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Total Solutions for Farmers

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Agrimech Mechanization Service Providers (MSPs) Training Program & Curriculum

5 Reasons Why Mechanization Owners and Service Providers need Training?:

1. Agricultural Mechanization is expensive and dynamic. These are the days of Conservation Agriculture and Climate Smart Agriculture. We must farm using our heads more than our muscles and protect soil health and other resources.
2. Agricultural tractors are complicated and the Implements and Equipment they power must be understood and used optimally for the most power and operational efficiency and for the best crop yields per unit of land.
3. Most MSPs are plough-operators. They need to learn to strip-till, plant on un-ploughed soil, spray, harvest etc. learn to operate balers, shredders, shellers, threshers, combine harvesters, silage packers and more. They need to become part of the Agrimech Mechanization Hubs Business Model, to have access to implements for their tractors, to team-up with other MSPs and stop travelling between farms with fuel expenses that lender them unprofitable.
4. MSPs need training and re-training. They need to learn old and new equipment with regards to vital implements and equipment adjustments, their calibration for optimal operations and applications and safe-use.
5. Tractor owners need to invest more in mechanization. They need to learn about modern IT enabled operations and digitization of information data collection, a smart way of keeping records they can use as evidence of work as they seek loans to expand their businesses. Owners will learn the capacity to observe and track what their tractors are doing and where they are, on a simple mobile phone. They will invest more as they cut out operational fraud around fuel-theft and inefficient use. The digital platform will tell owners when to service their machines among other information and benefits.

Training Outcomes:

- ✓ MSPs have great understanding of the usefulness of farm tractor and its ancillary equipment. They are ready to be professional and proud of their work, aware of how to be assisted to expand their businesses while addressing their contribution towards farm protection, food security and environment preservation. They are aware of how they can be in teams, protected

and in profitable work structures that drive he needed changes that need to happen, to avail more food at the village, the market and the country at large.

- ✓ MSPs are able to go beyond ploughs, to know more machinery applications and operations, identify key tractor and implement components, explain the design factors, workability, and make adjustments for their optimal efficiency and productivity as well as the safety of the equipment, themselves, the soil and the environment.

- ✓ MSPs are becoming clever semi-engineers and semi-mechanics, able to understand the theoretical principles and guidelines of machine components and linking these to the practical protections they need, in order to work for as long as they are designed for. They are able to trouble-shoot and to fix small problems in the field, if not stop them, before they happen.

- ✓ MSPs have clear understanding of the safe-interaction of machinery with soils and implications of soil-health on crop establishment (physical and biological) factors. They are aware of the breadth of mechanization, beyond crop establishment, into crop maintenance, harvest and post-harvest operations and business opportunities therein. With this foundation they are able to see in a new way their importance, role and contribution, hence new ways of becoming wealthy from clean work.

- ✓ Tractor Owners are gaining interest in investing more in tractors, noting the professionalism that is being injected by training operators and digitizing tracking, information and data collection processes. Non-farming middle-class players are beginning to have interest in investing in mechanization ownership and services.

- ✓ Youth are becoming mechanization entrepreneurs, ready to grow their businesses and even take-on the productivity of idle productive lands that are held by owners who are busy elsewhere. The burden of drudgerous work of women is being taken-over by youthful mechanization enthusiasts and businessmen. Women can now move higher in the value-chains, do better parenting and take-on more fast-money projects like in cottage value-addition) industry, poultry and fish farming.

Nature of Course[1]

Training Aim:

The Aim of the Training Programme is to nurture agricultural mechanization owners and operators who:

- understand the importance and breadth of their work,
- understand the efficient and effective operation of their machinery,
- serve professionally and with accountability to farmers and to the environment,
- are able to expand and grow their business and feed the citizenry.

[1] **Agrimech will Tailor-Make Courses according to the needs of the Sponsoring Party and the Assessed Needs of the Trainees**.

Training Objectives:

At the end of the Training, participants will be able to:

- Understand, explain and use tractors and their ancillary equipment effectively and safely from a point of knowledge and performance excellence.
- Know how to expand their businesses by working in climate-smart teams that make them professionally, available, accessible, affordable and accountable, in close proximity to their clientele.
- Know how to modernize and digitize their operations, to be more dependable as critical players in closing value-chain gaps and helping to sustainably avail more crop and livestock products at the market place.

Participants:

Training participants will typically be local agricultural mechanization owners and operators who work on their own farms or provide services to smallholder farmers. Aspiring farmers and machine operators are welcome. Institutions like County Governments, farming contractors and aggregators who would like to see their farmers mechanized, input providers who would like to improve farming practice etc., all form a special and open category of clients.

Course Content and Duration:

The course will be tailor-made to meet the needs of the sponsor and the trainee. Depending on contents and depth of the Curriculum needed, a typical course may last from 3 days to a month. A typical course will be a week long (5 days) once the subject matter has been specialized and given boundaries, in what can be a very broad subject matter.

Time quickly gets used up, in classroom-type training with background information, theory instruction, model-demonstrations and videos, discussions and trouble-shooting reviews.

Classes will typically be in the morning, followed by an early lunch and exciting long afternoons when the practical machine operation and demonstrations take place.

Planning and Preparation:

To be most effective and to meet the needs of the Client, before the training, Agrimech will have several exchanges and possibly visits with the client and trainees. The client will begin by completing the attached Training Needs Assessment Form, to help determine the nature and scope of the Course. Key consideration for training planning, presentation and organization are given below. The instructor should read each section carefully to ensure effective and efficient implementation of the training.

Participants:	The number of participants shall be limited to a maximum of 15 but dependent on the number of instructors and orderliness possible. The participants will be divided into groups of 5 for each equipment under discussion. Participants will preferably have leadership skills and appropriate level of basic education and business experience. No education will beat experience with machines! Trainees will most likely fall in the following categories: - New Drivers? - Youth (Men and Women), targeting small machines? - Work Aggregators and Booking Agents? (Men and Women) - Owners or Owner-Operators (Men and Women) - Mechanics. - Field Officers (Managers) - Others?
Venue:	The training venue will ideally have plenty of farm and other space, safe and clean accommodation (nearby) with airy classroom facilities, mains electricity and Wifi access. The venue will have lots of agricultural machinery and tractors and land that they can work. The space will be free from external distractions. Clients will have freedom to choose the Agrimech or their own venue if it is appropriate.
Training facilities:	• Multi-media projector and screen for showing videos. • Pre-prepared Power Point presentations highlighting key messages on all equipment covered in the training. • Flip chart stand, white board, white board pens. • Smart tractor and all ancillary equipment. • A set of appropriate tools for hands-on practical exercises. • Bare crop land for practicing tractor operation and implement applications. • Note books and pens for participants.
Dates for training:	Training dates will be selected during dry weather and off-season so that trainees do not lose valuable business time.
Registration:	Participants should reach the training venue at least a night early. Trainees should plan to leave the venue a night after the last day of training. On the evening of the last day of training, a celebration will take place, around which Training Certificates will be passed to Graduates. Registration will include adequate detail of the trainees as they will be made part of the Agrimech team and business growth path.
Participatory, experiential, and hands-on learning:	The training approach will be participatory, with emphasis on hands-on and experiential learning and sharing. The facilitator will apply interactive and fun-learning techniques to get participants free to belong and interact. Question and Answer (Q&A) sessions will receive special attention and trouble-shooting of previous field problems will be encouraged. Practical individual and group discussions and trouble-shoot competitions will add to the fun.

Participant evaluation:	A pre-training evaluation will take place before starting the training session. This will guide and assure the instructors of the needs of the trainees. A post-training evaluation will also be conducted. Agrimech will follow trainees to their work places in the weeks following the training. Trainees that perform poorly may miss being issued with Certificates.
Course and Instructor evaluation:	Participants of the training will evaluate the Course and the performance of the instructors. Aspects such as applicability of the learnings, the instructor's presentation style, edutainment, use of participatory techniques, etc. will be part of the evaluation.
Training Report:	Every training session will be backed by a report for the sponsoring individual or institution. The report will typically have four components: 1. What the training entailed, why, how it went and how it will be applied. 2. Outline of various class and field exercises and demonstrations 3. How the training will be followed up (including agreed commitments of the trainees as well as Agrimech) 4. Picture story of the training, including affiliated activities such as machinery work competitions, field-day exhibitions etc.

Outline of *The Course Curriculum*

The intensity of the training may range from an expectation of a basic exposure to the tractor and its multi-use functions to a fully proficient tractor operator. It is important that trainees understand and become comfortable with the tractor controls and with starting, moving and stopping the tractor before expecting them to master complicated maneuvers and the operations of ancillary equipment. Specific instructional details are contained in the modules identified below.

Course Quality:

The quality of a practical course - for practitioners is judged against the scale of how much the topics presented are handled from the ***What? Why? and How?*** perspectives.

This understanding and framework is applied below in determining the contents of the course. Each Training Module is packaged to address the What (***The Knowledge or The Theory***), the Why (***The Justification or The Attitude***) and the How (***The Practice***) of the undertaking. Often courses like this one are too academic and deal with the easy and well documented Theory (*The What*). They only touch on the Justification (*The Why*) and have little or no time and facilities to get into the Practice (*The How*).

From many years "in the game" Agrimech is aware of what the critical ingredients of a good training programme are. Agrimech therefore places a lot of emphasis on ***The How***, i.e. the Practice and her courses are designed with the Practitioner's Needs solidly in the mind and the plan.

Module 1: Tractors

Training Aim:
The aim of this Module is to increase agricultural machinery service providers' awareness and knowledge about tractors and to improve their skill in operating tractors safely and efficiently.

Module training objectives:
By the end of the module, participants will be able to:

- Understand and explain different types of tractors and their applications,
- Identify the major mechanical parts of agricultural tractors and their functions,
- Match and hitch implements to a tractor,
- Operate the machine efficiently and safely,
- Understand major failures/breakdowns associated with tractors and find solutions for how to fix them.

What?

What is a tractor?
What are the different types of tractors?

- Construction
  - Sit-on & drive
  - Walk along (walking tractor)
- Drive
  - Track type
    - Half or full track
  - Wheeled type
    - 2-wheeled
    - 3-wheeled
    - 4-wheeled
      - 2-wheel drive
      - 4-wheel drive
- Uses
  - Utility Tractors
  - Row Crop Tractor
  - Orchard Type
  - Industrial Tractor
  - Garden Tractor
  - Rotary Tillers
  - Implement Carrier
  - Earth Moving Tractors

Why?

- The why of tractor designs (Why tractors are able to do what they do)
- Fitting tractor to working conditions
- Modernizing agriculture
- Why tractor power is better than animal or human power
- Attracting youth to agriculture

- Removing drudgery from farming
- CSA

How?

How tractors work?

- The engine (The diesel engine and how it works –
  - Internal combustion;
  - Naturally aspirated diesel engines (without turbo)
  - Turbocharged diesel engines (with turbo).
  - Petrol engines
- Fuel system (fuel tank, fuel lift pump, fuel filters, injection pump, injector nozzles).
- Air intake and exhaust systems (air intake filter and cleaner, the air inlet manifold, turbocharger (if fitted), inlet and exhaust valves).
- Engine lubrication system (Oil pump, crankcase, oil cooler, oil filter, pressure regulating valve, pressure gauge).
- Engine cooling system (radiator and pressure cap, fan and fan belt, water pump and thermostat).
- Electrical system (Battery, starter motor and alternator).
- Transmission system (Brakes (oil bath), clutch, gearbox).
- Power Take Off (PTO),
- Implement hitch mechanism,
- Power-implement matching
- Operating the tractor:
  - Check oil, fuel and water levels and add to required levels
  - Join the machine with a variety of ancillary attachments
  - Start the tractor safely
  - Engage gears appropriately
  - Drive forward and stop the tractor safely
  - Reverse and stop the tractor safely
  - Manoeuvre and turn the tractor with different attachments
- Tractor Safety
  - Tractor hazards
    - Roll over
    - Run over
    - PTOs
    - Hydraulics
    - Ergonomics
    - Noise
    - Operator skills
- Trouble shooting
  - Engine will not turn over
  - Engine turns over but will not run
  - Engine overheats
  - Water disappears from radiator without visible leaks
  - Engine emits white/grey smoke while running
  - Engine losses power
  - Low oil pressure
  - Oil level goes up

    - Listening to the inside of the engine
- Maintenance
    - Regular inspections
    - Checking and replacing fluids
    - Cleaning and properly storing your tractor

Module 2: Land preparation

Training Aim:
The aim of this Module is to increase agricultural machinery service providers' awareness and knowledge about land preparation methods and their specific applications.

Module training objectives:
By the end of the module, participants will be able to:

- Explain the purpose of land preparation,
- Explain different methods of land preparation and how they impact on crop development and the environment,
- Select/advise on land preparation methods for specific applications.
- Carry out appropriate and high quality land preparation operations for farmers

What?

Definition – Manipulation of land to provide the best soil conditions, which will enhance the successful establishment of the crops to be grown. Land preparation involves clearing of land and subsequent soil manipulation (tillage) to allow for seed placement (planting).

- Land clearing, by definition, is the process of removing trees, stumps, brush, stones and other obstacles from an area to increase the size of the crop producing or pasture land base of an existing farm or to develop land for a new farm. Methods of land clearing include:
    - Burning method
    - Manual clear felling land clearing methods
    - Mechanized removal of woody vegetation by felling operations
        - Felling single trees by bulldozer blade
        - Clearing of bushy vegetation by mechanized choppers
        - Mechanized clearing of woody vegetation combined with root extraction

- Tillage methods:
    - Conventional tillage
    - Conservation tillage and Conservation Agriculture[2] (CA)
    - Strip tillage
    - Zero tillage

Why?

[2] **Agrimech has an entire Training Course in Conservation Agriculture and Climate-Smart Agriculture applied to Market-linked value chains, including institutional and policy reforms needed towards the wider Sustainable Agriculture Impacts. The Course comes highly recommended for clients seeking Holistic and Truly Transformative Mechanization Services engaging field level extension workers as much as other value chain players in Public-Private-Partnerships.**

- Land clearing
- Land preparation should improve field conditions in one or more of the following ways:
  - Reducing weed competition for light and nutrients,
  - Improving soil, water, and air conditions through cultivation,
  - Loosening tight or compacted soils
  - Control crop diseases & pest invasion
- Negative impacts of tillage
- Why we should abandon traditional methods of land preparation
- Why CA?

How?

Land clearing
Traditional land preparation
CA land preparation and links to Climate-Smart Agriculture (CSA)

Module 3: Planting

Training Aim
The aim of this Module is to increase agricultural machinery service providers' awareness and knowledge about planting methods and their specific applications, improve their skills in operating associated planting equipment safely, efficiently and profitably.

Module training objectives
By the end of the module, participants will be able to:

- Describe the different methods of planting crops, their application and advantages,
- Identify and describe associated planting equipment, their component parts, functions and adjustments,
- Understand major failures/breakdowns associated with the planting equipment and find solutions for how to fix them, and
- Calibrate the planters and operate them correctly, efficiently and safely.

What?

- Methods of crop establishment
- Conventional methods (Large seeds, small seeds, tubers, transplanting)
  - Manual methods
  - Animal-power use in planting

- Modern methods (Large seeds, small seeds, tubers, transplanting)
  - Seed drills and precision planters
  - Calibration of planters

Why?

- Planting quality
- Efficient utilization of inputs
- Optimization of soil-water resources

How?

- Conventional methods (Large seeds, small seeds, tubers, transplanting)
- Modern methods (Large seeds, small seeds (airseeder, etc) , tubers, transplanting, No-till Strip-till)
- Components of planters
    - Precision planters
    - Seed drills and Airseeders
    - Tuber planters
    - Transplanters
- Calibration of planters
- Adjustment, repair & Maintenance of planters

Module 4: Crop maintenance

Training Aim
The aim of this Module is to increase agricultural machinery service providers' awareness and knowledge about crop maintenance methods and their specific applications.

Module training objectives
By the end of the module, participants will be able to:

- Describe the different methods of crop maintenance and their application and advantages,
- Identify and describe associated crop maintenance equipment, their component parts, functions and adjustments,
- Calibrate the equipment and operate them correctly.

What?

Crop maintenance starts soon after crop germination through the growth and development of the crop and ends with crop harvesting, storage and distribution.
It encompasses processes such as weed control, pest control, disease control and supplementary undertakings such as fertilizer application, hilling/earthing, pruning, thinning, irrigation and drainage etc.

- Weed control
- Pest control
- Disease control
- Irrigation & drainage

Why?

- Weed control
- Pest control
- Disease control

- Irrigation & drainage

How?

- Weed control
  - Mechanical
  - Chemical
  - Agronomic
- Pest control
  - Chemical
  - Mechanical
  - Agronomic/IPM
- Disease control
  - Chemical
  - Mechanical
  - Agronomic/PM
- Irrigation & drainage
  - Different ways of irrigation
  - Different ways of drainage
  - Soil-water retention technology
- Sprayers & their components
- Sprayer calibration
- Sprayer safety (PPEs, chemical handling etc.)

Module 5: Harvest & Post-Harvest Handling

Training Aim
The aim of this Module is to increase agricultural machinery service providers' awareness and knowledge about harvesting and post-harvesting processes and applications.

Module training objectives
By the end of the module, participants will be able to:

- Describe the importance of proper harvesting and post-harvest handling,
- Describe the different methods of harvest and post-harvest processes and their application,
- Adjust, calibrate, operate and maintain selected harvest and post-harvest machinery properly,
- Understand and describe the process of hay and silage making.

What?

Harvesting is the act of removing a crop from where it was growing and moving it to a more secure location for processing, consumption, or storage, and post-harvest handling is the stage of crop production immediately following harvest. It involves processes such as threshing, shelling, cleaning, sorting, grading and packing.

  - Traditional harvesting & post-harvesting methods
  - Modern harvesting methods

Why?

Minimize post-harvest losses
Maintain quality of harvested crop
Timeliness
Reduce drudgery

How?

- Manual cutting+ machine threshing/shelling
- Combine harvesters (Pulled & self-propelled)
- Sorting & grading
- Transport
- Potato harvesting
    - Timing
    - Harvesting methods (manual vs machine harvesting)
    - Sorting, grading
    - Transportation
    - Storage
- Hay making
    - Cutting
    - Spreading, tedding
    - Raking
    - Baling
- Silage making
    - Shredding
    - Pitting

Module 6: Digitized Tractor and Operation Management

Training Aim
The aim of this Module is to equip Booking Agents with capacity to aggregate work for tractors and tractor owners with capacity to (digitally) track the location and work of their tractors and machinery, to monitor tractor performance with regards to fuel consumption and maintenance scheduling and to accumulate performance data useable in qualifying operators, and their business in pursuit of financing their business growth.

Module training objectives
By the end of the module, participants will be able to:

- Use the Hello Tractor or Trotro Tractor Mobile App to manage tractor work bookings.
- Utilize the Hello Tractor or Trotro Tractor Mobile App to track tractor and operational performance of machinery over space and time.
- Accumulate operator and machine performance data like needed for rewarding quality work and business-growth financing.

What?

The nature of the Kenyan farmers' mechanization services is one that has mechanization service providers (MSPs) chasing small and dispersed pieces of land. This makes mechanization services inefficient and wasteful of fuel, as tractors run between farms. Much fraud has been reported where tractor operators cheat tractor owners regarding where they are located at any one time and the areas covered in a work-day. Operators decide how much income to pass to the tractor owners, depending on their level of trustworthiness.

Digitizing farm operations means installing operation-enhanced Global Position System (GPS) gadgets on the tractors. These gadgets are then able to send signals to a computer or mobile phone, enabling the users to know where their tractor is and what work it has been allocated.

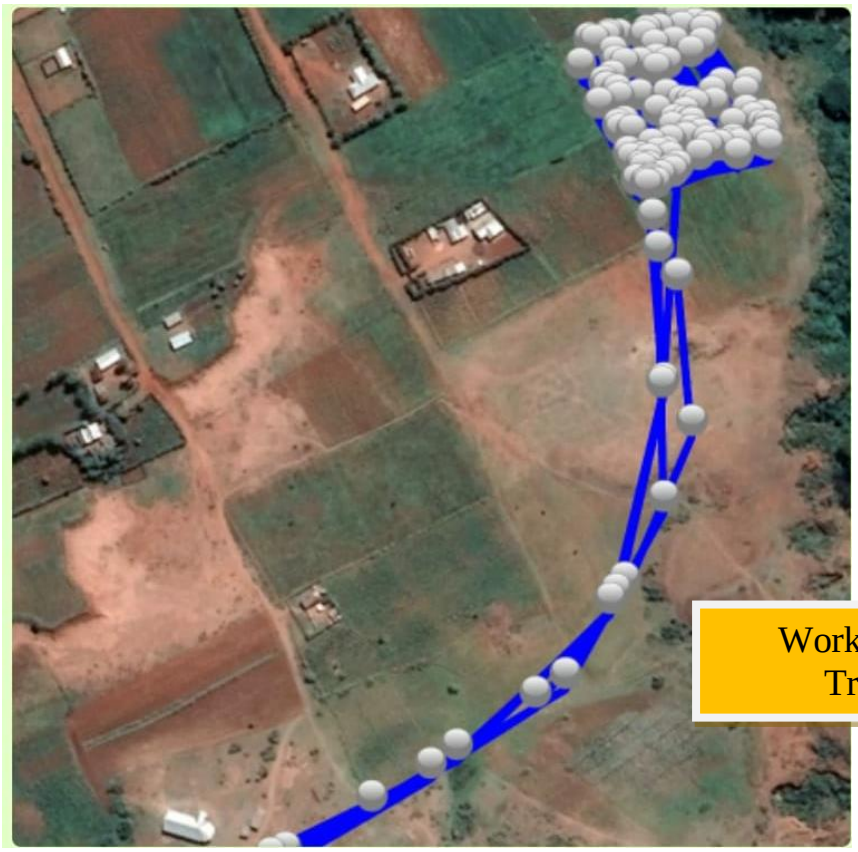
Why?

- To modernise work aggregation and scheduling.
- To eliminate fraud in the use of tractors and machinery in the hands of operators working in remote or far away locations.
- To track work and business performance to increase efficiency and effectiveness and to bring professionalism, coordination and team-work to the MSP operation and performance arena.
- To avail to smallholder farmers, the opportunity to grow their businesses and to be better value-chain players, able to deliver more and dependably to the market-place.
- Modern ways of farming are long overdue. Profitable mechanization services will attract youthful entrepreneurs to help modernize farming in dependable, accountable and clean businesses that lift the work burden from women farmers.

How?

- Train Booking Agents and Owners to utilise the Hello Tractor or Trotro Tractor Mobile Apps for work bookings, tractor and operator performance tracking and monitoring.
- Sensitise operators regarding the value of quality work and the rewarding of accountable performance with a possible Pay As You Go (PAYG) approach towards owning their own machines.
- Train tractor owners, machinery vendors, asset-leasing companies and even crop aggregators regarding the value of accumulating accurate performance data. Expose stakeholders to the value of quality performance and management data and its use in seeking funding to expand businesses of all concerned.

Training the Tractor and Implement Owner, Machine Operator, Work Booking Agent, Farmer, Input Provider, Market Off-taker, Machinery Vendor, Financier and other stakeholders of Mechanization Service Provision Services is the key to opening up the necessary support and growth towards the much needed Sustainable Agriculture led Renaissance for Kenya and the Continent.



Work Tracking on a Hello Tractor Mobile App