Farm Mechanization & Conservation Agriculture for Sustainable Intensification

Inception workshop for activities in Kenya and Tanzania

25th to 30th of March 2013, Kibo Palace Hotel, Arusha, Tanzania

List of acronyms

2WT:	Two-wheel tractor
ACIAR:	Australian Centre for International Agricultural Research
AIFSC:	Australian International Food Security Centre
CA:	Conservation agriculture
CARMATEC:	Centre for Agricultural Mechanization and Rural Technology
CGIAR:	Consultative Group on International Agricultural Research
CIMMYT:	International Maize & Wheat Improvement Center
CSU:	Charles Sturt University
FACASI:	Farm Mechanization and Conservation Agriculture for Sustainable Intensification
FAO:	Food and Agricultural Organization of the United Nations
IFPRI:	International Food Policy Research Institute
KARI:	Kenya Agricultural Research Institute
KENDAT:	Kenya Network for Dissemination of Agricultural Technologies
M&E:	Monitoring and Evaluation
SARI:	Selian Agricultural Research Institute
SIMLESA:	Sustainable intensification of maize-legume cropping systems for food security in eastern and southern Africa
SRA:	Small Research and development Activity
SSA:	Sub-Saharan Africa
UZ:	University of Zimbabwe
ZimCLIFS:	Integrating crops and livestock for improved food security and livelihoods in rural Zimbabwe

1. Background of the project

1.1. Summary of the process that led to this workshop

Below is a summary of the process that led to the launch of the "*Farm Mechanization and Conservation Agriculture for Sustainable Intensification*" project:

- *20th of December 2011*: First discussions between ACIAR and CIMMYT on the possibility to develop a project proposal looking at mechanizing CA in SIMLESA.
- *4th of January 2012*: Selection of Frédéric Baudron as the focal point to develop a concept note on small mechanization and conservation agriculture in Eastern and Southern Africa.
- *15th of January 2012*: First draft of a concept note titled "*Mechanization to Leverage sustainable Intensification in Sub Saharan Africa* (MELISA)".
- *19th of February 2012*: Submission of a "Small Research and development Activity" (SRA) proposal to ACIAR to finance a research design workshop for the finalization of a Phase 1 proposal (pre-proposal) to be submitted to ACIAR.
- *5th of March 2012*: SRA titled "*Research Design for MELISA*" granted by ACIAR
- *10th to 13th of April 2012*: Research design workshop in Addis Ababa, Ethiopia.
- *14th of June 2012*: Submission of a Phase 1 proposal (pre-proposal) titled "*Mechanization to Leverage sustainable Intensification in Sub Saharan Africa* (MELISA)" to ACIAR.
- *20th of June 2012*: Reception of the comments from the In-House Review and invitation to submit a Phase 2 proposal (full proposal).
- *6th of November 2012*: Submission of a Phase 2 proposal renamed "*Farm Mechanization & Conservation Agriculture for Sustainable Intensification*".
- *7th of December 2012*: Reception of the comments from a first external reviewer on the Phase 2 proposal.
- *12th of December 2012*: Reception of the comments from a second external reviewer on the Phase 2 proposal.
- *17th of December 2012*: Submission of a revised Phase 2 (second version).
- *20th of December 2012*: Small group meeting at ACIAR discussing the Phase 2 proposal and requesting for adjustments.
- *29th of January 2013*: Submission of a revised Phase 2 (third version).
- *28th of February 2013*: Submission of the final version of the Phase 2 proposal (fourth version) following ACIAR comments on the previous one.
- 18th of March 2013: Project accepted by ACIAR, letter of agreement signed by ACIAR and sent to CIMMYT.
- 25th of March 2013: Letter of agreement signed by CIMMYT.
- 25th to 30th of March 2013: Launch of the project in Arusha, Tanzania.

1.2. The project in brief

Rationale

The need for sustainable intensification in sub-Saharan Africa (SSA) is widely recognized. Although a lot of emphasis is being placed in current Research for Development work on increasing the efficiency with which land, water and nutrients are being used, farm power appears to be a 'forgotten resource'. However, farm power in SSA countries is declining due to the collapse of most tractor hire schemes, the decline in number of draught animals and the decline in human labour (e.g. stemming from rural-urban migration and pandemics). A consequence of low farm mechanization is high labour drudgery, which affects women disproportionally (in, e.g. weeding, threshing, shelling and transport by head-loading). Undoubtedly, sustainable intensification in SSA will require an improvement of the farm power balance through increased power supply - via improved access to mechanization - and/or reduced power demand via energy saving technologies such as conservation agriculture (CA).

Objectives

The overall goal of the project is to improve access to mechanization, reduce labour drudgery, and minimize biomass trade-offs in Eastern and Southern Africa, through accelerated delivery and adoption of 2WT-based technologies by smallholders.

The project has four principal objectives:

- To evaluate and demonstrate 2WT-based technologies to support CA systems, using expertise and implements from Africa, South Asia and Australia.
- To test site-specific commercial systems to deliver 2WT-based mechanization.
- To identify improvements in national institutions and policies for wide adoption of 2WT-based mechanization.
- To improve capacity and create awareness of 2WT-based technologies in the sub-region, and share knowledge and information with other regions.

Methods

The proposed project will be implemented in Ethiopia, Kenya, Tanzania and Zimbabwe. A range of methodologies will be employed by the project in these sites, including: (1) on-station and participatory on-farm evaluation of 2WT-based technologies; (2) business model development; (3) institution and policy analysis; (4) establishment of a permanent knowledge platform; and (5) establishment of an international mentoring platform aiming at building research capacity in the NARS by funding mentoring and training visits from countries such as Australia and India, and exchange visits between Africa and Australia/South Asia. A common M&E system including gender disaggregated data will be developed.

Partnerships

The project will operate in eight sites (two per country) half of them selected as a subset of existing ACIAR-funded project sites (SIMLESA and ZimCLIFS), the other half representing sites where NARS have conducted long-term CA and/or mechanization work. The project will be implemented mainly

via national agricultural research centres (or national NGOs) and regional networks in each participating country. There will be strong links with CGIAR, Australian and Asian partners who will provide specific training on agricultural engineering, as well as mentoring, capacity building, and academic support. CIMMYT will coordinate the project implementation through its Ethiopia office.

Output and Impact

A large body of knowledge will be generated and strong linkages amongst stakeholders (including private sector actors involved in business models) will be established. Thus, at the end of the project, we anticipate that ~360 rural service providers would have emerged, ~9,900 farms would benefit from 2WT-based CA, and ~25,200 farms would benefit from 2WT-based transport, threshing and/or shelling. With service providers expected to double their income, smallholders adopting 2WT-based CA expected to increase their income by 50% and smallholders adopting 2WT-based transport, threshing and shelling, expected to increase their income by 20%, such an adoption pathway would translate into an approximate cumulative economic value of US$ 19 million at the end of the project.

2. Day 1: Launch

2.1. Official opening and welcome remarks: take home messages (Dr Lucas Mboyi Mugendi, SARI; Dr John Dixon, ACIAR; Mrs Mellissa Woods, AIFSC; Dr Bruno Gérard, CIMMYT)

- It's the right time to research mechanization in Eastern and Southern Africa: labour wages in rural areas are on the rise in many areas, opening up opportunities for mechanization.
- Increased role of agribusinesses in farming and rural development
- Potential benefits of linking with South Asia: exchange of expertise and machinery
- Labour and access to specialized equipment is a major issue of CA in Eastern and Southern Africa
- CA requires site-specific smart sequences
- FACASI links strongly with SIMLESA, as one of its aims is to mechanize CA in SIMLESA. FACASI could actually be considered nested in SIMLESA. It also links with other AIFSC grants (Trees4Food, Adoption Pathways) and ACIAR grants (ZimCLIFS). Linkages between projects occur when sites are shared, personnel and other resources are shared, and when one or more project outputs are used by another project.

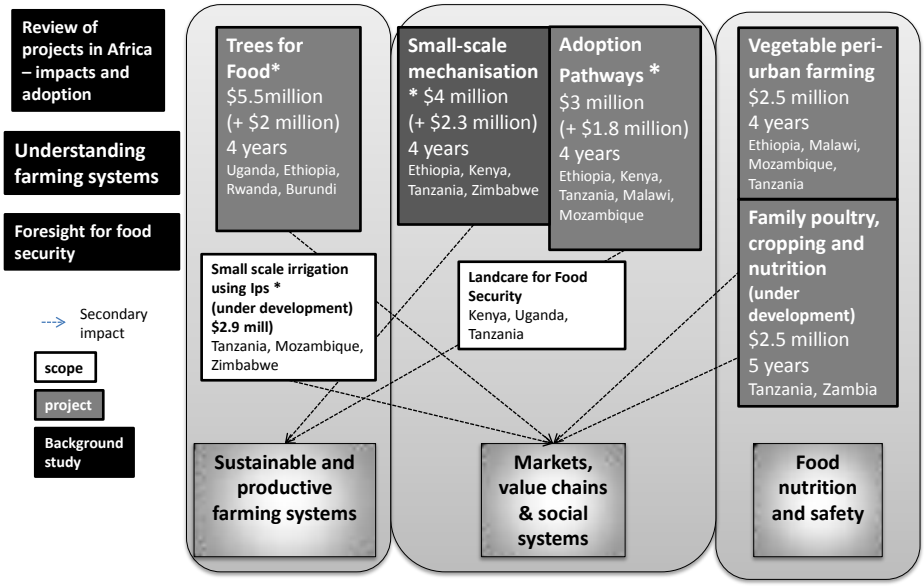

Figure 1 – Linkages between FACASI and other AIFSC funded projects.

2.2. Project's overview: justification, objectives and major activities (Dr Frédéric Baudron, CIMMYT).

- Farm power is declining in Eastern and Southern Africa and should be considered a resource as important as seeds, nutrients and water for the sustainable intensification of smallholder farming in the region.
- Mechanization increases farm power supply
- In this project, CA is primarily perceived as a power-saving technology (the suppression of inversion tillage reducing power requirement by about half). Other benefits of CA (water use efficiency, resource conservation) are secondary.
- By its power-saving nature, CA allows for the use of smaller and cheaper sources of power than conventional agriculture, such as 2WT.
- The use of 2WT may represent an economically, energetically and environmentally competitive option compared with the use of animal traction
- Several CA seeders and other ancillary equipment (e.g. trailers, threshers, shellers) are commercially available. FACASI will focus on the delivery of these commercially 2WT-based equipment, but not development or refine prototypes.
- FACASI is looking at delivering 2WT-based technologies to smallholders through rural entrepreneurs, as is presently the case in Bangladesh (although all have access to 2WT-based technologies there, only 1 in 30 farmers owns a 2WT)
- Unsubsidized business models will be developed i.e. private service providers will be utilized to support market systems, with services being embedded in the price of the technology

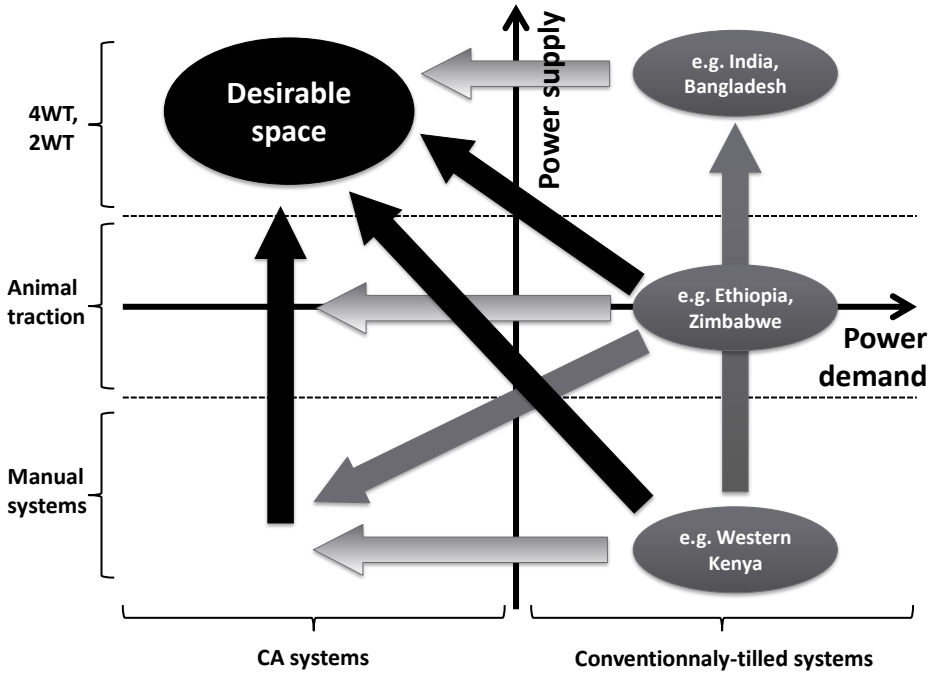

Figure 2 – FACASI will exploit synergies between CA and mechanization to improve the farm power balance.

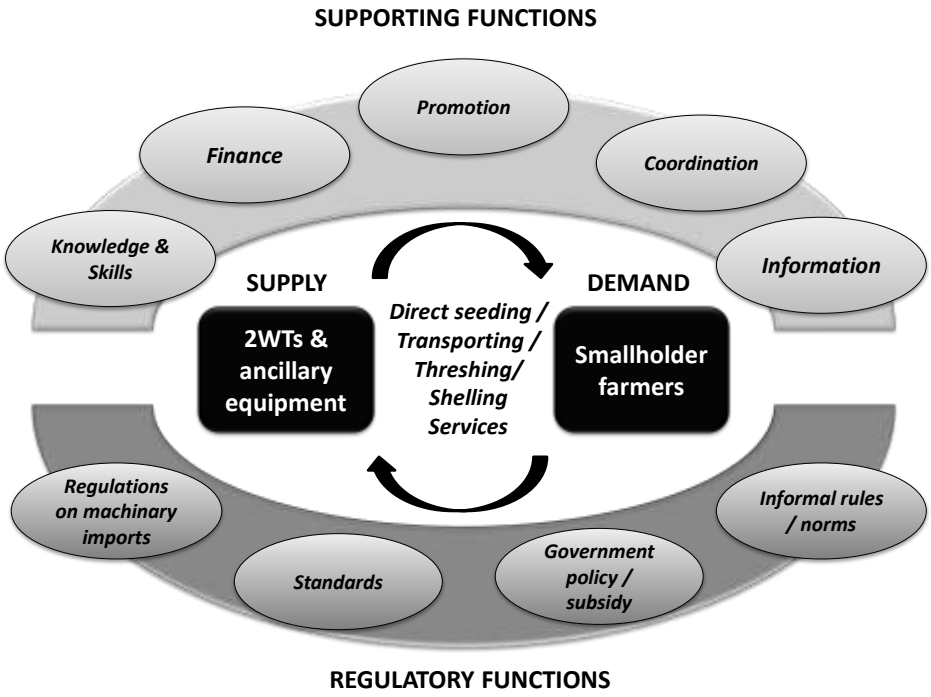

Figure 3 - Components of a generic 2WT-based technology business model

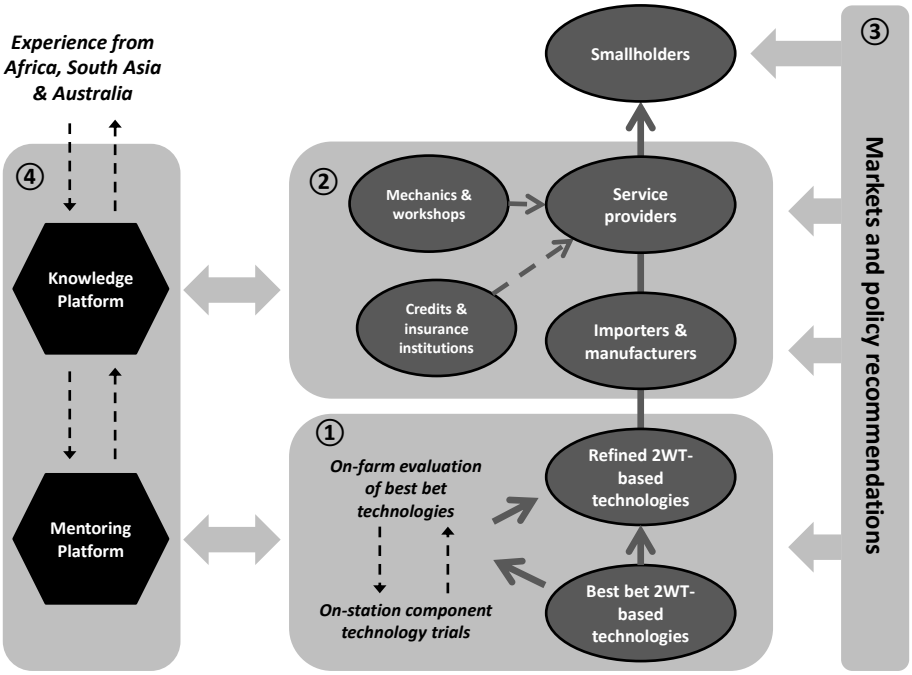

Figure 4 - Schematic representation of the project methodology, aiming at accelerating the delivery of 2WT-based technologies to smallholders in eight sites (four countries) of Eastern and Southern Africa. Symbols ①②③④ correspond to Objective 1, Objective 2, Objective 3 and Objective 4, respectively.

2.3. Linkages with SIMLESA (Dr Mulugetta Mekuria, CIMMYT)

- Vision of success: increase maize and legume yields by 30% while sustaining the environment, reduce downside yield risks by 30%, benefiting 650,000 farm households within 10 years
- Approach based on 3+3 "I"s: integration, innovation, impact, information, inputs, institutions
- Ethiopia, Kenya and Tanzania are common target countries for both SIMLESA and FACASI. In these 3 countries, FACASI will be implemented in one SIMLESA site, and in one non-SIMLESA site.
- What is in SIMLESA for FACASI
    - Experience with coordination and implementation
    - SIMLESA's M&E framework
    - Capacity building experiences
    - Profile and characterization of SIMLESA research communities
    - Initial adoption results
    - Knowledge on proven site-specific CA technologies From SIMLESA communities
    - Knowledge on maize and legumes varieties performing well under CA conditions
    - Experiences with Innovation platforms
- What is in FACASI for SIMLESA
    - Proven and tested mechanization options to enhance CA adoption
    - Approaches to reduce labour bottlenecks and labour drudgery
    - Capacity in the use of farm machinery

- Pathways to move from manual systems to animal traction systems and motorized systems
- Lessons and experience in business model development to scale out SIMLESA technologies

2.4. Policy aspects of farm mechanization: case of Ghana (Dr Xinshen Diao, IFPRI)

- In Ghana: demand for mechanized services is high and rising
  - Rising labor demand in agriculture due to population growth, urbanization and access to international markets
  - Plowing has become necessary in many places where animal traction is not an option
  - Rising labor cost made certain mechanized services - land preparation and threshing - more attractive than hiring labor
- Three stylized models based on the experiences of some Asian countries in which smallholders dominate
  - Bangladesh: small-scale farmers owning small machines
    - Imports and domestic market operated by the private sector, simple attachment developed by local manufacturers, repair workshops close to farmers
    - Role of the government: lifted import restrictions through trade liberalization and deregulation (in the late 1980s)
  - India: medium- to large-scale farmers owning tractors and supplying hired services
    - Medium-size tractors owned by farmers with holding size >4ha; hiring services provided to non-tractor owners; fully developed private-sector-led supply chain including tractor manufacturing and financing to tractor buyers
    - Role of the government: a broad-based subsidy policy applied to many types of agricultural machinery and tools (including attachments to draft animal) to encourage demand-driven adoption of mechanization technologies
  - China: professional service enterprises migrating for service provision
    - Driven by increased demand for specialized (e.g. harvest) mechanization and the existence of seasonal difference in harvesting a same crop across the country; existence of an innovative private sector in both manufacturing and service provision (small size combines designed to fit in pick-up truck for migration and for possibility to harvest small plots); good road infrastructure for migration
    - Role of the government: the local governments played a facilitating role in information and coordination
  - Key lessons from the 3 models
    - Small farm size and high land fragmentation is not necessarily a barrier to private investment in mechanization
    - Ownership of machinery by farmers is important for the successful and sustainable adoption of mechanization particularly for tractors. Investment in tractors by farmers can be made profitable when

        - Tractors tailored to farmers' economic conditions
        - Multifunctional operations being feasible
        - Hiring service market easy to develop
    - The private sector should handle importation
    - A liberalized trade policy is a must, although a (broad) subsidy policy is sometimes necessary to stimulate demand
    - Only through the market interaction of machinery supply and demand will suitable and affordable machinery be brought into the country
    - Local adaptation becomes possible even for a country without the capacity to manufacture tractors
    - Professional mechanized service providers become profitable only for more control-intensive operations using specialized equipment

2.5. What can we learn from South Asia?(Dr H.S. Sidhu, CIMMYT-BISA)

- Success stories of agricultural mechanization in Punjab:
    - Laser leveling: from 8 machines in 2005 to 6250 in 2011
    - Direct seeded rice: from 50 ha in 2006-07 to 5000 ha in 2010-11
- Machinery of interest for FACASI
    - National Zero Till Multi crop Planter 4 Rows for Power Tiller from National Agro Industries
    - Self-propelled forage harvester
    - Small four wheel tractors (15-20 HP) available at US$ 2,700 to 5,500
- Recent prototypes of interest for FACASI
    - "Easy seeder": a zero-till tyne system equipped with a residue pusher and a vertical cutter
    - "Relay seeder" (e.g. of wheat in cotton)

2.6. Experience with small mechanization and CA in Kenya (Dr Pascal Kaumbutho, KENDAT)

- Importance of trust relationships, as much as value chain approach.
- Long-term experience with Farmer Field Schools
- Challenge of "mercenary brokers" taking the profit (ethical trade?)
- Importance of the "first mile" (i.e. distance from the farm to the collection point): only 0.4 to 10.6% of the entire chain, but represents 20 to 37% of the transport costs
- Business model development:
    - KENDAT's Agribusiness Health Centres could be used by FACASI
    - Farm Concern's Commercial Village Model is another avenue
- Sale of 2WT with the case of Flying Horse (Mr Zhao)
    - Sells 2WT at a competitive price (US$ 2,000 alone, US$2,700 with a plough and a cultivator, and US$ 2,900 with a trailr)

- But draws more attention than business

- KENDAT's experience with mechanization
  - Emphasis should be put on entrepreneurship and agribusiness and not on technology research
  - Mechanization is a means to an end.
  - Market volumes discourage sellers and other mechanization business investors.
  - Policy is not conducive to mechanized agriculture (whole unit vs spares tax, support to smallholders)
  - Irrigation enhances mechanization
  - Kenya's tractor business environment is unfriendly (AGCO case)
  - Equipment is best acquired, operated, serviced and replaced under private (supported) ownership.
  - Hilly terrain and rough roads discourage adoption. General tendency is to overload!
  - Local assembly and adaptation can be a vibrant industry, once the critical mass of is established.
  - Increased hours of use help: Use for human and goods transport: Contract use: Advancing to road and soil works.
  - Spread of motorbikes will enhance 2-Wheeler adoption. The time is now!

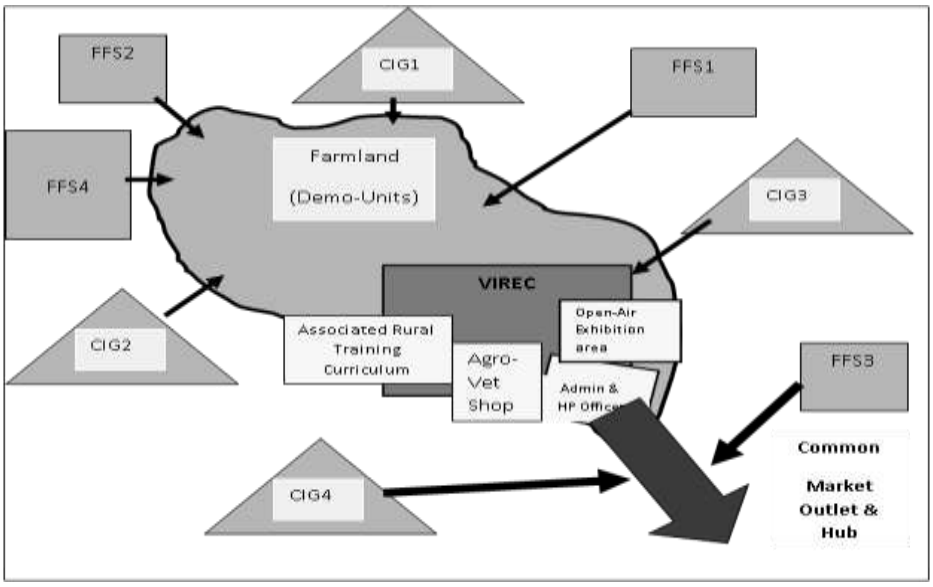

Figure 5 – Schematic representation of an Agribusiness Health Centres

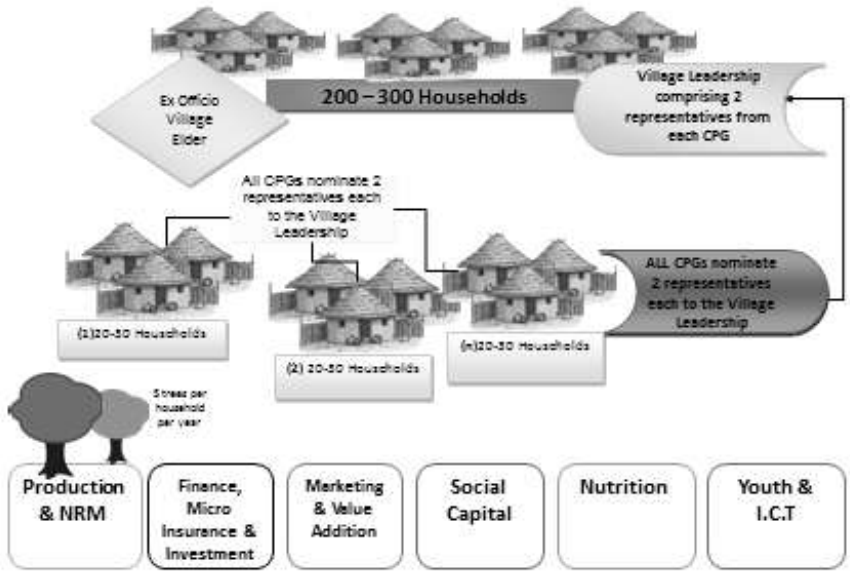

Figure 6 – Schematic representation of a Commercial Village

2.7. Experience with small mechanization and CA in Tanzania (Mr Wilfried Mariki, SARI)

- The Tanzania Agro-mechanization Strategy (TAMS) was initiated in 2005 by the Ministry of Agriculture, Food Security and Cooperatives (MAFC)
- 4,571 2WTs were imported in 2010/11, distributed to almost all districts in the country, with priority to Farmer Field Schools. Farmer Field Schools only paid 20% of the 2WTs and ancillary equipment (80% subsidies)
- Local industry manufacturing 2WT direct planters and rippers: Nandra Engineering Works in Moshi, Intermech in Morogoro, Mohamend Elmi in Hanang District
- 2Wts are found to be easier to maintain and to have higher field efficiency than oxen (for conventional ploughing: 3-4 acres per hour vs. 1/4-1/2 acres per hour). 2Wts are also more efficient for transport.
- Challenges
    - Cost of unsubsidized 2Wts and ancillary equipment for smallholders
    - Farmers require skills for the use and maintenance of 2WTs
    - Lack of spare parts
    - Difficulties to operate the 2WT: walking behind it and turning it in the field
- Opportunities
    - Government subsidies
    - Interest of farmers in 2WTs due to their versatility
    - Existence of farmer field schools
- Way forward

- Creating awareness about the use of 2WT for CA
- Engage the private sector
- Training

2.8. Presentation of Objective 1 (Prof. John Blackwell, CSU)

- Output 1.1. Most promising 2WT and technologies identified and acquired
  - Sites have been choses, data for site characterization is available and site characterization will start in April 2013
  - Innovation platform are functional in every SIMLESA site (half of the project sites). In other sites, Farmer Field School or Commercial Villages exist and can be beefed up or turned into innovation platforms
  - The farm survey will take place in 3 waves: (1) focus group discussion, (2) general characterization through interview, (3) detailed characterization of a subsample of farms selected after a typology. GCAP and SEP/CCAFS will lead the process.
- Output 1.2: Best bet 2WT based technologies evaluated on station and on station component technology research
  - The research teams have been formed in each country
  - On-station research will be through replicated field trials
- Output 1.3: Best bet 2WT technologies evaluated on farm and continuously refined
  - On-farm research will not be conducted through replicated field trials, but rather through demonstration
  - Researchers will be required to visit all sites regularly
- Output 1.4: Exploration of short term incentives and long term impact of 2WT based technologies on farmer livelihoods, through farm bio-economic models
  - This will be led by GCAP and SEP/CCAFS, using result from the farm survey

2.9. Presentation of Objective 2 (Mr Heiko Bamman, FAO)

- It is essential for long term-success that services are embedded in the day-to-day functioning of a value chain through the intermediary, the producer organization, a service provider, or government provider and not simply left to NGOs providing temporary solutions through specific projects (OXFAM 2011)
- 5 principles for sustainable market linkages
  - Chain wide collaboration and innovation
  - Focus on and strengthen market linkages
  - Fair and transparent governance
  - Equitable sharing of costs, risks and profits
  - Equitable access to services and information
- The Business Model Approach in FACASI will use a combination of the “Market System Development Approach” (MSDA) from the International Development Enterprises (iDE) and of the “Inclusive Business Model Approach” (IBMA) from the Rural Infrastructure and Agro-Industries Division of FAO (AGS).

- Key characteristic of the MSDA: Development or strengthening of services (e.g. information, agricultural training, etc.) embedded in the price of the product
- Key characteristic of the IBMA: improved efficiency and profitability by creating transparency, understanding, trust
- The business model approach for the commercialization of 2WT-based CA: a shift in approach: a shift in paradigm
    - from a supply-side approach to a demand-side and commercial approach
    - from a sectorial approach to a holistic approach (e.g. bundling of products and services)
    - from a public sector-focus to a more private sector-focus
    - fairly new in R&D, still open questions

2.10. Presentation of Objective 3 (Dr Moti Jaleta, CIMMYT)

- Adoption and impact are results of the interplay of policies, markets and institutions, and smallholder farmers
- Policies
    - Create or increase incentives
    - Are influenced by lobby groups
- Markets/Institutions
    - Distribute the created/available incentives (availability, accessibility, profitability, affordability)
    - Are influenced by the structure of markets, institutional arrangements (affecting the equity/fair distribution of incentives)
- Smallholder farmers
    - Adopt and use the technology
    - Influenced by resource endowment, agroecology, infrastructure, etc
- Major flows to consider: 2WT, spare parts, and services (including finantial products and insurance)
- Example of policies: import tariff, subsidy, quota
    - Affect importers, domestic manufacturers, distributors and service providers
- Examples of rules and regulations: quality and standard, mobility/road transport
    - Affect importers, domestic manufacturers, distributors, transporters and service providers

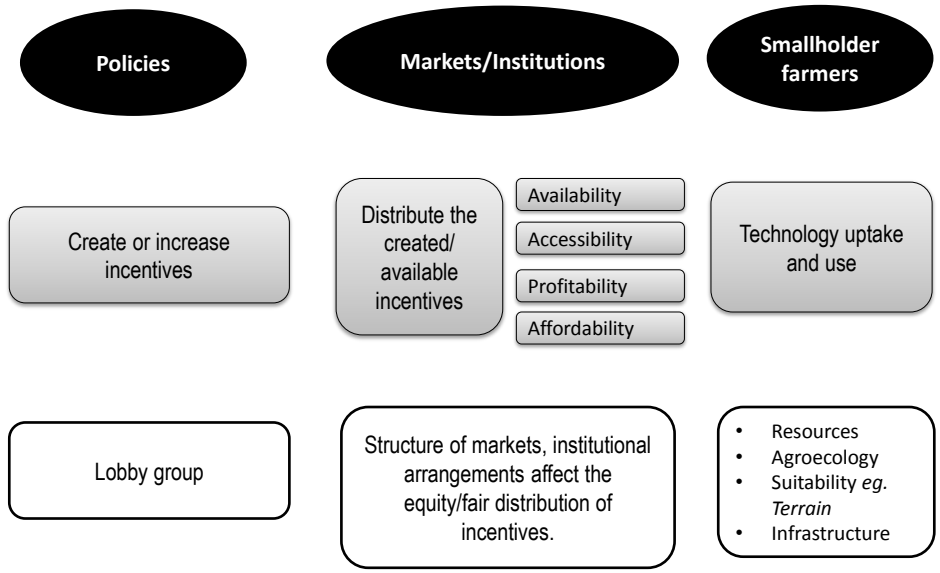

Figure 7 – Delivery as influenced by policies, markets and institutions.

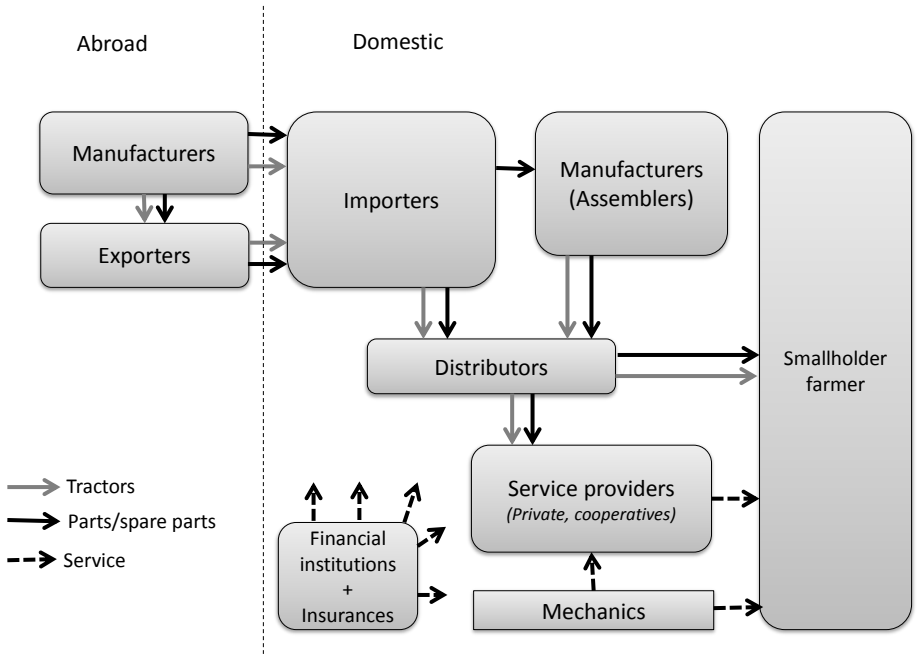

Figure 8 – Main value chains to be considered in FACASI

3. Day 2: Field visit

3.1. Visit of Karangai village

3.2. Visit of Ilkiushin village

3.3. Visit of Tanganyika Farmers' Association (importer)

3.4. Visit of the Centre for Agricultural Mechanization and Rural Technology (CARMATEC)

4. Day 3

4.1. Governance and management of the project (Dr Frédéric Baudron and Dr Bruno Gérard, CIMMYT)

- Matrix structure: 4 objectives across 4 countries
- One Project Coordinator (PC) per country. Ethiopia: Mr Girma Moges; Kenya: Dr Pascal Kaumbutho; Tanzania: Mr Wildfried Mariki; Zimbabwe: Dr Raymond Nazare. The role of the country PC is to coordinate all project activities in the country, with support from CIMMYT offices in Ethiopia, Kenya and Zimbabwe.
- One Objective Mentor (OM) per Objective/ Objective 1: Prof. John Blackxell; Objective 2: Mr Rajiv Pradhan (?); Objective 3: Dr Moti Jaleta; Objective 4: Mr Saidi Mkomwa.
- One Project Manager (Dr Frédéric Baudron), whose role is to manage project implementation, ensure reporting in a timely fashion and liaise with the project partners to ensure that milestones and outputs are delivered according the agreed timeframe.
- A Project Management Committee (PMC) will be formed by the 4 PC and one representative of each of the implementation institutions. I will be chaired by the director of the Global CA program of CIMMYT (Dr Bruno Gérard). It will meet at least quarterly, preferably monthly (some of these events will be tele-conferences) to review progress and help planning, and follow the M&E. Minutes will be shared with the project scientists.
- A Project Steering Committee (PSC) will be formed by senior professionals not associated with implementation partners. The PSC will receive progress reports semi-annually and meet annually, provide oversight, review progress and advise the Commissioned Organization and ACIAR on adjustments in implementation arrangements. The proposed PSC members are:
    - Mr Martin Bwalya from CAADEP
    - Prof. Richard Bell from Murdoch University
    - Richard Shetto, adviser of MAFS
    - Mrs Elizabeth Bischof from AGCO
- An advisory Group (AG) will be formed in each country by government Ministerial representatives, policy makers, R&D leaders, NGOs, and private sector representatives. AG will review, oversight and guide implementation in country, and build alliances for scaling out within country.

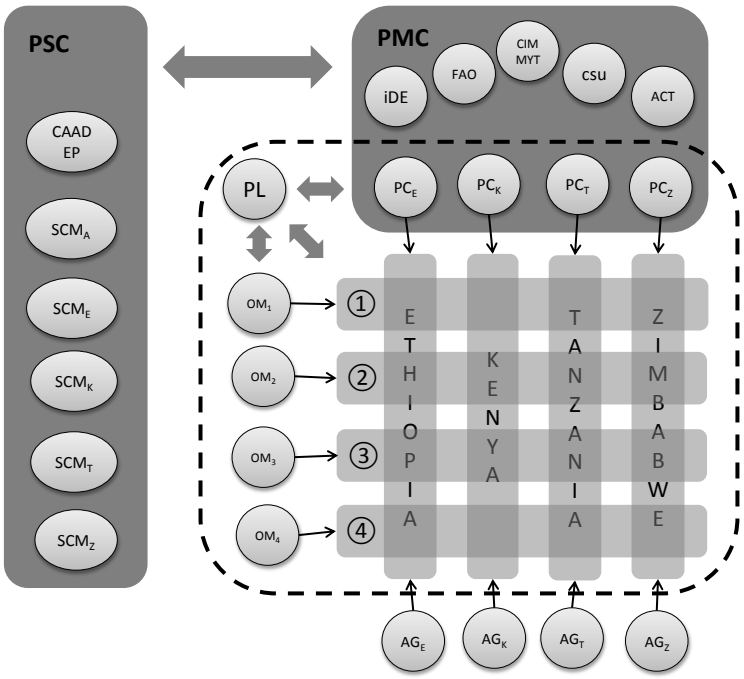

Figure 9 – Governance and management of FACASI

4.2. Site characterization

The sites of Kakamega (SIMLESA site) and Laikipia (non-SIMLESA site) have been selected for the implementation of FACASI in Kenya. The sites of Mbulu (SIMLESA site) and Arumeru (non-SIMLESA site) have been selected for the implementation of FACASI in Tanzania.

These sites will be characterized in detail by reviewing available secondary data by early May (see template in Appendix 3).

4.3. Focus group discussion and farm survey

The aim of the focus group discussion is to get an understanding of power supply and demand in the study sites (including manual labour, animal traction, and engine power) and map bottlenecks and sources of drudgery. 8 focus group discussions will be undertaken in Kenya (Kakamega and Laikipia) on June 10-14, 2013 and in Tanzania (Karatu and Arumeru) on June 17-21, 2013. Each focus group shall comprise 24 to 30 participants (women and men).

Following the focus group discussion, a farm survey will take place in each site. About 100 households will be surveyed in each site, with the aim of gathering quantitative data to explore the potential consequences of various scenarios of adoption of small mechanization for different types of farm households. Emphasis will be placed on energy use (e.g. power, external inputs) and energetic efficiency. Economic and environmental indicators will also be taken into account. Figure 10 below represents schematically the analytical framework underpinning this survey. Figure 11 is a more

elaborate representation of this framework: the purpose of the survey will be to quantify each compartment and each arrow of Figure 11, for each farming household surveyed.

A draft of a proposed survey tool (to be amended after the focus group discussion) is given in Appendix 4.

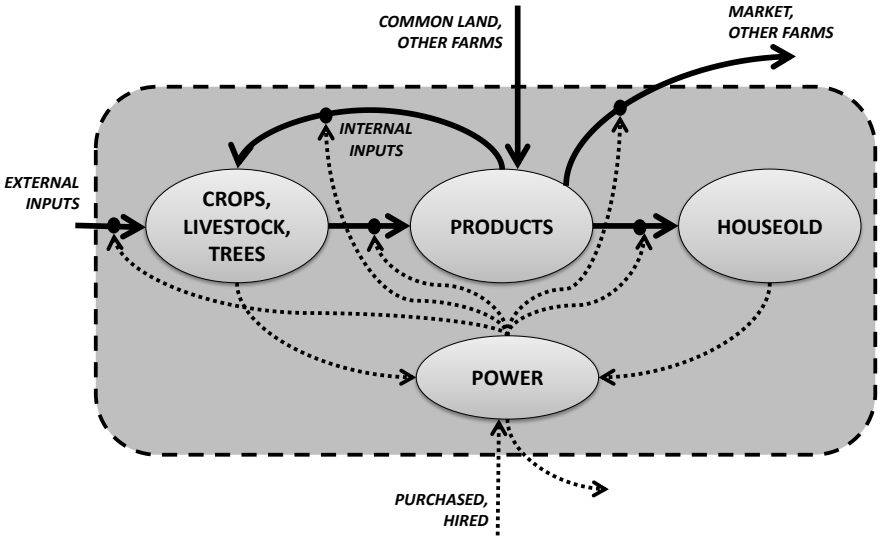

Figure 10 – Analytical framework underpinning the farm survey

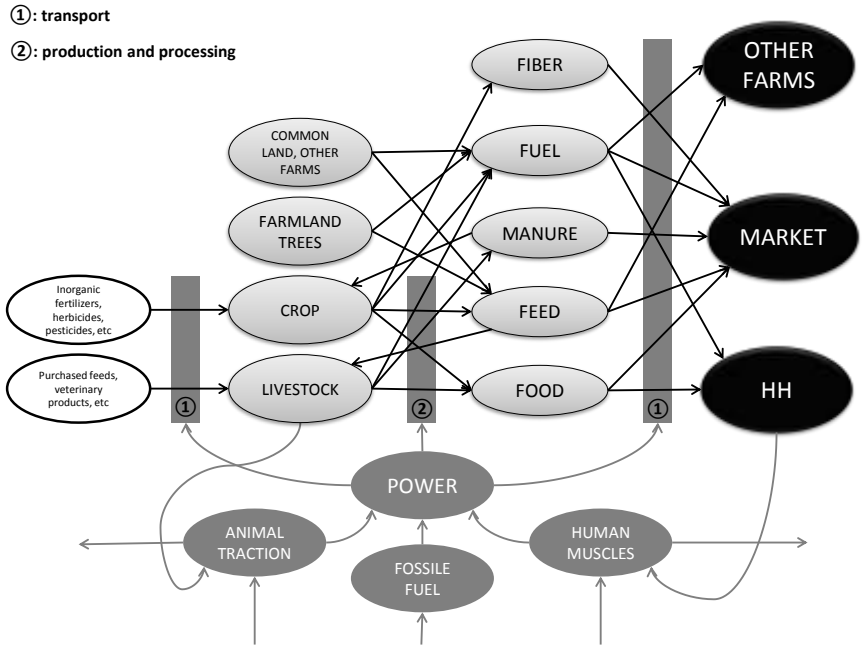

Figure 11 – More elaborate representation of the analytical framework in Figure 10.

4.4. Best bets CA seeders for inventory

"Best bets" should be suitable and commercially available equipment. By commercially available, we mean equipment with a standard guaranteed quality, with a modest unit price (probably not exceeding US$ 1,500) that can be purchased locally or manufactured from elsewhere and shipped to Africa in relatively short delays (less than 6 months) regardless of the quantity ordered. To be suitable to African conditions, equipment should fulfill the following points:

- The machines will have to be very robust but as simple as possible.
- Handling of weeds as much as stubble (weeds may be more of a problem than stubbles). This will necessitate disc openers on any non-rotary machine (particularly tined seeders).
- In rocky soils (which may be common in some sites) the use of rotary machine will be impossible and will necessitate a spring release type mechanism to allow "stump or rock jumping" this could mean each sowing unit attached via a parallelogram arrangement.
- Given the erosive nature of the soils and climate, bed planting and retention of "permanent" beds should be tested as an option with the requisite seeder in areas where insufficient residue can be retained as mulch to effectively control erosion.

Based on the above, an inventory of CA seeders presently available yield only few options, that can be grouped in 4 categories: seeders for strip tillage, direct seeders, seeders that may become commercially available in the near future, and options for bed planting.

- Seeders for strip tillage
    - Seed drills from Danyang Liangyou Machinary Co. Ltd (China) (http://www.chinalyjx.com/en/Index.asp): 2BG-100 for sowing only (Figure 12a) and 2BFG-120 for sowing and fertilizing (Figure 12b)
    - Versatile Multi Planter (Bangladesh) (Figure 12c), although its commercial availability still has to be proven
    - National Zero Till Multi Crop Planter for Power Tiller from National Agro Industries (India) (http://www.nationalagroinds.com/) (Figure 12d)

- Direct seeders
    - Fitarelli Maquinas Agricolas (Brazil) (http://www.fitarelli.com.br/): one-line direct seeder (Figure 13a) and two-line direct seeder (Figure 13b)
    - Industria Mecanica Knapik, Ltda (Brazil) (http://19449.br.all.biz/plantadeira-plantio-direto-g95451): one-line direct seeder (Figure 13c) and two-line direct seeder (Figure 13d)
    - Gongli LTD (China) (Figure 14a)
    - Khedut Automatic Seed Drill (India) (http://khedutagro.com/agriculture_equipment.html) (Figure 14b)
    - Ndume two row seed drill (Kenya) (Figure 14c)
    - Nandra ripper planter (Figure 14d)

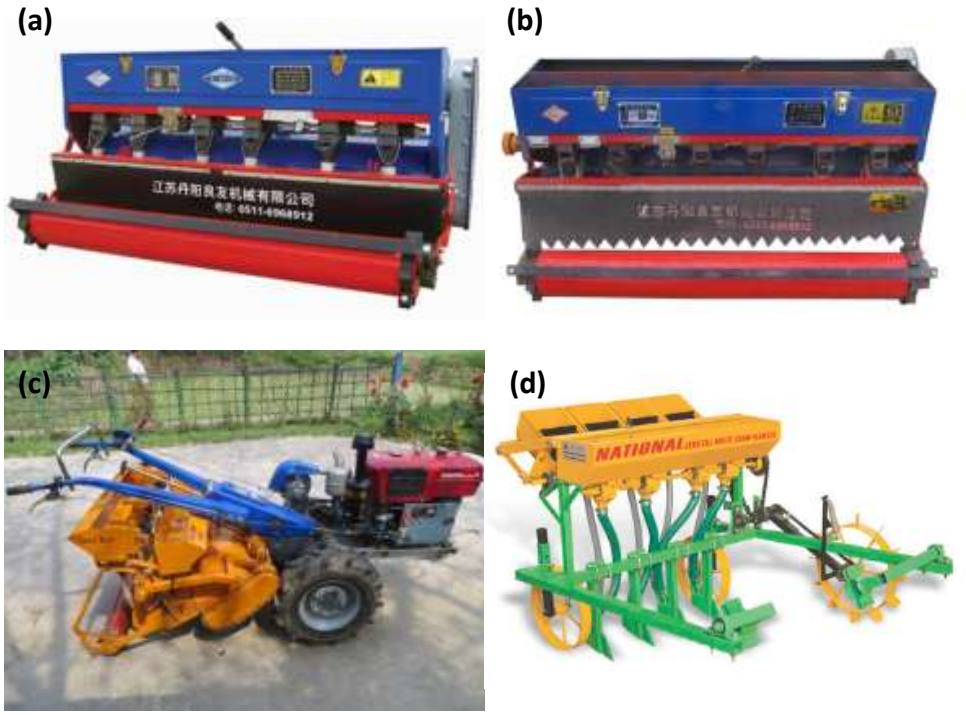

Figure 12 – seeders for strip tillage

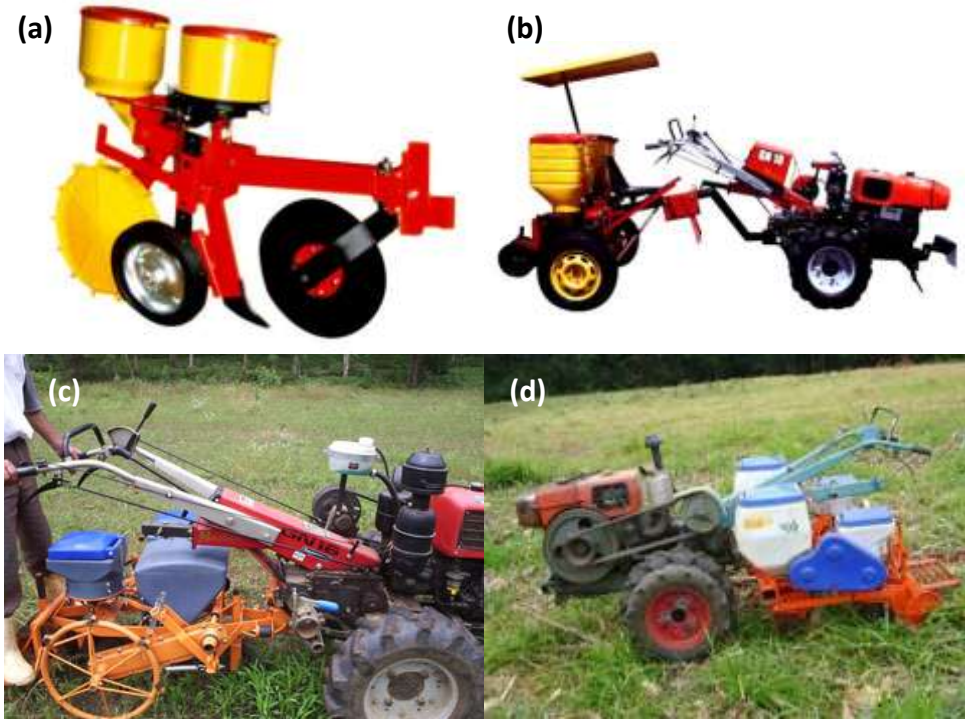

Figure 13 – direct seeders

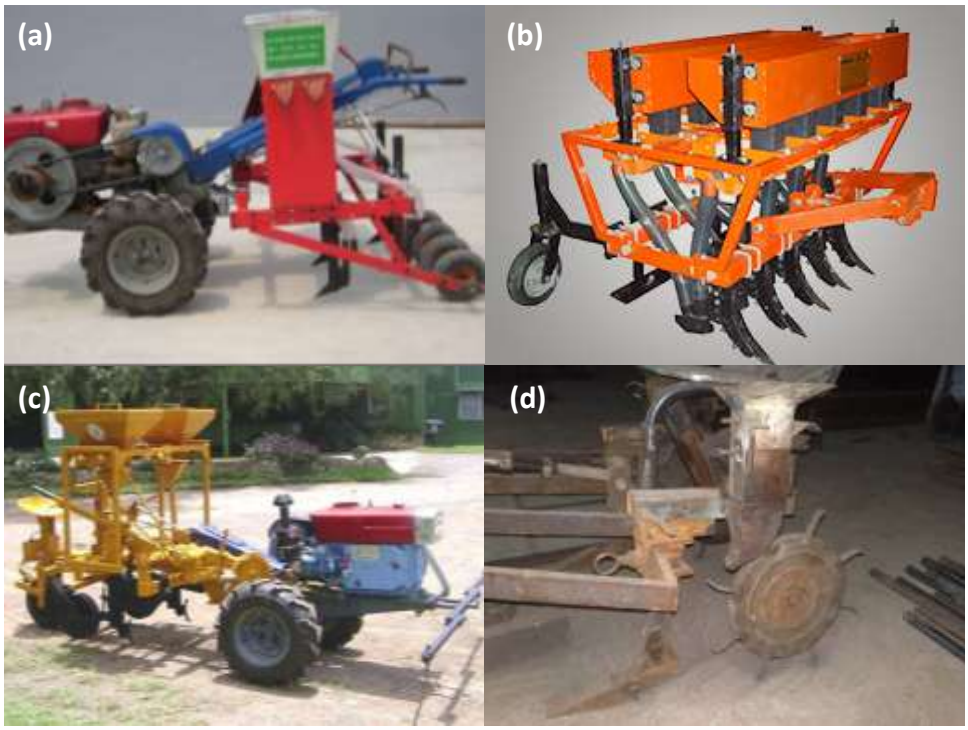

Figure 14 – direct seeders (continuous)

- Seeders that may become commercially available in the near future
    - Intermech direct seeder (Figure 15a)
    - CIMMYT Multi-Crop/Multi-Use Tool Bar Based Tine Prototype Implement (Figure 15b)
    - 2BFMDC-6 from Western Chengdu (China) (Figure 15c)
    - John Morrisson seeder (USA) (Figure 15d)

- Options for bed forming/planting
    - Modified 2BG-100 seed drill (China) (Figure 14a): this is not CA (total surface disturbance)
    - Bed planter with rotary blades and roller type bed shaper (Bangladesh) (Figure 14b): this is not CA (total surface disturbance)
    - Planter with tool bar mounted bed shaper (Bangladesh) (Figure 14c): this is not CA (requires a tilled soil)
    - Bed forming using shovels mounted on a tool bar (Figure 14d): this may be considered CA (no soil disturbance between furrows)

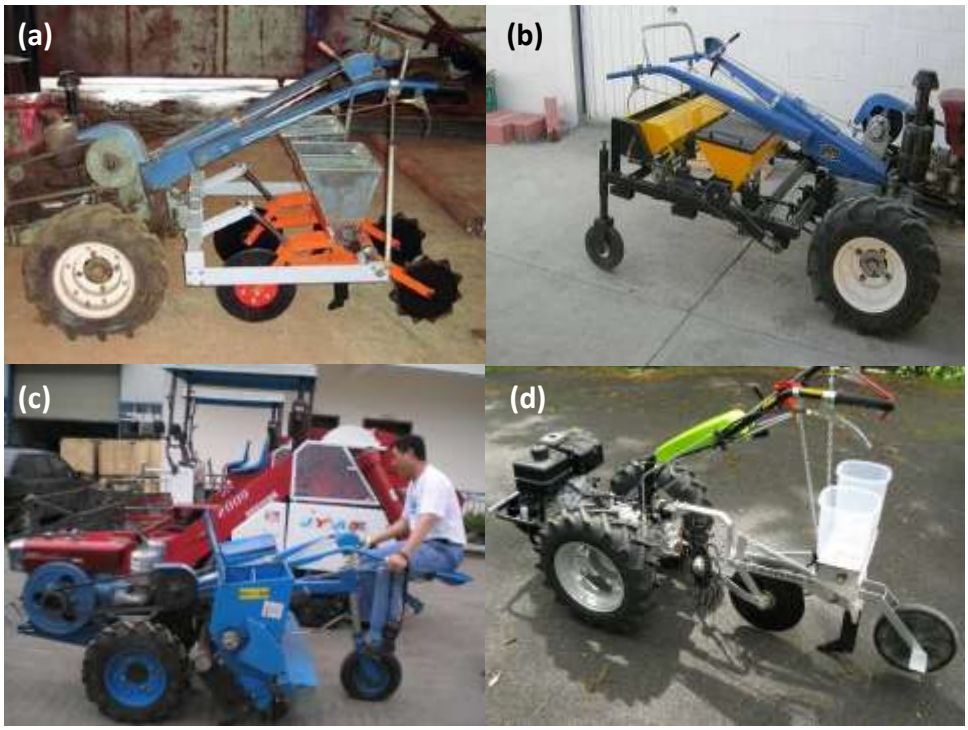

Figure 15 – seeders that may become commercially available in the near future

Figure 14 – options for bed forming/planting

This preliminary inventory of existing “best bet” CA seeders at international level will be completed by inventories at country level. These country-level inventories will include ancillary equipment others that seeders, and in particular threshers, shellers, trailers and forage cutters.

5. Day 3& 4: Planning

A workplan per country was developed for all activities under Objective 1 to take place between March 2013 and February 2014 (Appendix 5). A small group also refined the workplan for activities under Objective 2 (Appendix 6).

6. Day 5 & 6: 2WT training

- Morning of Day 1
    - Presentation on “Agricultural Machinery Safety” by Scott Justice (Figure 15)
    - Video on Dongfeng two-wheel tractor assembly (Figure 16)
    - Demonstration of the Danyang 2BG6A for single-pass full tillage and seeding (Figure 17). Very good performance.
- Afternoon Day 1
    - Set up of the 2BG6A for strip tillage (Figure 18)
    - Demonstration of strip tillage (Figure 19 and 20). Very good performance.
    - Presentation on “Examples of Rural Mechanization for Small-Scale Farmers Based on Chinese 2-Wheel Tractors” by Ken Sayre (Figure 21)
- Morning Day 2
    - Presentation on “Seed Meters and Furrow Adjustment” by Scott Justice
    - Demonstration of the Gongli seeder (Figure 22 and 23). The machine was observed to handle residue and weed biomass poorly, and the use of a cutting disc was suggested as a possible improvement. Further improvement were suggested for African conditions, and in particular to (1) remove the third and last bar (as the machine would be used mainly for sowing 2 rows and not more), which would allow to lower the seed andfertilizer boxes, and (2) to add a back tire and seat for transport.

Figure 15

Figure 16

Figure 17

Figure 18

Figure 19

Figure 20

Figure 21

Figure 22

Figure 23

7. Day 5 & 6: Business model training

See separate report “FACASI Business Model Training” by Rajiv Pradhan, Heiko Bamman, Branka Krivokapic-Skoko, Eden Kassaye and Richard Rose.

Appendix 1: program

Day 1, 25th of March 2013: LAUNCH

8h30 – 9h00	Registration	
9h00 - 9h30	Official opening	Dr Lucas Mboyi Mugendi
9h30 – 9h50	Welcome remarks by ACIAR	Dr John Dixon
9h50 – 10h10	Welcome remarks by AIFSC	Mrs Mellissa Woods
10h10 – 10h30	Welcome remarks by CIMMYT	Dr Bruno Géard
10h30 – 11h00	**TEA BREAK**	
11h00 – 11h30	Project's overview: justification, objectives and major activities.	Dr Frédéric Baudron
11h30 – 11h50	Linkages with SIMLESA	Dr Mulugetta Mekuria
11h50 - 12h10	Policy aspects of farm mechanization: case of Ghana	Dr Xinshen Diao
12h10 – 12h30	What can we learn from South Asia?	Dr H.S. Sidhu
12h30– 14h00	**LUNCH BREAK**	
14h00 – 14h30	Experience with small mechanization and CA in Tanzania	Mr Wilfired Mariki
14h30 – 15h00	Experience with small mechanization and CA in Kenya	Dr Pascal Kaumbutho
15h00 – 15h30	Overview of Objective 1 with emphasis on Year 1 activities	Prof John Blackwell
15h30 – 16h00	**TEA BREAK**	
16h00 – 16h30	Overview of Objective 2 with emphasis on Year 1 activities	Mr Heiko Bammann
16h30 – 17h00	Overview of Objective 3 with emphasis on Year 1 activities	Dr Moti Jaleta
17h00 – 17h30	Overview of Objective 4 with emphasis on Year 1 activities	Mr Saidi Mkomwa
17h30 – 18h30	**COCKTAIL**	

Day 2, 26th of March 2013: FIELD VISIT

Day 3, 27th of March 2013: PLANNING

8h30 – 9h30	Governance and management of the project	Dr Bruno Gérard and Dr Frédéric Baudron
9h30 - 10h30	Presentation of the selected sites	Mr Wilfried Mariki and Dr Pascal Kaumbutho
10h30 – 11h00	**TEA BREAK**	
11h00 – 12h30	Planning for Output 1.1. (parallel sessions Tanzania//Kenya)	Facilitator: Prof. John Blackwell and

		Dr. Frédéric Baudron
12h30– 14h00	**LUNCH BREAK**	
14h00 – 14h30	Presentation in plenary	
14h30 – 15h30	Planning for Output 2.1. (parallel sessions Tanzania//Kenya)	Facilitator: Rajiv Pradhan and Heiko Bammann
15h30 – 16h00	**TEA BREAK**	
16h00 – 16h30	Planning for Output 2.1. (continued)	
16h30 – 17h00	Presentation in plenary	
17h00 – 17h30	Recap	

Day 4, 28th of March 2013: PLANNING

8h30 – 10h00	Planning for Output 3.1. (parallel sessions Tanzania//Kenya)	Facilitator: Dr Moti Jaleta
10h00 - 10h30	Presentation in plenary	
10h30 – 11h00	**TEA BREAK**	
11h00 – 11h30	The Knowledge Platform of the Project	Saidi Mkomwa
11h30 – 12h30	Planning for Activity 4.1.3 (parallel sessions Tanzania//Kenya)	Facilitator: Saidi Mkomwa
12h30– 14h00	**LUNCH BREAK**	
14h00 – 15h00	Presentation in plenary	
14h30 – 15h30	The International Mentoring Platform of the Project	Prof John Blackwell and Dr Frédéric Baudron
15h30 – 16h00	**TEA BREAK**	
16h00 – 17h00	Monitoring and evaluation	Mr Charles Nkonge
17h00 – 17h30	Recap and presentation of the training during the following days	

Day 5, 29th of March2013: PARRALEL TRAININGS

- Operating a 2WT tractor (CARMATEC)
- Concept of business model (KIBO PALACE HOTEL)

Day 6, 30th of March2013: PARRALEL TRAININGS (continued)

- Operating a 2WT tractor (CARMATEC)
- Concept of business model (KIBO PALACE HOTEL)

Appendix 2: list of participants

Name	Organization	Country	Email
John Dixon	ACIAR	Australia	John.Dixon@aciar.gov.au
Mellissa Woods	AIFSC	Australia	mellissa.wood@aciar.gov.au
George Mburathi	ACIAR	Kenya	gmburathi@gmail.com
Elizabeth Oguthu	AIFSC	Kenya	Elizabeth.Ogutu@aciar.gov.au
Frédéric Baudron	CIMMYT	Ethiopia	f.baudron@cgiar.org
Bruno Gérard	CIMMYT	Mexico	b.gerard@cgiar.org
Mulugetta Mekuria	CIMMYT	Zimbabwe	m.mekuria@cgiar.org
Moti Jaleta	CIMMYT	Ethiopia	m.jaleta@cgiar.org
Scott Justice	CIMMYT	Nepal	sejustice@gmail.com
Ken Sayre	CIMMYT	Mexico	k.sayre@cgiar.org
Jens Andersson	CIMMYT	Zimbabwe	J.Andersson@cgiar.org
Michael Misiko	CIMMYT	Ethiopia	m.misiko@cgiar.org
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John Blackwell	CSU	Australia	jblackwell@csu.edu.au
Branka Krivokapic-skoko	CSU	Australia	bkrivokapic@csu.edu.au
Heiko Bammann	FAO	Italy	Heiko.Bammann@fao.org
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Richard Rose	iDE	Bangladesh	richard.rose@ide-bangladesh.org
Edene Kassaye	iDE	Ethiopia	e_kassaye@ide.org.et
Xinshen Diao	IFPRI	United States	x.diao@cgiar.org
Saidi Mkomwa	ACT	Kenya	Saidi.mkomwa@act-africa.org
Joseph Mutua	KENDAT	Kenya	jmutua@kendat.org
Pascal Kaumbutho	KENDAT	Kenya	pkaumbutho@kendat.org
Charles Nkonge	KARI	Kenya	cnkonge@kari.org
Chris Outram	Ndume Ltd.	Kenya	co@wananchi.com
Abel Gikenyi	Car & General	Kenya	abel@cargen.com
Stephen Mwaniki Ngeru	Femo-works	Kenya	sm.ngeru@gmail.com
Wilfried Mariki	SARI	Tanzania	wmariki@gmail.com
John Sariah	SARI	Tanzania	jsariah@yahoo.com
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Prosper Inyasi Massawe	SARI	Tanzania	prostuma@yahoo.com
Dr Lucas Mboyi Mugendi	SARI	Tanzania	lmugendi@yahoo.com
Elley Mbise	SARI	Tanzania	elleymbise@yahoo.com
Marietha Owenya	SARI	Tanzania	mariethaowenya@yahoo.co.uk
Charles Lyamchai	MAFC	Tanzania	lyamchai@yahoo.com
Lameck Isack Hazali	MAFC	Tanzania	lameckihazali@gmail.com
Peter Chisawilo	Intermech	Tanzania	pchisawillo@gmail.com
Frank Lesirium	Nandra	Tanzania	nandraeng@gmail.com
Wilson Baitani	CARMATEC	Tanzania	wmbaitani@yahoo.com
Stanley Mwangi	Farm Concern	Tanzania	mwangi@farmconcern.org

Appendix 3: indicators for site description

Indicator	Unit
Total area of the site	km2
Total cropped area	km2
Total population	thousands
Male population	thousands
Female population	thousands
Adult population	thousands
Total number of household	thousands
Proportion of female-headed household	%
Main crops	Ranked list
Main livestock types	Ranked list
Main soil types	Ranked list
Main agricultural commodities sold (cash crops, livestock product, etc)	Ranked list
Proportion of cultivated area uunder irrigation	%
Proportion of stone-free cultivated area (in the topsoil)	%
Size of the land holding	average, minimum and maximum
Slope in the farmland	average, minimum and maximum
Number of four-wheel tractors in the area	number
Number of two-wheel tractors in the area	number
Number of cattle in the area	thousands
Number of donkeys in the area	thousands
Number of horses in the area	thousands
CA adopters	thousands
Surface area under CA	ha
Density of fair to good roads	km/km2
Density of poor roads	km/km2
Density of very poor roads	km/km2
Presence of fuel stations in the area	Y/N
Fuel cost	US$/L
Presence of local repair workshops in the area	Y/N
Existence of farmers' organization (FFS, IP, cooperative)	Y/N
Number of farmers belonging to a farmers' organization	thousands
Presence of a research station in the area	Y/N

Appendix 4: draft survey tool

1. General

1.1. Head of the household

Name		GPS coordinates	
Village		County/District	
Age		Situation (e.g. widow)	
Sex		Education	

1.2. Household composition

Nb of male adults		Nb of female adults	
Nb of adult having permanent off-farm employment		Nb of adult having temporary off-farm employment	
Nb of children going to school		Nb of children not going to school	
Nb of infants			

1.3. Linkages of the household

Nb of people outside of the HH depending on it (e.g. elderly, sick)	
Nb of relatives outside the HH helping financially	

1.4. History of the household

Where was the head of the HH born?	
Where is (s)he from originally?	
Which did (s)he start cultivating this particular piece of land	
Who gave him/her this piece of land?	
Does (s)he have a title deed?	
What (s)he farming before?	
If not, was was his/her main activity?	

2. Capital

2.1. Land

Total surface of the farm (ha)		Uncleared land (ha)	
Land usually under cultivation (ha)		Land usually under fallow (ha)	

2.2. Equipment

Equipment	Specification (e.g. horsepower)	Number
Four-wheel tractor		
Two-wheel tractor		
Water pump		
Plough		
Cultivator		
Trailer		
Wheelbarrow		

3. Main enterprises

3.1. Crop (including feed)

3.1.1. Long rains

Crop types	Surface (ha)			
	Last LR	Normal LR	Good LR	Bad LR

3.1.2. Short rains

Crop types	Surface (ha)			
	Last SR	Normal SR	Good SR	Bad SR

3.2. Livestock

Livestock species/types	Number of heads	
	Currently	**A year ago**
Oxen		
Bulls		
Indigenous cow		
Improved dairy cow		
Indigenous heifer		
Improved dairy heifer		
Steers		
Sheep		
Goats		
Horses		
Mules		
Donkeys		
Pigs		

4. Input-Ouput

4.1. Crop

4.1.1. Inputs

4.1.1.1. Last long rains

Crop types	Manure	Fertilizer 1		Fertilizer 2	
	Quantity	**Type**	**Quantity**	**Type**	**Quantity**

4.1.1.2. Last short rains

Crop types	Manure	Fertilizer 1		Fertilizer 2	
	Quantity (kg)	**Type**	**Quantity (kg)**	**Type**	**Quantity (kg)**

4.1.2. Labour and farm power used on-farm: crop grown during the last long rains

Task per crop		Month(s)	Labour								Draft power				Tractor power			
			Own Men		Own Women		Own Children		Hired		Own		Hired		Own		Hired	
			D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M
1.																		
	Land prep 1																	
	Land prep 2																	
	Land prep 3																	
	Sowing																	
	Thinning																	
	Transp Inp																	
	Fertilizing 1																	
	Fertilizing 2																	
	Transp Man																	
	Manuring																	
	Weeding 1																	
	Weeding 2																	
	Weeding 3																	
	Herbicide 1																	
	Herbicide 2																	
	Pesticide 1																	
	Pesticide 2																	
	Harvesting																	
	Transp harv																	
	Shell/Thresh																	
	Winnowing																	
	Milling																	
	Transp mark																	
2.																		
	Land prep 1																	
	Land prep 2																	
	Land prep 3																	
	Sowing																	
	Thinning																	
	Transp Inp																	
	Fertilizing 1																	
	Fertilizing 2																	
	Weeding 1																	
	Weeding 2																	

	Transp Man																	
	Manuring																	
	Weeding 3																	
	Herbicide 1																	
	Herbicide 2																	
	Pesticide 1																	
	Pesticide 2																	
	Harvesting																	
	Transp harv																	
	Shell/Thresh																	
	Winnowing																	
	Milling																	
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	Land prep 1																	
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	Land prep 3																	
	Sowing																	
	Thinning																	
	Transp Inp																	
	Fertilizing 1																	
	Fertilizing 2																	
	Weeding 1																	
	Weeding 2																	
	Transp Man																	
	Manuring																	
	Weeding 3																	
	Herbicide 1																	
	Herbicide 2																	
	Pesticide 1																	
	Pesticide 2																	
	Harvesting																	
	Transp harv																	
	Shell/Thresh																	
	Winnowing																	
	Milling																	
	Transp mark																	

4.1.3. Labour and farm power used on-farm: crop grown during the last short rains

Task per crop		Month(s)	Labour								Draft power				Tractor power			
			Own Men		Own Women		Own Children		Hired		Own		Hired		Own		Hired	
			D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M	D/M	H/M
1.																		
	Land prep 1																	
	Land prep 2																	
	Land prep 3																	
	Sowing																	
	Thinning																	
	Transp Inp																	
	Fertilizing 1																	
	Fertilizing 2																	
	Transp Man																	
	Manuring																	
	Weeding 1																	
	Weeding 2																	
	Weeding 3																	
	Herbicide 1																	
	Herbicide 2																	
	Pesticide 1																	
	Pesticide 2																	
	Harvesting																	
	Transp harv																	
	Shell/Thresh																	
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	Land prep 3																	
	Sowing																	
	Thinning																	
	Transp Inp																	
	Fertilizing 1																	
	Fertilizing 2																	
	Weeding 1																	
	Weeding 2																	

	Transp Man																	
	Manuring																	
	Weeding 3																	
	Herbicide 1																	
	Herbicide 2																	
	Pesticide 1																	
	Pesticide 2																	
	Harvesting																	
	Transp harv																	
	Shell/Thresh																	
	Winnowing																	
	Milling																	
	Transp mark																	
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	Land prep 1																	
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	Land prep 3																	
	Sowing																	
	Thinning																	
	Transp Inp																	
	Fertilizing 1																	
	Fertilizing 2																	
	Weeding 1																	
	Weeding 2																	
	Transp Man																	
	Manuring																	
	Weeding 3																	
	Herbicide 1																	
	Herbicide 2																	
	Pesticide 1																	
	Pesticide 2																	
	Harvesting																	
	Transp harv																	
	Shell/Thresh																	
	Winnowing																	
	Milling																	
	Transp mark																	

1.1.1. Production

1.1.1.1. Long rains

Crop types	Production (kg)			
	Last LR	Normal LR	Good LR	Bad LR

1.1.1.2. Short rains

Crop types	Production (kg)			
	Last SR	Normal SR	Good SR	Bad SR

1.1.2. Product use

1.1.2.1. Last long rains

Crop	Proportion (%)			
	Consumed	Fed to livestock	Sold	Bartered

1.1.2.2. Last short rains

Crop	Proportion (%)			
	Consumed	Fed to livestock	Sold	Bartered

1.1.3. Residue use

1.1.3.1. Last long rains

Crop	Proportion (%)						
	Retained in the field	Burnt	Communal grazing	Fed to livestock	Fuel	Construction	Market

1.1.3.2. Last short rains

Crop	Proportion (%)						
	Retained in the field	Burnt	Communal grazing	Fed to livestock	Fuel	Construction	Market

1.2. Livestock

1.2.1. Feed

Ingredient		Proportion of the ratio (%)		
		Last short rains	Last long rains	Last dry season
From the farm				
From the common land or other farms				
Purchased				

1.2.2. Milk production

Period	Milk production (L/day) and proportion sold (%)							
	Last		Normal		Bad		Good	
	L/day	%	L/day	%	L/day	%	L/day	%
Short rains								
Long rains								
Dry season								

1.2.3. Culling of live animals

Period	Nb of animals sold and slaughtered for self-consumption							
	Last year		Normal year		Bad year		Good year	
	Sold	Self-cons	Sold	Self-cons	Sold	Self-cons	Sold	Self-cons
Oxen								
Bulls								
Indigenous cow								
Improved dairy cow								
Indigenous heifer								
Improved dairy heifer								
Steers								
Sheep								
Goats								
Horses								
Mules								
Donkeys								
Pigs								

2. Use of biomass for feed, fuel and construction

2.1. Fuel

Material	Proportion of the fuel used in a day (%)		
	Short rains	Long rains	Dry season
Dung from the farm			
Dung from the common land or other farms			
Fuelwood from the farm			
Fuelwood from the common land or other farms			
Residues from the farm			
Residues from other farms			

2.2. Construction materials

Quantity of material used per year	
Poles from the farm (nb)	
Poles from the common land (nb)	
Purchased poles (nb)	
Branches (from nb trees)	

3. Labour and farm power used off farm

3.1. Labour and farm power sold out

Source of labour/power	**Task**	**Month(s)**	**D/M**	**H/D**
Men				
Women				
Children				
Draft power				
Tractor				

3.2. Household tasks (e.g. collection of water and firewood)

Task	**Month(s)**	**Men**		**Women**		**Children**		**Draught animals**		**Tractors**	
		D/M	**H/D**	**M**	**D/M**	**M**	**D/M**	**M**	**D/M**	**M**	**D/M**

4. Food calendar

4.1. In (kg)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Harvest												
Purchase												
Labour sold ou												
Oxen services												
Tractor services												
Support												
Food aid												

4.2. Out (kg)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Consumption												
Sale												
Hiring labour in												
Hiring oxen services												
Hiring tractor services												
Support												

5. Cash calendar

5.1. In (%)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crop 1:												
Crop 2:												
Crop 3:												
Labour sold out												
Oxen services												
Tractor services												
Milk and dairy												
Cattle												
Sheep and goats												
Chicken												
Fruit												
Vegetables												
Beer												
Firewood												
Employment												
Remittances												

5.2. Out (%)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Food												
Hiring labour in												
Hiring oxen services												
Hiring tractor services												
Seeds												
Fertilizers												
Herbicides & pesticides												
Vet products												
Livestock feed												
School fees												
Clothes												

Appendix 5:

Kenya

Objective 1: To evaluate and demonstrate 2WT-based technologies to support CA systems, using expertise and implements from Africa, South Asia and Australia.

No.	Outputs / Activities	Milestones	Kenya SubActivity / Milestone Detail	Due date and Current Status	Responsibility / Participants	Risks / assumptions, Mitigation
Output 1.1	**Most promising 2WT-based technologies identified and acquired**					
Activity 1.1.1	Biophysical and socio-economic site characterization (desk study)	Site-specific report detailing biophysical (e.g. major soil types, main crops) and socioeconomic (e.g. labour availability, cultural setting, proportion of women-headed households) context	• Visit Bungoma and borrow from SIMLESA characterisation of Bungoma. • Desk-top study Laikipia and visit the area for baseline. • Report findings and submit tentative Baseline data and plans to CIMMYT	By 24th April for Activity Plan and By end May for Baseline: ▪ Reconnaissance visit has taken place and project team sat with key field implementers in the 2 localities. ▪ Draft Plan report is under development. SIMLESA office is yet to deliver Baseline data.	▪ Pascal, Mutua, Abel made the field trips. ▪ KARI & CarGen are helping with baseline data. ▪ GCAP (lead), CSU, will receive final reports for comment by May 30, 2013.	▪ MOU with KARI is at an advanced stage. ▪ Project funds are delayed. Funds will be needed by May 8, 2013 at the latest ▪ It is possible to get operational data from machine hirers, though their record keeping skills are weak. We did get some ball-pack figures.
Activity 1.1.2	Focus group discussion in each innovation platform on the current knowledge and skills on 2WT-based technologies	Report on the current knowledge and skills on 2WT-based technologies in each innovation platform	• Take every arising opportunity to learn about the 2WT industry. • Conduct preliminary on-site and phone interviews. • Conduct FGDs by meeting beneficiary Groups and their supporters in both operational areas.	By June 30th 2013 ▪ CIMMYT specialist (Dr Misiko) will be present for the FGDs (Week of June 10, 2013) and these have been scheduled.	▪ Contacts with lead persons on the ground have been established. ▪ Stakeholders are being mobilised to participate in the FGDs. ▪ GCAP, SEP, CSU will stay informed and contribute accordingly	It has already proved that service providers are the best entry points. These are definitely interested in the entry of the 2WT's. During our 1st Visit they emphasised that FACASI team should get them good and proven equipment for their particular conditions. They will do the rest.

Activity 1.1.3	Farm survey with focus on farm power and drudgery, disaggregated by gender	Baseline report for each site Cross-site database available through the knowledge platform	▪ Farm Surveys will be conducted back to back with the FGDs in the 2 project areas. ▪ FGDs will reveal key informants and further information and experience (information) generators to be followed by team beyond the FGD. ▪ Thorough true-situation reports with clear operational as well as livelihood gaps will arise. ▪ Clear entry points with 2WT will be defined for each site based on Baseline data and arising survey findings.	▪ Week of June 10, 2013 with follow-ups in the following week as and if necessary. ▪ Report of survey by July 15.	▪ KENDAT, KARI and Dr Misiko under GCAP and CSU leadership and report effectively) ▪ Equipment and Service providers including ATC Mabanga, CarGen, Femoworks, Kalalu hirers and County Government alike etc. will be convinced by business gaps that arise.	▪ SIMLESA Baseline report for Bungoma will be needed by May 15, 2013 ▪ More baseline data will be needed for Laikipia than is available from the initial visit of April 2013 ▪ There is political stability and farmers are willing to share information. ▪ Needs will come out clearly and motivate all parties upon win-win realizations.
Activity 1.1.4	Inventory and characterization of most promising 2WT-based technologies available in each country	Country-specific report	▪ KENDAT and Team & GCAP to develop guidelines and conduct inventory and characterization of 2WT by types and use.. ▪ Email discussions on best-bet 2WT and accessories discussions are ongoing by project leadership across the world. ▪ CarGen is compiling sales data to be ready by May 15. ▪ India trip will help clarify 2WT based technologies further.	▪ Field surveys and discussions with peripheral sources of data and information to be conducted fully by July 15, 2013 ▪ India trip to happen between April 28 and May 11, 2013 ▪ Report of survey with best-bet technology combinations by site and use, ready by July 30. ▪ Full survey of the equipment and how it is used, choice range, advantages, challenges and weaknesses.	Cargen and other importers/sellers, KENDAT team supported by GCAP, SEP, CSU, SIMLESA and other farmers, Government Agricultural Technology Centres and Service providers.	▪ Secondary information is available from industry. ▪ Farmers and service providers will struggle to critic equipment they have never seen or used.

Activity 1.1.5	Import of most promising 2WT and ancillary equipment (including transport trailers and herbicide sprayers), based on inventory, site characterization and likely farm demand.	2WT and ancillary equipment available in each site for testing	▪ Report on what equipment is already available including opinions on local manufacture, shared industrial or business roles for supply-chain efficiency etc. ▪ Decisions on equipment to be imported to be made firmly and quickly. ▪ Thorough report on best-bet technologies to import based on social and business acceptability, technical feasibility and financial viability.	▪ Identity of locally available equipment by end of July 2013. ▪ Imports to be conducted by KENDAT and Team. ▪ Orders to be placed by end of June 2013, so equipment is cleared by September 15 at the latest. ▪ Equipment to be available for on-station testing season beginning October 2013.	KENDAT, KARI and CIMMYT (Office in Nairobi may assist).	▪ Firm decisions on best-bet machinery must not delay process. ▪ Early decision on range 2WT and accompanying accessories and equipment (Asia or Brazil?) will be necessary. ▪ There are no known barriers to importation of equipment by the project. ▪ Hopefully funds assigned for equipment purchase will be adequate to have at least 5 sets per area.
Output 1.2	**Best bet 2WT-based technologies evaluated on-station and on-station component technology research**					
Activity 1.2.1	Training of researcher teams in the calibration, operation, repair and maintenance of 2WT and ancillary equipment	Research teams trained	▪ Train research and Local Service Provider including supplier and repairer teams on-station. ▪ Test-out plug-on field work timers among adaptations the 2WTs and equipments will need for localization.	▪ Training of Research teams will be during the October 2013 to January 2014 cropping season. ▪ By end of December 2013, research and operator teams are sure equipment is absolutely ready for in-field work.	KENDAT and Team with KARI and LSP's to be guided to undertake operational and socio-economic research. CSU, GCAP to advice and monitor.	All knowledge gaps in 2WT-based technologies will be identified and sealed.
Activity 1.2.2	Development of protocols for on-station testing	On-station evaluation protocols	KENDAT and Team to generate on-station protocols, transferable to in-field.	On station and in-field transferable protocols ready by end of September, 2013.	CSU, KARI, GCAP to follow closely and advise KENDAT Team.	Import of 2WTs and ancillary equipment is not delayed by importation process, including payment of duties or waivers.

Activity 1.2.3	Researcher-managed field evaluation of most-promising 2WT-based technologies	Technical report on the comparative performance (e.g. field capacity, ease of operation, fuel consumption) of the equipment and on their adaptation to suit local circumstances; and recommendations for on-farm evaluation.	▪ On-station testing by researchers and service providers. ▪ Open-day for farmers and other beneficiaries to appreciate demos on the machinery at on-station work.	Testing all through the October 2013 cropping season.	KENDAT Team of suppliers, repairers and business modellers with CSU and GCAP monitoring.	▪ Local service providers (LSPs) will be so convinced as to want to own the equipment right away with special project finance arrangements. ▪ No extreme weather events are foreseen.
Output 1.3	**Best bet 2WT-based technologies evaluated on-farm and continuously refined**					
Activity 1.3.1	Identification of at least five farm-sites per innovation platforms for participatory evaluation of 2WT-based technologies	Farm-sites identified and characterized	▪ Innovation platforms, one to two for each area have been identified. ▪ Selection of 5 testing farms per IP is ongoing. ▪ IPs will include farmers, input providers, LSPs, market-link establishers, financiers, value-adders and produce processors etc. ▪ IP approach means that machinery will serve crop enterprises with LSPs free to cut across the selected testing area, to grow a business.	▪ All on-farm testing plans will be sealed by end of January, 2014. ▪ Field testing will be run under credible and trained service providers into the season commencing March 2014. ▪ Viable machinery rental business observable by end of June 2014.	KENDAT Team will Lead with CSU, GCAP supporting.	It has been checked that viable entrepreneurs (LSPs) exist in each site and preliminary discussions showed they are willing to be involved in on-farm evaluation of 2WT-based technologies.
Activity 1.3.2	Development of protocols for on-farm testing	On-farm evaluation protocols	▪ KENDAT and Team to develop field-evaluation protocols, with due regards for social (ownership and service), operational (Field Capacity and efficiency) and financial performance (Purchase, fuel and repair services), among other evaluation details.	▪ Protocols ready by end of January 2014	KENDAT Team, CSU and GCAP monitoring and reporting.	Both on-station and on-farm testing and researching arrangements are well supported by 2WT partners and have been preliminarily addressed. Some land hiring will be needed on one of the sites.

Activity 1.3.3	Training of innovation platform members on basic calibration, operations and maintenance of tractors and ancillary equipment	Innovation platform members trained	▪ Training of any arising LSPs who may not have been already trained on-station ▪	▪ All formal training will be aimed to end by start of March 2014 cropping season.	KENDAT Team and LSPs supported by GCAP and CSU.	On-farm testing will seal all possible safety and business security issues that could arise.
Activity 1.3.4	Participatory evaluation and adaptation of best bet 2WT-based technologies	Technical report on the performance of the best bet technologies (e.g. range of crops that can be successfully sown, residue handling capacity, performance under a range of typical soil textures, moisture contents and bulk densities)	▪ LSP – led business services as machinery testing platform. ▪ Training and leaning on-the-job will receive close –follow-up throughout. ▪ Machinery will be sued across all possible operations be they seeding, weeding, spraying, threshing & shelling, all forms of transport, water pumping etc.	On farm testing will be a continuous process beginning March 2013.	KENDAT Team, LSPs and their supporters, value-chain business developers etc. supported by CSU and GCAP	There is political stability and hopefully no extreme weather events will occur.
Output 1.4	**Exploration of short term incentives and long-term impact of 2WT-based technologies on farmer livelihoods through farm bio-economic models.**					
Activity 1.4.1	Development of farm typology, based on farm power availability and constraints	Prototype farms for simulation	Mapping of farms under LSPs, the learnings in terms of types of natural conditions, socio-cultural and institutional structures, human knowledge, equipment and business advancement impacts.	Ongoing processes but intensified from January 2014 onwards.	KENDAT Team supported by GCAP, SEP and CSU.	Hopefully diversity between farms is observable as to allow for the delineation of farm, hence types and their categorization.

Activity 1.4.2	Selection (or development) of a farm-scale model, calibration and validation	Model ready for simulation, for each farm type	▪ Engage LSPs to be able to standardise an operational system that can be taught readily and with completeness to incoming others. ▪ Aspects of: - Understanding soil and work environment, hence farm differences, - Equipment primary parts, operational settings - Service and repair guidelines - Operational record keeping - Customer reach & service etc. etc. Leading to a research model.	Ongoing process from January 2014.	KENDAT Team supported by GCAP, SEP and CSU.	Models exist or can be developed to answer the particular research questions of the project; data available to calibrate and validate the selected model.
Activity 1.4.3	Identification of realistic scenarios of change in available farm power and simulation of these scenarios	Outputs of simulation runs (e.g. expected labour input, cash flow) of various realistic modelling scenarios (incorporating adoption rate of different 2WT-based technologies)	Conduct researcher and LSP and all IP members interaction events (field-days, seminars and workshops) towards standardising operations to levels that can be modelled to conduct simulation of change dynamics of mechanization and advancement processes.	Ongoing process from January 2014	KENDAT Team supported by GCAP, SEP and CSU.	The selected model demonstrates contrasted outputs for the different scenarios to be captured in scientific models.
Activity 1.4.4	Participatory workshops discussing simulation outputs within each innovation platform	Workshop report for each innovation platform	▪ Conduct researcher and LSP and all IP members interaction events (field-days, seminars and workshops). ▪ Researchers keen to decipher learnings that have farm power, socio-economic or other scientific basis.	Ongoing process from January 2014	KENDAT Team supported by GCAP, SEP and CSU.	Innovation platform members have interest in discussing simulation outputs

NARS = National Agriculture Research System (DRD, KENDAT, EIAR, UZ), GCAP = Global Conservation Agriculture Program of CIMMYT, SEP = Socio-Economic Program of CIMMYT, CSU = Charles Sturt University, FAO = Food and Agriculture Organization of the United Nations, iDE = International Development Enterprise, ICAR = Indian Council of Agricultural Research

Tanzania

Objective 1: To evaluate and demonstrate 2WT-based technologies to support CA systems, using expertise and implements from Africa, South Asia and Australia.

No.	Outputs / Activities	Milestones	Start	Finish	Responsibility	Risks / assumptions	Applications of milestones	Links with other projects
Output 1.1	**Most promising 2WT-based technologies identified and acquired**							
Activity 1.1.1	Biophysical and socio-economic site characterization (desk study)	Site-specific report detailing biophysical (e.g. major soil types, main crops) and socioeconomic (e.g. labour availability, cultural setting, proportion of women-headed households) context.	01/04/2013	30/05/2013	SARI	Secondary information is available	Baseline data for Activity 1.2, 1.3 and 1.4	
1.1.1.1		Site characterization Information available.	1/04/2013	30/04/2013	-Upendo Titi, -Prosper Massawe -Wilfread Marik	Secondary information is available	Literature search	SIMLESA and ABACO
1.1.1.2		Hard and electronic document available and shared.	1/05/2013	30/06/2013	Upendo Titi, -Prosper Massawe -Wilfread Marik		Report on site characterization produced and submitted.	
Activity 1.1.2	Focus group discussion in each innovation platform on the current knowledge and skills on 2WT-based technologies	Information on the current knowledge and skills on 2WT-based technologies in each innovation platform	15/06/2013	15/07/2013	SARI	Members of innovation platforms are interested in 2WT-based technologies	Baseline data for Activity 1.2, 1.3 and 1.4	

1.1.2.1		-Solicit of information from the farmers.	15/06/2013	30/07/2013	-WilfredMarik, -Wilson Baitan -Hazali Lameck -John Sariah		Visit and conduct group discussion with the IP/Farmers group/ Farmers Field School (FFS)	CASARD, SIMLESA and ABACO
1.1.2.2		-Documentation	30/07/2013	15/08/2013	-WilfredMarik, -Wilson Baitan -Hazali Lameck -John Sariah		Report writing and sharing	
Activity 1.1.3	Farm survey with focus on farm power and drudgery, disaggregated by gender	Baseline report for each site Cross-site database available through the knowledge platform	15/08/2013	30/08/2013	SARI	Political stability and security conditions allowing farm survey Farmers willing to share information	Baseline data for Activity 1.2, 1.3 and 1.4 Identification of specific entry points for 2WT-based operations in the 8 sites Baseline against which to monitor impact Data for typology in Activity 1.4.1	
1.1.3.1		Availability of Survey tool	16/08/2013	30/08/2013	-Upendo Titi -Prosper Massawe -Wilfred Marik -Marietha Owenya -Hazali Lameck -Baitan Wilson		Development of the survey tool Pretesting of the survey tools with sample farmers groups	SIMLESA and CA – SARD

1.1.3.2		Documentation	16/08/2013	30/08/2013	-Upendo Titi -Wilfred Marik -Prosper Massawe -Marietha Owenya -Hazali Lameck -Baitan Wilson		Report writing	
Activity 1.1.4	Inventory and characterization of most promising 2WT-based technologies available in each country	Country-specific report	1/07/2013	31/08/2013	SARI	Secondary information is available	Selection of best bet 2WT-based technologies	
1.1.4.1		Documentation	1/07/2013	30/08/2013	-Wilson Baitan -Lameck Hazal -Marik -Mbise	Secondary information is available	Literature search and report writing	LGAs
Activity 1.1.5	Import of most promising 2WT and ancillary equipment (including transport trailers and herbicide sprayers, **seeders**), based on inventory, site characterization and likely farm demand.	2WT and ancillary equipment available in each site for testing	1/08/2013	31/19/2013	DRD/SARI	No barriers to importation of equipment by the project	2WT-based technologies available for on-station and on-farm evaluation	Farm machinery dealers
Output 1.2	**Best bet 2WT-based technologies evaluated on-station and on-station component technology research**							
Activity 1.2.1	Training of researcher teams in the calibration, operation, repair and maintenance of 2WT and ancillary equipment	Research teams trained	01/09/2013	31/09/2013	SARI	Knowledge gaps in 2WT-based technologies exist and are identified	Basic skills on how to operate and maintain tractors and ancillary equipment gained by the research team, before on-farm valuation	

1.2.1.1		Basic skills on how to operate and maintain tractors and ancillary equipment gained by the research team.	01/09/2013	31/09/2013	In country dealer		Conduction of training by In country dealers	Machinery manufacturers and suppliers
Activity 1.2.2	Development of protocols for on-station testing	On-station evaluation protocols	1/11/2013	31/12/2013	SARI	Import of 2WTs and ancillary equipment is not delayed by importation barriers and payment of duties	Protocols for Activity 1.2.4	
1.2.2.1		Field book and Trial design and execution protocol available.	01/10/2013	15/10/2013	John Sarah Wilfred Marik Prosper Massawe		Development of guideline for trial implementation (design, field book, variables for analysis, and analysis procedures)	SIMLESA and CA SARD
Activity 1.2.3	Researcher-managed field evaluation of most-promising2WT-based technologies	Technical report on the comparative performance (e.g. field capacity, ease of operation, fuel consumption) of the equipment and on their adaptationto suit local circumstances; and recommendations for on-farm evaluation.	1/01/2014	31/07/2014	SARI	National teams involved in the project have the capacity to conduct field evaluation; political stability in the different countries, no extreme weather events	Selection of candidate technologies to be evaluated and adapted on-farm	

1.2.3.1		Field experimentation	Jan/2014	Dec/2014	-John Sariah -Wilfred Marik Baitan Wilson -Marietha Owenya -Mbise -Upendo Titi -Hazal -Massawe		Establishment of field trials. Two trials per site. Trial size depends on the number of best bet available. Each trial will contain three replications.	CA SARD, SIMLESA.
Output 1.3	**Best bet 2WT-based technologies evaluated on-farmand continuously refined**							
Activity 1.3.1	Identification of at least five farm-sites per innovation platforms for participatory evaluation of 2WT-based technologies	Farm-sites identified and characterized	1/10/2013	30/11/2013	SARI	Potential entrepreneurs exist in each site and are willing to be involved in on-farm evaluation of 2WT-based technologies	Array of biophysical circumstances to evaluate 2WT-based technologies	

1.3.1.1		Sites located	1/11/2013	30/11/2013	-John Sariah -Marik _Marietha -Upendo -Massawe		In collaboration with stake holders (farmers), six sites will be selected close to the SIMLESA hubs in Mbulu and Arumeru and based on criteria set -Land availability, -Farm size -Soil characterization -Topography	SIMLESA
1.3.1.2		Community sensitization	1/10/2013	30/11/2013	-John Sariah -Marik _Marietha -Upendo -Massawe -Baitan -Mbise -Wilson		Convene meeting with the community (IP, Farmer groups, Extensionist) or stakeholders	SIMLESA
Activity 1.3.2	Development of protocols for on-station testing	On-farm evaluation protocols	1/11/2013	31/12/2013	SARI	National partners accept the need for on-farm participatory evaluation of 2WT-based technologies	Protocols to be used to produce output 1.3.4.	

1.3.2.1		Field trials establishment in Mbulu and Arumeru (trial designs, field protocol)	1/11/2013	31/12/2013	John Sarah Wilfred Marik Prosper Massawe		Development of field book (treatments identification) and information sharing. Seeding of the experiments using best bet planters	SIMLESA and CA SARD
Activity 1.3.3	Training of innovation platform members on basic calibration, operations and maintenance of tractors and ancillary equipment	Innovation platform memberstrained	1/12/2013	31/12/2013	CARMATEC	Knowledge gaps in 2WT-based technologies exist and are identified	Skills in the use of 2WT and ancillary equipment	
1.3.3.1		Awareness creation among the IP members	1/12/2013	31/12/2013	-Motorbike mechanics, -Machinery dealers, -Mechanics		Conduction of training (encourage of women)	LAMP, SIMLESA and CA SARD
1.3.3.2		Documentation	1/01/2014	31/01/2014	-SARI -CARMATEC -Machinery dealers		Report writing and sharing.	LAMP, SIMLESA and CA SARD
Activity 1.3.4	Participatory evaluation and adaptation of best bet 2WT-based technologies	Technical report on the performance of the best bet technologies (e.g. range of crops that can be successfully sown, residue handling capacity, performance under a range of typical soil textures, moisture contents and bulk densities)	1/01/2014	31/12/2014	-SARI -CARMATEC -Machinery dealers	Political stability in the different countries, no extreme weather event	Refined technologies scaled out through business models (Objective 2) Research questions for on-station component technology investigation	

1.3.4.1		Field experimentation.	1/01/2014	31/12/2014	SARI,CARMATEC , EXTENSIONIST		Farmers selection/on farm experiment -Plot size 20 x 50 m	LAMP, SIMLESA and CA SARD
1.3.4.2		Dissemination	Late stage of crop		John Sariah Wilfred marik Baitan Mbise Hazal Prosper Marietha Upendo		Farmers assessment, -Field days -Exchange visits	
Output 1.4	**Exploration of short term incentives and long-term impact of 2WT-based technologies on farmer livelihoods through farm bio-economic models.**							
Activity 1.4.1	Development of farm typology, based on farm power availability and constraints	Prototype farms for simulation	1/06/2013	30/09/2013	GCAP (lead) SEP, CSU, DRD	Diversity between farms exist to allow for the delineation of farm types	Construction of farm prototypes to be used to produce output 1.4.3	
1.4.1.1		Check and verify the available data collected in 1.1.2 and 1.1.3 to identify farm typology (desk top study)			Upendo, Frederic, Songporne, Santiago			FACASI

Activity 1.4.2	Selection (or development) of a farm-scale model, calibration and validation	Model ready for simulation, for each farm type	1/10/2013	28/02/2014	GCAP (lead) SEP, CSU, SARI	Models exist or can be developed to answer the particular research question of the project; data available to calibrate and validate the selected model	Model adapted to local circumstances and research question to be used to produce output 1.4.3	CCAFS
1.4.2.1		Farm bio-economic model components and structure identified and agreed for each farm type			Upendo, Frederic, Songporne, Santiago			
1.4.2.2		Model calibration and validation			Upendo, Frederic, Songporne, Santiago			
Activity 1.4.3	Identification of realistic scenarios of change in available farm power and simulation of these scenarios	Outputs of simulation runs (e.g. expected labour input, cash flow) of various realistic modelling scenarios (incorporating adoption rate of different 2WT-based technologies)	1/03/2014	30/06/2014	GCAP (lead) SEP, CSU, DRD	The selected model demonstrates contrasted outputs for the different scenarios	Outputs communicated in user friendly forms (diagrams, etc.)	CCAFS
Activity 1.4.4	Participatory workshops discussing simulation outputs with each innovation platform	Workshop report for each innovation platform	1/07/2014	30/07/2014	SARI	Innovation platform members have interest in discussing simulation outputs	Guidance selection of a range of site specific 2WT based technologies to be used under objective 2w	CCAFS

1.4.4.1		Output of the model			Fredrick, Sonpong Sant ago Upendo			GCAP and CICAF
1.4.4.2		Stakeholder meeting			Hazal, Extensionoist			
1.4.4.3		Reports and recommendation						

DRD = National Agriculture Research System (DRD, KENDAT, EIAR, UZ), GCAP = Global Conservation Agriculture Program of CIMMYT, SEP = Socio-Economic Program of CIMMYT, CSU = Charles Sturt University, FAO = Food and Agriculture Organization of the United Nations, iDE = International Development Enterprise, ICAR = Indian Council of Agricultural Research

Appendix 6: workplan March 2013-February 2014 for Objective 2

SN	Outputs/ Activities	Milestones	Due date of output/ milestone	Responsibility
Output 2.1	**Country- and site specific market analysis of small-scale mechanization**			
Activity 2.1.1	Country-level literature review, complemented by a quick appraisal using key informants, of the following markets: 2WT, ancillary equipment, two-wheelers and three-wheelers, spare parts	Report on sector profile and sector organization in each country	TAN, KEN: September 2013; ETH, ZIM: Apr 2014	SEP (lead) NARS, GCAP
2.1.1.a	*TA Team (iDE-FAO) provides guideline on literature review to SEP.*		*5-Apr-13*	*Richard Rose*
2.1.1.b	*SEP works with National Social Ecomonic Partners to conduct literature review (2.1.1)*		*30 May, 2013*	*SEP*
2.1.1.c	*National Partners prepare report on literature review)*		*30 May, 2013*	*SEP*
2.1.1.d	*Review of Literature Review by TA Team*		*15 June, 2013*	*iDE-FAO*
2.1.1.e	*Finalization by NARS*		*30 June, 2013*	
Activity 2.1.2	Interview of national and local market actors (local importers, manufacturers, financial organization, mechanics and workshops) including the Government institutions	Report on the performance and constraints of the sector in each country	TAN, KEN: Jun 2013; ETH, ZIM: Jun 2014	NARS (lead) SEP, iDE, FAO, GCAP
2.1.2.a	*TA Team (iDE-FAO) provides guideline to NARS (Tanzania and Kenya) on conducting study into sector performance and constraints*		*15 June, 2013*	*Richard Rose (iDE)*
2.1.2.b	*NARS conduct market investigation with local actors*		*30 July, 2013*	*NARS*

2.1.2.c	*NARS prepares report on performance and constraints of the sector*		*15 August, 2013*	*NARS*
2.1.2.d	*TA Team review reports*		*30 August, 2013*	*Richard Rose, Rajiv Pradhan, Eden Kassaye (iDE); Heiko Bamman (FAO)*
2.1.2.e	*NARS finalize the reports*		*15 September, 2013*	*NARS*
Activity 2.1.3	Multi-stakeholder roundtable discussions in each IP to identify underlying causes for market systems weakness	Report on the identification of key services and interventions necessary to establish sustainable market systems. Recommendations on strategies enhancing markets and service deliveries	TAN, KEN: Nov 2013; ETH, ZIM: Aug 2014	NARS (lead) iDE, FAO, SEP, GCAP
2.1.3.a	*TA Team travels to Tanzania and Kenya (3-4 days) intervention development using ILA Framework*		*30 September, 2013*	*Richard Rose, Rajiv Pradhan, Eden Kassaye (iDE)*
2.1.3.b	*Constraints identified through sector performance and constraints report (Activity 2.1.2). Interventions are identified with NARS people*		*15 October, 2013*	*NARS*
2.1.3.c	*Validation workshop - multistakeholder roundtable with local stakeholders*		*15 October, 2013*	
2.1.3.d	*Report recommendations on strategies for enhancing market systems and service delivery drafted*		*30 October, 2013*	*NARS*
2.1.3.e	*Report reviewed by TA Team*		*15 November, 2013*	*Richard Rose, Rajiv Pradhan, Eden Kassaye (iDE)*

2.1.3.f	*Report finalised by NARS*		*30 November, 2013*	*NARS*
Output 2.2	**New or upgraded business model designed and re-designed**			
Activity 2.2.1	Focus group discussions with each actor group to prioritize critical success factors related to actor linkages and supporting services	Prioritized list of interventions	TAN, KEN: January 2014; ETH, ZIM: Oct 2014	SEP, NARS (lead) iDE, FAO, GCAP
2.2.1.a	*Design business models for each intervention*		*30 November, 2013*	*Business Model Expert*
2.2.1.b	*Review of business models by TA Team*		*15 December, 2013*	*iDE-FAO*
2.2.1.c	*Interventions tested through further engagement with market actors and customers (FGDs)*		*15 January, 2013*	*Business Model Expert*
Activity 2.2.2	Multi-stakeholder roundtables to secure agreement on an action plan for the design of a new business model or the upgrading of an existing one	Draft agreements with identified stakeholder/market actor	TAN, KEN: Feb 2014; ETH, ZIM: Jan 2015	NARS (lead) iDE, FAO, SEP, GCAP
2.2.2.a	*Agreements drafted by Business Model Expert (between project and key Private Sector Actor (PSA))*		*30 January, 2014*	*Business Model Expert*
2.2.2.b	*Agreements reviewed by TA Team (as required)*		15 February, 2013	*Richard Rose, Rajiv Pradhan, Eden Kassaye (iDE); Heiko Bamman (FAO)*
2.2.2.c	*Agreements developed and signed with key stakeholders (2WT Companies, importers etc)*		*28 February, 2014*	*Business Model Expert*

Activity 2.2.3	Ex ante business study to assess the potential impact of new/upgraded business models (considering the size of the market, profit along the market chain, etc.)	Cost-benefit analysis for farmers, net present value and breakeven point of investment for rural service providers, for local importers and manufacturers, and for financial and credit institutions	TAN, KEN: Jun 2014; ETH, ZIM: May 2015	SEP, iDE, FAO (lead) NARS,
2.2.3.a	*Develop guidelines to conduct the study to assess impacts of new/ upgraded business model*		*30 March, 2014*	*iDE-FAO*
2.2.3.b	*Provide guidance on target study respondents*		*30 March, 2014*	*iDE-FAO*
2.2.3.c	*Training provided to study team*		*15 April, 2014*	*Business Model Expert*
2.2.3.d	*Conduct Study on new/ upgraded business models*		*15 May, 2014*	*Business Model Expert & Study Team*
2.2.3.e	*TA team reviews draft study report*		*30 May, 2014*	*iDE-FAO*
2.2.3.f	*Report finalised by Business Model Expert*		*15 June, 2014*	*Business Model Expert*
Activity 2.2.4	Focus group discussions to 'demonstrate incentive' (cost-benefit analysis, net present value, breakeven point) to each group of market actor (including financial institution)	Reports on the focus group discussion	TAN, KEN: Jul 2014; ETH, ZIM: Jul 2015	SEP, NARS (lead) iDE, FAO
2.2.4.a	*TA Team provides guideline to NARS and SEP on demonstrating incentives to particular market actors*		*30 June, 2014*	*iDE-FAO*
2.2.4.b	*NARS and SEP conduct FGDs with market actor groups*		*30 July, 2014*	*NARS & SEP*
2.2.4.c	*NARS and SEP finalize reports*		*15 August, 2014*	*NARS & SEP*

Activity 2.2.5	Annual multi-stakeholder roundtable in each IP to evaluate and refine (if need be) the new/upgraded business model	Minutes of the roundtable	TAN: Aug 2014, Aug 2015, Aug 2016; KEN: Jun 2014, Jun 2015, Jun 2016; ETH: Jul 2015, Jul 2016; ZIM: Aug 2015, Aug 2016	NARS (lead) SEP
2.2.5.a				
2.2.5.b				
2.2.5.c				