15	NA
14	-15	NA
15	-15	NA
16	-15	NA
Total	-240	73
Average	-15	24.33

Thom-Mbela village, T/A Chigaru

Pin Level Reading
Date of recording:
20130816 20140711

Woodland Plot

Pin No	P-G	P-G
1	-15	0
2	-15	5
3	-15	4
4	-15	2
5	-15	-0.5
6	-15	-4.5
7	-15	-1.5
8	-15	-0.5
9	-15	-0.5
10	-15	-5
11	-15	-0.5
12	-15	-1
13	-15	-4
14	-15	0
15	-15	-3
16	-15	1
Total	-240	-9
Average	-15	-0.56

Bare land

Pin No	P-G	P-G
1	-15	0
2	-15	0
3	-15	-5
4	-15	0
5	-15	-21.5
6	-15	-21
7	-15	-12
8	-15	-7
9	-15	-8.5
10	-15	-15.5
11	-15	-11.5
12	-15	-4.5
13	-15	-19.5
14	-15	-14.5
15	-15	-15
16	-15	-14.5
Total	-240	-170
Average	-15	-10.63

Kavalo village, T/A Chigaru

Pin Level Reading
Date of recording:
20130820 20140715

Woodland Plot

Pin No	P-G	P-G
1	-15	-23
2	-15	-20
3	-15	-18
4	-15	-6
5	-15	-24
6	-15	-14
7	-15	-11
8	-15	-5
9	-15	-18
10	-15	0
11	-15	-19
12	-15	-20
13	-15	-17
14	-15	-12
15	-15	-20
16	-15	-8
Total	-240	-235
Average	-15	-14.69

Bare land

Pin No	P-G	P-G
1	-15	NA
2	-15	53
3	-15	87
4	-15	27
5	-15	NA
6	-15	NA
7	-15	-10
8	-15	0
9	-15	NA
10	-15	-21
11	-15	0
12	-15	2
13	-15	0
14	-15	17
15	-15	43
16	-15	90
Total	-240	288
Average	-15	24.00

Mkolesya village, T/A Kapeni

Pin Level Reading
Date of recording:
20130819 20140723

Woodland Plot

Pin No	P-G	P-G
1	-15	-22
2	-15	-19
3	-15	-14
4	-15	-15
5	-15	0
6	-15	-14
7	-15	-30
8	-15	-12
9	-15	-16
10	-15	-13
11	-15	-16
12	-15	-6
13	-15	-18
14	-15	-15
15	-15	-17
16	-15	-19
Total	-240	-246
Average	-15	-15.38

Bare land

Pin No	P-G	P-G
1	-15	0
2	-15	-17
3	-15	-20
4	-15	-18
5	-15	-20
6	-15	-7
7	-15	-12
8	-15	-16
9	-15	-23
10	-15	-15
11	-15	-19
12	-15	-10
13	-15	-15
14	-15	-6
15	-15	-9
16	-15	-15
Total	-240	-222
Average	-15	-13.88

Annex 5 2014/2015 Data

Kavalo village, T/A Chigaru

Pin Level Reading
Date of recording:
20130820 20140715 20150625

Woodland Plot

Pin No	P-G	P-G	P-G
1	-15	-23	-26.5
2	-15	-20	-23.5
3	-15	-18	-28.5
4	-15	-6	-6
5	-15	-24	-19.5
6	-15	-14	-8
7	-15	-11	-10.5
8	-15	-5	-13
9	-15	-18	-9.5
10	-15	0	0
11	-15	-19	-20.5
12	-15	-20	-18.5
13	-15	-17	-10.5
14	-15	-12	-3
15	-15	-20	-10
16	-15	-8	-9
Total	-240	-235	-216.5
Average	-15	-14.69	-13.53

Bare land

Pin No	P-G	P-G	P-G
1	-15	NA	NA
2	-15	53	NA
3	-15	87	NA
4	-15	27	-13
5	-15	NA	NA
6	-15	NA	NA
7	-15	-10	NA
8	-15	0	NA
9	-15	NA	NA
10	-15	-21	NA
11	-15	0	NA
12	-15	2	NA
13	-15	0	NA
14	-15	17	NA
15	-15	43	NA
16	-15	90	NA
Total	-240	288	-13
Average	-15	24.00	-13.00

Mkolesya village, T/A Kapeni

Pin Level Reading
Date of recording:
20130819 20140723 20150625

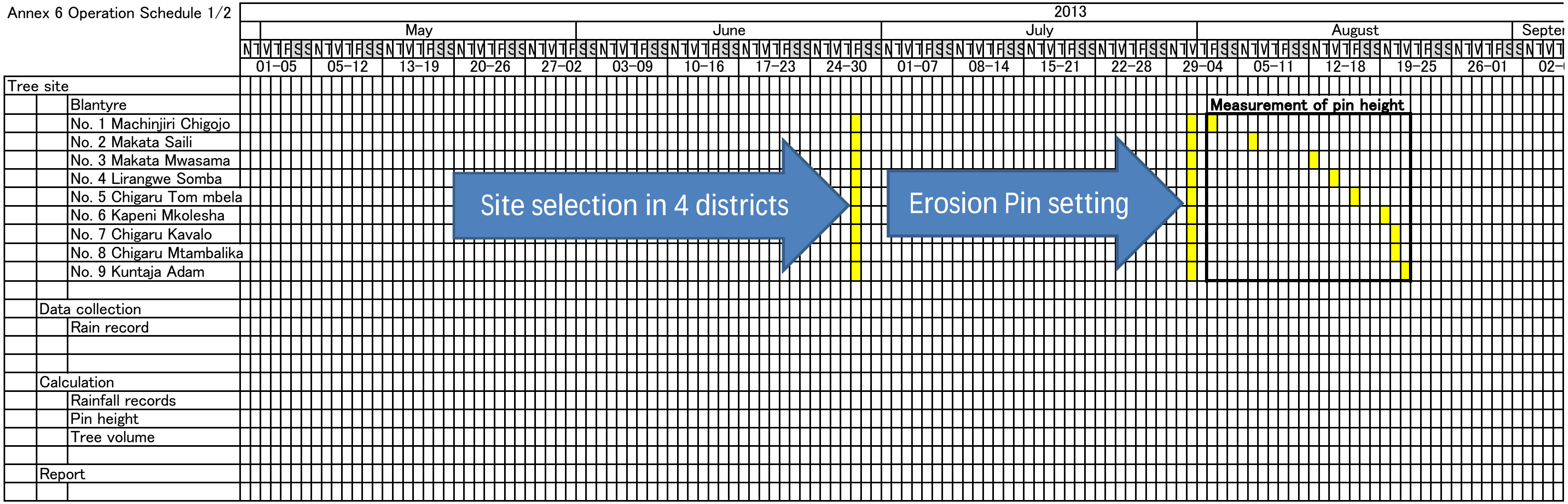
Woodland Plot

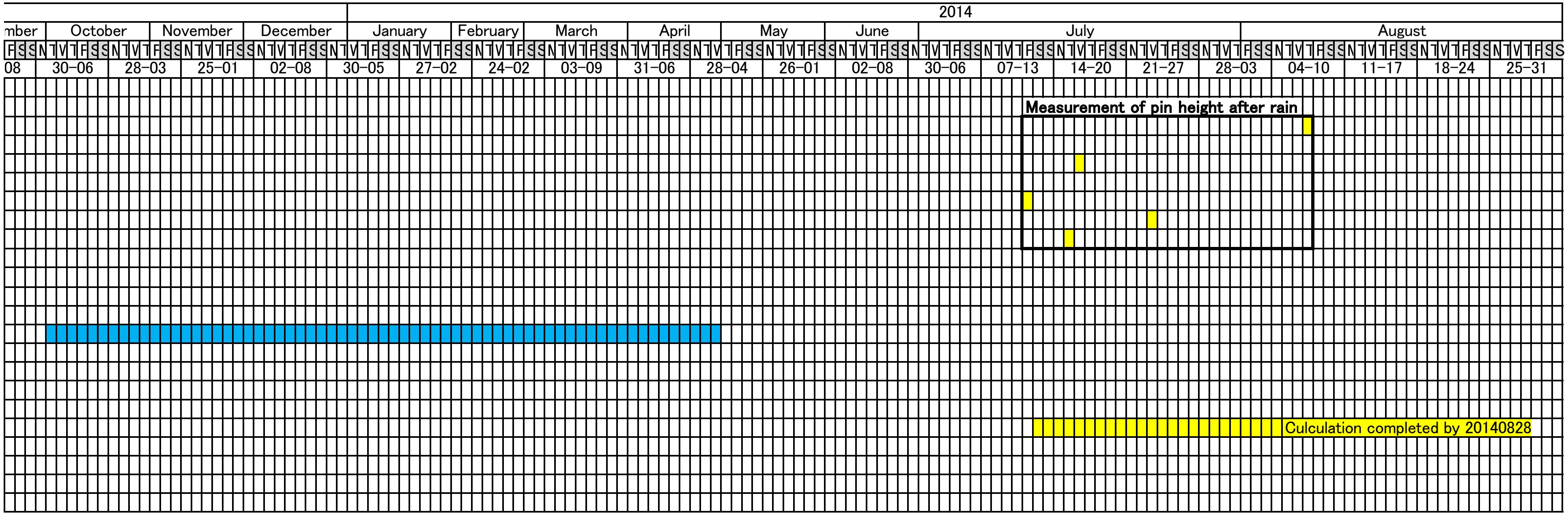
Pin No	P-G	P-G	P-G
1	-15	-22	-17
2	-15	-19	-12.5
3	-15	-14	-14
4	-15	-15	-37.5
5	-15	0	-17.5
6	-15	-14	-12.5
7	-15	-30	-29.5
8	-15	-12	-19
9	-15	-16	0
10	-15	-13	-14
11	-15	-16	-19.5
12	-15	-6	-13
13	-15	-18	-16
14	-15	-15	-9.5
15	-15	-17	-17
16	-15	-19	0
Total	-240	-246	-248.5
Average	-15	-15.38	-15.53

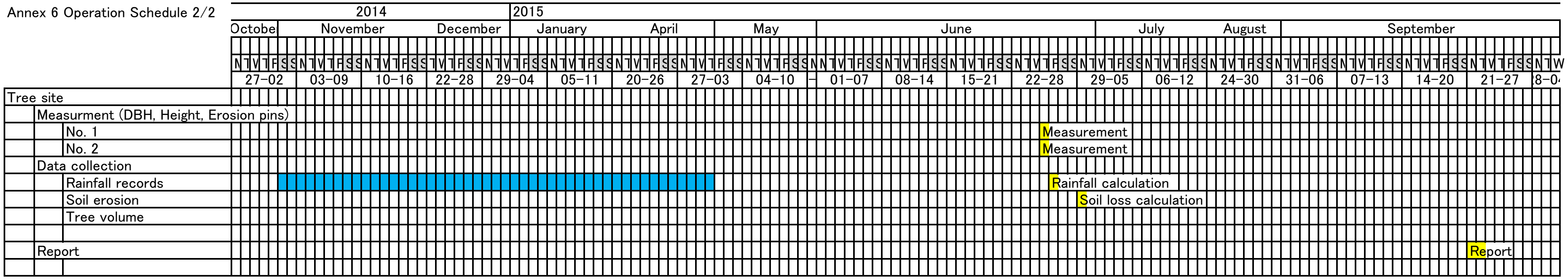
Bare land

Pin No	P-G	P-G	P-G
1	-15	0	-6.5
2	-15	-17	-12.5
3	-15	-20	-22.5
4	-15	-18	-8
5	-15	-20	-13
6	-15	-7	-8
7	-15	-12	-6.5
8	-15	-16	-7.5
9	-15	-23	-8
10	-15	-15	-5.5
11	-15	-19	-10
12	-15	-10	-5.5
13	-15	-15	-8.5
14	-15	-6	-2.5
15	-15	-9	0
16	-15	-15	-8
Total	-240	-222	-132.5
Average	-15	-13.88	-8.28

Annex 6 Operation Schedule 1/2




2014
mber
October
November
December
January
February
March
April
May
June
July
August
08
30-06
28-03
25-01
02-08
30-05
27-02
24-02
03-09
31-06
28-04
26-01
02-08
30-06
07-13
14-20
21-27
28-03
04-10
11-17
18-24
25-31
Measurement of pin height after rain
Culculation completed by 20140828



Annex 6 Operation Schedule 2/2

					2014		2015																	
			October	November		December		January	April		May				June		July		August			September		
			NTVTFSS	NTVTFSS	NTVTFSS	TVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	N	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTVTFSS	NTW
			27-02	03-09	10-16	22-28	29-04	05-11	20-26	27-03	04-10	-	01-07	08-14	15-21	22-28	29-05	06-12	24-30	31-06	07-13	14-20	21-27	8-0
Tree site																								
	Measurment (DBH, Height, Erosion pins)																							
		No. 1														Measurement								
		No. 2														Measurement								
	Data collection																							
		Rainfall records	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦						Rainfall calculation								
		Soil erosion															Soil loss calculation							
		Tree volume																						
	Report																						Report	

COVAMSⅡ

Working Paper

No. 9

Soil Loss Study for Maize gardens and Small scale check dams

September 2015

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Mr. F. Kwezani	RMT Research Team member
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Mr. C. Nyirenda	TST member, Balaka
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The project for Promoting Catchment Management Activity in Middle Shire
(COVAMS Ⅱ)
Forestry department / Japan International Cooperation Agency

List of Contents

1 Introduction

In the planning stage of the COVAMS II project, soil conservation techniques used by COVAMS and COVAMS II project were thought that it is necessary to be verified their effectiveness through research. It was finally appeared in the project design matrix (PDM) as the output 3. The output 3 was described that “Effectiveness of the catchment management techniques of COVAMS is quantitatively verified by an action research”.

For this output 3 of the PDM a short term expert was dispatched in the year 2013 and designed the research and set research sites in farming garden and tree cover area. There are three research items following the extension subjects of the COVAMS II project such as contour ridge technique, tree growing technique and small scale gully control technique.

Main objective of the research was to measure the soil volume prevented from erosion by applying conservation techniques promoted by COVAMS II project.
In this report, the result of research on the contour ridge and small scale gully control is explained.

2 Objectives of the research on contour ridge and small scale gully control

Objective of the research was explained in the action research plan as following, “The purpose of Action Research is to verify quantitatively the effects of three COVAMS soil management techniques (contour ridging, tree planting and gully control)”. Focusing on two techniques, contour ridging and gully control, it could be described that the objective of research is to know volume of the soil prevented from erosion by applying those techniques, and for contour ridging effect of technique on the yield of Maize is also measured.

3 Research method

3.1 3 sites in Blantyre

Research method was explained in the action research plan in detail from how to set the sites to how to measure the soil volume eroded from the experiment plot. For the first three sites which constructed in Blantyre district in 2013/2014 fiscal year, soil volume is measured from sediment particles from the sample runoff water.

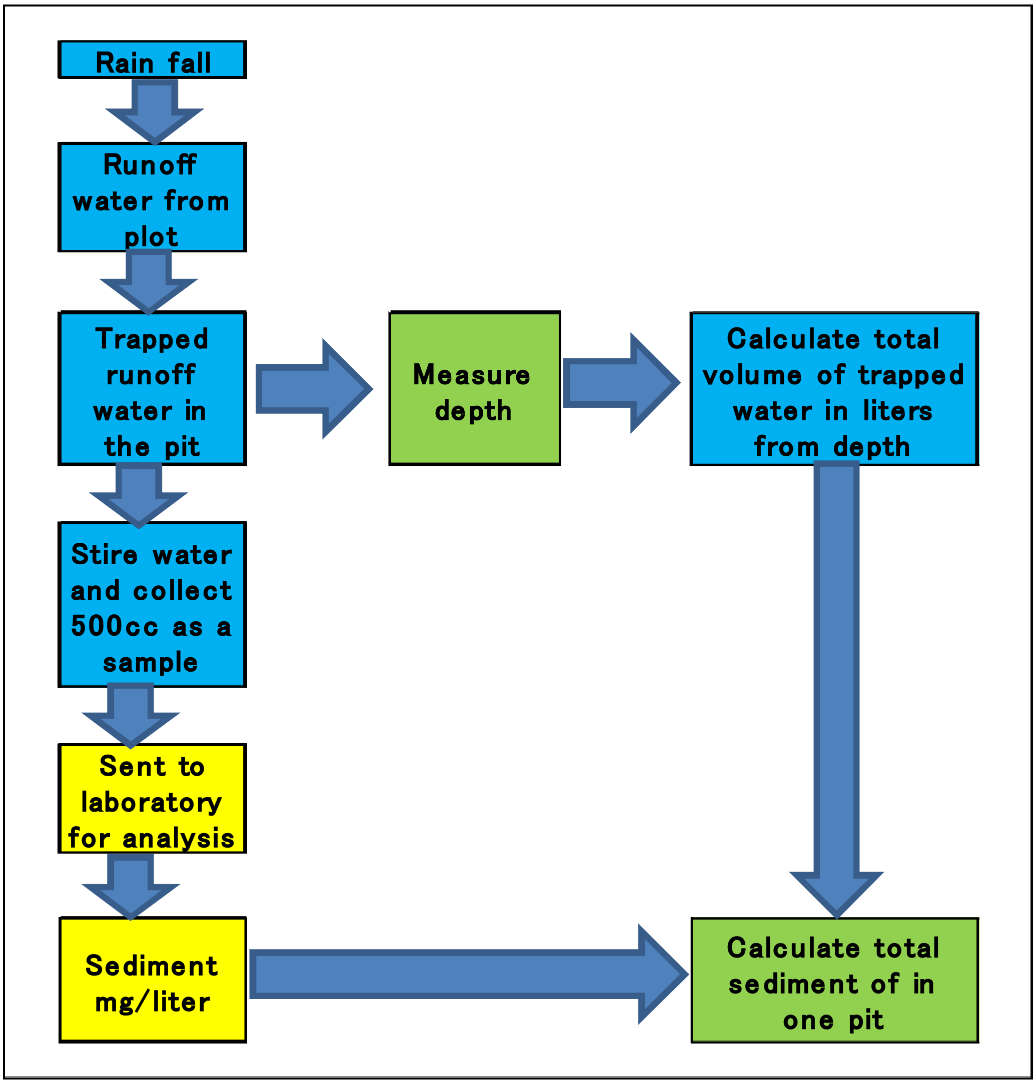


Figure 1 Process of sampling and calculation of total volume of sediment

3.2 Simplified 7 sites

It was planned as simplified method of the research on soil loss study from maize garden in 2014 after completing first data collection in 3 sites in Blantyre.

For the simplified seven sites for contour ridges research which constructed in

2014/2015 fiscal year, deposited soil in the trapping ditches were measured physically after rainy season.

Sites were set following the steepness of the slope which was categorized by LRCD such as steep slope, moderate slope and gentle slope. It was expected that three sites would be constructed in all districts according to the slope category but due to the availability of land and its size only Mwanza district could secure three types of research plots.

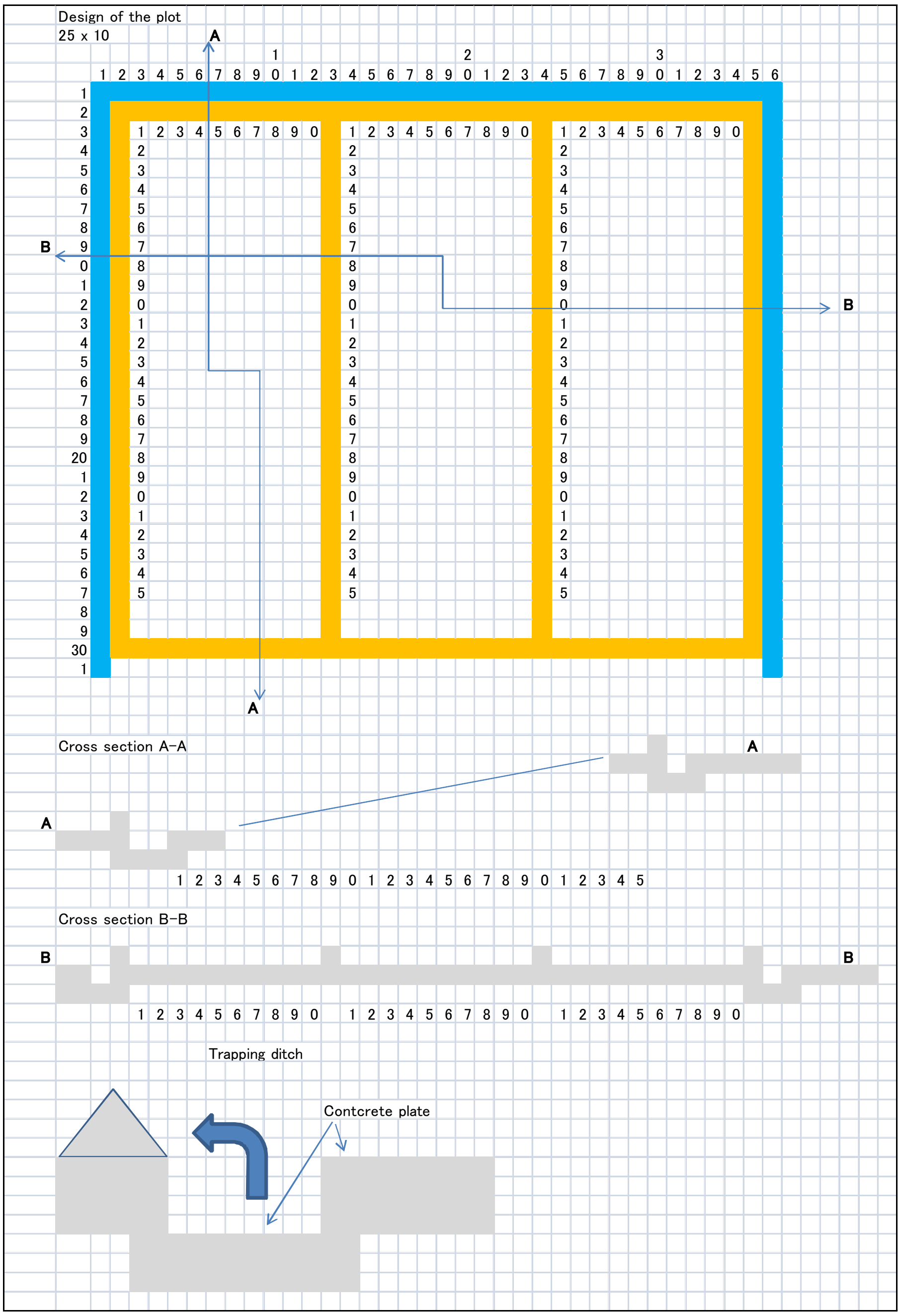


Figure 2 Typical design of research plot

3.3 Yield of Maize

Maize yield was measured plot by plot after harvesting, shelling and drying to the condition for storage in both 3 sites and 7sites.

3.4 Gully control

Research method was explained in the action research plan in detail how to measure the soil volume prevented from erosion in the gully if check dams were constructed in the gully. For this 2014/2015 season the research team planned to measure size of check dams, particularly width and height of the check dams and to estimate total soil volume accumulated behind the check dams constructed.

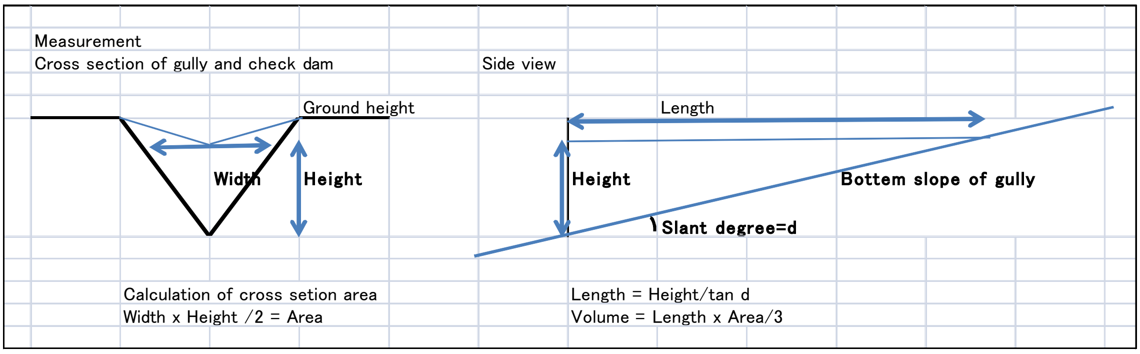


Figure 3 Measurement of check dam and volume calculation

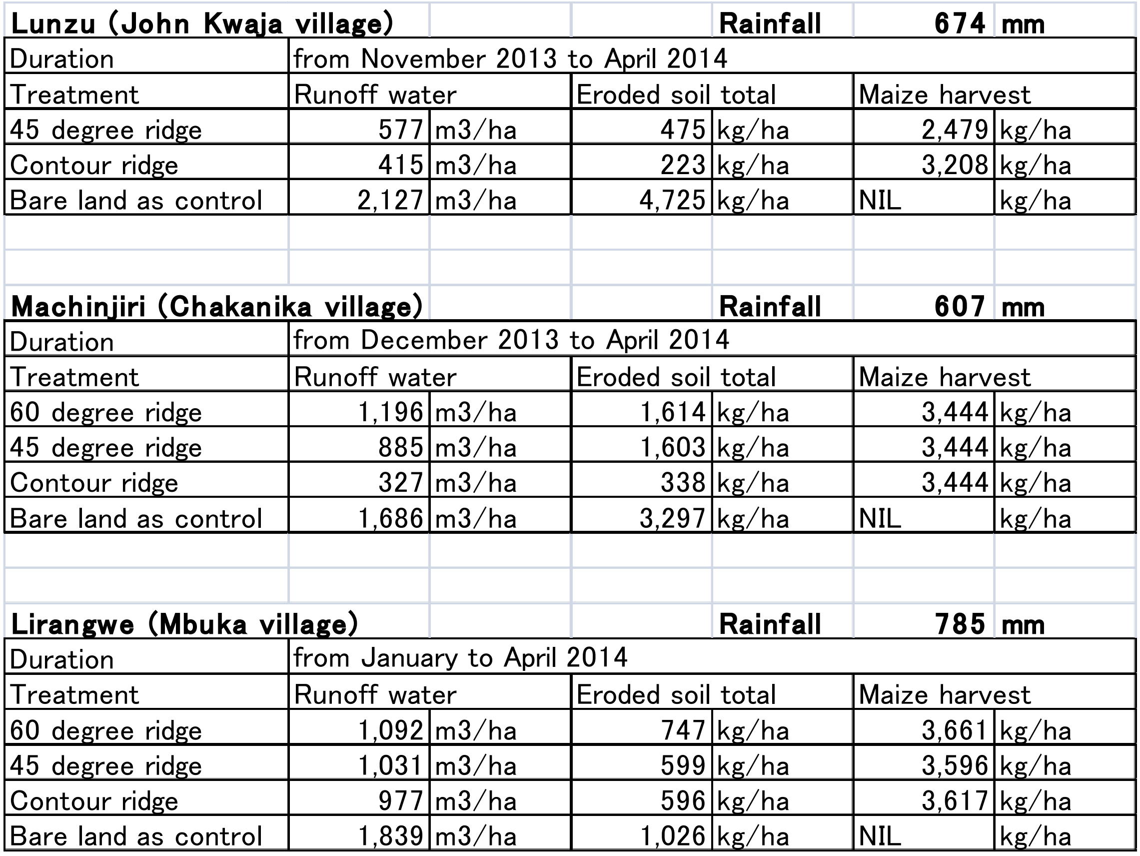
4 Result

4.1 3 sites in Blantyre

2013/2014 season

Observation and data collection carried out in 3 sites only in this season. After analysis of sample water and calculation of runoff water volume following result was obtained.

Table 1 Result of soil loss study in 2013/2014



Lunzu (John Kwaja village)			**Rainfall**	**674**	**mm**
Duration	from November 2013 to April 2014				
Treatment	Runoff water	Eroded soil total		Maize harvest	
45 degree ridge	577	m3/ha	475	kg/ha	2,479	kg/ha
Contour ridge	415	m3/ha	223	kg/ha	3,208	kg/ha
Bare land as control	2,127	m3/ha	4,725	kg/ha	NIL	kg/ha

Machinjiri (Chakanika village)				**Rainfall**	**607**	**mm**
Duration	from December 2013 to April 2014					
Treatment	Runoff water		Eroded soil total		Maize harvest	
60 degree ridge	1,196	m3/ha	1,614	kg/ha	3,444	kg/ha
45 degree ridge	885	m3/ha	1,603	kg/ha	3,444	kg/ha
Contour ridge	327	m3/ha	338	kg/ha	3,444	kg/ha
Bare land as control	1,686	m3/ha	3,297	kg/ha	NIL	kg/ha

Lirangwe (Mbuka village)				**Rainfall**	**785**	**mm**
Duration	from January to April 2014					
Treatment	Runoff water		Eroded soil total		Maize harvest	
60 degree ridge	1,092	m3/ha	747	kg/ha	3,661	kg/ha
45 degree ridge	1,031	m3/ha	599	kg/ha	3,596	kg/ha
Contour ridge	977	m3/ha	596	kg/ha	3,617	kg/ha
Bare land as control	1,839	m3/ha	1,026	kg/ha	NIL	kg/ha

John Kwaja

Runoff water: There was significant difference between control plots and ridged plots. Runoff water volume from control plots was 2,127 m3/ha, while contour ridge plots recorded 415 m3/ha. 45 degree ridge plots recorded slightly more than contour plots.

Soil volume: Reflecting the difference of runoff water volume, soil volume is also showing significant differences between control plots and ridged plots. Control plots recorded 4,725kg/ha, while contour ridge plots recorded 223 kg/ha. 45 degree ridge plots recorded more two times of contour ridge plots.

Maize yield: 45 degree ridge plots got 2,479 kg/ha of maize while contour ridge plots got 3,208 kg/ha.

Chakanika village

Runoff water: There was significant difference between control plots and ridged plots. Runoff water volume from control plots was 1,686 m3/ha, while contour ridge plots recorded 327 m3/ha. 45 degree ridge plots recorded 885 m3/ha and 65 degree ridge plots recorded 1,196 m3/ha.

Soil volume: Reflecting the difference of runoff water volume, soil volume is also showing differences between control plots and ridged plots. There was significant difference between contour ridge plots and other two degreed ridge plots. Contour ridge plots recorded 338 kg/ha while two other ridge plots recorded 1,603 and 1,614 kg/ha. It was almost five times..

Maize yield: There was no difference between contour ridge, 45 degree ridge and 60 degree ridge plots although total yield is higher than average of maize yield in Malawi.

Mbuka village

Runoff water: There was significant difference between control plots and ridged plots. Runoff water volume from control plots was 1,839 m3/ha, while contour ridge plots recorded 977 m3/ha. 45 degree ridge plots recorded 1,031 m3/ha and 65 degree ridge plots recorded 1,092 m3/ha.

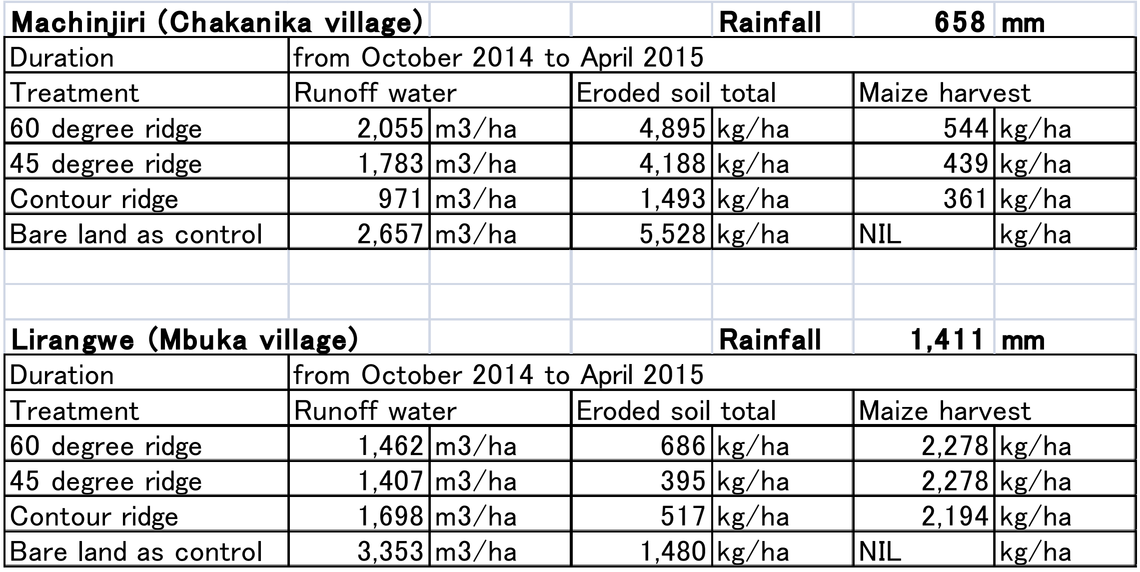
Soil volume: Reflecting the difference of runoff water volume, soil volume is also showing differences between control plots and ridged plots. There was no significant difference between contour ridge plots and degree ridge plots. Control plots recorde 1,026 kg/ha and other ridge plots recorded between 596 to 747 kg/ha.

Maize yield: There was no significant difference between contour ridge, 45 degree ridge and 60 degree ridge plots although total yield is higher than average of maize yield in Malawi.

2014/2015 season

In this season, data was collected from two sits only. John Kwaja site could not collect sample water from the site. The project management asked to collect right data but the owner could not. The project decided to suspend operation in John Kwaja site.

Table 2 Result of soil loss study in 2013/2014



Machinjiri (Chakanika village)				**Rainfall**	**658**	**mm**	
Duration	from October 2014 to April 2015						
Treatment	Runoff water		Eroded soil total		Maize harvest		
60 degree ridge	2,055	m3/ha	4,895	kg/ha	544	kg/ha	
45 degree ridge	1,783	m3/ha	4,188	kg/ha	439	kg/ha	
Contour ridge	971	m3/ha	1,493	kg/ha	361	kg/ha	
Bare land as control	2,657	m3/ha	5,528	kg/ha	NIL	kg/ha	
Lirangwe (Mbuka village)				**Rainfall**	**1,411**	**mm**	
Duration	from October 2014 to April 2015						
Treatment	Runoff water		Eroded soil total		Maize harvest		
60 degree ridge	1,462	m3/ha	686	kg/ha	2,278	kg/ha	
45 degree ridge	1,407	m3/ha	395	kg/ha	2,278	kg/ha	
Contour ridge	1,698	m3/ha	517	kg/ha	2,194	kg/ha	
Bare land as control	3,353	m3/ha	1,480	kg/ha	NIL	kg/ha	

Chakanika village

Runoff water: There was significant difference between control plots and ridged plots. Runoff water volume from control plots was 2,657 m3/ha, while contour ridge plots recorded 971 m3/ha. 45 degree ridge plots recorded 1,783 m3/ha and 65 degree ridge plots recorded 2,055 m3/ha. There was notable difference between contour ridge plots and degree ridge plots.

Soil volume: Soil volume is showing differences between control plots and contour ridged plots. There was significant difference between contour ridge plots and other two degreed ridge plots. Soil volume is much more than the one in 2013/2014. Control plots recorded 5,528 kg/ha, while contour ridge plots recorded 1,493 kg/ha. 45 degree plots recorded 4,188 kg/ha and 60 degree plots recorded 4,895 kg/ha

Maize yield: There was very small differences between contour ridge, 45 degree ridge and 60 degree ridge plots. Total yield is very much smaller than last year and much lower than average in Malawi.

Mbuka village

Runoff water: There was significant difference between control plots and ridged plots. Runoff water volume from control plots was 3,353 m3/ha, while contour ridge plots recorded 1,698 m3/ha. 45 degree ridge plots recorded 1,407 m3/ha and 65 degree ridge plots recorded 1,462 m3/ha.

Soil volume: Reflecting the difference of runoff water volume, soil volume is also showing differences between control plots and ridged plots. There was no significant difference between contour ridge plots and degree ridge plots. Control plots recorded 1,480 kg/ha, while contour ridge plots recorded 517 kg/ha. 45 degree plots recorded 395 kg/ha and 60 degree plots recorded 686 kg/ha.

Maize yield: There was no significant difference between contour ridge, 45 degree ridge and 60 degree ridge plots.

Observations through two seasons

- Runoff water volume in Mbuka site was observed that ridge plots did not show significant difference due to the overflowing from one to other pits.
- Soil volume seems smaller than the figure usually used in Malawi. Reason of that could be the way of sample collection. Trapped water in the pits must be stirred evenly when sample was taken, but in general heavy particles in the runoff water dropped to bottom of the pit even in the process of stirring.
- Maize harvest did not show clear difference between contour ridge plots and degree ridge plots except in John Kwaja site. Reason was not clear but width of the plots, 2 meters might contribute for that result as working like box ridges.

4.2 Simplified 7 sites

2014/2015 season

It was first season to collect data from seven sites. The research operation was supervised by LRCO of each district except Balaka and collaboration with CCOs in charge of the village where research plots were constructed.

Table 3 Result of soil loss study in 7 sites

			Soil volume			area m2	volume m3/ha			Maize				Rainfall
District	Village	Treatment	Number	liters	volume		C. Rate	**Volume**	**Diff**	**Weight**		**kg/ha**		**mm**
Neno	Daudi	CA	32	25	800.0	244.6	1.3	**25.2**	**16.9**	**66.0**	kg	**2,698**		**1,137**
20150528	medium slop	Contour ridge	35	25	875.0	263.9	1.3	**25.5**	**16.5**	**58.0**	kg	**2,198**		
		Control	58	25	1,450.0	265.5	1.3	**42.0**		**67.0**	kg	**2,524**		
Mwanza	Chikoleka	CA	13	25	325.0	244.0	1.3	**10.2**	**10.5**	**61.0**	kg	**2,500**		**1,251**
20150605	Steep slope	Contour ridge	20.5	25	512.5	245.7	1.3	**16.0**	**4.7**	**70.5**	kg	**2,869**		
		Control	29	25	725.0	268.9	1.3	**20.7**		**64.5**	kg	**2,399**		
	Tchale	CA	36	25	900.0	233.8	1.3	**29.6**	**42.7**	**93.5**	kg	**3,999**		**1,033**
	medium slop	Contour ridge	45	25	1,125.0	233.5	1.3	**37.1**	**35.2**	**101.0**	kg	**4,325**		
		Control	84	25	2,100.0	223.4	1.3	**72.3**		**103.0**	kg	**4,611**		
	Kawiriza	CA	22	25	550.0	253.2	1.3	**16.7**	**2.0**	**44.5**	kg	**1,758**		**1,037**
	gentle slope	Contour ridge	19	25	475.0	232.0	1.3	**15.7**	**2.9**	**63.5**	kg	**2,737**		
		Control	24.25	25	606.3	249.4	1.3	**18.7**		**64.5**	kg	**2,586**		
Balaka	Chizinga E	CA	10.5	25	262.5	250.0	1.3	**8.1**	**11.9**	**52.0**	kg	**2,080**		**1,100**
20150612	250m2	Contour ridge	26	25	650	250.0	1.3	**20.0**	**0.0**	**72.0**	kg	**2,880**		
	gentle slope	Control	26	25	650	250.0	1.3	**20.0**		**101.0**	kg	**4,040**		
	Chizinga W	CA	23	25	575	250.0	1.3	**17.7**	**75.4**	**70.0**	kg	**2,800**		**1,133**
	250m2	Contour ridge	40	25	1000	250.0	1.3	**30.8**	**62.3**	**96.0**	kg	**3,840**		
	medium slop	Control	121	25	3025	250.0	1.3	**93.1**		**72.0**	kg	**2,880**		
Blantyre	Chiwalo	CA	11	25	275	392.7	1.3	**5.4**	**2.7**	**127.0**	kg	**3,234**		**1,066**
20150609	Medium slop	Contour ridge	19	25	475	500	1.3	**7.3**	**0.8**	**65.0**	kg	**1,300**		
	500m2	Control	21	25	525	500	1.3	**8.1**		**63.0**	kg	**1,260**		

Daudi village

Slope is categorized in medium slope.

Soil volume: There was clear difference between control plot and other two plots. Soil volume from control plots was 42 m3/ha while from contour ridge plots and CA plots recorded 25.5 m3/ha and 25.2 m3/ha respectively.

Maize yield: There was no significant difference between control and other two plots.

Chikoleka village

Slope is categorized in steep slope

Soil volume: Although slope is steep, total soil volume measured is not very much. Soil volume from control plots was 20.7 m3/ha while from contour ridge plots and CA plots recorded 16.0 m3/ha and 102 m3/ha respectively.

Maize yield: There was no significant difference between control and other two plots.

Tchale village

Slope is categorized in medium slope.

Soil volume: There was a lot of erosion in this site and clear difference between control plot and other two plots. Soil volume from control plots was 72.3 m3/ha while from contour ridge plots and CA plots recorded 37.1 m3/ha and 29.6 m3/ha respectively.

Maize yield: There was no significant difference between control and other two plots. It was best harvest in this season among those 7 sites.

Kawiriza village

Slope is categorized in gentle slope.

Soil volume: Reflecting the category of slope, there was not clear difference between control plot and other two plots. Soil volume from control plots was 18.7 m3/ha while from contour ridge plots and CA plots recorded 15.7 m3/ha and 16.7 m3/ha respectively.

Maize yield: There was no significant difference between control and other two plots.

Chizinga village east site

Slope is categorized in gentle slope.

Soil volume: Reflecting the category of slope, there was not clear difference between control plot and contour ridge plot but CA plot was smaller than. Soil volume from control plots was 20.0 m3/ha while from contour ridge plots and CA plots recorded 20.0 m3/ha and 8.1 m3/ha respectively.

Maize yield: There was no significant difference between contour ridge plot and CA plot while control got more yield than other two.

Chizinga village west site

Slope is categorized in medium slope.

Soil volume: There was most larger volume of eroded soil in control plot in this site. Soil volume from control plots was 93.1 m3/ha while from contour ridge plots and CA plots recorded 30.8 m3/ha and 17.7 m3/ha respectively.

Maize yield: There was no significant difference between three types of plot and contour ridge plot got more harvest than other two.

Chiwalo village

Slope is categorized in medium slope.

Soil volume: The site recorded smallest volume of eroded soil among 7 sites in this season. Soil volume from control plots was 8.1 m3/ha while from contour ridge plots and

CA plots recorded 7.3 m3/ha and 5.4 m3/ha respectively.
Maize yield: There was big difference between CA plot and other two plots.

4.3 Small scale gully control

Measurement was taken height and width of check dams and bottom slope of the gully. During the field survey in Neno, it was realized that considerable number of small scale check dams were constructed. Most of them were constructed by using stones because there are a lot of stones in the area.
Width and height were well matched with size and depth of gully itself. In total 61 check dams were measured in Chikunguru village.

In Blantyre, only five (5) samples were measured in Chenga village. The area was relatively flat with very gentle slope. Material for check dams was most of cases shrub and sticks because stone is hardly seen in the area. Villagers explained that they constructed many check dams but heavy rain and flood in January washed away most of check dams. After the rain LFs constructed some check dams during TOT for LFs but because of the scarcity of woody resources, constructed check dams by using shrubs and sticks were destroyed as the source of fuel wood.

Height of the check dams was in the range of 0.08 and 0.50 meter with average of 0.181 meter. Width of the check dams was in the range of 0.50 and 3.00 meter with average of 1.478 meter. Slope of the gully at the point of constructed check dams was in the range of 1 and 17 degree with average of 9.7 degree. (Refer Annex 6)

Number of constructed check dams was obtained from practice survey in each district. Result was compiled as the Working Paper No. 7. There were 21,362 check dams constructed in the 2014/2015 season.

5 Conclusion

5.1 Contour ridges

Effect of contour ridges were estimated by using observed volume of soil eroded from the 7 simplified research plots and estimated area of conserved garden from practice survey. In 2014/2015 season, total of 1,103 ha of maize garden was conserved with contour ridges, and applying 17.49 m3/ha of soil volume it was estimated that 19,287 m3 of soil was prevented from erosion.

Table 4 Volume of soil prevented from erosion
Comparison between control plot and contour ridge plot

Site	**Differene m3**		**Area conserved ha**	**Total volume m3**
Neno	16.5		303	5,000
Mwanza 1	4.7		108	508
Mwanza 2	35.2			3,802
Mwanza 3	2.9			313
Balaka 1	0		299	0
Balaka 2	62.3			18,628
Blantyre	0.8		393	314
Total	122.4		**1,103**	
Average	**17.49**		**1,103**	**19,287**

5.2 Small scale gully control

Effect of small scale gully control was estimated by using measured sample size of checks dams and number of check dams constructed from practice survey.

In 2014/2015 season, total of 21,362 check dams were constructed in all four districts, and applying 0.075 m3 of soil volume it was estimated that 1,602 m3 of soil was deposited in the check dams and prevented from erosion.

Table 5 Volume of soil trapped in check dams (Estimate)

District	Number of check	Volume of check dams m3			**Total volume m3**		
		Min	**Average**	Max	Min	**Average**	Max
Neno	6,376	0.002	**0.075**	0.519	13	**478**	3,309
Blantyre	2,276				5	**171**	1,181
Balaka	3,699				7	**277**	1,920
Mwanza	9,011				18	**676**	4,677
Total	**21,362**				43	**1,602**	11,087

5.3 Yield of Maize

In 2014/2015 season there was an excessive rainfall and outbreak of insect in farming garden, so the result of yield in 7 simplified study sites did not show significant differences between control and contour ridge plots.

6 Recommendations

6.1 Contour ridges

The positive effect of contour ridges moisture retention and against soil erosion is not the point of argument, it is well known subject and the soil los study also proved that point.

- Scientific research is very difficult in collection of real sample of runoff water by the land owners in the villages. It could be implemented in research institutions in their closed and controlled research environment if such kind data is necessary for the government.
- Simplified research is more applicable in the extension project to collect basic data about the volume of soil eroded from farming garden.

6.2 Small scale gull control

- Gully control is like treatment for disease and sickness. It cost labor and times.
- Prevention of gully from growing has to be put emphasis in the villages by conserving upstream gardens with contour markers and realigned ridges.

6.3 Yield of maize

Unfortunately, effectiveness of contour ridges and realigned planting ridges for yield could not see in 2014/2015 planting season due to the excessive heavy rain and outbreak of insects in the farming gardens. However, from the experience of COVAMS and most practiced farmers in COVAMS II, there are strong supports for the relationship between contour ridges and good harvest.

It is recommended that study will continue one more season to collect data on changes of yield.

Reference

1 Action Research Plan, COVAMS II, 2013
2 Working paper No. 4 Analysis of COVAMS approach in its effectiveness 2014
3 Working paper No. 7 Result of practice survey in Gully control 2014

Annex

1 Rainfall data 2013/2014 from 3 sites
2 Rainfall data 2014/2015 from 2 sites
3 Rainfall data 2014/2015 from 7 sites
4 Soil volume calculation 3 sites 2013/2014
5 Soil volume calculation 2 sites 2014/2015
6 Sample survey result of small scale check dams

Annex 1 Rainfall data 2013/2014 from 3 sites

	LUNZU							**MACHINJILI**							**LIRANGWE**					
Date	**Novemb**	**Decemb**	**January**	**Februar**	**March**	**April**	Date	**Novemb**	**Decemb**	**January**	**Februar**	**March**	**April**	Date	**Novemb**	**Decemb**	**January**	**Februar**	**March**	**April**
1				2			1					4		1			19	3		
2			21	1			2			12				2		2	73	47		
3			17				3			22	19			3			3			
4	3			2		21	4				70			4			5	2		
5				3			5			1				5			21	3		
6		8		2			6							6			1			
7			41	83			7			22				7			10		10	
8			2	1	4		8				7			8					1	15
9				2	1	6	9			3	36	3	16	9			7	6		
10			13	37			10				19			10				36		3
11				2			11						2	11			7	3		
12	3		10	6			12			19	15			12			4	61		
13		16	26	3			13							13		10	25	30		
14		4	14	2			14		26	18				14		4		65		
15			2	1	7		15				40			15		15	1	17		
16		8	1	2			16		22		2			16	2		1	3	20	
17				5	3		17				2	4		17		3		3		
18		10			13		18		26			14		18					21	
19	10	4			10		19		49			7	2	19	10	14				
20	18	8					20		5					20						
21		2					21		3	4		3		21		3				
22		4		2			22				4			22	1		2	4		
23	5		2	6			23	7		1	3			23	1		3	10		
24			9	1			24							24					18	
25				2			25				10			25		7		10	10	
26		31					26		2	8				26			33		10	
27		4		4			27				9			27		75				
28			75	28			28	2	13	6				28	5	8	23		3	
29	7	2				27	29	32	1				20	29		3	61			18
30		1	2				30		2	20				30			21			
31		1	1				31			11				31			33			
Total	46	103	236	197	38	54	Total	41	149	147	236	35	40	Total	19	144	353	303	93	36
Acc	46	149	385	582	620	674		41	190	337	573	608	648		19	163	516	819	912	948
													607							785

Annex 2 Rainfall data 2014/2015 from 2 sites

	Chakanika – Machinjiri								M'buka – Lirangwe						
Date	October	Novemb	Decemb	January	Februar	March	April	Date	Octobe	Novemb	Decemb	January	Februar	March	April
1								1				3	3		
2					91			2				2	15		
3								3				25		10	2
4								4							
5								5				30	40		1
6								6				14			3
7		11			40			7				8			
8								8				30			
9				16				9		10		88			
10					24			10			11				
11			11					11			9	100		2	
12								12			3	100	20		
13					77			13			2	95			1
14				91				14			17	13		1	
15								15			4	5	21		2
16								16				4	70		1
17			2		31			17	2	4	5	3			
18								18				1			
19								19						11	10
20			30				22	20			3	1			
21								21			2	3	5		20
22			10					22			21	9		2	
23			30	15			37	23			4		58		
24								24							
25					26			25					71	1	
26								26			3	10	54		
27								27			1	11		5	
28				40				28	1		5	100		2	
29			8					29			30	30			
30								30				20			
31			32			14		31			29	100		9	
Total	0	11	123	162	289	14	59	Total	3	14	149	805	357	43	40
Acc	0	11	134	296	585	599	658	Acc	3	17	166	971	1328	1371	1411

Annex 3 RAINFALL DATA 2014/2015 from 7 sites 1/3

DISTRICTS:
MWANZA Chikoleka

	2014			2015			
Date	October	Novemb	Decemb	January	Februar	March	April
1				27			
2				34	18		
3				30	10	30	
4				16	77		
5				13	16	5	
6				74	9		
7				86			
8				22			
9			4	5			
10			6				
11				14	12		
12			10	120			
13				5	9		
14				4			
15				5	28		
16					17		
17				54			
18		21	10	14			
19			13				
20							
21							
22			2	24	15		
23			18		18	23	
24					43		
25			24		88		
26					6		
27							
28			36				
29						24	
30			46	18			
31			26	22			
Total	0	21	195	587	366	82	0
						G. Total	1251

DISTRICTS:
MWANZA Tchale

	2014			2015			
Date	October	Novemb	Decemb	January	Februar	March	April
1				35	9		
2		3		20	10		
3				30	20		
4				25		28	
5				12	70		
6				35			
7				50	5	5	
8				75		10	
9			10	15			
10			12	15	5		
11		4					
12			2	5			
13			2	70			
14					4		
15				9	5		
16				7	7		
17					10		
18		20	25	30			
19			7		9		
20					5		
21					5		
22			35	5			
23				4	2		
24					10		
25				5	50	5	
26			40	4	90		
27			1				
28							
29			8	7			
30			12				
31			25	5			
Totl	0	27	179	463	316	48	0
						G. Total	1033

DISTRICTS:
MWANZ. Kawiliza

	2014			2015			
Date	October	Novemb	Decemb	January	Februar	March	April
1				13			
2		1		22	14	16	
3		1		30		37	
4				22	58		
5				39	9		
6				36	2	5	
7				55			
8				6			
9			9	5		6	
10			12	3		1	
11				31	4		
12				68			
13			8	8			
14			5		6		
15			1	7	8		
16					7		
17				19	14		
18		20	26	4			
19			8				
20					4		
21							
22			50	8	2	1	
23					16		
24				2	58		
25			22		63	5	
26			5	6	17		
27				4		8	
28			3	2			
29				1		9	
30			34	8			
31			52	6		5	
Total	0	22	235	405	282	93	0
						G. Total	1037

RAINFALL DATA ON SOIL LOSS FOR 7 SITES 2014/2015 RAINFALL DATA ON SOIL LOSS FOR 7 SITES 2014/2015

Annex 3 Rainfall data 2014/2015 from 7 sites 2/3

DISTRICTS: BALAK Chizinga West								DISTRICTS: BALAK Chizinga North							
	2014			2015					2014			2015			
Date	Octobe	Novemb	Decemb	January	Februar	March	April	Date	Octobe	Novemb	Decemb	January	Februar	March	April
1				27				1				7			
2					27			2				4	30		
3				31	13			3				31	10		
4				29	22			4				20	20		
5				55	11			5				25	10		
6				40	12			6				50	11	3	
7				25		4		7				55			
8			1	100				8				100			
9				7				9				5			
10					2			10				30	2		
11				31	31			11				80	32		
12				80				12					13		
13				14	14			13				11	20		
14					21			14					50		
15					46			15							
16				7				16				5			
17			2	15				17			2	10			
18			26	29				18			28	26			
19			15					19			20				
20								20					6		
21						2		21						3	
22			27		61			22			28				
23					5			23					8		
24			1					24			1		62		
25			78	31	12			25			85	30	10		
26					14			26				10	12		
27				7				27				2			
28			1					28			1				
29			13	15		24		29			11	10		25	
30			72	10				30			60	8			
31			7	16				31			3	15			
Total	0	0	243	569	291	30	0	Total	0	0	239	534	296	31	0
					G. Tota		1133							G. Tota	1100

Annex 3 Rainfall data 2014/2015 from 7 sites 3/3

DISTRICTS:
NENO Daudi

	2014			2015			
Date	Octobe	Novemb	Decemb	January	Februar	March	April
1				5.3			
2				21	41	5.8	
3		3.2		20	0.9	0.3	
4				24	44	10	
5				31	35	7.8	
6				55	5	3	
7				32		0.4	
8				37			
9				5.1			
10				36			
11			0.5	34			
12				78	25		
13				9.8	6		
14					7		
15			15.1	9.6	35		
16				5.8	8.1		
17				36			
18		0.9	37	25			
19		1.8	36		6		
20					0.1		
21							
22			3	0.2			
23					23	9.9	
24					15		
25			0.6		39	24	
26							
27							
28				44			
29			9.8	23		5.5	
30			18.5	33			
31			23.8	31		34	
Total	0	5.9	144.3	595.8	290.1	100.7	0
						G. Tota	1137

DISTRICTS:
Blantyr Chiwalo

	2014			2015			
Date	Octobe	Novemb	Decemb	January	Februar	March	April
1				4	7		
2					15		
3				9	28		
4				41	9		
5				29			
6		3		4			
7				7			
8				59	15		
9			55	9	4		
10			3	20			
11			8	145	40		
12				110			
13				130			
14			2		6		
15					25		
16							
17	3						
18				12			9
19						22	4
20			13				15
21					30		
22					1		
23					2		
24							
25				1	60		
26				9			
27				2			
28				6			
29			12	10		9	
30			19	19			
31			6	15			
Total	3	3	118	641	242	31	28
						G. Tota	1,066

Annex 4 Soil volume calculation 2013/2014

Site: **Lunzu**

Date		2013/11/19			2013/11/20			2013/11/29			2013/12/6			2013/12/13		
Rainfall (mm)		10			18			7			8			16		
		water	soil		water	soil		water	soil		water	soil		water	soil	
Treatmen	Plot	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total
45	1	30.8	1160	35712	67.0	4410	295615	37.8	2950	111371	14.1	2280	32217	55.6	4360	242556
45	5	30.2	240	7256	72.0	810	58359	39.8	2280	90670	14.7	2170	31793	65.3	980	63995
45	7	32.0	2280	73064	79.3	1710	135673	42.6	3810	162339	15.6	1070	16672	67.9	1780	120884
45	12	29.1	2540	73794	69.2	60	4154	29.3	6270	183480	13.1	560	7323	61.3	1010	61960
total				189825			493801			547860			88006			489395
0	2	31.4	1700	53429	68.6	5260	360686	38.8	3680	142819	15.5	870	13445	57.3	2670	153000
0	6	29.9	330	9862	72.1	200	14429	39.8	1690	67211	15.2	830	12648	61.7	2780	171433
0	9	32.8	2340	76813	72.9	1470	107168	41.5	3970	164908	15.6	1300	20313	61.7	1170	72213
0	10	32.1	410	13179	72.1	250	18023	39.5	850	33595	14.0	1540	21626	65.3	60	3921
total				153282			500305			408533			68031			400567
C	3	32.4	1570	50854	323.5	2040	660000	108.3	2940	318260	16.8	4800	80681	300.0	5060	1518000
C	4	28.8	730	20988	382.9	150	57429	147.0	2990	439645	18.1	1840	33377	365.7	1800	658286
C	8	29.0	730	21205	406.0	1930	783496	121.0	2280	275952	15.7	90	1409	337.3	1760	593672
C	11	30.3	1810	54897	413.3	3210	1326740	109.4	5160	564398	18.3	3590	65817	348.0	1220	424503
total				147943			2827665			1598256			181283			3194460

Date		2013/12/16			2013/12/18			2013/12/20			2013/12/26			2014/1/2		
Rainfall (mm)		8			10			8			31			21		
		water	soil		water	soil		water	soil		water	soil		water	soil	
Treatmen	Plot	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total
45	1	17.6	60	1057	28.5	290	8276	48.7	1810	88211	137.5	590	81130	89.3	300	26795
45	5	19.5	1500	29302	33.3	660	21949	61.7	2500	154217	179.7	1560	280341	112.1	370	41486
45	7	20.7	1150	23784	34.1	40	1364	63.5	1830	116235	183.8	1030	189301	108.9	230	25054
45	12	18.5	3490	64431	35.8	1380	49389	55.7	490	27315	143.9	1740	250472	93.3	460	42904
total				118574			80978			385978			801244			136239
0	2	19.3	810	15648	30.0	410	12300	51.5	1380	71016	156.7	260	40746	95.5	80	7636
0	6	16.4	520	8543	34.0	60	2041	56.0	950	53200	145.7	1030	150094	102.2	180	18390
0	9	21.1	4500	94891	31.3	130	4070	57.1	?		161.2	1180	190242	97.8	110	10758
0	10	20.5	4620	94600	30.2	2330	70455	57.6	930	53612	167.2	1280	214039	97.1	70	6796
total				213682			88866			177827			595121			43580
C	3	18.1	1240	22426	70.5	190	13404	273.5	2450	670147	1092.8	1890	2065462	335.3	1180	395647
C	4	19.5	950	18558	68.8	120	8254	262.9	3160	830629	1066.6	3540	3775641	351.4	450	158143
C	8	22.4	12430	278195	58.6	1720	100772	256.7	1420	364537	1078.3	4570	4927684	349.3	3670	1281761
C	11	24.2	8390	202835	80.0	1250	100000	286.3	2730	781616	1129.4	4470	5048207	374.8	1490	558510
total				522014			222430			2646929			15816994			2394061

Date		2014/1/7			2014/1/10			2014/1/12			2014/1/13			2014/1/	
Rainfall (mm)		41			13			10			26			14	
		water	soil		water	soil		water	soil		water	soil		water	
Treatmen	Plot	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l
45	1	203.1	80	16250	51.3	140	7177	29.0	80	2319	80.7	380	30659	42.1	40
45	5	367.7	390	143419	68.7	770	52880	39.1	400	15628	74.2	160	11875	43.7	200
45	7	923.7	880	812838	70.5	1210	85365	35.9	640	22982	74.3	190	14114	43.3	580
45	12	400.0	40	16000	53.8	710	38219	33.3	1180	39251	68.5	350	23962	37.7	1820
total				988508			183641			80179			80610		
0	2	174.0	90	15663	51.0	30	1530	30.7	70	2150	81.8	20	1636	43.1	150
0	6	209.2	210	43938	55.8	520	28998	37.2	340	12662	68.6	160	10971	41.9	40
0	9	209.0	90	18806	56.5	330	18640	34.8	480	16696	73.1	60	4387	45.3	2680
0	10	187.9	860	161613	52.7	740	39002	34.5	260	8976	71.6	240	17191	39.8	1450
total				240020			88170			40484			34186		
C	3	1967.8	230	452594	223.5	570	127412	71.9	30	2156	385.3	760	292824	40.6	910
C	4	1922.3	2240	4305868	271.4	600	162857	76.6	470	35995	354.3	550	194857	43.4	880
C	8	1973.5	720	1420925	271.6	750	203731	66.8	360	24055	429.8	2500	1074457	50.8	8650
C	11	1995.2	870	1735843	267.8	1060	283881	81.5	420	34232	374.8	160	59974	51.2	4060
total				7915230			777881			96438			1622112		

Site: **Machinjiri**

Date		2013/12/18			2013/12/19			2014/12/30			2014/1/3			2014/1/7		
Rainfall (mm)		26			49			2			22			22		
Teratme nt	Plot No.	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total
60	1	109.8	1140	125197	1660.5	1430	2374514	52.5	1130	59356	474.0	1160	549807	1421.7	2510	#######
60	8	110.0	440	48379	1650.8	4960	8188079	41.8	240	10027	530.7	610	323755	1419.1	1280	#######
60	9	98.7	320	31573	1842.9	770	1419068	49.8	370	18418	532.3	1830	974178	1412.5	1590	#######
total				205149			11981661			87800			######			#######
45	3	89.8	390	35019	390.5	7360	2873905	45.6	180	8205	209.5	1280	268190	288.9	1850	534444
45	5	99.8	330	32926	1399.0	980	1370974	44.7	240	10726	477.6	1550	740306	1270.8	900	#######
45	10	84.3	370	31196	1295.8	2260	2928602	57.9	250	14468	200.0	2560	512000	1085.8	1470	#######
total				99141			7173481			33399			######			#######
0	4	94.8	500	47400	237.3	1570	372542	47.1	110	5179	171.3	690	118211	184.6	430	79360
0	7	93.6	330	30894	226.2	1420	321246	49.0	120	5881	176.8	####	######	169.0	450	76060
0	12	99.6	120	11948	258.0	330	85130	53.7	210	11279	85.7	120	10278	187.0	370	69204
total				90241			778919			22339			######			224623
C	2	570.9	3180	1815544	2470.7	3480	8597961	76.7	1780	136467	726.4	1400	######	1859.6	150	278934
C	6	579.1	4040	2339372	2284.2	2740	6258602	47.5	560	26586	647.7	1540	997442	1770.2	3070	#######
C	11	575.9	1560	898358	1967.3	1370	2695202	49.8	50	2490	522.2	####	######	1590.6	690	#######
				5053274			17551766			165542			######			#######

Date		2014/1/12			2014/1/15			2014/1/31			2014/2/3			2014/2/9		
Rainfall (mm)		19			18			11			19			36		
Teratme nt	Plot No.	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total
60	1	84.9	520	44172	82.8	1510	125022	191.7	310	59430	68.9	1800	123959	2427.3	790	1917539
60	8	93.1	130	12100	50.2	430	21596	158.2	140	22149	100.9	670	67572	2379.2	550	1308533
60	9	84.4	130	10978	156.3	1650	257832	131.5	1070	140731	92.9	3110	288884	2387.5	650	1551889
total				67250			404449			222309			480415			4777962
45	3	89.0	20	1779	69.6	650	45223	137.7	850	117008	65.3	550	35926	1990.5	520	1035054
45	5	91.2	90	8211	73.2	320	23418	146.8	770	113069	63.9	210	13411	2098.8	3510	7366742
45	10	83.9	70	5875	71.8	300	21540	103.3	130	13423	167.6	1240	207872	2264.3	3120	7064645
total				15865			90182			243499			257209			15466441
0	4	104.1	570	59347	64.4	350	22531	106.3	500	53133	55.8	180	10050	415.5	1460	606637
0	7	93.6	360	33702	49.2	400	19692	223.0	380	84721	62.2	130	8089	673.0	610	410537
0	12	93.3	360	33574	75.2	290	21816	193.5	620	119982	63.4	420	26632	524.2	790	414135
total				126623			64039			257836			44771			1431309
C	2	111.1	1090	121086	330.0	4640	1531200	210.0	1880	394800	430.0	3700	1590952	2453.0	1430	3507728
C	6	88.8	11360	1009035	456.7	3590	1639553	142.9	260	37160	229.0	1090	249645	2448.5	460	1126316
C	11	98.2	8250	810441	177.5	2660	472049	171.8	170	29211	62.4	3900	243551	2454.8	1710	4197744
				1940563			3642802			461171			2084148			8831787

Date		2014/2/10			2014/2/12			2014/2/26			2014/3/18			2014/4/	
Rainfall (mm)		19			15			??			14			??	
Teratme nt	Plot No.	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	mg/l
60	1	209.1	1010	211182	75.1	860	64544	72.4	2200	159216	115.5	290	33488	66.6	510
60	8	213.9	1160	248111	55.3	80	4427	167.8	800	134280	55.1	140	7716	52.4	70
60	9	282.2	1230	347096	61.5	610	37509	93.8	250	23444	51.6	80	4124	61.3	520
total				806389			######			316941			45328		
45	3	85.6	1310	112169	57.4	130	7467	136.3	310	42245	51.2	180	9209	67.2	500
45	5	186.9	830	155133	57.5	280	16109	162.2	660	107036	53.6	80	4286	60.0	220
45	10	117.8	860	101277	87.8	380	33380	128.8	60	7726	59.6	110	6553	61.6	350
total				368579			56956			157008			20049		
0	4	67.5	440	29700	46.9	50	2344	67.9	40	2717	50.4	190	9579	34.7	240
0	7	76.0	1040	79040	49.9	170	8481	90.4	1390	125691	62.2	160	9956	64.4	270
0	12	77.7	200	15545	57.1	150	8562	89.3	460	41100	63.6	240	15273	65.2	610
total				124285			19387			169508			34807		
C	2	585.9	2200	1289022	373.3	190	70933	313.3	1610	504467	125.2	460	57604	481.0	640
C	6	522.4	2340	1222305	264.5	80	21161	322.6	1080	348387	85.9	100	8588	145.4	400
C	11	531.1	1500	796679	307.7	610	######	344.6	850	292923	132.4	430	56926	203.1	380
				3308007			######			1145777			123118		

Site: Lirangwe

Date		2014/1/26			2014/1/28			2014/1/29			2014/1/31			2014/2/2		
Rainfall (mm)		33			23			61			33			47		
Treatmen t	Plot No.	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total
60	4	243.1	2020	491137	28.6	1120	32000	1840.9	870	#######	575.1	80	46011	569.2	300	170772
60	8	331.9	6590	2187011	25.7	60	1545	1919.7	940	#######	890.0	520	462803	616.5	900	554856
60	11	339.1	2250	763040	27.6	270	7440	2067.8	650	#######	606.5	1300	788395	290.0	90	26102
total				3441188			40985			#######			######			751731
45	2	57.5	420	24137	22.5	90	2025	2006.5	1120	#######	192.0	50	9600	675.8	310	209502
45	7	60.5	30	1814	26.7	350	9333	1381.7	1070	#######	1069.0	400	427599	1187.3	380	451164
45	12	79.3	390	30943	28.3	200	5663	2144.8	1140	#######	291.1	860	250389	216.6	140	30320
total				56893			17021			#######			687587			690986
0	3	58.1	710	41231	21.7	550	11917	1105.4	2970	#######	74.9	1100	82430	375.2	390	146338
0	5	72.8	190	13840	22.9	400	9156	1401.1	160	224173	1006.3	560	563526	877.2	290	254399
0	9	64.8	180	11663	24.0	210	5048	1894.3	950	#######	1252.4	870	######	664.1	710	471513
total				66733			26121			#######			######			872249
C	1	791.2	440	348128	40.8	650	26549	1978.6	900	#######	430.7	180	77530	670.4	290	194404
C	6	839.6	620	520536	57.5	500	28764	1756.9	510	896029	520.0	390	202801	1299.2	200	259837
C	10	595.0	1120	666401	39.3	1990	78273	2063.9	780	#######	647.8	90	58303	1025.9	60	61551
total				1535065			133587			#######			338635			515791

Date		2014/2/10			2014/2/13			2014/2/16			2014/2/23			2014/2/25		
Rainfall (mm)		36			30			3			10			10		
Treatmen t	Plot No.	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total
60	4	527.9	260	137258	1446.9	310	448542	871.8	620	540503	10.2	30	306	12.9	70	900
60	8	74.5	350	26077	1710.7	240	410568	349.5	150	52418	13.3	190	2518	16.3	230	3738
60	11	146.6	30	4399	1383.3	540	747004	680.8	30	20423	14.1	70	986	15.9	590	9392
total				167733			#######			613344			3809			14029
45	2	384.1	200	76829	349.8	990	346289	894.4	210	187828	14.8	80	1183	15.0	20	300
45	7	94.5	60	5669	1059.0	1130	#######	2034.1	50	101705	20.0	50	1000	17.3	1760	30478
45	12	80.0	20	1600	961.4	840	807559	569.7	40	22787	11.6	190	2198	12.5	440	5522
total				84098			#######			312321			4381			36300
0	3	99.8	180	17958	1044.3	1800	#######	1471.5	10	14715	12.2	100	1224	11.6	90	1047
0	5	93.1	30	2794	235.2	1070	251626	2245.7	60	134742	15.7	40	630	14.3	40	570
0	9	97.7	50	4884	156.9	250	39216	2223.7	70	155659	21.6	60	1297	12.2	170	2081
total				25636			#######			305117			3151			3698
C	1	797.3	440	350831	1921.1	1240	#######	1629.5	50	81476	38.3	100	3827	28.4	40	1136
C	6	372.6	90	33537	2269.2	1360	#######	2074.4	80	165953	34.9	100	3494	29.0	10	290
C	10	276.0	550	151817	2063.9	320	660432	692.5	50	34625	34.9	50	1744	26.0	150	3900
total				536185			#######			282055			9066			5325

Date		2014/3/9			2014/3/17			2014/3/19			2014/3/24			2014/3/	
Rainfall (mm)		??			21			??			18			10	
Treatmen t	Plot No.	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	soil mg/l	total	water volume	mg/l
60	4	21.1	40	844	46.3	1280	59323	596.8	830	495336	419.7	160	67149	31.9	1760
60	8	15.8	90	1418	53.3	230	12267	49.6	230	11408	37.0	60	2221	17.0	50
60	11	12.0	70	843	36.4	50	1822	32.0	80	2560	11.4	180	2057	24.7	50
total				3104			73412			509304			71426		
45	2	20.6	170	3494	202.1	280	56576	404.1	110	44449	136.0	120	16320	37.2	30
45	7	21.5	130	2800	280.9	150	42128	470.6	30	14118	342.5	80	27396	34.6	200
45	12	11.6	60	694	59.3	10	593	40.2	780	31373	15.3	90	1376	33.5	310
total				6989			99297			89941			45093		
0	3	18.4	100	1837	52.5	140	7354	67.3	910	61281	52.8	170	8971	27.2	250
0	5	19.4	40	774	57.8	70	4044	69.6	80	5570	44.4	80	3556	36.9	40
0	9	17.8	320	5683	32.9	100	3293	39.8	850	33828	51.9	90	4673	15.0	800
total				8294			14692			100680			17200		
C	1	38.5	20	770	580.2	120	69629	670.4	390	261439	282.6	1110	313651	67.8	80
C	6	75.3	90	6780	667.2	150	######	757.3	800	605831	403.9	450	181771	70.2	40
C	10	70.6	60	4234	588.9	70	41224	739.2	2170	1604109	322.3	230	74126	68.1	30
total				11784			######			2471379			569548		

14	2014/1/24			2014/1/25			2014/1/28			2014/2/7			2014/2/10			2014/2/12			2014/2/23			2014/2/28			2014/3/15			2014/3/18			2014/3/19			2014/4/4									
	9			??			75			83			37			6			6			28			7			13			10			21									
soil	water	soil		water	soil		water	soil		water	soil		water	soil		water	soil		water	soil		water	soil		water	soil		water	soil		water	soil		water	soil		G. Total		area m3	Total			
total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total	volume	mg/l	total							
1683	27.2	40	1088	57.9	20	1159	356.3	20	7125	306.3	220	67375	127.1	720	91517	20.9	290	6061	25.4	40	1016	237.5	40	9500	14.1	180	2543	49.9	40	1995	28.5	20	571	87.7	60	5264	1,176,243		60	196,040,558		196	
8744	24.4	270	6593	64.3	950	61120	453.2	30	13596	512.3	870	445729	197.5	280	55290	22.1	540	11930	27.7	670	18542	290.3	320	92903	16.0	70	1123	68.7	680	46699	33.3	60	1995	97.0	740	71789	1,839,223		60	306,537,142		307	
25091	24.5	350	8591	60.7	810	49134	833.5	2360	1966986	1518.7	1010	1533931	381.5	1700	648615	21.1	120	2536	36.1	220	7950	353.8	700	247692	15.3	50	767	70.5	280	19754	33.2	210	6968	97.9	670	65574	6,383,258		60	1,063,876,390		1,064	
68585	18.3	520	9500	60.0	400	24000	488.9	240	117341	1028.5	440	452559	121.5	440	53473	12.7	30	381	33.9	750	25421	218.5	1480	323323	13.5	130	1750	53.8	60	3230	29.5	200	5895	87.5	300	26250	1,994,361		60	332,393,477		332	
104104			25772			135413			2105048			2499594			848895			20908			52929			673419			6184			71678			15429			168877	11,393,085	mg	240	474,711,892	mg/ha	**475**	**kg/ha**
6472	25.0	50	1250	57.5	70	4027	347.4	350	121579	263.2	20	5263	148.1	330	48859	20.7	40	829	28.1	10	281	541.2	710	384221	16.6	20	332	51.0	310	15813	30.0	780	23400	90.9	450	40909	1,544,938		60	257,489,745		257	
1675	25.1	20	501	60.7	360	21857	329.2	60	19754	249.2	60	14954	144.4	130	18769	21.1	510	10786	31.5	80	2520	525.6	660	346916	14.8	30	443	55.8	40	2231	34.0	510	17352	93.2	60	5591	1,067,768		60	177,961,313		178	
121336	23.0	60	1383	60.2	540	32516	379.1	40	15164	364.2	350	127463	158.2	140	22154	20.2	700	14152	34.8	1090	37913	268.7	30	8060	13.3	50	667	56.5	490	27677	31.3	340	10643	93.4	130	12143	1,231,174		60	205,195,667		205	
57655	21.9	270	5914	58.8	370	21765	330.2	60	19810	254.0	2100	533333	151.7	70	10618	20.0	100	2000	34.3	370	12686	257.1	140	36000	15.1	20	302	52.7	340	17920	30.2	20	605	104.0	350	36391	1,511,625		60	251,937,514		252	
187138			9048			80165			176306			681013			100400			27767			53399			775196			1743			63641			52000			95033	5,355,505	mg	240	223,146,060	mg/ha	**223**	**kg/ha**
36981	21.5	140	3013	55.3	460	25447	1956.1	1570	3071007	2419.6	910	2201870	990.1	680	673253	17.9	30	536	123.4	20	2468	1040.0	20	20800	13.6	160	2179	223.5	250	55882	70.5	610	43035	297.1	1020	303000	13,109,336		60	2,184,889,382		2,185	
38205	21.8	100	2175	54.4	1260	68532	1972.3	590	1163647	2478.2	980	2428669	960.8	30	28825	17.7	470	8307	113.9	570	64912	1063.6	900	957265	13.0	40	521	271.4	550	149286	68.8	630	43332	254.3	880	223771	15,877,971		60	2,646,328,476		2,646	
439624	21.4	450	9643	60.0	640	38400	2047.9	3120	6389336	2345.5	80	187642	798.7	1360	1086232	40.7	80	3256	71.4	170	12132	858.2	90	77236	12.0	20	239	271.6	670	182000	58.6	60	3515	235.8	550	129701	19,910,809		60	3,318,468,162		3,318	
207908	26.2	1170	30600	#VALUE!	1010		2201.8	22850	50310694	2462.1	620	1526503	863.1	500	431529	20.9	760	15868	112.3	40	4491	1575.3	360	567117	18.3	150	2750	267.8	530	141940	80.0	210	16800	389.6	30	11689	64,509,342		60	10,751,557,065		10,752	
722717			45431			132379			60934684			6344684			2219838			27968			84002			1622418			5689			529108			106682			668162	113,407,459	mg	240	4,725,310,771	mg/ha	**4,725**	**kg/ha**

6							
soil							
total	G. Total		area m3	Total			
33965	9,449,750		60	#########		1,575	
3671	########		60	#########		2,036	
31864	7,383,540		60	#########		1,231	
69500	########	mg	180	#########	mg/ha	**1,614**	**kg/ha**
33617	5,159,461		60	859,910,143		860	
13200	########		60	#########		1,853	
21560	########		60	#########		2,094	
68377	########	mg	180	#########	mg/ha	**1,603**	**kg/ha**
8320	1,427,050		60	237,841,748		238	
17400	3,729,094		60	621,515,736		622	
39789	924,247		60	154,041,086		154	
65509	6,080,391	mg	180	337,799,524	mg/ha	**338**	**kg/ha**
######	########		60	#########		3,537	
58162	########		60	#########		3,463	
77169	########		60	#########		2,894	
######	########	mg	180	#########	mg/ha	**3,298**	**kg/ha**

26	2014/4/6			2014/4/29									
	??			??									
soil	water	soil		water	soil								
total	volume	mg/l	total	volume	mg/l	total	G. Total		area m3	Total			
56088	268.6	30	8059	38.7	130	5029	4,160,874		60	693,479,040		693	
850	41.9	200	8373	39.3	200	7862	5,550,415		60	925,069,130		925	
1233	189.2	40	7568	22.4	30	673	3,728,000		60	621,333,287		621	
58171			24000			13564	########	mg	180	746,627,152	mg/ha	**747**	**kg/ha**
1117	48.4	260	12572	40.0	370	14800	3,254,354		60	542,392,314		542	
6923	93.8	20	1876	38.5	390	15000	3,814,093		60	635,682,208		636	
10380	251.8	240	60430	20.2	640	12944	3,719,789		60	619,964,770		620	
18420			74878			42744	########	mg	180	599,346,430	mg/ha	**599**	**kg/ha**
6806	71.9	310	22289	34.7	320	11111	5,599,202		60	933,200,356		933	
1476	76.3	170	12970	54.0	110	5940	1,489,786		60	248,297,639		248	
12000	37.4	20	747	38.4	80	3071	3,643,862		60	607,310,362		607	
20281			36006			20122	########	mg	180	596,269,452	mg/ha	**596**	**kg/ha**
5424	1239.9	940	#######	92.5	150	13881	7,077,047		60	##########		1,180	
2809	888.6	210	186596	97.8	300	29345	6,310,554		60	##########		1,052	
2043	244.6	40	9783	89.5	180	16101	5,078,471		60	846,411,812		846	
10276			#######			59327	########	mg	180	##########	mg/ha	**1,026**	**kg/ha**

Annex 5 Soil Volume calculation 2014/2015

Lirangwe		1			2			3			4			5			6			7			8			9			10			11			12			13			14	
	Treat	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l
Plot 4	60	19.8	300	5938.8	24.0	1300	31142.9	20.9	300	6263.7	84.7	700	59276.6	20.4	1400	28615.4	23.3	100	2329.7	23.3	100	2329.7	1211.5	100	121154.0	1048.6	NA		45.4	NA		18.6	100	1857.1	813.0	900	731685.0	1647.1	500	823540.0	16.9	100
Plot 8	60	15.8	800	12600.0	20.2	0	0.0	17.8	300	5325.0	62.6	200	12527.5	13.3	1100	14575.0	10.8	400	4300.0	10.8	400	4300.0	164.8	300	49434.8	499.9	NA		44.3	NA		41.3	200	8266.7	164.8	100	16478.3	2097.2	900	1887516.0	32.4	700
Plot 11	60	11.4	1300	14857.1	18.4	500	9183.7	10.8	800	8653.1	38.0	300	11400.0	12.2	1400	17142.9	18.8	300	5632.7	18.8	200	3755.1	171.6	300	51486.5	781.8	NA		31.8	NA		41.8	1000	41818.2	259.4	100	25939.8	2057.6	600	1234560.0	14.3	300
Plot 2	45	12.9	2000	25833.3	11.5	2800	32083.3	13.1	200	2625.0	75.5	300	22650.0	12.5	2400	30000.0	16.7	600	10000.0	16.7	700	11666.7	386.8	1100	425486.1	1150.8	NA		40.5	NA		40.5	100	4050.6	189.0	100	18900.0	2214.6	400	885832.0	35.0	500
Plot 7	45	19.3	600	11561.0	23.1	300	6923.1	23.1	300	6923.1	66.2	400	26482.8	21.0	500	10512.8	30.8	100	3076.9	30.8	200	6153.8	94.5	200	18896.6	1233.5	NA		54.6	NA		38.7	0	0.0	329.0	100	32898.5	2241.7	200	448333.3	37.9	100
Plot 12	45	21.6	1200	25887.6	25.6	500	12809.0	24.9	400	9977.5	65.1	200	13011.0	15.5	1300	20137.3	10.8	200	2156.9	10.8	100	1078.4	504.7	200	100942.8	1068.1	NA		41.1	NA		33.7	1100	37078.7	96.2	700	67313.1	1729.8	600	1037872.0	12.2	200
Plot 3	0	18.4	700	12857.1	22.5	500	11250.0	18.4	600	11020.4	64.8	200	12962.0	41.7	900	37518.1	14.3	200	2857.1	14.3	100	1428.6	758.8	300	227630.8	1101.1	NA		50.1	NA		16.3	100	1632.7	624.2	100	62423.1	1964.6	100	196457.3	14.3	800
Plot 5	0	16.8	800	13446.8	23.6	1000	23555.6	18.9	300	5680.9	65.9	200	13185.2	11.5	1200	13787.2	13.0	200	2595.7	13.0	100	1297.9	1099.4	100	109942.7	2140.2	NA		49.6	NA		24.4	400	9777.8	329.7	100	32967.0	2241.0	400	896413.3	20.7	1400
Plot 9	0	17.9	96100	1723172.4	20.6	300	6181.8	18.8	400	7517.2	66.0	300	19812.5	17.9	600	10758.6	15.9	300	4758.6	15.9	100	1586.2	710.8	600	426490.2	2292.9	NA		50.0	NA		36.4	100	3636.4	2310.8	100	231078.3	2294.9	400	917966.7	29.9	1000
Plot 1	C	20.7	400	8296.3	27.7	800	22123.5	89.0	700	62268.7	701.4	900	631215.0	49.3	2100	103521.1	30.6	300	9185.2	30.6	100	3061.7	2344.7	0	0.0	2136.6	NA		410.3	NA		89.3	300	26776.1	2340.6	100	234056.0	2334.4	1900	4435322.0	62.4	200
Plot 6	C	44.7	4000	178876.4	77.6	2800	217155.6	246.3	800	197052.6	718.1	4600	3303168.0	5.4	2000	10731.7	36.6	500	18275.9	36.6	700	25586.2	1865.7	100	186574.7	1301.2	NA		578.9	NA		113.5	400	45384.6	2255.1	100	225508.0	2251.2	500	1125593.3	68.0	600
Plot 10	C	24.4	1200	29333.3	45.1	300	13517.2	191.9	800	153529.4	731.3	1000	731282.4	45.3	5700	258137.9	37.8	1700	64222.2	37.8	100	3777.8	1891.0	800	1512765.3	548.4	NA		465.0	NA		88.4	900	79516.5	959.0	500	479483.3	1846.2	400	738460.0	63.1	200

Machinjiri		1			2			3			4			5			6			7			8			9			10			11			12			13			14	
	Treat	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l
Plot 1	60	6.4	10900	69574.5	4.3	400	1702.1	348.5	1900	662121.2	257.6	1000	257575.8	42.2	500	21098.9	1855.2	11300	20963195.0	31.2	4000	124835.2	1353.7	13000	17597450.0	438.6	9900	4342525.0	2563.2	100	256315.0	37.8	500	18901.1	348.5	200	69697.0	911.2	100	91115.0	498.1	1700
Plot 8	60	38.2	1100	42044.4	36.0	500	18000.0	137.6	1000	137571.4	137.6	2100	288900.0	42.7	5900	251733.3	1525.7	6400	9764224.0	31.6	3000	94666.7	167.8	7200	1208084.2	341.7	15900	5432500.0	2268.9	200	453784.0	38.2	100	3822.2	170.4	3600	613542.9	931.7	300	279498.0	313.9	1600
Plot 9	60	46.0	700	32200.0	37.2	200	7440.9	211.0	300	63287.7	238.4	800	190684.9	43.8	5500	240777.8	1901.7	1500	2852490.0	32.9	7000	230322.6	159.4	12700	2023893.6	375.3	17900	6718630.1	2194.3	200	438865.3	35.1	800	28043.0	320.5	400	128219.2	1256.5	700	879533.7	608.9	900
Plot 3	45	49.3	200	9860.5	37.6	600	22536.6	138.9	900	125014.3	163.7	500	81863.6	40.0	400	16000.0	1429.0	1100	1571900.0	30.2	1400	42341.5	619.0	5500	3404500.0	377.8	17200	6497777.8	2116.3	400	846501.3	40.0	1100	44000.0	189.6	400	75854.5	679.0	1100	746900.0	409.0	1700
Plot 5	45	51.1	400	20444.4	38.8	4200	163116.3	137.3	3700	507874.9	192.7	300	57814.3	41.2	1800	74222.2	1473.7	8400	12379360.0	31.9	3200	101953.5	578.8	43600	25237692.3	363.6	8600	3127272.7	1920.5	200	384105.3	41.2	600	24740.7	192.7	200	38542.9	578.8	300	173653.8	363.6	1300
Plot 10	45	51.1	0	0.0	42.6	2000	85106.4	106.6	2400	255731.1	111.6	2000	223193.3	42.6	1800	76595.7	1397.1	5900	8242850.7	34.0	2000	67957.0	149.6	2100	314160.0	109.1	14900	1625226.9	2727.9	100	272790.0	42.6	100	4255.3	119.2	2800	333647.1	598.2	800	478543.2	184.0	2300
Plot 4	0	2.8	900	2535.2	8.5	400	3380.3	114.2	1600	182690.9	160.2	21700	3476568.4	13.9	2300	31918.4	0.0	1200	0.0	31.1	1700	52888.9	206.8	14500	2998305.1	182.3	11400	2078400.0	1679.6	300	503888.0	42.1	600	25250.0	182.3	100	18231.6	160.2	300	48063.2	114.2	700
Plot 7	0	26.7	800	21393.3	8.8	500	4386.0	99.1	2500	247872.3	132.7	3400	451043.3	40.2	3200	128703.3	732.6	1800	1318602.0	35.7	1800	64314.6	308.2	2700	832131.1	242.6	8700	2110819.7	1745.6	100	174560.7	38.0	100	3797.8	156.2	800	124953.8	242.6	1000	242623.0	182.0	1300
Plot 12	0	53.7	200	10741.6	49.2	300	14764.0	107.0	1800	192626.1	142.1	5000	710434.8	42.5	1200	50966.3	307.2	11500	3533333.3	38.0	1500	57033.0	157.2	3300	518682.4	89.6	1500	134347.8	1107.9	100	110791.0	49.2	2600	127955.1	190.1	1000	190117.6	278.3	300	83478.3	220.3	600
Plot 2	C	159.6	100	15963.6	24.0	600	14373.6	884.7	700	619313.3	825.0	500	412500.0	182.1	600	109236.4	2432.3	9200	22377160.0	77.9	1700	132458.3	974.3	8500	8281833.3	340.0	10600	3604000.0	2845.8	800	2276613.3	71.7	800	57333.3	944.5	600	566680.0	1302.9	0	0.0	373.3	3100
Plot 6	C	88.6	1700	150666.7	34.1	2100	71571.4	808.5	100	80849.3	689.0	1600	1102464.6	147.2	900	132463.6	2272.0	1500	3407940.0	48.3	2100	101393.9	868.2	9600	8334976.0	261.3	5100	1332580.6	2840.6	600	1704364.0	62.4	1100	68693.9	1286.4	600	771816.0	1465.6	300	439668.0	293.5	200
Plot 11	C	139.1	2600	361600.0	45.4	300	13625.0	856.0	5400	4622490.0	766.5	1200	919820.0	224.6	1900	426769.2	2319.9	9500	22039430.0	78.4	2200	172408.2	178.4	1800	321061.2	316.9	4300	1362769.2	2858.7	0	0.0	70.2	100	7020.4	1393.0	0	0.0	1632.2	1500	2448315.0	408.9	200

	15			16			17			18			19			20			21			22			23			24			25			26			27				
mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	mg	kg/ha
1693.9	27.3	100	2725.3	11.4	200	2285.7	323.5	0	0.0	1672.3	600	1003380.0	59.4	200	11884.6	40.6	100	4057.7	33.8	300	10153.8	2211.6	400	884648.0	441.3	500	220661.3	20.4	800	16351.6	23.3	700	16307.7	12.2	400	4898.0	32.1	100	3208.8	3996389.2	666
22689.7	31.7	400	12689.7	20.5	500	10229.9	914.4	1800	1645920.0	1694.9	500	847426.7	92.0	200	18390.2	54.7	200	10933.3	66.4	300	19912.1	1168.1	300	350432.0	1039.4	100	103936.0	38.9	400	15540.2	20.2	700	14160.9	13.0	400	5200.0	54.4	200	10880.0	5103663.9	851
4285.7	35.8	500	17888.9	12.2	100	1224.5	102.0	100	10202.7	1780.7	0	0.0	31.8	1300	41311.1	36.2	300	10866.7	36.0	600	21600.0	2057.6	700	1440320.0	304.5	800	243566.3	12.9	300	3857.1	12.7	500	6326.5	19.6	200	3918.4	54.1	300	16227.3	3246024.1	541
																																								12346077.2	686
17500.0	35.0	100	3500.0	12.7	1100	13979.2	594.0	100	59395.8	2119.6	100	211964.0	58.0	400	23189.9	31.7	200	6333.3	40.3	400	16101.3	259.7	200	51941.2	677.7	700	474366.7	91.9	200	18382.0	40.5	1500	60759.5	14.2	300	4250.0	44.3	400	17721.5	2448511.4	408
3794.9	40.7	100	4070.6	25.1	500	12564.1	1233.5	100	123348.3	1635.7	100	163569.3	83.0	200	16597.7	49.9	500	24941.2	54.8	1400	76752.9	496.9	100	49689.2	1109.3	1100	1220204.3	84.8	400	33931.0	41.6	1500	62470.6	23.1	200	4615.4	38.5	200	7692.3	2376003.7	396
2431.4	46.9	0	0.0	15.3	700	10705.9	330.7	300	99200.0	1825.2	100	182516.0	58.7	100	5866.7	41.8	300	12533.3	39.3	500	19662.9	1078.6	400	431444.0	733.0	200	146598.0	17.5	400	6980.4	14.1	1800	25411.8	20.9	200	4179.8	56.7	300	17000.0	2292794.3	382
																																								7117309.5	395
11428.6	40.2	100	4024.1	14.3	100	1428.6	644.6	0	0.0	2094.3	200	418856.0	79.7	400	31898.7	42.7	200	8530.1	49.6	100	4963.9	583.5	300	175038.5	438.7	800	350984.6	12.9	100	1285.7	12.2	400	4898.0	18.6	400	7428.6	26.1	300	7833.3	1606635.8	268
28933.3	25.1	200	5022.2	15.7	800	12595.7	610.7	300	183200.0	1995.9	700	1397148.7	43.1	200	8622.2	34.2	300	10266.7	45.1	200	9022.2	423.8	600	254309.4	602.7	500	301358.5	13.6	100	1361.7	31.8	1200	38133.3	11.5	300	3446.8	75.8	200	15160.5	3391231.4	565
29899.0	12.1	0	0.0	22.2	900	20000.0	692.7	400	277061.0	2054.9	100	205493.3	44.2	200	8846.2	54.2	500	27115.4	35.8	1100	39333.3	186.3	200	37254.9	646.2	400	258492.7	28.7	300	8606.1	29.5	500	14747.5	16.9	500	8448.3	64.2	300	19250.0	4307506.6	718
																																								9305373.8	517
12487.8	156.2	400	62471.9	38.0	700	26617.3	2334.4	100	233438.0	2334.4	100	233438.0	594.8	100	59475.0	395.3	300	118590.0	492.3	500	246125.0	2334.4	700	1634066.0	1933.2	600	1159896.0	156.2	100	15618.0	97.3	900	87582.1	38.0	400	15209.9	629.6	300	188880.0	9629720.5	1,605
40800.0	366.3	700	256421.1	47.4	600	28449.4	2251.2	200	450237.3	2251.2	100	225118.7	747.5	200	149496.0	233.7	500	116842.1	387.4	200	77473.7	2251.2	500	1125593.3	1752.8	100	175284.0	267.4	300	80210.5	97.8	900	88036.4	40.4	400	16179.8	912.1	400	364848.0	8728897.3	1,455
12629.2	194.1	300	58235.3	54.0	2300	124252.9	2045.7	100	204574.3	2045.7	500	1022871.7	404.1	100	40406.5	256.1	200	51214.3	448.8	200	89755.6	2045.7	1100	2250317.7	1697.5	100	169747.3	147.1	300	44117.6	94.3	900	84857.1	42.8	300	12827.6	503.7	100	50365.3	8280197.8	1,380
																																								26638815.6	1,480

	15			16			17			18			19			20			21			Total	
mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	liters	mg/l	mg	mg	kg/ha
846741.7	438.6	100	43863.9	3389.2	0	0.0	763.7	2900	2214585.0	257.6	100	25757.6	33.4	900	30065.9	20.2	1500	30329.7	61.9	4500	278350.5	47945800.0	7,991
502222.2	202.8	3100	628611.1	3370.0	100	337004.7	723.8	200	144752.0	313.9	9500	2981944.4	40.4	3000	121333.3	47.1	5400	254400.0	120.4	100	12038.7	23570677.7	3,928
548049.0	402.9	100	40294.3	3335.7	500	1667863.3	785.5	100	78554.3	118.2	1500	177228.8	35.1	1100	38559.1	61.5	3100	190617.0	121.0	100	12103.4	16587658.1	2,765
																						88104135.7	4,895
695300.0	346.0	1000	346031.7	3456.7	100	345669.3	649.0	500	324500.0	250.8	1100	275873.0	32.7	1000	32682.9	60.9	3700	225148.9	125.3	200	25050.8	15755306.8	2,626
472727.3	327.3	1300	425454.5	3344.6	200	668912.0	668.3	200	133653.8	254.5	600	152727.3	36.5	2400	87627.9	70.0	600	42000.0	125.5	200	25105.4	44299001.6	7,383
423200.0	206.2	400	82496.0	3288.4	400	1315360.0	450.3	100	45028.4	111.6	11600	1294521.0	42.6	3900	165957.4	75.6	100	7560.0	121.7	100	12168.1	15326347.5	2,554
																						75380656.0	4,188
79927.3	95.6	700	66920.0	936.1	400	374440.0	240.7	600	144406.8	116.0	3500	406000.0	20.0	1100	22000.0	108.7	100	10872.7	81.6	100	8160.0	10534846.7	1,756
236550.0	129.3	900	116332.0	2224.5	500	1112270.0	584.0	200	116800.0	405.9	5100	2070271.0	42.4	1800	76351.6	71.1	1700	120888.9	119.1	0	0.0	9574664.3	1,596
132173.9	132.5	200	26504.3	1603.4	300	481032.0	456.0	100	45600.0	96.1	700	67260.9	49.2	300	14764.0	80.9	3200	258782.6	157.2	0	0.0	6761389.0	1,127
																						26870900.0	1,493
1157333.3	466.0	500	233000.0	3406.9	200	681380.0	436.0	3700	1613200.0	182.1	1000	182060.6	24.0	1700	40725.3	26.2	300	7846.2	75.8	2300	174416.7	42557427.3	7,093
58709.7	450.7	1800	811181.8	2840.6	200	568121.3	480.5	200	96090.9	197.5	300	59245.5	34.1	700	23857.1	62.4	900	56204.1	122.0	100	12203.0	19385061.6	3,231
81782.4	468.3	4600	2154288.2	3427.5	700	2399231.3	677.0	100	67701.7	255.4	400	102153.8	49.6	300	14875.0	76.3	300	22898.0	166.8	100	16676.9	37554915.6	6,259
																						99497404.5	5,528

Gully
small scale gully
Survey on size

No.	Check			Gully	Cross sec	Volume
	Material	Height m	Width m	Slant degr	m2	m3
1	Stone	0.5	1.75	8	0.438	0.386
2	Stone	0.2	1	8	0.100	0.024
3	Stone	0.2	0.5	8	0.050	0.006
4	Stone	0.2	3	8	0.300	0.213
5	Stone	0.2	1.55	8	0.155	0.057
6	W shrub	0.15	1.75	8	0.131	0.041
7	Stone	0.2	0.5	4	0.050	0.012
8	Stone	0.3	0.8	4	0.120	0.104
9	Stone	0.2	0.8	4	0.080	0.031
10	W shrub	0.3	1.2	4	0.180	0.154
11	Stone	0.3	2.2	4	0.330	0.519
12	W shrub	0.3	1.5	4	0.225	0.241
13	Stone	0.3	1.5	4	0.225	0.241
14	Stone	0.2	1.5	14	0.150	0.030
15	Stone	0.15	1	1	0.075	0.107
16	Stone	0.1	1	1	0.050	0.048
17	Stone	0.2	1.2	1	0.120	0.100
18	Stone	0.15	1.5	9	0.113	0.027
19	Stone	0.4	1.5	9	0.300	0.189
20	Stone	0.1	2	9	0.100	0.021
21	Stone	0.1	1.8	9	0.090	0.017
22	W shrub	0.3	1.6	4	0.240	0.275
23	W shrub	0.3	1.6	4	0.240	0.275
24	W shrub	0.1	2	4	0.100	0.048
25	Stone	0.35	1.5	11	0.263	0.118
26	Stone	0.15	1.6	11	0.120	0.025
27	Stone	0.15	1.3	11	0.098	0.016
28	Stone	0.15	1.1	11	0.083	0.012
29	Stone	0.2	1.4	5	0.140	0.075
30	Stone	0.15	1.5	5	0.113	0.048
31	Stone	0.15	1	5	0.075	0.021
32	Stone	0.15	1.5	5	0.113	0.048
33	Stone	0.2	1.7	5	0.170	0.110
34	Stone	0.2	2	14	0.200	0.053
35	Stone	0.1	1.5	14	0.075	0.008
36	Stone	0.2	1.5	16	0.150	0.026
37	W shrub	0.15	1.3	16	0.098	0.011
38	Stone	0.15	1.3	16	0.098	0.011
39	Stone	0.1	2	12	0.100	0.016
40	Stone	0.1	2	12	0.100	0.016
41	Stone	0.15	2	12	0.150	0.035
42	Stone	0.1	1	12	0.050	0.004
43	Stone	0.1	1	14	0.050	0.003
44	Stone	0.1	0.7	14	0.035	0.002
45	Stone	0.1	1	14	0.050	0.003
46	Stone	0.1	1	14	0.050	0.003
47	Stone	0.1	1.8	14	0.090	0.011
48	Stone	0.1	1.1	14	0.055	0.004
49	Stone	0.15	1.7	14	0.128	0.022
50	Stone	0.1	1.6	14	0.080	0.009
51	Stone	0.1	1	14	0.050	0.003
52	Stone	0.1	1	14	0.050	0.003

53	Stone	0.1	1	14	0.050	0.003
54	Stone	0.15	1	14	0.075	0.008
55	Stone	0.1	1.3	14	0.065	0.006
56	Stone	0.35	2	17	0.350	0.134
57	Stone	0.2	2	17	0.200	0.044
58	Stone	0.2	2.2	17	0.220	0.053
59	Stone	0.2	2	17	0.200	0.044
60	Stone	0.2	1.8	17	0.180	0.035
61	Stone	0.2	1.6	17	0.160	0.028
62	brush wood	0.18	2	3	0.180	0.206
63	brush wood	0.3	2	7	0.300	0.244
64	brush wood	0.08	1.5	6	0.060	0.011
65	brush wood	0.13	1.8	2	0.117	0.131
66	brush wood	0.14	1.5	2	0.105	0.105
	Total	11.93	97.55	638	9.05325	4.934093
	Average	**0.181**	**1.478**	**9.7**	**0.137**	**0.075**
	Max	**0.500**	**3.000**	**17**	**0.438**	**0.519**
	Min	**0.080**	**0.500**	**1**	**0.035**	**0.002**