



Australian Government
Australian Centre for
International Agricultural Research



***Farm Mechanization and Conservation Agriculture for
Sustainable Intensification (FACASI)***

WORKSHOP REPORT

2WT TRAINING FOR SERVICE PROVIDERS

HELD 18-22 MAY 2015

**AT INSTITUTE OF AGRICULTURE ENGINEERING, HATCLIFFE,
HARARE, ZIMBABWE**

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1.0 INTRODUCTION

A training workshop was organized for service providers in 2WT operation and business management. The workshop was held from 18th to 22nd of May 2015 at the Institute of Agricultural Engineering, Hatcliffe, and Harare. The target participants included potential service providers from the two project sites of Domboshava and Makonde. In addition, participants were drawn from Alliance Cotton Ginnery and Farm Shop since these two organizations are forming part of business models to be implemented. Extension officers from project sites were also part of the training. A total of 23 participants attended the workshop, of which only one was a woman the rest men.

The objectives of the workshop were to:-

- Enhance understanding of Conservation Agriculture and gaps to be filled by mechanization
- Impart knowledge on 2WT operational management
- Impart knowledge and skills in business management of 2WT and related services
- Provide hands-on experience on usage of 2WT and various attachments

Facilitation of the workshop was done by the following:-

- ❖ Dr. W. Mupangwa-CIMMYT
- ❖ B. Edziwa –CIMMYT
- ❖ P.Nyoni- Mechanization Department
- ❖ D. Mhiribidi- Mechanization Department
- ❖ K. Murira- Mechanization Department
- ❖ R. Nazare- University of Zimbabwe

Three staff members assisted during field work to set the machines and demonstrate usage.

Training manuals were developed and used during training including power point presentations. It should be noted that the manuals are still under development and testing and will be finalised in due course.

2.0 WORKSHOP PROCEEDINGS

2.1 Opening Remarks

The National Coordinator, Eng. Nazare gave the opening remarks. He highlighted the workshop had been organised to provide operation skills and maintenance in 2WT and business management. The service providers should understand the technology including agronomic issues so that they provide a one stop shop. Understanding of seed rates, herbicides application, and fertiliser application should be clear to the contractors.

It was indicated that the Ministry of Agriculture is supporting the programme and should influence future policy that pertains to importation of mechanization equipment. The facilitators will provide back-stopping to the service providers to ensure business technology uptake and expansion.

2.2 Conservation Agriculture (CA)

Dr. W. Mupangwa presented conservation agriculture principles and lessons learnt. There is need to shift from the conventional tillage system to CA so as to have sustainable agriculture especially due to the climatic change being experienced. CA was defined as a combination of technologies such as

residue retention, zero- and reduced tillage, crop rotations, green manure cover crops, controlled traffic and raised beds. When used in combination these, over time, reduce, and often reverse, the degradation of soil and water resources. Residue retention and minimum tillage distinguishes conservation agriculture from conventional agriculture.

The 2WT is a new mechanization for CA. Lessons learnt in CA include:-

- Farmer knowledge and skills need serious attention
- Cost and availability of CA equipment
- Lack of credit/loan facilities
- Viable market for farm products/produce
- Not every CA system fits in every environment
- CA gives higher yields & is more profitable compared with conventional practice in the long term
- Limited land area can be done with the current CA options available in southern Africa
- CA equipment in use is not multi-purpose

2.3 Value Chain for Small Scale Mechanization

Value chains mean actors connected along a chain producing, transforming, and bringing agricultural goods and services to end-consumers thus adding value through a sequenced set of activities. Participants discussed the actors in mechanization and then developed the value chain. Functions of each actor were discussed and including gap that require attention.

2.4 2WT-Machine Operations and Uses

Mr Murira then came in explaining the mechanization for small scale farmers and how the two wheel tractor closes the big gap from the farmer who uses animal power to the farmer who uses four wheel tractors. Mrs Gunda then made the introduction to two wheel tractors, the benefits, the safety and regulations to be observed.

Miss Mhiribidi presented on the general features of the two wheel tractor, the gears and the starting up theory. Mr Mangoma lastly spoke about the pre checks to be carried out on the tractor, the necessary adjustments to be done as well as the different machine operations and uses. This made the farmers have an appreciation of the two wheel tractor as the tractor will not only save them on timely operations and labour reduction but also it coming in as a business project whereby they can provide services at a fee to the community due to its versatile uses like shelling, transportation, silage cutting, planting etc.

2.5 Agronomic Issues

Mr Murira presented on seed, fertilizer and herbicide application rates for maize, soya beans and sugar beans and seed plate selection. Mhiribidi emphasised on the importance of correct maintenance for the machinery. She presented on the different maintenance procedures to be carried out on the tractor, planters, sprayer and the trailer. This was followed by a visit to the equipment shed for a view of the different types of implements which can be used with the two wheel tractor. The participants managed to assemble the two row Fitarelli planter

2.6 Machine Use

Practicals on pre checks and starting up the tractor were done. Each participant was given an opportunity to do the pre checks first and then start up the tractor with the assistance of the trainers

2.7 Business Management

The prices of various attachments were discussed include the source. The participants brainstormed on costs associated with 2WT and classified them into fixed and variable costs. In small groups the

participants looked costs of 2WT with sheller, trailer and double row planter. The tables below shows costs calculated per hour (break-even point per hour) for the three attachments.

2WT and Trailer : Assumption- Cost of 2WT-\$2000, Trailer \$1800, 1248 hours

Fixed Costs	USD	Variable costs	USD
Depreciation	342	Fuel	3744
Interests	418	Lubricants	56.16
Insurance	60	Repairs	190
Licence	30		
Driver	1200		
Total	2050		3990.16
Break even costs	4.84		

Formula (total costs/hours per yr)

2WT & Sheller

Assumption shelling maize and sugar beans, 8 hour day, maize 16tons/day, beans 12 tons/day, Maize May-July 26dysX3=78days; 78X8=624 hours

624 X 2 =1248 tons

Sugar bean=may to June 52X8=416 hours

Fixed Costs	USD	Variable costs	USD
Depreciation	66	Wages	686
Interest	121	Fuel 20L/day	2340
Depreciation tractor	180	Maintenance	200
Interest tractors	220	Insurance	260
		Lubricants	35.5
Total	587		3521.5

Break Even 6.584135

2WT and Double Row Planter

Fixed Costs	USD	Variable costs	USD
Depreciation	180	Service/repair	100
Interest	220	Driver's salary	750.4
Insurance	100	Fuel	975.52
Planter		Lubricants	14.63
Depreciation	465		
Interest	495		
Insurance	225		
Storage	130		
Total	1815		1840.55
Breakeven/hour	7.79		
Breakeven/ha	19.49		

2.8 Practical Driving and hitching equipment

The participants were then taught on how to hitch the implements to the tractor and managed to drive the hitched planter throughout the afternoon. Laboratory calibration of the planter was done as well.



2.9 Cash-Flow Planning

In the same groups of 2WT and sheller, trailer and double row planter, participants developed cash flow for the business. Some of the groups added other items in the cash flow and one group developed cash flow for three months instead of one year. There is need to further follow-up and mentor on this subject. Investment options and loan repayment issues were discussed.

2.10 Field Visit

The afternoon session started with the group travelling to the Production Engineering Institute - Scientific and Industrial Research and Development Centre (SIRDC) where a range of two wheel tractor powered equipment were showcased. Some of the equipment includes Bean direct seeder, chicken plucker, soyabean thresher, potato grader etc.

The group was welcomed and led by Senior Research Engineer who explained various equipment and machine they import from South Korea as well as equipment they also produce at the institute. The engineer then handed over the group to the marketing officer who introduced maize seed as one of their product at the centre. The centre is also into breeding maize seed and so far they have produced one variety called sirdamaize. Their seed is graded therefore it can suit the planting equipment used by two wheel tractor that works with more uniform grain size. The participants learnt that beside the use of two wheel tractor for planting, transportation, shelling, milling, irrigation it can also power chicken plucker, potato grader and a fertilizer spreader (just to mention a few). That means farmer can spread top dressing fertilizer using the machine as power source.



Powered chicken plucker

Powered potato grader

Research Engineer explaining their products

2.11 Field Practicals

The group then returned to the training centre where they proceeded with training programme. In this case, they proceeded to the field to familiarize with driving, field calibration. Before they start up the machine, they started with machine and equipment daily pre-checks which include checking

engine oil, fuel, coolant level, tyre pressure etc. After the “walk around” inspection and ensure that the system was ready for use, the two machines were started and one hitched double row direct seeder and the other one hitching the trailer that transported the single row direct seeder. At the field, every participant had a chance to tractor driving.



Participants on the way to the field

Facilitator explaining operations



A participant adjusting the seeding depth of seeder

Participants showing the seeding depth of

Different planting depth for the double row seeder was used by adjusting depth control wheels and everyone familiarized with the operation. A row marker was developed in order to maintain the inter row spacing and only the available maize seed was used for calibration.

2.12 Shelling

This session covered a detailed practical teaching on multipurpose sheller that uses a Chinese Changfa engine and was facilitated by Mr Gangata. Participants were shown the various parts and functions of the sheller.

The sheller can be for several crops that include maize, small grains, soyabean, sugar bean and sunflower. The output of the sheller are +/-2 tonnes/hr and other crops +/-1.5 tonnes/hr. Engine pre checks for the sheller engine were also shown to the participants which are engine oil, radiator water, and fuel and belt tension. Other pre-checks on the sheller include checking for loose bolts and nuts and greasing of bearings.

Safety on operation of the sheller was also emphasized. The sheller needs to be properly secured with a well hitched stand at the hitching point and blocks on the wheels to avoid movement of the sheller when in operation.

Shelling was demonstrated to the participants by shelling sugar beans, unfortunately there was a malfunction of the sheller resulting in it crushing the beans as well as mixing beans with chuff.



2.13 Business Management

The group discussed issue of marketing, service promotion and managing the business. Keeping of records is a critical success factor in any business. Physical and financial records are the main types of records required by the service contractor. The cash book was illustrated and forms a key to financial records. In terms of physical records, service providers should keep records of business operations conducted per days and the machine usages in terms of oil, fuel used and repairs conducted.

3.0 WORKSHOP SUMMARY/CONCLUSION

The participants indicated that workshop was a necessity and should be done regularly. Participants were asked to write their profiles, indicating 2WT attachments of priority. This will be used as follow-up for their business models.

The workshop evaluation indicated appreciation of the training. However, time was not adequate for the topics to be covered in detail hence follow-up mentorship programmes are a pre-requisite.

Annexes

Annex 1: Workshop Programme: Service Providers Training Workshop to be held 18-22 May 2015

Date/Time	Thematic Area	Facilitator	Practicals
Day One -18 May 2015			
08:30-09:00	Registration	B.Edziwa	
09:00-09:30	Introductions, Opening Remarks	National Coordinator	
09:30-10:30	CA Principles, Challenges and Gaps	Dr. Mupangwa	
10:30-11:00	Tea Break		
11:00-12:00	Value Chain for small scale mechanization	B.Edziwa	
12:00-13:00	Small Scale mechanization; introduction to two wheel tractors; Safety and regulations; Two wheel tractor control features/-gears; How to start-up; Two wheel tractor pre checks & Machine adjustments; Machine operations & uses	K.Murira P.GUNDA D MHIRIBIDI Mr. Mangoma	
13:00-14:00	Lunch Break		
14:00:17:00	Pre-checks and start-up	K.MURIRA. Mr. Mangoma, Mr, Gangata	Hands-on practicals
Day Two-19 May 2015			
08:30-10:30	Types of implements Hitching and Mounting Equipment	P.GUNDA Mr. Mangoma/K.Murira	
10:30-11:00	Tea Break		
11:00-13:00	Maintenance of machine and equipment ; Agronomic Issues- seed/fertiliser rates, planting depth, plant population, herbicide application rates	D MHIRIBIDI K. Murira	Exercises, Group Discussions
13:00-14:00	Lunch Break		
14:00:17:00	Hands-on:- Calibration of planters ; Hitching; Practical driving On-field adjustments	P.GUNDA; K.MURIRA Mr. Mangoma; Gangata	Field practicals
Day Three-20 May 2015			
08:30-10:30	Prices of various attachments; 2WT attachments-Services offered; Custom hire charges, Costing ,Break-even analysis and pricing- service charges ; Understanding markets	B.Edziwa	Ex. costing & pricing
10:30-11:00	Tea Break		
11:00-13:00	Cash book, Cash Flow budgeting	B.Edziwa	Ex. Cash Flow
13:00-14:00	Lunch Break		
14:00-17:00	Hands-On:- Hitching various equipment	GUNDA , Mangoma ,MHIRIBIDI,MURIRA	
Day Four- 21 May 2015			
08:30-10:30	Investment appraisal-deciding which equipment to buy -Capital Needs	B.Edziwa	Group discussions
10:30-11:00	Tea Break		
11:00-:13:00	Assessing the market; Business Model and Plan; Business Promotion; Understanding competitors; Business Risks	B.Edziwa	Group discussions
13:00-14:00	Lunch Break		
14:00-17:00	Demonstration on shelling/threshing	K.MURIRA, Mr. Gangata, Mr. Mangoma	Hands-on practice
Day Five 22 May 2015			
08:30-09:30	Record Keeping; Monitoring business performance	B.Edziwa	
09:30-10:30	Managing staff	B.Edziwa	
10:30-11:00	Tea Break		
11:00-12:00	Workshop Summary; Workshop Evaluation; Way Forward	P. Nyoni ; B.Edziwa	
12:00-12:15	Closing Remarks	NC	
12:15	Lunch and Departure		

Annex 2: Workshop Evaluation

Workshop Evaluation

Evaluation variables	Number of responses
Accomplishment of workshop objectives	
Yes	16
Partially	1
Useful Topics	
• Driving 2WT and planting	8
• Machine operations, uses, calibrations	6
• Costing and record keeping	6
• CA, agronomic issues	4
• Cash book and cash flow, marketing	3
• Business management	3
• Prices of attachments	1
Topics to be removed	
• Too much time spent on practicals	1
Skills to be applied after training	
• Record keeping and marketing	7
• Actual usage of 2WT and maintenance	6
• Cash book , costing and cash flow budgeting	3
• Business management	3
• CA principles and Agronomic	3
• Transport and shelling	1
General Comments	
• Relevant workshop for farmers and agro-dealers should be done regularly	8
• Empowering workshop, wonderful, educative keep it up	5
• Training needed more time to explain to some participants further detail	4
• Groups should not be mixed up, and should be small groups	1
• Need to visit dealers of 2WT	1
• There is need for further training in practicals	1
• Should bring certified (tested) equipment for demonstration	1
• Need for follow-up after workshop important	1

Annex 3: List Of Participants

No.	NAME	Organization/ Occupation	Gender		CONTACT DETAILS
			Male	Female	
1	Farai Ndlovu	Mealie Brand	M		0773 455 361/0718 059971
2	Jaji Francis	Agritex	M		0772 854 633/0714 000245
3	Crispen Gandanhamo	Farmer/SP	M		0777 326 777
4.	Tavagwisa Munetsi	“	“		0716 032985
5	Learnmore Munangwa	“	“		0733 615 556
6	G. Masendeke	“	“		0733 803485
7	Gwengwere Ngoni	“	“		0774 785 086
8	Maposa Jafeti	Mechanization Dept	“		0773 205724
9	Darlington Chasara	Farmer/SP	“		0714 333 833/0782027416
10	Chayanika Elwen	“	“		0716 717 839
11	Ambrose Ngwerume	ZFU-Farmer	“		0772 393 393
12	Samson Mpofu	“	“		0717 251 942
13	Clara Gweudzo	ZFU-Farmer		F	0775 324 975
14	Tambudzai Muradzikwa	Bain New Holland	M		0771 610 566
15	Shadreck Kamba	Agro-Dealer	“		0716 286 211/0775 445879 sak.kamba@gmail.com
16	Chingozha Mishek	Mechanization	“		0773 031137
17	Miros Demberere	Farmer/SP	“		07711 82622
18	Servias Nyathi	“	“		0714 004 652
19	Mashozhera Paradzayi	“	“		0715435207
20	Gift Mazanhi	“	“		0716471200
21	Makaroni Museza	“	“		0771 337073
22	Isaac Mbewe	NTS	“		0733679665
23	Machona Kaira	NTS	“		0774 9805426
Facilitators					
	<i>Betina Edziwa</i>	CIMMYT		F	0772 417 491
	<i>Patricia Nyoni</i>	Mechanization		F	0774 827 693
	<i>Dr. Walter Mupangwa</i>	CIMMYT	M		0773 930 140
	<i>Delight Mhiribidi</i>	Mechanization		F	0773 441184
	<i>K. Murira</i>	Mechanization	M		0772 980067
	<i>J. Mangoma</i>	Mechanization	M		0772 406 186
	<i>Mr. Gangata (field)</i>	Mechanization	M		0773 839 913
	<i>R. Nazare</i>	University of Zimbabwe	M		0773 531 660

Note : Dorcas Matangi 0776 985 415 participated for the last two days