MECHANISATION AND CLIMATE SMART AGRICULTURAL PRACTICE MODEL FARMS - FIELD DAY DEMONSTRATIONS REPORT

Market Development Programme for Northern Ghana (MADE)

NATHAN

made
MARKET DEVELOPMENT FOR NORTHERN GHANA

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SUBMITTED BY
Nathan Associates London Ltd.
www.nathanlondon.co.uk

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LIST OF ACRONYMS

ABC	Assessment and Business Case
BDA	Business Development Advisors
BDS	Business Development Service
CF	Conservation Farming
CSA	Climate-Smart Agriculture
DFID	Department for International Development
FEA	Farm Enterprise Advisor
MDS	Market Development Specialist
NSEZ	Northern Savannah Ecological Zone
ROI	Return on Investment
PFJ	Government of Ghana's Programme for Jobs
SHS	Smallholder Farmer

SECTION 1. EXECUTIVE SUMMARY

The Market Development Programme for Northern Ghana (MADE) is a market systems development programme funded by the UK Department for International Development (DFID) that supports and incentivises private sector actors to improve the functioning of markets, in an effort to build the resilience and productivity of smallholder farmers (SHFs) in the Northern Savannah Ecological Zone (NSEZ) of Ghana. The programme promotes the use of an "Advanced Model", which is built around a set of seven rights for SHFs and centres on the delivery of integrated bundles of inputs and services – such as certified seeds, fertilisers, and mechanisation and advisory services – by agribusinesses to their SHF clients. Over its six years of implementation, the MADE programme has witnessed significant increases in yields and incomes, as well as improvements in the productivity and competitiveness of both agribusinesses and smallholder farmers alike.

In Year 6 of the programme, MADE supported its lead partner firms and support enterprises to expand the range of services offered and to consider innovative new technologies aimed at further refining the Advanced Model, specifically the adoption of climate-smart agricultural (CSA) practices and on-farm water management and mechanisation services. To promote their wider adoption, MADE entered into collaborative partnerships with 11 of its agribusiness partners, to establish model farms and conduct field demonstrations to showcase the value of these interventions to agribusinesses and smallholder farmers.

Between 27 October and 15 December 2019, MADE's agribusinesses conducted a total of 14 final field day demonstrations across five regions of the Northern Savannah Ecological Zone (NSEZ). Five of the demonstrations focused on climate-smart agricultural (CSA) and conservation farming (CF) practices, while the other nine focused on mechanisation and on-farm water management practices. The field day demonstrations attracted a total of 2,726 farmers from all 11 partner agribusinesses, of whom 49% were female SHFs.

A series of field demonstrations were given by MADE's 11 agribusiness partners at pre- and post-harvest stages. However, this report focuses specifically on the final field demonstrations, which were held at each of the model farms at the harvesting stage. The following report covers the key findings and lessons learned from the model farms, including the environmental and commercial advantages of correctly applying these technologies and practices. The key findings and observations from the CSA model farms included:

- An average 74% return on investment (ROI) through the use of approaches such as minimum or zero tillage, use of improved seed varieties, row planting, intercropping, use of organic pesticides and/or fertilisers, and soil ripping;
- A cost saving of 29% in land preparation compared to conventional ploughing methods;
- 6% less seed required when planting in rows, and substantially improved rates of germination through improved planting depths and plant spacing, while making it easier to control pests, conduct weeding and harvest;
- Significant increases in yield, compared to the adjacent control fields. On average, the CSA model farms had a yield of 1.68 metric tons of produce per acre, compared to 1.1 metric tons per acre on the control farms. One model farm had a yield that was double that of the control field (2.2 MT/acre and 1.1 MT/acre, respectively).

CSA model farms were also able to demonstrate the value of minimum and zero tillage in reducing soil erosion, improving water retention and improving crop quality. At the SHF level, such practices enable improved livelihoods, food security and resilience to the harmful effects of climate change.

The key findings from the mechanisation and on-farm water management model farms included:

- An average 63% return on investment (ROI) for partner firms that invested in direct seeding technology, mechanical/combine harvesting, bond construction and short-duration rice seed varieties (Model Farm Scenario B) on their model farms;
- Improved yields of up to 50% when using improved rice seed varieties;

- Average yield gains of 64% (4.36 metric tonnes per hectare compared to 2.65 metric tonnes per hectare) in model farms adopting improved mechanisation technologies.

While all model farms highlighted the enormous potential of these approaches and technologies to improve yields, increase ROI for agribusinesses, increase incomes for SHFs, enhance the quality of produce and improve resilience to climate change, MADE and its partners have also noted some observations and some recommendations that can improve the efficacy of these interventions in the future. In particular:

- Enhanced efforts should be made to strengthen ties between mechanisation service providers and agribusinesses. This will enable increased access to and availability of specialised equipment and services in the NSEZ;

- When deciding to implement similar interventions in the future, qualified field coordinators should be engaged to provide technical support to agribusinesses, to ensure they are properly implementing all interventions on the model farms;

- Additional refresher trainings and capacity-building should be provided to farm enterprise advisors to reinforce their expertise in the area of climate-smart agricultural practices.

SECTION 2. CLIMATE SMART AGRICULTURE AND MECHANISATION FINAL FIELD DAY DEMONSTRATIONS

2.1 Objectives of Model Farm Demonstrations

As part of its mandate to promote the adoption of sustainable agricultural practices, MADE entered into collaborative partnerships with 11 of its agribusiness partners to establish model farms, with the aim of encouraging the use of, and investment in, innovative technologies and practices such as climate smart agriculture (CSA), on-farm water management and mechanisation services. Under this scheme, three different model farm 'scenarios' were established, and several field days were held to showcase the value and benefits of these practices, such as improved yields and quality of produce, and to encourage buy-in from agribusinesses and small holder farmers (SHFs). The three scenarios established were as follows:

- Model farm scenario A was designed to showcase the value and benefits of conservation agriculture measures, including minimal/zero tillage, intercropping with legumes (macuna) and row planting (dibbling), in combination with the use of climate-smart inputs (i.e. organic pesticides) in maize production;
- Model farm Scenario B was designed to showcase the value and benefits of direct seeding technology, with short-duration seed varieties in rice production;
- Model farm Scenario C was designed to showcase the value and benefits of water management technologies and practices, such as bounding, laser levelling and mechanical transplanting in rice production.

Seventeen model farms were established under the three scenarios described above. Through these partnerships, MADE provided co-investment support in the amount of [redacted] GHS for scenario A (compared with [redacted] GHS for partner firms), [redacted] GHS for scenario B (compared with [redacted] GHS for partner firms) and [redacted] GHS (compared with [redacted] GHS for partner firms).

Once the model farms were established, a series of field day demonstrations were held at critical stages of the farming cycle, to provide practical demonstrations of the different techniques. The initial set of field day events focused on land preparation, planting and proper application of fertilisers and chemicals. Following the first and second field days, a final field day at the harvest stage was organised to bring all demonstration activities on the model farms to an end, and to further stimulate interest and uptake in the practices and technologies showcased. It also provided farmers with an opportunity to witness first-hand the benefits of these practices at harvest time, and the differences in performance between the model farms and control farms.

After an initial field assessment of all model farms, and the completion of the first and second field days, 14 of the farms were selected as suitable for the final field day demonstrations. Of these, five were CSA model farms (scenario A), and the other nine were mechanisation model farms (scenarios B and C). This breakdown was determined to be the most appropriate based on the specific needs and challenges of the respective target groups.

The sections that follow discuss key findings from the final field days that were carried out at all 14 model farms from 27 October-15 December 2019. The observations and lessons learned from these model farms will also inform future interventions by agribusinesses, and programming opportunities for other implementing partners.

2.2 Methodology of Final Field Demonstration Days

MADE's market development manager together with a market development specialist held discussions at each of the model farm sites, to agree on the objectives, structure and timeline for the final field day demonstrations, including the best approach to mobilise farmers in order to generate maximum impact.

The MADE team and partner firms agreed to bring together lead farmers from previously formed farmer groups or clusters, with the aim of gauging their perceptions of the practices and technologies

showcased, and to gather their feedback on the possibility of farmers and agribusinesses investing in these practices in the upcoming season.

To attract farmers to attend, a combination of methods was agreed on with partner firms, including radio announcements made three to four times a day before the event, using the agribusiness' farm enterprise advisors and their network of lead and affiliate farmers. In some cases, partner firms also organised transportation to bring farmers from remote communities to the model farm. As a result, numerous farmers from the surrounding communities and well beyond the vicinity of the model farms were able to attend the demonstrations.

While the overall turnout at the final field days was very good, partner firms did engage in deliberate efforts to limit the participation of lead farmers, as they were already well-positioned to support farm enterprise advisors in sharing key lessons from the model farms and encouraging uptake of these interventions by SHFs. In addition, smaller groups of farmers would make interactions more participatory and engaging and would reduce possible damage to demonstration crops that were not yet ready for harvest.

At each final field day event, farm enterprise advisors designated by each partner firm explained the practices and technologies that had been applied, using a participatory approach to encourage ideas to be shared, to reinforce the information that had been learned. Participants were also taken on guided tours to physically inspect the model farms and assess their performance, particularly in comparison to adjacent control farms. Lastly, the field day event provided an opportunity for farmer-to-farmer exchanges and a broad sharing of experiences between participants.

Following the demonstrations, a group of participants were asked to take part in a questionnaire to share their thoughts on the field day, their likelihood of adopting the practices demonstrated, and the potential barriers that would prevent them from adopting them.

SECTION 3. FINAL CSA FIELD DAY RESULTS

3.1 CSA Activities and Results

A final field day event was held at each of the five model farms, across three regions of the NSEZ, designated to introduce climate-smart agriculture and conservation farming (CF) practices such as zero or minimum tillage and row planting techniques. Conservation farming consists of land management practices that are location- and crop-specific and that seek to protect the soil against erosion and degradation, as well as improve its quality and biodiversity. These measures promote good agronomic practices including timely planting and improved land husbandry through crop rotation, minimal soil disturbance and maintenance of a permanent soil cover.

During the climate-smart agriculture conservation farming demonstrations, the following topics were discussed:

Optimal planting density and spacing for maize

It was explained that maize yields are closely related to plant population – in particular, a greater number of plants results in higher yields. However, farmers were also instructed to be mindful of increasing the plant population too significantly, and to ensure that they follow required distancing between rows and between each plant in the row. Optimal plant spacing is important to allow for ease of field operations, including fertiliser application and weeding.

Pictures 1 and 2: CSA field day demonstrations ([redacted])

A farmer uses his left foot to measure the spacing between maize plants in rows.

A facilitator from [redacted] showcases grain sizes from treated and control plots.

Appropriate post-storage harvest

It was explained how post-harvest practices strongly influence the final quality of produce. Proper post-harvest storage also results in reduced grain loss. While pre-harvest losses are a challenge, caused by a number of factors such as insects, inadequate water supply, too much fertiliser and poor weed control, post-harvest losses are primarily caused by poor storage practices and conditions. The field day demonstrations provided an ideal opportunity to explain proper post-harvest storage and handling

measures to reduce or prevent losses that may occur while farmers are waiting for opportunities to sell their crops.

Overall, the techniques and practices applied on the demonstration plots led to an increase in yields compared to the control plots, and so demonstrated the value of techniques such as minimum or zero tillage, use of row planting and organic fertilisers, among others. A summary of results is shown in Table 1 below, including the cost of production and return on investment.

Additionally, a return on investment (ROI) analysis indicated that a CSA option combining zero tillage, improved hybrid seeds, organic pesticides and good agronomic practices is economically viable and cost efficient. For example, adoption of zero tillage techniques have been shown to result in a cost savings of 3% in land preparation, compared to conventional ploughing methods. In addition, row planting optimises plant spacing and utilises up to 6% fewer seeds, while making it easier to control pests, conduct weeding and harvest.

Table 1. CSA field day demonstrations – yield and budget analysis (in GHS)

PARTNER	CSA PRACTICE	YIELD (MT/ACRE)		TOTAL COST OF PRODUCTION	FIXED COST	GROSS REVENUE	GROSS MARGIN	NET RETURN	ROI
		Test	Control						
[redacted]	Improved seed, minimum tillage, row planting	2.2	1.1	[redacted]	67	[redacted]	[redacted]	[redacted]	91%
[redacted]	Improved seed, minimum tillage, row planting	1.5	1.0		67				70%
[redacted]	Improved seed, zero tillage, intercropping	1.2	1.0		67				34%
[redacted]	Improved seed, soil ripping	1.78	1.2		67				90%
[redacted]	Improved seed, minimum tillage, row planting, organic fertiliser	1.70	1.20		67				90%
						AVERAGE	1,010	983	74%

Pictures 2,3 and 5: CSA field day demonstrations

Farmers attend a training session ([redacted])

Threshing and bagging ([redacted])

Threshing ([redacted])

Farmer attendance was very encouraging across the majority of model farms, with some farms exceeding the target attendance of 200 farmers per event. Overall, a total of 773 farmers (including 249 female farmers) participated in the five field day events for the climate smart agriculture (CSA) demonstrations (see Table 2 below).

Table 2. Participants at the CSA field day demonstrations

AGRIBUSINESS	DEMONSTRATION LOCATION	DISTRICT	REGION	RECORD OF FARMER ATTENDANCE		
				MALE	FEMALE	TOTAL
[redacted]	Kapalbe	East Gonja	Northern	80	66	146
[redacted]	Kulinkpegu	Mion	Northern	34	17	51
[redacted]	Yendi	Yendi Municipal	Northern	30	20	50
[redacted]	Kenkele	Daffiama-Busie	Upper West	207	44	251
[redacted]	Bantama	Sene West	Bono East	163	102	265
			TOTAL	**514**	**249**	**763**

3.2 Farmers' Observations and Reflections on CSA Field Days

Feedback from participants indicated they were very receptive to the climate-smart agricultural practices demonstrated. In particular, they expressed enormous satisfaction with conservation tillage practices that will enable them to reduce labour inputs and overall costs. One farmer stated:

> "Perhaps not much thought was given at the beginning, but now it appears to offer a significant incentive with a good yield pay-off."

Farmers also noted that adoption of drought-tolerant and quick-maturing maize seed varieties represent an effective way to improve low yields. Improved seed varieties can more effectively withstand prolonged exposure to unfavourable weather conditions, which have been increasing in frequency and have even affected the current harvest. Farmers observed that the grain size and weight of maize cobs from the control plots were much smaller and weighed less than those on the demonstration plots that had been planted in rows and were treated with the appropriate weedicides and fertilisers. After seeing the size differences, one farmer said:

> "We are used to our old ways of farming but now realise the significance of what you keep telling us for some time now."

Another said:

> "Every farmer wants to experience a good yield. So, with bigger cob size, fewer cob defects, implementing these practices on a one-acre land will give me much better yield than the yield output from two acres using current local practices."

Notwithstanding all these benefits, farmers considered the use of improved seed varieties to be very costly. Additionally, none of these seed types are covered by the Government of Ghana's Programme for Jobs (PFJ) subsidy scheme. As a result, the practice of recycling seeds is still prevalent among many smallholder farmers, and they are likely to do the same with improved seed varieties, if measures are not put in place to improve the affordability of such inputs and to better educate farmers on the negative effects of recycling seeds.

3.3 Agribusiness CSA investments and SHF targets for 2020/21

As a result of the demonstration trials and the positive feedback from the majority of participating farmers, agribusiness firms are pledging to incorporate climate-smart practices and inputs into their premium bundle packages in the 2020/21 season. Table 3 below shows the investments in climate-smart agro-inputs that the agribusiness firms intend to make in the upcoming farming season.

Table 3: Planned investment in CSA input and outreach targets for 2020/21 season

AGRIBUSINESS	CSA PRACTICES TO BE ADOPTED	OUTREACH TARGET	COVERAGE (ACRES)
[redacted]	Improved hybrid seed, minimum tillage, row planting organic pesticides, farm advisory services	716	1132
[redacted]	Improved certified seed, row planting, farm advisory services	150	247
[redacted]	Improved certified seeds, zero tillage, row planting farm advisory service	320	570
[redacted]	Improved certified seed, soil ripping services, row planting, farm advisory service	152	479
[redacted]	Improved hybrid seed, organic pesticides, zero tillage row planting, farm advisory service	600	900
	TOTAL	**1,938**	**3,328**

SECTION 4. FINAL MECHANISATION FIELD DAY RESULTS

4.1 Mechanisation Field Day Activities and Results

Final field day events were held at each of the nine model farms selected to demonstrate mechanisation services and water management techniques for rice crops, spread across five regions in the Northern Savannah Ecological Zone. Most smallholder farms continue to plant rice using the traditional seed broadcast method. This method wastes seeds, reduces yield and negatively impacts farmers' ability to repay their input credit with rice at the end of the season. In addition, farmers attain less than 50% of the potential yield achievable with existing rice varieties. Low yields are also the result of the ineffective use of farm inputs such as seeds, fertilisers, herbicides and pesticides.

The field days aimed to address these challenges, and enabled agribusinesses to demonstrate best practices in land preparation. These included mechanisation during planting and harvesting, weed management and appropriate fertiliser application as a means of reducing labour costs, best nursery management practices before transplanting, and use of raised bounds as a way for conserving nutrients and water in lowland valleys. Two new approaches to planting rice were demonstrated: direct seeding into the soil through the use of mechanical equipment; and nursing rice seeds and transplanting the seedlings to the field at the appropriate time.

To maximise the impact of the field days, the following activities were offered:

1. The main activity was a field transect walk. Groups of 15 participants were taken on a tour of the model farm to allow for observation and collection of data on yield performance indicators. Key indicators included the number of tillers and filled grains per panicle in specified plants.

Pictures 6 and 7: Mechanisation field day demonstrations

Demonstration farm walk throughs ([redacted])

Demonstration farm walk throughs ([redacted])

Picture 8: Mechanisation field day demonstrations

Harvesting and processing dry and wet rice cut ([redacted])

2. Low-cost mechanical cutters for rice harvesting were showcased, so participants could see how the tedious process of harvesting rice, usually done by sickle, can be performed with relative ease. Farmers took turns operating the machine and found it to be suitable for small landholdings. Due to the lightweight nature of the mini harvester, female SHFs were capable of operating the machine without difficulty. Overall, participants were pleased with the performance of the rice harvester and found it to be a suitable alternative to the traditional methods of harvesting rice. They are pursuing options for acquiring some harvesters for the upcoming season.

Picture 9: Mechanisation field day demonstrations

Trying out the hand-operated mechanical harvester for the first time ([redacted])

Results from the model farms demonstrated increased yields compared to the control farms. Tables 4a and 4b below show yield information and farm investment analysis for each of the model farm sites:

Table 4a: Model farm budget analysis

PARTNER	MEASURES SHOWCASED (SCENARIO B)	YIELD (MT/HA)		TOTAL PROD. COST (GHS)	NET RETURN	ROI
		MODEL FARM	CONTROL FIELD			
[redacted]	Direct seeding, bond construction, combine harvesting	3.83	2.40	[redacted]	[redacted]	60%
[redacted]	Direct seeding, bond construction, combine harvesting	5.4	3.5	[redacted]	[redacted]	83%
[redacted]	Direct seeding, combine harvesting	4.1	2.60	[redacted]	[redacted]	58%
[redacted]	Direct seeding, bond construction, mechanical harvesting	5.8	2.8	[redacted]	[redacted]	97%
[redacted]	Direct seeding Mechanical harvesting	3.2	2.6	[redacted]	[redacted]	26%
[redacted]	Direct seeding Mechanical harvesting	3.8	2.00	[redacted]	[redacted]	54%

Table 4b: Model farm budget analysis

PARTNER	MEASURES SHOWCASED (SCENARIO C)	YIELD (MT/HA)		TOTAL PROD. COST (GHS)	NET RETURN	ROI
		MODEL FARM	CONTROL FIELD			
[redacted]	Direct seeding Combine harvesting	2.0	1.8	[redacted]	[redacted]	37%
[redacted]	Land levelling Bound construction Row transplanting Combine harvesting	2.04	0.96	[redacted]	[redacted]	37%
[redacted]	Land levelling Bound construction Row transplanting Combine harvesting	2.50	2.25	[redacted]	[redacted]	42%

Picture 10, 11 and 12: Mechanisation field day demonstrations

Women winnowing harvested rice ([redacted])

Bagging harvested paddy ([redacted])

Sharing yield results with farmers ([redacted])

4.1 Mobilisation and Farmer Attendance during Mechanisation Field Days

In total, 1,953 farmers attended the field day events. The lead farmers will subsequently share the findings with their cluster of SHFs.

Table 5: Farmer participation at field days

PARTNER	DEMO LOCATION	DISTRICT	REGION	RECORD OF FARMER ATTENDANCE		
				MALE	FEMALE	TOTAL
DIRECT SEEDING (A)						
[redacted]	Zamzugu Yepala	Central Gonja	Savannah	81	42	123
[redacted]	Monkula	Karaga	Northern	74	127	201
[redacted]	Sandema	Builsa North	Upper East	213	334	547
[redacted]	Bui	Kasena Nankana	Upper East	61	89	150
[redacted]	Gbetouri	Jirapa	Upper West	59	63	122
[redacted]	Drobe- Kofi Djan	Sene West	Bono East	132	111	243
[redacted]	Nasia	West Mamprusi	North East	111	76	187
			SUB TOTAL (A)	**731**	**842**	**1,573**
NURSERY AND WATER MANAGEMENT (B)						
[redacted]	Monkula	Karaga	Northern	77	133	210
[redacted]	Kologo	Kasena Nankana	Upper East	46	124	170
			SUB TOTAL (B)	**123**	**257**	**380**
			TOTAL	**854**	**1,099**	**1,953**

4.2 SHF Observations and Reflections from Mechanisation Demo Days

Following the demonstrations of various mechanisation services and on-farm water management for rice crops, farmers shared their observations and key take-aways, as follows:

- While farmers noted that certified improved seed varieties are more expensive than normal seed varieties, the returns far outweigh the costs. As a result, many SHFs have resolved to adopt the use of certified seeds.
- Combine harvesters and other mechanical harvesters were observed to be effective in reducing post-harvest losses, as these machines prevent paddy breakage, and the process enables separation of unfilled grains from the paddy.
- Bounding is an important means to localise nutrients for rice plants in low-lying areas that are prone to flooding.
- While many farmers have become aware of the benefits of CSA practices and mechanisation through various dissemination channels, they have been reluctant to adopt these practices. However, the field day demonstrations enabled them to view first-hand the effectiveness of these practices, and to better understand the potential for improving yields and incomes. Over

70% of the 450 farmers interviewed indicated that they had replicated some of the technologies on their own farms.

4.3 Agribusiness investments in the 2020/21 season

As a result of the positive feedback from the majority of farmers who attended field day events, and the significant yield increases achieved on the model farms compared to the control farms, agribusinesses are pledging substantial investments for the 2020/21 season. This will be in a combination of both farm machinery/equipment and training for their out-grower farmers. Table 6 below shows the projected investments in specialised mechanisation services that agribusinesses aim to make available to farmers.

Table 6: Projected investment in mechanisation service deployment and outreach targets for 2020/21 season

PARTNER	MECHANISED SERVICE DEPLOYMENT	OUTREACH TARGET	COVERAGE (ACRES)
[redacted]	Ploughing and harrowing, direct seeding, bound construction, land levelling, combine harvesting	425	855
[redacted]	Ploughing and harrowing, direct seeding, bound construction, combine harvesting	500	1,500
[redacted]	Ploughing and harrowing, direct seeding, combine harvesting, land levelling, mechanised transplanting	316	702
[redacted]	Ploughing and harrowing, direct seeding, bound construction, mechanical harvesting	264	528
[redacted]	Ploughing and harrowing, direct seeding, mechanical harvesting	115	230
[redacted]	Ploughing, harrowing and rotavation, direct seeding, bound construction, combine harvesting	300	750
[redacted]	Ploughing and harrowing, direct seeding, combine harvesting	238	520
	TOTALS	**2,158**	**5,085**

SECTION 5. OVERALL RATINGS OF THE FINAL FIELD DAYS

Following completion of the final field day demonstrations, participants were asked to rate them based on the usefulness of the information presented, to show whether their expectations had been met, and the extent to which they were interested in and willing to adopt the practices and technologies demonstrated. Ratings assessed various factors, including relevance of the sessions offered and the methods used to deliver the sessions, among others. The table below gives a summary of the results. Overall, 80% of farmers in attendance rated the field day as good.

Table 7: Ratings Agribusiness Field Days

RATING	POOR	AVERAGE	GOOD
How will you rate the quality of this field day event(s) based on the relevance of the learning/exposure created?	82	191	2,453
How will you rate the quality of the field day based on the method used for delivering each session?	164	191	2,372
How will you rate the quality of the field day based on the information presented?	55	191	2,481
How will you rate the quality of the field day based on the language used?	27	109	2,590
How will you rate the quality of the field day based on the season of farming?	273	545	1,908
How will you rate the quality of the field day based on the day of the week?	409	545	1,772
Overall percentage	**6.2%**	**10.8%**	**83.0%**

While farmers were largely appreciative of the information, they gained from the field day, some participants made suggestions for improvements for any future demonstrations. For example:

- Partner firms should be mindful of avoiding certain days of the week, to prevent a disappointing turnout. For example, the observance of Juma prayers on Fridays in Muslim-dominated communities, market days and funeral ceremonies should be taken into account when deciding on specific dates for events.
- Advertising the field day in advance will allow farmers to plan accordingly and allow increased turnout.
- Partner firms should offer free samples, especially when introducing a new crop variety or input to farmers at such events.
- Continuous follow-ups should be conducted with farmers, to ensure that the practices and/or technologies introduced during the demonstrations are being appropriately applied.

SECTION 6. CONCLUSION AND RECOMMENDATIONS

At the conclusion of the final field days, farmers indicated that they were generally pleased with the quality of the event and noted that they had acquired new knowledge about innovative technologies and practices. The demonstrations not only improved their awareness of CSA, on-farm water management and approaches to mechanisation, but also enhanced their capacity to become more productive farmers. Farmers also appreciated the manner in which the demonstrations were conducted, which took into consideration the entire farming process – from pre-harvest to post-harvest – rather than presenting disparate, disconnected pieces of information. An overwhelming majority of farmers not only expressed interest in implementing the practices on their own farms, but also indicated their desire and willingness to impart this knowledge to their peers. Suggestions were made to expand the model farms so that other SHFs could be reached in subsequent cropping seasons.

Recognising an increased interest among SHFs in these services and techniques, all 11 agribusinesses said that they would seek to expand the Advanced Model bundles they are currently providing to their affiliated SHFs, to include some or all of the inputs and services showcased on the model farms. In addition, 10 agribusinesses have noted that they will establish 17 model demonstration farms in the coming 2020/21 farming season, to further increase awareness and uptake of these practices and technologies.

Overall, the MADE team and partner agribusinesses noted the following successes from the model farms:

- Utilising the direct seeding technique for planting rice crops, rather than the traditional method of rice seed broadcasting, results in reduced seed wastage by an average of 35%. This method was of significant interest to many participants, who were impressed with the resulting yield performance and expressed their intention to adopt improved certified seeds, employ the direct seeding technique and follow good agronomic practices in the next farming season.

- By using a mechanical rice transplanter, a larger area can be covered in less than half the time. Use of this equipment also minimises the labour required for planting.

- Transplanting rice seedlings in rows ensures optimum stocking density, minimises nutrient competition, allows for maximum growth and development and results in higher yields.

- The use of bound construction is important for retaining water and conserving essential nutrients in the rice fields.

- Adoption of soil ripping tillage practices, using a mechanical harvester, can result in reduced harvest losses of between 4-10% compared to conventional ploughing. This method prevents breakages in the rice and removes all unfilled grains from the paddy before marketing of the paddy.

- Row planting optimises plant spacing and requires up to 6% fewer seeds. It also enables easier pest control management, weeding and harvesting.

- Adoption of minimum tillage practices contributes to cost savings of approximately 29% in land preparation, when compared to conventional ploughing methods.

While the final field day demonstrations were largely viewed as a success, and the demonstrated approaches and technologies earned widespread interest and buy-in among agribusinesses and SHFs, the following challenges were noted, which should be addressed for future demonstration:

- Some partner firms improvised the minimum tillage approach, due to the unavailability of appropriate equipment, farm tools and technical support.

- Seed drills used for planting were not calibrated correctly, as this was the first time that agribusinesses had used this planting method. As a result, the seed allocation per drill was incorrect, which resulted in several unseeded, dry patches in the rice field. These

agribusinesses then resorted to refilling the drills with seedlings raised in a nearby rice nursery to achieve an adequate plant population.

- Weed infestation was seen to be one of the main challenges with the direct seeding method, mainly because weeds tend to grow more rapidly in dry, seeded fields. In addition, implementing effective control measures increases overall on-farm management costs.

- While some partner firms demonstrated an adequate understanding of climate-smart agriculture techniques, others had limited technical capacity to appropriately implement CSA-focused demonstrations.

- The scattered nature of rice farmlands is likely to make it difficult and cost prohibitive for partner firms to deploy machinery to service the requests and demands of its farmers.

In addition to the challenges and suggested improvements noted for future field day demonstrations, the model farms also provided an opportunity to reflect on broader lessons learned and recommendations for future interventions by agribusinesses and/or other donor-funded programmes, as follows:

Recommendations:

- Enhanced efforts should be made to strengthen ties between mechanisation service providers and agribusinesses. This will enable increased access to and availability of specialised equipment and services in the NSEZ;

- When deciding to implement similar interventions in the future, qualified field coordinators should be engaged to provide technical support to agribusinesses, to ensure they are properly implementing all interventions on the model farms;

- Additional refresher trainings and capacity-building should be provided to farm enterprise advisors to reinforce their expertise in climate smart agricultural practices.