



Business Models of Two Wheel Tractors in Southern and Eastern Africa



Australian Government
Australian Centre for
International Agricultural Research



 **CIMMYT**_{MR}
International Maize and Wheat Improvement Center

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FACASI: Technical Working Paper 1- July 2016

About the FACASI Project

The Farm Mechanization and Conservation Agriculture for Sustainable Intensification (FACASI) project addresses the decline of Farm power in Africa. The Project works with small holder farmers to deliver small mechanization based on inexpensive, two wheeled tractors and the introduction of power-saving technologies, like conservation agriculture. The overall goal is to improve farm power balance, reduce labour drudgery, and minimize biomass trade-offs in Eastern and Southern Africa, through accelerated delivery and adoption of 2WT-based technologies by smallholders

For more information, visit www.facasi@act-africa.org

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Acknowledgements

This Technical working paper is a collaborative work by the FACASI project Country coordinators, G. Girma and Bisrat Getnet, Ethiopia; Raymond Nazare and Special Musoni Zimbabwe; John Sariah, Eric Njau, Benesta Titus, Tanzania; Joseph Mutua and P. Kaumbutho, Kenya; Achora Janet Cox and Weldone Mutai from ACT. The paper was jointly developed with the FACASI- CIMMYT Business development specialists led by Kahan David Gerald.

Special thanks go to the Technical Review Committee members, David Kahan, Frederic Baudron, Richard Bell, Scot Justice and Saidi Mkomwa.

The background information for this paper was informed by syntheses of the FACASI Countries market analysis and business modelling reports. This information was supplemented with the Knowledge Management working group discussion notes from the Monitoring and Evaluation and knowledge management workshop held in Nanyuki, Kenya in April 2015.

The paper has been synthesized and designed by the African Conservation Tillage Network Team composed of Janet Achora, Weldone Mutai and Eng. Saidi Mkomwa.

The production of this paper has been made possible by the generous support of the Australian International Food Security Centre (AIFSC), through the Australian Centre for International Agricultural Research (ACIAR) and the International Maize and Wheat Improvement Centre (CIMMYT).

Recommended Citation

FACASI Technical WP (2016). Business Models of Two Wheel Tractors in Southern and Eastern Africa: Technical Working Papers, July 2016.

Acronyms and Abbreviations

2WT	Two Wheel Tractor
4WT	Four Wheel Tractor
AAL	Agrimech Africa Ltd
ACIAR	Australian Centre for International Agricultural Research
ACT	African Conservation Tillage Network
AIFSC	Australian International Food Security Centre
ATA	Appropriate Africa Technology
ATDC	Agricultural Technology Development Centres
CA	Conservation Agriculture
CIMMYT	International Maize and Wheat Improvement Centre
CSF	Critical Success Factors
EIAR	Ethiopian Institute of Agricultural Research
FACASI	Farm Mechanization and Conservation Agriculture for Sustainable Intensification
GDP	Gross Domestic Product
iDE	International Development Enterprises
KALRO	Kenya Agriculture and Livestock Research Organization
KENDAT	Kenya Network for Dissemination of Agricultural Technologies
M & E	Monitoring and Evaluation
METEC	Metal and Engineering Technology Corporation
PASS	Private Agricultural Sector Support Limited
SACCO	Savings and Credit Organizations (s)
SIMLESA	Sustainable Intensification of Maize and Legume Systems for Food Security in Eastern and Southern Africa
SP	Service Provider
ZIMCLIFS	Zimbabwe Crop-Livestock Integration for Food Security

1 Introduction

Agriculture is the leading sector of the economies of the four FACASI project countries Ethiopia, Kenya, Tanzania and Zimbabwe and provides a means of livelihood for about 60 to 80 percent of the rural populations. The sector contributes 18 to 26% GDP annually and accounts for between 60 to 80% of the total exports. The Agricultural sector is characterized mostly by small holdings maize-legume (beans, soya beans, lablab, pigeon pea, groundnuts) farming system managed by small scale farmers who cultivate less than two hectares of land. These farmers rely on rain fed agriculture for their agricultural production and attain average maize yields of about one tonne/hectare. Most of the land is cultivated by hand (80%), oxen (13%), and tractors (5%) and usually intercropped. Thus, the sector is poorly mechanized with over 80 per cent of the land prepared using manual labour with the hand hoe as the main tool of trade and the remaining using animal drawn equipment.

This reliance on family human labour has proved a big limitation to productivity, income generation and expansion of agriculture. The cost of machinery is often a limiting factor for small scale farmers who have low purchasing power to afford mechanized farming. In this regard, therefore, governments have to devise ways of mechanizing this sector to effectively contribute to the achievement of real agricultural growth and increasing productivity among small scale farmers.

Mechanization improves the timeliness and efficiency of farm operations leading to cost savings and increased yields; it reduces drudgery in farming activities thereby enhancing lifestyles and it provides employment opportunities in communities and can lead to agriculture-led industrialization and rural economic growth. Depending on varied circumstances, the problem of shortage of labour arising from high rural-urban migration of able-bodied persons is another reason for mechanization. The Two Wheel Tractor (2WT) is one of the solutions that can address the small scale mechanization challenges due to its relative low cost, ease of use and versatility.

A total of eight FACASI project sites were selected in the four countries; Hawassa Zuria and Assela in Ethiopia, Bungoma and Laikipia in Kenya, Mbulu and Arumeru in Tanzania, and Domboshawa and Makonde in Zimbabwe. One site per country was already participating either under the SIMLESA or ZIMCLIFS projects. Each site was working with a number of farmer groups.

Smallholder farmers require support in transiting from the rudimentary methods of tilling land to mechanization in a bid to modernize agricultural operations through a market-oriented wealth creating and enabling environment. This requires the efforts of the governments, non-governmental organizations and the private sector to work together and share information on suitable business models that can be used to promote the 2WT.

As most small farmers may never be able to own a 2WT (and other needed agricultural equipment) due to their high costs, the FACASI project targeted the private sector based supply chain, specifically the agri-machinery Service Providers to promote conservation agriculture and facilitate access by smallholders to affordable farm equipment and technologies through 2WTs and business modelling. The project linked small holder farmers to mechanization technologies and input supply networks. After a situational analysis of selected sites, the project identified five key business models used in the supply chain for accessing 2WT services. The aim of this paper is to highlight these business models, suitability of the functions performed in the promotion of the 2WT, and propose ways to improve businesses along the value chains.

2 Understanding business models for smallholder mechanization

The business model approach has become popular in recent years (Osterwalder et al., 2005) partly because the continuously changing business processes, practices, and operations have to meet the needs of the marketplaces to ensure competitiveness and sustainability. But what is a business model? One of the most compelling definitions of a business model is that given by Osterwalder et al. “how a company organizes to generate revenue and sustain itself”. A more nuanced definition has been given by the Business Model Institute, as a “method to acquire customers, service them and make money in doing so” (Muehlhausen, 2013). In its most simplistic form, it is simply a blueprint of how a company or enterprise does business. As a conceptual framework it contains elements and relationships that enable companies to express their business logic showing how a business can acquire its customers, service them and make money in doing so. The business model can, subsequently, be understood as representing the architecture of the business and its network of partners to create, market and deliver value to generate profitable and sustainable revenue streams.

Business models in this respect can be viewed as a sub-set of a value chain which takes a macro perspective of the 2WT mechanization chain. The business model approach focuses on addressing the specific constraints that affect stakeholder relations. These could include the relationship between the farmer – the customer – and the dealer, the farmer and the service provider and the farmer and the manufacturer of spare parts. In the context of smallholder agriculture, business models must deliver essential services to farmers to enable them to adopt and utilize improved technologies. There is a growing body of experience showing that “win-win” outcomes are possible through commercially viable business models which involve small farmers and businesses (Vorley et al., 2008). A strong dealer-service provider- farmer relationship is the foundation on which commercially viable business models can be developed to provide mechanization services that meet farmers’ requirements in terms of quality, price and support services.

3 Analytical framework and approach

The business model concept can be used as an analytical tool to understand how a business enterprise operates, interacts with its clients, covers costs and makes profits. An analytical framework was developed to appraise the business models of the key supply chain actors including dealers, manufacturers and service providers. The analytical framework is presented in Table 1. Analysis of each business model covered the main components of the business model wheel as elaborated below. The results of a business model analysis allow the business to understand where it needs to innovate in order to compete more efficiently or to reach its desired target customers.

Table 1: Business Model Segments and Definitions

Components	Segments	Definition
Infrastructure	Business organization	The organization of the business that includes the channels of communication, the key partners, and key suppliers as characterized through a business model mapping.
	Key partners and collaboration	The type of relationships that the business has with its buyers, suppliers, service providers; the motivations and disincentives for collaborating.
	Resources	Resources required to produce and add value (human, financial, physical, intellectual etc.) and the activities and processes key for the business operations.
	Activities	Activities that are crucial for the business to successfully function. They are required to create and sustain a Value Proposition, reach markets, maintain customer relationships, and earn revenue.
Offering (Product/ service)	Products	The products and services that the business offers to meet the needs of different categories of customer. This also comprises not only the company’s bundles of products and services but the way in which it differentiates itself from its competitors (e.g. low price, good quality).
	Flow of products/ services and distribution	Channels refer to how the business reaches and interfaces with its customers. In the case of agricultural technologies, the distribution channel is the logistics supply chain, which transfers the product between the dealer and its customers.
	Market attractiveness	Market attractiveness involves marketing a product/ service to the right combination of market, niche and customer. This involves understanding the current and future demand for the product and service.
	Value proposition	The value proposition underpins the success of any business model and is the reason why customers choose a product or service over another. The value proposition should offer a solid combination of economic, social and environmental value to both downstream and upstream actors.
	Business strategy	The strategies that the business model drivers/ partners have to increase profits and market share; enter into a new market; and consolidate an existing market, etc.

Components	Segments	Definition
Customer	Customers, market segmentation	Understanding the needs of the customers or customer segments to determine how to best satisfy those needs.
	Customer relations	The type of relationship the business wants to create with each customer segment in order to deliver the product/ service.
	Customer benefits and satisfaction	Businesses must identify the benefits that they provide to customers and their satisfaction with the product/ service.
Monetization	Prices	The prices and margins set in the creation and delivery of a value proposition and in generating income.
	Costs	The cost structure refers to the costs incurred for the creation and delivery of a value proposition, maintaining customer relationships and generating income.
	Revenues	The revenue stream refers to the way a business makes income from each customer segment. The revenue stream comprises the value proposition ensuring that it reaches a customer (segment) through a certain channel, supported by a distinct type of relationship.
	Profitability and finance	This refers to the overall profitability of the business and the gross margin of the different services or products offered.
	Sales/ market performance	The performance of the business with respect to marketing and sales.
Sustainability	Capacity and competencies	The capacity, competencies and skills needed for the business to <i>innovate, respond to changes and risks</i> and ensure that the business model is able to sustain itself.
	Risk mitigation	Activities and interventions needed to mitigate business risks that could cause the business to fail.
	Innovation	Innovations that are needed to strengthen the business model and its ability to compete. These could be technological, product and processes.
	Competitive advantage	Competitive advantage is the sum of all the aspects of the business model (core competencies and culture) that competitors would wish they could copy. It is critical in ensuring a competitive advantage and keeping the business model strong.

Source: Adapted from Osterwalder (2004) and Muehlhausen (2013)

The steps to analyse the different business models are summarized below:

- i). *Identification of existing business models*: Existing business models are identified through a series of key informant interviews, meetings with experts and key informants, extension workers, private sector actors and service providers.
- ii). *Analysis of the current business model*: This step analyses the way business owners and/ or managers are currently doing business. The individual business models are characterized through the range of attributes listed previously – infrastructure, customers, the offering, monetization, and sustainability.
- iii). *Identification of critical success factors (CSFs)*: The CSFs are what customers particularly value when buying machineries and technologies or receiving services. Round-table discussions take place between the key business model actors (dealers, manufacturers, service providers) and their customers and is important to identify critical constraints from the two perspectives (business and customer).
- iv). *Design of an upgraded business plan*: Based on the results of the business model analysis and the CSF strategies and actions for upgrading the business models can be developed.

4 Business models employed in accessing 2WT services in the FACASI project

4.1 Overview

Business models mainstream business thinking by reducing reliance on multi-stakeholders approaches and focusing on real development drivers. As mentioned, earlier, they are blueprints that explain how businesses, in this case of 2WTs and conservation agriculture, are organized to generate revenue and sustain themselves. A broad range of business models for the provision of mechanization goods and services were identified in the four countries and later prioritized for in-depth analysis. The models were represented into four analytical groupings: (1) private sector led service provider (SP) models (2) farmer group led SP models (3) corporate led service provider models and (4) dealer-manufacturer led supply chain models. The first three categories represent service providers offering custom hire services directly to their farmer clients. The fourth category is broader than the others and characterizes the linkages between the importer (dealer) and manufacturer and their customers (SPs and farmers) as an integral relationship in the 2WT supply chain.

The business models identified can be elaborated more fully:

- i). *Service provider-led models*
 1. Individual ownership service provider business model;
 2. Group ownership service provider model;
 3. Corporate ownership service provider models (contract farming, and the one-stop-shop or hub).
- ii). *Dealer/Manufacturer-led models*
 4. Dealer-led input linkage level model; and
 5. Manufacturer-led input linkage level model.

4.2 Individual ownership service provider business model

This business model encompasses businesses owned by individuals or individuals in partnerships.

The distinguishing factor of this model is the flexibility of the business owners to make business decisions that do not require broad consultations especially approvals for actions. In this model, individual owners offer 2WT services to clients in the form of tractor hire services, maintenance of the 2WT machinery, ancillary equipment, and support services. Small holder farmers and entrepreneurs at community level characterize this model. They own the tractors and provide services to the communities at a fee. They are the end users in the 2WT value chain. The advantages of this model include high level of business ownership and accountability; better management of equipment, faster adoption of ideas and high levels of innovations. . Owners of this type of business respond in a timely manner and are able to make appropriate adjustments to situations. If managed well there is good prospects of high business returns.

The model however faces a number of challenges especially in the rural setting as the business relies heavily on individuals to perform all the tasks involved. The individual model though owned by one person, employs other personnel to handle the various sectors of the business. Individual businesses also tend to be high risk; the line between the business and individual finances is often blurred as the business is treated as an extended household activity. This can have dire consequences for a hire service business often facing problems in mobilizing resources to start the enterprise.

Based on intervention logic analysis through focused group discussions and farm surveys, interventions to improve this model include capacity building of the individual businesses in the areas of management and leadership skills, business management, risk management, modern IT and awareness creation on creating partnerships and fund raising strategies.

Notwithstanding, the individual ownership service provider business model is the most widely used model in the project areas and is the most suitable in the provision of tractor hire services to farmers as these

businesses form part of the communities that they serve. The success of the 2WT depends on this model because its clientele exert greater demand for the tractor in the supply chain. Table 2 below illustrates the individual businesses providing 2WT services in the four countries.

Table 2: Individual ownership businesses providing 2WT services to farmers

Country	Approximate no. of individual service providers	Approximate no. of farmers as service providers	Approximate no. of farmers reached in the project area
Ethiopia	4		200
Kenya	13	8	300
Tanzania	15	32	2000
Zimbabwe	2	6	10

Source: FACASI project reports, 2014.

Ethiopia

In Ethiopia there are four individual owned 2WT service providers around Hawasa city (Tulo and Dore Bafena Kebele). All the service providers are model farmers and they have operators who were trained by the FACASI project. These service providers received the 2WT through a lending scheme organised by METEC - a government parastatal dealer and manufacturer. The terms of lending require a 30 percent down payment with the remaining 70 percent paid over a 24 month period. To strengthen their business and use the 2WT throughout the year FACASI provided a trailer to each service provider as a grant. Although they started their business recently the service providers offer ploughing and transportation services and have started making money. Since the technology is new for the area and spare parts availability sparse, this has been a major obstacle to ensure smooth performance in the field. Moreover, in some of locations awareness of conservation agriculture (CA) is low and farmers are reluctant to stop ploughing and adopt the new ripper/ seeder technology developed by the project. In order to address the problem of spare parts availability, the project is working closely with local manufacturers and mechanics who can support the hire service providers by repairing and maintaining equipment. Similarly in collaboration with EIAR the project is working on field trials and organizing demonstration and field days in potential CA sites to help farmers to realise the benefits of 2WT mechanization for CA.

Kenya

In Laikipia County, two brothers provide services to other farmers using a 2WT provided by the FACASI project. According to them, the tractor can plant eight acres of land in a day, using the two-row Fitarelli, under ideal conditions. This is as opposed to planting three acres using draught animal power with a single row Fitarelli planter or one acre, using human power in the form of ten women a day. The brothers report that they can make good money comparatively using the 2WT for service provision. They are also able to do some 80 acres in a season of a short 4-week planting window, which translates to some 200 farmers. Despite keeping poor records, the brothers know that at a 4 litre fuel consumption per day compared to the hassles of feeding draught animals, waking up to walk some 14km at 3 am, draught and diseases that make draught animal maintenance a true challenge. However while 2WT beat oxen and labour hands down, their challenges are real in comparison to the use of a 4WT, a dream of providers that are climbing progressively from oxen. The challenges include: i) low speed between farms which could be long distances apart. ii) Limited power for many other operations sought by CA clients such as harrowing and subsoiling. The providers value greatly the fact that the 2WT is versatile for transport, post-harvest operations like shelling and threshing.

Tanzania

In Tanzania, there are about sixteen 2WT service providers in Mbulu district and a further sixteen in Arumeru district. These are a mixture of group and individual service providers, and all of them are farmers. They have good experience in farming, and maintain a good relationship with their fellow farmers as well. Most of them are experienced in providing hiring services such as transportation using trailers, Shelling using shellers or threshers, tillage, milling and water lifting in irrigations.

Challenges: 95 percent of them are not providing services at full capacity so most farmers are not reached, the services are not provided as business but ‘business as usual,-’ i.e., casual service at a fee. The service providers do not take these activities as business venture, and lack business management skills such as record keeping, organizational skills and business management in general. Other challenges are; lack of spare parts around their areas of work, lack of machine management and maintenance knowledge, lack of mechanics available locally, lack of mechanization extension services, lack of investment and operating capital and lack of competent operators.

Zimbabwe

In Zimbabwe, individual farmers who also own 4WT tractors hire them out for a fee for various services to other farmers. The service operations include ploughing, planting, harvesting and transportation. The custom hire charges vary from area to area ranging from \$42/ha in Makonde to \$60-65/ha in Domboshawa.

4.3 Group ownership service provider model

The second type of business model is group-based models where individuals or individual farmers come together and form groups with the main purpose of serving the members’ interest. In this model, the key characteristic is that its focal point is the satisfaction of the members in a group. These groups are legally registered and have a governing constitution and management structure. The groups can be very large (cooperative societies) or small depending on their objectives. Their main aim is to provide services to their members as well as non-members. Groups or cooperatives that own machinery are able to offer timely services to their members in line with their constitutions. The advantage of this business model is its ability to pool resources for the procurement of required machinery through collective action and to utilize economies of scale in lowering the cost of doing business and the cost of equipment. The business risk is spread and communities progress as services are provided to beneficiary members irrespective of their status in the society.

Group ownership model is often well intended but faces a number of challenges associated with group dynamics, leadership and business management that more often than not lead to the disintegration of the groups. Other challenges include slow decision making mechanisms, slow pace of service provision that lead to member dissatisfaction, and relatively low profits per member. Group dissolution is often high. The model encompasses cooperative unions, community based groups such as mixed groups, youth groups, women groups and men groups.

Despite the challenges, the model is popular and is useful in pooling resources amongst resource poor communities. Groups can be assisted through capacity building in the areas of organizational skills, leadership skills and business management to serve their members better. This model is most suitable in providing tractor hire services at community level as membership is comprised of farmers. With proper management, it has the potential to provide reasonable demand for the 2WT. Table3 below shows the community based groups and Cooperative unions providing 2WT services.

Table 3: Community Based Groups & Cooperative Unions providing 2WT services to farmers

Country	No. of CBO service providers	No. of Cooperative Unions service providers	No. of farmers reached in the project area
Ethiopia	-	3	150
Kenya	1	-	20
Tanzania	17	-	2500
Zimbabwe	3	-	2400

Source: FACASI project reports, 2014.

Ethiopia

Among the three cooperative unions engaged in 2WT service, DuroLangano Vegetable and fruit cooperatives union is the one working in ArsiNegele. The union established in 2000 E.C. by 16 primary cooperatives of 1200 members out of which, 1110 male and 90 Females. The union works mainly in vegetable and fruit marketing, distribution of agricultural inputs. The union's capital is around 14 million. The union had no experience of tractor service business and their business has so far centred on agricultural output and input marketing. But now they have expanded their businesses and started offering 2WT based services to their members and non-members. The union received a 2WT with a trailer from FACASI project implementing partner organization called IDE. On average each cooperative had given service for 50 farmer over a period of two months. The union provides the services through hired operators and this creates a challenge in controlling the day to day activities of the service provision and meeting the farmers' demands.

Kenya

Tuuti Community group in Bungoma County is a 2WT service provider founded between 2008 and 2010. The group was given the 2WT through a Ministry of Planning programme. The group has 32 members of whom 20 are active. It has a committee that manages the tractor service and they offer services to members as well as non-members. The group experienced technical difficulties, a situation that kept their tractor idle for several years. They eventually received technical support from the FACASI project which got their machinery operational. They are however yet to get into active service provision. The groups' main challenges is organizational, including the support of a trained member to serve others

In 2014, the Government of Kenya established a mechanization unit under the Kenya Agriculture and Livestock Research Organization (KALRO) at Katumani in Machakos County. This unit has conducted a survey of 2WT needs and will share its findings with the public. The Government of Kenya also received a donation of ten 2WT from the Government of South Korea. The mechanization unit hopes to enhance 2WT service through the Agricultural Technology Development Centres (ATDCs), spread throughout the country.

Zimbabwe

No group business models have been formed in Zimbabwe yet. FACASI activities are newly formulated. Independent group models have been set up in Zimbabwe in 2016 starting off with shelling services. These groups are using their own resources to acquire the equipment with financial and technical support from FACASI. The objective is for them to raise income from the shelling services and then go on to buy tractors and planters for the coming cropping season in October 2016.

It is **important** to note that for **Tanzania**, under this category, the description and illustration of the business model scenario or case is the same as described earlier under Individual ownership service provider business model.

4.4 Corporate Ownership Service Provider Models

The third service provider business model are large corporate companies that offer various products and services to farmers either through outright purchases or through contracts have the potential to include tractor hire services to their clients. Included here are players in the input markets such as suppliers of seed, fertilizers and chemicals and output markets – companies that deal in selling or processing marketed produce or both. These are medium to large companies with well-established sound business management systems and large capital bases. Companies with contractual arrangements with farmers are best placed to offer hire services. They are able to negotiate contracts with farmers and are often involved in building the capacity of their contracted farmers. Because of the contractual nature of their interaction with farmers, a symbiotic relationship is created between the two actors and when contracts are honoured, a level of trust is created. Farmers can rely on the companies to provide products and tillage services on credit and payments are made in kind after harvest. The advantage of this model is that contracts are negotiated beforehand and farmers are able to receive services on time.

The main obstacle in providing tractor hire services to small holder farmers in this model lies in the physical distance between the farmers and the companies. Corporate companies tend to be located in centralized offices with regional offices far from the needs of the farmers. This can however be addressed if the companies are linked with individuals or groups that offer hire services through an agreed memorandum of understanding.

Other challenges faced by corporate companies include susceptibility to international market fluctuations that affect the contractual arrangements made with farmers in terms of pricing of machinery, dishonoured contracts by the farmers and fluctuating bank interest rates. Areas of intervention include introduction of business-oriented conservation agriculture to identify wealth-creating opportunities, increase income, reduce farmer losses decrease input costs and boost yields hence the farmers' ability to pay his debts. Corporate companies should participate in policy making processes that address their challenges. However, Table 3 below shows corporate companies providing services to farmers.

In Kenya, through KENDAT (an NGO) and Agrimech Africa Ltd (AAL) are implementing the mechanization hub. The hub is an alternative corporate service model. It is a multi-purpose training and information exchange centre offering hire services and run on a commercial basis. This model functions as a one-stop shop, providing mechanization services (2WT and 4WT based), together with complementary bundles of management and economic services that include finance, training and advisory services. The information and services exchange centre aims to focus on crop aggregation, storage and even value-addition with winning links to market outlets and industrial processors. The hub is intended as a one-stop-shop for all agribusiness partners to congregate and build business relationships. Day to day activities, apart from farm mechanization and transport services include but are not limited to agro-input sales and training, operational formal and informal training (including women and youth). Facilities include a demonstration farm and technical-training aids, sales unit with workshop, provision of spare parts, repairs and maintenance unit, referral services meetings, product launches etc.

Full range of mechanization services for crop and livestock farmers is seen by AAL as an entry point to future full-range of agribusiness services including all components of the agricultural value and supply chains. The ultimate vision for AAL is a one-stop hub with "total solutions for farmers", like their slogan reads.

Table 4: Corporate companies providing 2WT services to farmers

Country	No of corporate companies providing tractor hire services to farmers	No of farmers reached in the project area
Ethiopia	Ethiopia does not have this type of model	
Kenya	Through FACASI and the support of USAID, Kenya Feed the Future Innovation Engine (KFIE) KENDAT (an NGO) and her subsidiary business-wing company, Agrimech Africa Ltd (AAL) – where KENDAT has 20% shares has established a one-stop-centre for mechanization hire services by farmers. AAL has trained and employed three service providers as well as absorbed two other highly experienced providers into the hub services model. Another company working under the corporate model is Nyabon Enterprises, based in Kisumu in Western Kenya. Nyabon sells 2WT models from India and is establishing a sales-training and service unit to work with those that purchase their machinery.	
Tanzania	In Tanzania by the time of writing this paper, this model had not been identified. but the project is in the process of looking for these models	
Zimbabwe	Three companies were currently setting up (cotton, chillies contracting companies and one promoting agro dealers). Examples from Zimbabwe include, Alliance Gineries a cotton contraction company, Better Agriculture, a chillies contracting company and Farm shop a company promoting agro dealers and offering 2WT based services	The contracted farmers targeted would be in excess of 500

Source: FACASI project reports, 2014

4.5 Dealer Led Input Linkage Level Model

The fourth model are dealer-led input linkage business models. Here, dealers are the large companies whose main business is the importation of tractors, machinery and equipment. They have sound capital bases and management systems in place. They are mainly based in the capital cities with regional offices that serve their interests. They are the key suppliers of technology as they are involved in the introduction and marketing of new technologies developed elsewhere but consumed in their areas operations. In addition to importing technologies, dealers are involved in providing market information to farmers about the technologies through demonstrations and other channels of communication. They also support farmers and other stakeholders through trainings in business management and machinery operations and maintenance. Some dealers may offer direct tractor hire services to farmers through their field offices in addition to their core businesses of sale of machinery. Their support mechanism to farmers and other service providers makes them a valuable player in the 2WT value chain.

Challenges faced by dealers include relatively low business turnover due to low purchasing power of clients, changing taxation system (VAT depends on government of the day) they focus on large commercial farmers and do not give smallholders mechanization priority due to their low purchasing power. Intervention areas include involvement in policy formulation, formation advocacy association and partnerships with financial institutions to empower the small holder farmers and other stakeholders in accessing the 2WT, Table 5 shows that few dealers are importing 2WT.

Table 5: Dealers importing tractors in the project areas

Country	Approximate No of tractor importers (dealers)	Approximate No dealers that import 4WT	Approximate No dealers that import 2WT	Approximate number of 2WT in the county (2013)
Ethiopia	12	12	4	Over 5000
Kenya	10	10	4	Less than 500
Tanzania	53	53	10	Over 6000
Zimbabwe	17	12	5	Over 150

Source: FACASI project reports, 2014

Ethiopia

The Adama Agricultural Machinery Industry which formerly was called Nazareth Tractor Assembly Plant (NTAP), is a government factory that is engaged in assembling “semi-knocked down” (SKD) tractor parts. NTAP is involved in assembling pedestrian-controlled tractors with 8-15HP, small size tractors with 18-40HP and heavy duty tractors with up to 130 HP. It is also engaged in the production of simple implements such as disc harrows and disc ploughs, as well as in the assembly of 6, 8, 10 and 12 ton trailers for haulage and transportation of agricultural inputs and products. During the period NTAP has been in operation, it has produced a total of about 6,000 tractors mostly small to medium sized.

NTAP was renamed the Adama Agricultural Machinery Industry (AAMI) in 1992. It was transferred to the Metal and Engineering Technology Corporation (METEC) in 2010. Within the last three years, it is estimated that METEC has imported around 5000 tractors and 3000 2WT, increasing the previous estimate to around 10,000 tractors. So far, more than 1000 of imported 2 WTs have been sold to the regions, and Southern region took the biggest share by purchasing 300 walking tractors. Availability of this machinery offers greater opportunity of enhancing their use in the promotion of mechanized conservation agriculture.

AMIO Engineering

AMIO Engineering Imported 25 Sifang and 2 Dong Feng china made walking tractors in 2012 and sold 15 of them. The main reason for importing the two brands was to compare their performance. After sale service includes one year warranty period and training for operators. The challenges for not selling the entire tractor to clients are affordability and low tillage efficiency. Amio also imports ploughs, trailers, harvesters/reapers, planters, pumps, shellers and forage cutters. The company maintains fast moving spare parts from stock.

Problems associated with 2WT include low market demand, low comfortableness of tractors, no proper skill and training for operators to operate the tractors, no quality control system. They believe 2WTs do have a potential to scale up in specific areas but this all depends on soil type and awareness creation for clients.

Kenya

There are some ten, 2WT importers in Kenya. There are only three established importers while the rest import on an order basis or as business opportunities arise. The established companies are Flying Horse, CAMCO and Marina Machineries. Occasional importers on a case by case basis are such as Car and General, Nyabon Enterprises and Ndume Ltd. Nyabon Enterprises Ltd is an upcoming dealer with interest in serving smallholders directly. Lotech Ventures Ltd is an upcoming fabricator for 2WT sprayers and trailers. They also fabricate manual tools like shallow weeders and 2WT subsoilers, rippers and ridgers.

Tanzania

In Tanzania there are 53 companies that sell 4WTs and 2WTs and among those 10 companies sell 2WTs (MAFC 2014). This increase of farm machinery dealers has been caused by the following factors that has led to high competition and better performance within the sector: government intervention through tenders to promote farm machinery availability to smallholder farmers, better enabling environment that encourages importation, VAT on farm machineries waived, availability of finances to importers and farmers through government support: Agricultural investment window in Tanzania Investment Bank, involvement of commercial banks and non-banking institutions in provision of finances to smallholder farmers. As result there has been an increase in farmers shifting farm power from oxen to small mechanization equipment like 2WTs. The local dealers are experienced in importing several farm technologies and also supplying using different channels to different customers in the country. They have branches in different regions and work with agents to ensure supply to their customers.

The challenges that these companies face are: lack of proper information sharing on the industry situation and progress between the government and importers, there is no strong coordination among market players from importers to farmers and no facilities that address the issue of risk sharing among the market systems. This has caused a big gap between farmers and farm machinery dealers, failure for most dealers to conduct on-field demonstrations that accelerate the adoption process to farmers, long supply chain from the dealers to farmers who live in the rural areas, low purchasing power of most farmers especially smallholder farmers, and changes in importation policies on farm machineries and spare parts.

Zimbabwe

In Zimbabwe, Appropriate Africa Technology (ATA) is the main importer of 2WT. The company imports from China the Changfa brand. The machines are of varying sizes in terms of horse power (12-22hp). The ATA rebrand the machines with company name (ATA). ATA has been importing an average of 50 units per year. With the general decline of the 4WT sales over the years the 2WT has an estimated market share of less than 5%. Some of the challenges faced are lack of awareness of 2WT and their capabilities, lack of 2WT attachments on the local market, lack of training facilities to promote correct use of the 2WT technology.

4.6. Manufacturer led Input Linkage Level model

The fifth model, is a manufacturer-led input linkage business level. Eastern African countries do not manufacture tractors; some countries are however involved in the manufacture of various tractor machinery attachments and ox-drawn implements. The distinguishing feature of the manufacturer led business model is their ability to respond to the needs of the end users by crafting implements suitable to the local communities. They guarantee spare parts and after sale services, a key element in adoption of mechanization, as this eliminates the need for importing spare parts which would not only be costly but also delay operations. Some manufacturers also assemble tractors thereby increasing the number of tractors available as well as creating jobs. Their specialization and locations makes them unsuitable in dealing directly with farmers in offering tractor hire services. They can however work closely with individuals, dealers and groups in meeting the demands of the farmers.

Challenges faced by manufacturers include high cost of importing raw materials, high costs of machine parts available in the domestic market, high interests on capital loans, business management due to too many operations and in some cases low use of IT.

The Manufacturing sector is the key stepping stone in the mechanization strategy in the region. The sector requires support from governments, in creating an enabling environment that will enable the sector to transform itself into fully-fledged tractor manufacturer. They require long term low interest financing, provision of factory space, support in research and development and support in importation of heavy duty machinery at lowered costs. Private sector manufacturer are few and under developed. Those in place

require capacity building in manufacturing technology, business management and information technology. Such training must include quality control and quality assurance to ensure manufacturing of lasting products. Table 5 below shows a summary of corporate companies offering 2WT services to farmers.

Table 6: Corporate companies providing 2WT services to farmers

Country	No of Manufacturers	No. that manufacture accessories for 2WT
Ethiopia	1	1
Kenya	1	0
Tanzania	4	10

Source: FACASI project reports, 2014

Ethiopia

Kaleb service PLC established 22 year ago with a vision to become the biggest manufacturer in the country. The company imports and sells both heavy duty tractors combine harvesters and agricultural implements. The company provides after sale service like training for operator, maintenances and repairs for damaged components within one year of warranty period.

The company imports tractor attachments, forage cutters, trailers, planters, sheller, threshers, sprayers and harrows. Mechanical seed drill, sheller and multi-crop threshers are being manufactured by the company locally. The company participates in trade fairs, demonstrations etc. as a means of promoting their products and equipment. The challenges on importation of 2WT especially from China are excessive vibration and lack of after sale service since Dong Feng brands do not have a sole agent for the service.

Kenya

Ndume Ltd is the largest manufacturer of farm tillage equipment in the country. Their posho mills have been in Kenya for a long time. The Farm implements they manufacture include Disc harrows, cultivators, trailers, seeders, ditch harrows. They have knowledge on the promotion of soil health and conservation agriculture therefore they do not manufacture disc ploughs because they create hard pans in soils. Ndume Ltd is the largest manufacturer of equipment in the country.

They sell about 300 posho mills, 30 disc-hallows and 30 chisel ploughs in a year. The prototypes are self-designed. They employ about 80 people and prefer on job training for their employees. They do not have distribution networks and only manufacture on order, therefore they do not stock equipment. The repair services are for their own equipment, they therefore do not provide these services to the public. They give their customers a one year warranty. They plough back their profits into the business to avoid bank loans because of the high cost of credit in Kenya. The company currently does not manufacture 2WT accompaniments but would be a good chain partner in manufacturing of 2WT equipment

Tanzania

In Tanzania, Nandra Engineering, Intermech, Elmi Farm Equipment and Victoria, are the few known companies for manufacturing farm machinery, mostly accessories. Nandra engineering and all the other companies supply their farm machinery all over the country. Farm implements manufactured include shellers, threshers, planters, winnowing machines, trailers disc plough, rippers, hallows and milling machines. Nandra engineering and Elmi manufacture oxen ploughs and they have manufactured one piece of 2WT each as an entry point.

The market for these implements is commercial farmers and smallholder farmers or rural entrepreneurs. The companies provide after sales services, spare parts and they are closer to customers.

Challenges faced are: the high cost of capital, lack of long-term loans or financial packages, competition with imported implements, high costs of machine parts in the domestic market, lack of policies to promote locally manufactured policies, and lack of business management skills especially in the area of business models.

Zimbabwe

Grownet Investments is a Zimbabwean small-scale agricultural equipment manufacturer, with interests in producing appropriate technologies for emerging smallholder farmers, and related post-harvest equipment. The company manufactures ox-drawn equipment, shellers, and direct seeders for both ox and tractor drawn. Since 2009, Grownet has established collaborative initiatives with research institutes, non-governmental organizations and the national agricultural extension services in efforts to design and manufacture direct seeders and jab planters for CA purposes. Grownet is currently in the process of developing a single row no till planter to be drawn by 2WT's.

Hastt Zimbabwe was a leading manufacturer of agricultural implements, haulage equipment and plough and harrow discs for both the local and export markets. The company produces animal and tractor drawn implements. The implements, together with their spare parts are available countrywide through a network of distributors and agents. The tractor drawn implements are designed for land preparation, fertilizer application, planting, cultivation, as well as post-harvest handling. Spares for the tractor drawn implements are also readily available. Hastt offers back-up service and spare parts to the customers complemented by a service workshop facility for the repair and refurbishment of equipment.

The company is a major global competitor of plough discs in Africa. It exports different types of implements to Angola, Namibia, Zambia, Malawi, Mozambique and Tanzania. Due to the current economic factors affecting the country, the company produces according to demand and has stopped stocking products with exception of spare parts. Products are sold on cash basis there is no credit provision. Formerly known as Tinto Industries, the company has been operating since 1970. It changed its name to Hastt Zimbabwe in 1997.

Zimplow is the biggest manufacturer of animal drawn equipment in the country. Situated in Bulawayo the company exports its products into the region as far North as Tanzania and Namibia to the South. The company is one of 3 that were trained by the FACASI project to manufacture 2 wheel tractor accessories. They have invested in the manufacturing of no till planters, shellers and cultivators for 2WT. Zimplow has potential to be the biggest supplier of 2WT accessories and the capacity to distribute the same regionally. The company has an in-house R&D capability.

4.7 Characterisation of Business Models

Table 7, below summarises the main characteristics of each of the five business models discussed above. The models can be engaged either as sole traders, management team or as group management depending on the opportunities. Across the value chain, they would address machinery/equipment manufacturing/spare parts, contract farming/provision of inputs, and hire services cutting across different players.

Table 7: Characterization of identified business models

Attributes	Business model types				
	<i>Individual ownership model</i>	<i>Group ownership Model</i>	<i>Corporate ownership model</i>	<i>Dealer led model</i>	<i>Manufacturer led model</i>
<i>Ownership/ management</i>	Sole trader	Group management	Management team	Sole trader	Management team
<i>Goods and services offered</i>	Tractor hire services	Provision of inputs and services to members Tractor hire services	Provision of farm inputs, contract farming Tractor hire	Sale of machinery and spares Tractor hire	Manufacture and sale of spare parts Tractor hire
<i>Technology</i>	Multi-functional use	Specialised and/ or multi-functional use	Specialised and multi-functional	Imported 2WTs and implements	Basic implements and spare parts
<i>Key actors</i>	Clients, financial institutions, dealers, manufacturers, mechanics	Group members, dealers, manufacturers, financial institutions, mechanics	Contracted farmers, dealers, manufacturers, financial institutions	Clients, financial institutions,	Clients, financial institutions, dealers,
<i>Business motivation</i>	Profit	Effective, efficient and equitable services to members	Profits and farmer profits	Profit	Profit
<i>Business location</i>	Local level	Local level	Rural towns and rural areas with satisfactory infrastructure	Urban centres or periphery at district/ regional level	Rural towns or cities at regional or national level
<i>Market segmentation</i>	Smallholder farmers in niche settings	Members and non-members in niche settings	Contracted farmers	Service providers/ spare parts workshops/ farmers/ farmer groups	Service providers/ spare parts workshops/ farmers/ farmer groups
<i>Financing</i>	- Micro-finance loans - Term lending - Matching grants - Leasing	- Micro finance - Equity - Term lending - Grants	- Equity - Term lending	- Equity - Term lending	- Equity - Term lending
<i>Methods of revenue collection</i>	Pay in kind, pay in cash	Pay in kind, pay in cash	Direct deductions after harvest	cash	cash
<i>Business profitability and sustainability</i>	High/ medium/ low	Medium/ low	High	High	High/ medium

4.8 Analysis and upgrading

Analysis of the diverse business models identified Critical Success Factors¹ which led to the development of upgrading strategies. In general, the business models could be strengthened by addressing seven major aspects of business model development: a) Creating awareness of technologies, market and promotional development, b) coordinating business to businesses partnerships, c) facilitating linkages with financial institutions and markets, d) facilitating links with local government and public sector extension, e) responding to customer needs, and f) adding value by improving technical, management and business skills. The most common upgrading interventions for each of the business models are given in the table 8

¹ Critical Success Factors (CSF) refer to the most important factors affecting buyer decisions and satisfaction with chain products and services. The CSFs vary according to the different customer segments.

Table 8: Business Model Upgrading Strategies

Upgrading strategies	Business models				
	<i>Individual ownership model</i>	<i>Group ownership Model</i>	<i>Corporate ownership model</i>	<i>Dealer led model</i>	<i>Manufacturer led model</i>
Creating awareness of technologies, market and promotional development	Promotion through demonstrations and advertisements (TAN, ZIM)			<ul style="list-style-type: none"> o Market development through branding (TAN, ZIM) o Stronger linkages with potential customers (TAN) o Market development through promotion (ETH) 	Market development through branding (KEN)
Coordinating business to businesses partnerships	<ul style="list-style-type: none"> o Coordination with dealers for spare parts (TAN) o Development of linkages to mechanics and workshops (ZIM) 	<ul style="list-style-type: none"> o Develop linkages with dealers for equipment and spare parts (TAN) o Develop linkages to workshops and local mechanics (TAN) o Develop linkages to local spare part stockists (TAN) 	<ul style="list-style-type: none"> o Develop relations with farmer organizations, finance and machinery suppliers (KEN) o Access to spare parts supplies (KEN) o Develop links with mechanics and repair and maintenance workshops (KEN) 	<ul style="list-style-type: none"> o Develop linkages to local mechanics (TAN) o Develop linkages with existing service providers/ operators (TAN) o Develop relations with local dealers to access spare parts (TAN, ZIM) o Strengthen links with local manufacturers (TAN) o Develop stronger linkages with customers (TAN) 	<ul style="list-style-type: none"> o Develop links with mechanics (TAN, ZIM) o Develop partnership with dealers to manuf. equipment (ZIM/ TAN) o Develop linkages to local spare part stockists (ZIM) o Develop stronger linkages with customers (TAN)
Facilitating linkages with financial institutions and markets	<ul style="list-style-type: none"> o Develop linkages with financial institutions to access term lending (KEN, TAN, ZIM, ETH) o Develop linkages with financial institutions to access working capital (KEN, TAN, ZIM) o Develop linkages with micro finance institutions to access working capital (ETH) 	<ul style="list-style-type: none"> o Develop linkages with financial institutions to access term lending (TAN) o Develop linkages with financial institutions to access working capital (TAN) o Develop linkages with product traders/ buyers (TAN) 	<ul style="list-style-type: none"> o Develop linkages with financial institutions to access term lending (KE) 	<ul style="list-style-type: none"> o Develop linkages with financial institutions to access term lending (TAN, ZIM, ETH) o Promote new financial products - machinery leasing (TAN) o Develop linkages with financial institutions to access working capital (ZIM, ETH) 	<ul style="list-style-type: none"> o Develop linkages with financial institutions to access term lending (TAN) o Develop links with Business Development Service providers for access to finance (TAN)

Upgrading strategies	Business models				
	<i>Individual ownership model</i>	<i>Group ownership Model</i>	<i>Corporate ownership model</i>	<i>Dealer led model</i>	<i>Manufacturer led model</i>
Facilitating links with local government and public sector extension	Access support from Government extension and mechanization service providers (TAN)	Strengthen linkages with extension H)			Access training and extension support for manufacturing farm machinery (TAN)
Diversifying in response to customer demands	<ul style="list-style-type: none"> Broaden the range of services offered – expand accessories (KEN, TAN) Promote after sales services through a cadre of local technicians (TAN) Stock spare parts inventories (ZIM) 		Broaden the range of machineries and equipment offered (KEN)	<ul style="list-style-type: none"> Establish a cadre of field agents (TAN) Establish a cadre of service providers/ operators (ZIM) Develop a system of local district agents to provide after sales services (ETH) Develop local artisans/ workshops for repairs (ETH) Find ways to lower the price of the machines to make them more affordable (ETH) Facilitate establishment of local spare parts agents (TAN) Provide after sale services and guarantees to customers (TAN) 	<ul style="list-style-type: none"> Diversify into other lines of business – importing equipment and providing services (KEN) Diversify the range of equipment
Adding value by improving technical, management and business skills	<p>Provide business skills training for SPs (KEN, TAN)</p> <p>Provide SPs and operators with training in machinery use and maintenance (TAN, ZIM)</p>	Provide business skills training for group leaders and members (TAN, ETH)	Provide training in operations and business management (KEN, ZIM)	Provide dealers with training in machinery use and maintenance (TAN, ZIM)	<ul style="list-style-type: none"> Provide manufacturers with operational and maintenance training on 2WTs and accessories (KEN, TAN) Upgrade the capacity of local mechanics (TAN) Training staff in manufacturing of different farm machineries (TAN)

In summary, as mentioned early, the business models could be strengthened by addressing these seven major aspects of business model development as discussed subsequently:

Developing awareness of technologies and market demand:

Critical to market development is the need to focus on developing demand among smallholder farmers. In situations where the demand for mechanization goods and services is weak efforts were seen to be needed by both public and private actors to develop the market. A range of market development interventions were identified to address the weaknesses in the markets – both from the demand and supply perspectives. In practice, some of these interventions affect both sides of the market, concurrently. Interventions for the business model managers could include conducting market assessments, developing promotional materials and advertising using the local radio and other forms of mass media communication, organizing field days and participating in exhibitions, product branding and in general formulating an extension and demonstration strategy. In Zimbabwe for example, agricultural shows, Expos and other platforms were used to increase awareness of the 2WT and or attachments. These led to a demand for the establishment of demonstration plots in different districts throughout the country some of which were not located in the project areas. Demonstration plots were set up and there was commendable attendance by villagers in the areas.

Some of the better performing business models upgrading strategies include some of these instruments as a way of encouraging competition amongst machinery dealers and service providers to attract customers into the sector. Considerable effort is needed to create awareness of the appropriate technologies and most effective has been the organization of field days, demonstrations supported by other promotional efforts. Demonstration and promotion although co-funded by the public sector were undertaken by private sector service providers in a number of business models, especially in Tanzania, with implicit belief that once demand picks up the private sector would play a stronger role in driving and expanding market demand.

Coordinating business to businesses partnerships:

Coordinating the relationship between the importer/manufacturer, service provider and farmers was identified as an important area of business model upgrading. It is apparent that the more effective delivery of the tractors, accessories and spare parts to customers can help meet customers' requirements in terms of affordability, delivery time and after sales services. From the dealer to the customer there are a number of decisions to be made about the flow of machinery products, information and money. However most of these decisions take place independent of one another which results in inefficiency and ultimately a higher cost of the machinery and technologies to the customer (service provider/ farmer). The more successful the dealer-customer relationship is, the more successful the dealer has been in expanding customer demand. The upgrading areas of intervention in strengthening business to business coordination applies to the dealer-manufacturer led supply chain models and in some instances private sector or farmer group led service provider models.

In Tanzania, discussions with Kishen and Farm equip, two of the largest and most active local importers, led to agreements being reached on the possibility of 1) providing farm equipment (2WTs and attachments) to service providers on a loan basis; and 2) organizing demonstrations of equipment at farm level to expand the market for their products and services. Linkages and collaborative arrangements were also made between the private sector dealers and manufacturing companies (CAMARTEC), with the project facilitating the coordination process.

In Kenya, KENDAT made efforts to develop linkages and collaborative arrangements with financial institutions to access loans and negotiate leasing arrangements (RentCo, Lavrae, Chase bank, KCB and Quipbank). Other partnerships focused on expanding awareness of the programme by developing outreach with organizations that have a strong customer base of smallholder farmers (BIDCO, Mt. Kenya Gardens and Meru greens). Formal agreements were reached with BIDCO and Meru Greens to support their farmers in the mechanization of soya, sunflower, French beans in particular

Facilitating links with finance, support service organizations and markets:

To afford the service of contractors for motorized-machineries and to buy non-motorized equipment, access to finance is vital for farmers and rural entrepreneurs. The business models support this assertion showing that 2WT mechanization technologies are unlikely to be adopted without access to financial resources required to purchase the technology and complementary inputs. Availability of finance is a prerequisites for small enterprises to take advantage of the new 2WT technologies, and sets the pace and direction for scaling-up. However, the conditions of lending (e.g., interest rate, repayment period, own finance, collateral) are critical for adoption and influence the direction and pace of 2WT development. The business models also highlight that access to finance is required for the upstream actors of the supply chain to strengthen their existing businesses whilst setting up new businesses for entrepreneurs willing to stock spare parts, establish workshops and manufacture implements.

In Tanzania, linkages with financial institutions (PASS and EFTA) were developed and arrangements made for potential Service Providers to access loans with the project contributing technically to the design of tailor-made financial packages for prospective customers. In Ethiopia, however, relations were developed with METEC – a major government parastatal. Agreement was reached for potential service providers to purchase machines through METEC with soft loans. Model service providers operating on an individual service provider basis, received 2WTs after providing a 30 percent down payment with the remaining 70 percent of the capital to be paid in instalments over a two year period. The District Agriculture Bureaus provided guarantees to METEC for the remaining 70 percent.

KENDAT is working with an NGO named Hand-in-Hand to train farmers and organize them into table-banking Community Based Organizations which can eventually become self-financing entities under their own microfinance outfits. These entities, once firm and well established in funding members can become members of regional or national level microfinance Savings and Credit Organizations (SACCOs), to help them access larger funds, among other developments. At the very least, farmers will become business persons able to afford mechanization services and eventually hopefully own 2WT units that they can open to the wide range of possibilities and innovations

This demand confirms the view that business models for mechanization need to be broadened to consider the need for closer integration between input and output markets. Smallholder farmers lie at the interface of the input and outputs markets and the relationship with inputs/ mechanization dealers and output traders/ processors. This supports the view expressed by Lundy of inter linked business models (Lundy, 2012). Farmers are the customers/ consumers of mechanization technologies but are also the suppliers of raw material for buyers of agricultural produce. The linkage between the two markets and the value chain stakeholders is vital to generate the revenue required to afford either buying or renting farm machinery. The upgrading strategy of a number of business models recognize the need for support to facilitate access to product markets.

Facilitating links with local government and public sector extension:

Important where public sector extension services are effective with good outreach in the rural areas. This is particularly the case in Ethiopia and to a lesser extent in Tanzania where training and advisory support is present. Another factor is the importance given by a country to mechanization as a strategy. Tanzania is a good case in point and Kenya. Furthermore, local government has a prevalent role in those countries where regionalization (Ethiopia) and decentralization (Kenya, Tanzania) has been prevalent and in the cases of Ethiopia and Tanzania – with a socialist past – the role of cooperatives and farmer organizations is more prominent.

In Zimbabwe, the FACASI project is building the capacity of government extension services to offer advisory and training services in 2WT based technologies. All formal skills training courses are now offered at Hatcliff training centre which is a government institution. Onsite training in the project districts is offered by government extension workers trained by FACASI project. The FACASI project is assisting in the creation of the National CA Centre of Excellency sponsored by ACT, whose primary objective is to offer advisory training and extension services on CA including 2WT based forms to all farmers in the country. Roundtable meetings were conducted between the Ministry of Agriculture Mechanisation and Irrigation Development, Agritex, the University of Zimbabwe and farmers in Domboshawa and Makonde. Training was conducted for service providers from Makonde and Runene at the institute of agricultural engineering.

In Kenya, the mechanization hub is gaining prominence in the local government operational and development scene. The hub has been discussed as a credible solution for farmers at two forums called by Meru and Laikipia Governors, where it is located. The hub has been visited by the Governor of Trans Nzoia County and his assistants, from 400km away. A delegation from Embu County (120km away) has come to witness live, what dynamics and vigour a hub can generate at the smallholder development scene. It is foreseen that as the hub business grows and rolls out to other areas, local and national government interest and hopefully support will be attracted. As mentioned elsewhere in this paper Kenya government which used to think only 4WT is now surveying the possibility of expanding to 2WT support. Each of the Ten ATDCs has received a 2WT unit as a ‘start up’ to introduce this service to communities. As the previously elusive aspect of the HOW of getting services to farmers takes shape, the Hub Model will gain increasing prominence

Diversifying in response to customer demands:

Delivery of 2WT based mechanization needs to be responsive to customer needs. One way that this can be done is to ensure that dealers provide after sales services, financing, training in operating and repairing machinery whilst ensuring that products are of high quality and safety. Moreover, mechanization hire services, however, cannot be viewed in isolation from access to complementary inputs and advisory services. There was seen to be a strong demand by farmers and other customers to provide access to additional complementary inputs and support. If these products and services are packed together, there is the likelihood of appealing to a larger number of customers and developing the client base. The demand for inputs and services is often interrelated. In short, a range of service support is likely to be more effective than the promotion of a single service. A process could be followed to identify and address the most significant bottlenecks that restrain production and productivity. This might include, for example, limited access of farmers and other stakeholders to markets, finance and information combined with low levels of entrepreneurial capacity and business opportunities. By recognizing mechanization as a system, more comprehensive and longer term interventions could be identified that may require public sector support.

To increase the life span of agricultural machineries, maintenance is critical. Repair and maintenance services in all of the project countries are currently at an infant stage. Given the lack of specialized repair and maintenance providers, importers are currently providing the services for tractors and other motorized machineries. However, most of these dealers are located in the major urban centres and only a few of them have mobile workshops in rural areas. Subsequently, machines are not inspected and maintained regularly which ultimately lead to failure and high cost for the customer. Service providers and farmers have demanded better access to machinery spare parts and after-sales services.

Adding value by management processes:

Management can be divided into operational and technical management and business management. The former includes logistical management – responsibility for getting the machinery and spare parts from the manufacturer, importer and dealer to the user – and operational and technical management of machinery. Logistics improvement affect the level of costs and if managed properly can significantly improve a business's response to its customer. In this way it is considered a value adding activity. Developing the skills of service providers and local artisans in operating and maintaining the machinery also contributes to reducing costs and value adding. Business management includes developing skills in marketing, accessing and utilizing finance and diagnosing and monitoring the performance of the business. Ensuring that these processes are planned and managed efficiently can translate into added value, lower transaction costs, and increased competitiveness for dealers, farmer organizations and smallholders.

A key upgrading strategy that came out of the business model appraisal is the need to develop entrepreneurial skills amongst machinery dealers and manufacturers as well as service providers involved in the machinery supply and service chains. Critical to this process is developing entrepreneurial and management capacity of the supply chain stakeholders to adapt to changing markets, technologies and policies, including opportunities to use agricultural machinery in off- farm and non-agricultural activities such as in transportation and rural infrastructure maintenance.

In the case study countries where the markets are weak, the project fulfils a key role as facilitator and service provider supporting the private sector business models to upgrade their businesses. Many of the interventions proposed require external assistance although in some cases where the incentives exist private sector dealers, manufacturers and service providers are likely to drive the upgrading process by themselves.

5 Conclusions

Five main models are discussed in this paper, the individual ownership business model, group ownership model, corporate ownership model, dealer-led model and manufacturer-led model. In all the four countries, these models are at different levels and vary from country to country. The FACASI project uses the 2WT as an entry point to small holder mechanization because of the positive attributes of its multi-purpose functionality, low energy consumption, low purchase price and ease of maintenance providing mechanization opportunities for Africa's fragmented land holdings. For the 2WT-model technologies to be available to farmers and bring impact; business management should be improved, linkages with private sector such as dealers and financial institutions should be enhanced and awareness to farmers on these technologies should be created. Infrastructures are essential for sustainability of these models; availability of local mechanics, local spare parts suppliers and availability of dealers in their remote areas at low cost should be facilitated to be in place.

The findings also show that there are no clear prescription as to what model works best, where? Business models need to recognize the local context and develop in a way that is compatible with the farming system, the enabling environment and accessibility to markets. Attention has to be given to the needs and demand of customers and other supply chain stakeholders. It should be reiterated that there is no 'one-size-fits-all' preferred business model. The experience from the project shows that every business model is context specific. It is not a promising strategy to import so called successful business models that may have worked in a particular context to another. It should also be realized that business models are dynamic, evolving organically as they adapt to the vagaries of the market system. A well performing model at any point in time will constantly need to innovate and evolve to respond to change and the risks that the business faces.

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Glossary

Business model	A business model describes the process of how an individual firm creates, captures and delivers value. The business model captures the interdependence of activities, thus the firm, suppliers, customers and value creation for all parties involved. It refers to the method to acquire customers, service them and make money in doing so. The business model concept can be used as an analytical tool to understand how a business enterprise operates, interacts with its clients, covers costs and makes profits
Business model analysis	Involve the use of modelling as an analytical tool to understand how the businesses operate and how costs are covered, how profits are made and how these businesses interact with customers
Conservation Agriculture	CA is a set of soil management practices that minimize the disruption of the soil's structure, composition and natural biodiversity. CA has proven potential to improve crop yields, while improving the long-term environmental and financial sustainability of farming. It is an approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment. CA is characterized by three linked principles, namely: <i>Continuous no or minimum mechanical soil disturbance; Permanent organic soil cover and Diversification of crop species grown in sequences and/or associations.</i>
Critical Success Factors (CSF)	Refer to the most important factors affecting buyer decisions and satisfaction with chain products and services. The CSFs vary according to the different customer segments.
Tractors	Tractors are the most important and versatile type of equipment used by farmers wanting to mechanize some or all of their farm operations. Apart from providing an important means of transporting heavy farm inputs and produce to and from the farms, tractors are useful in coupling other motorized and non-motorized implements for the efficient and timely land preparation that is necessary for achieving high yields and minimizing postharvest losses
Two Wheel Tractor	Two-wheel tractor or walking tractor, represent a single-axle tractor, a tractor with one axle, self-powered and self-propelled, which can pull and power various farm implements such as a trailer, cultivator or harrow, ripper, a plough, or various seeders and harvesters. The operator usually walks behind it or rides the implement being towed. Have varying horse power capacity.
Two Wheel Tractor services	These are services which can be accomplished through the application and use of two wheel tractors, these ranges from ripping, planting, fertilizer application, boom spraying, transportation, grass cutting, milling, shelling, threshing and water uplifting.
Agricultural Mechanization	Agricultural mechanization is the application of mechanical technology and increased power to agriculture, largely as a means to enhance the productivity of human labour and often to achieve results well beyond the capacity of human labour. Mechanization entails meeting the growing requirements for power and timeliness of operation as agricultural systems attain more intensive production. Mechanization is the pillar for making farm operations efficient and productive since it determines efficiency and productivity of all the other inputs used in crop production such as seeds, fertilizer, water, labour and time
Mechanization Hub	Refer to as a one-stop shop, providing mechanization services (2WT and 4WT based), together with complementary bundles of management and economic services. These include finance, training and advisory services, marketing with links to market outlets. The model is intended as a one stop shop to demonstrate technologies, provide spare parts and provide repairs and maintenance support. The contract farming and mechanization hub models are clustered as corporate led.
2WT service provider	Refers to Organization, business or individual which offers 2WT-based services (which include land preparation/direct seeding, threshing/shelling, and transport) on commercial terms to framers or clients.



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