Training of Trainers (ToT) on the dissemination of CSA practices and CIS toward increasing the productivity of target crops

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SUMMARY

Sustainable environmentally, economically viable, and socially acceptable ways are important factors in increasing food production and achieving food security. To achieve increasing food production, the capacity development of key stakeholders especially extension agents and youth farmers is of great necessity, toward increasing the adoption of climate-smart agricultural practices. The training of trainers (ToT) was organized to equip the lead beneficiary with relevant knowledge and skills on the dissemination of CSA practices and CIS towards increasing the productivity of target crops in order to increase the farmers' adoption across the intervention villages. Specifically to; (1) review and share the experience of the 2022 on-farm participatory demonstration; (2) educate them on the importance and objectives of trials and demonstrations; (3) ensure the field technicians (ANCAR, CERAAS, identified local) in charge of setting up and supervising trials as well as demonstrations fully understand the designed protocol and monitor them to achieve good results; (4) train them on techniques of quality seed production and (5) benefit of climate-based advisories through ISAT platform for Increase productivity.

For effective learning, clarity, and understanding among the trainees, a one-day training was facilitated at a central location within each cluster. In Koumpentum cluster (Tambacounda region), the training was held on 9 May 2023 at the conference hall "De Sante Central, Koumpentoum. In Daga Birame cluster, the training was held on 10th May 2023 conference hall "Central Regional, Kaffrine. Meanwhile, in Thiel Cluster and Meouane clusters were held on the 16th and 17th June 2023. In Thiel cluster, the training was held in the meeting room of the council office, and in the Meouane cluster, it was held in the CLAC Hall. Each cluster consists of six (6) villages, two representative farmers from each village were invited including the lead farmer and one person responsible for the management of the manual rain gauge, and or a representative of women farmers. A total of 79 participants attended the training across the four clusters including lead farmers and other farmers representatives, ANCAR extension agents, field assistants, and facilitators (ICRISAT, ISRA-CRZ, ISRA-CERAAS) respectively. During the training, the presentation includes Climate-smart management practices toward increasing pearl millet and groundnut productivity in Senegal such as ISFM, and the importance of micro-dosing techniques for increasing production and net income. Other training sessions include dissemination of climate information services across the AICCRA project sites and training for meat and milk production. The participants from the Koumpentoum cluster, Tambacouda region, being the newly added cluster, appreciated the training session and acknowledged they understood the project goals and activities with clarity and promised their willingness to adopt the climate-smart technologies and innovation of the project in their area. Similarly, the participants from Daga Birame. Farmer representatives present at the training were evaluated at the beginning, and they were asked about their knowledge of AICCRA, and its activities. Farmers in Tambacouda who had no prior knowledge of AICCRA as a newly added cluster to the existing ones, but at the end of the training, farmers were well-informed about AICCRA and its objectives. The training was very educating and informative to the farmers with rap attention given by the farmers.

ACKNOWLEDGEMENTS

1. INTRODUCTION

AICCRA project since its implementation in Senegal, has disseminated various Climate-smart innovations and information for the improvement and increased yield productivity of major crops in Senegal. Climate has a strong influence on agriculture, it's considered the most weather-dependent of all human activities[1] with impacts on food security[2]. Both variability and change in climate affect food production availability, stability of food supplies, food utilization, access to food, and food prices everywhere in the world[2]. Increasing food production using environmentally sustainable, economically viable, and socially acceptable ways are important factors to achieving food security. Integrated Soil Fertility Management (ISFM) is a set of practices related to cropping systems, fertilizers, organic resources, and other amendments on smallholder farms to increase production and input use efficiency[3]. The soil fertility enhancement technologies developed over the years for the main staple food crops in West Africa, such as sorghum and millet remain one of the climate-smart technology practices against climatic risks for better farm-level interventions. Thus, the technology adoption remains low due to limited access to inorganic fertilizers due to high market prices and inadequate use of manure amendments. The combination of organic resources and mineral fertilizer as inputs formed the technical backbone of integrated soil fertility management (ISFM), especially when adopting micro-dose application strategies. The farmers that choose the technologies have a higher benefit/cost ratio and net positive gains with low risk to the environment. Fertile fields are a great asset to farmers. But improper agricultural management can lead to land depletion, therefore, training capacity building on how best to effectively use and adopt these technologies by farmers is an important output tool in achieving an excellent outcome. Thus, to achieve increased food production, capacity building of key actors especially extension agents and farmers are of great necessity toward increasing the adoption of climate-smart agricultural practices.

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[3] Akinseye, Folorunso M., Birhanu Zemadim Birhanu, Hakeem A. Ajeigbe, Madina Diancoumba, Karamoko Sanogo, and Ramadjita Tabo (2023). Impacts of fertilization management strategies on improved sorghum varieties in smallholder farming systems in Mali: Productivity and profitability differences. Heliyon Vol.9 (3) https://doi.org/10.1016/j.heliyon.2023.e14497

The overall objective of this training is to equip the participants with relevant knowledge and skill on the dissemination of CSA practices and CIS towards increasing the productivity of target crops in order to increase the farmers' adoption across the intervention villages. Specifically to; (1) review and share the experience of the 2022 on-farm participatory demonstration; (2) educate them on the importance and objectives of trials and demonstrations; (3) ensure the field technicians (ANCAR, CERAAS, identified local) in charge of setting up and supervising trials as well as demonstrations fully understand the designed protocol and monitor them to achieve good results and; (4) benefit of climate-based advisories through ISAT platform for Increase productivity. The training focused on improved soil fertility management practices, increase production and yield using improved seeds of targeted crops like millet, peanut, and sorghum against local varieties, presentation and importance of climate-smart information (iSAT), setting up and establishing technology parks in clusters, demonstration plots in multi-location within the community, practical demonstration on the proper application of fertilizer, recommended rate of fertilizer and management practices on-farm for successful production.

The structure of the training report highlighted farmers' experience and performance of 2022 agricultural technology during the 2022 season across clusters, climate-resilient agriculture demonstration for the 2023 cropping season, and presentation of CIS through the iSAT platform.

2. WORKSHOP PROCEDURE

2.1. Farmer's experience with the 2022 agricultural season technology deployed in Daga Birame, Thiel, and Meouane clusters

2.1.1. Daga Birame Cluster

Farmer representatives across the six villages in the cluster described the climate-based agro-advisories disseminated last season, as timely, accurate, and informative which supports their activity. On the production technology, improved seeds produced better yields than local varieties, for example, a farmer from the Mbeuleup community confirmed that he produced 12kg of shell grain groundnut from 1.2kg of seed provided for planting. Similarly, the SL28 millet variety was culturally accepted by the farmers across the communities. They appreciated the taste of the food of the millet when prepared into "couscous", according to the farmers the taste was excellent against their locally produced millet. A woman representative of farmers in the Mbeuleup community

appreciated the CERAAS/ICRISAT constant visit to their field and advisory last season, she requested that more farmers be trained on the installation of the protocol rather than the lead farmers alone, she was assured that the supervisor team will be very much available this season to be of help to them and see to the success of their demonstration.

Photo 1: Cross section of the participants during training sharing their experience 2022 agricultural season at Daga Birame

2.1.2. Thiel Cluster

Farmers noted that the millet demonstration plots, were heavily attacked by caterpillars and midges during the flowering period and by birds during the panicle filling period, meanwhile for the peanut demonstration plot, there was no major constraints observed during growth. They also highlighted the delay in seed availability last year, which caused a delay in planting. They mentioned a lack of communication, as they received surprise visits several times last year, which affected their planning. They also requested increased support to ensure the success of the demonstration plots, particularly during sowing, fertilization, and data collection. Furthermore, they requested that activity of the project should extend beyond the rainy season for the farmers extend.

Additionally, the technology park manager mentioned several constraints he faced during the previous growing season, including the absence of measuring equipment, signposts for proper identification of different treatments, and individual protective equipment kits for phytosanitary

treatment. He also mentioned that animals caused damage due to the absence of barricade in the park. Despite all these constraints, the farmers expressed motivation regarding the implementation of climate-smart practices. They emphasized that they had learned a lot, especially the micro-dosing technique, which they had successfully applied in other fields. They appreciated the climate-smart practices implemented, particularly the spacing in groundnut production, which contributed to yields increased. They also commended the spacing and seed density per hill of millet production. The facilitator of training promised to address all their concerns to avoid any shortcomings experienced during the 2022 growing season. In anticipation of the 2023 growing season, farmers present at the training were assured of the availability of seeds for the season which would be distributed to them before the onset of the rainy season. Phytosanitary kits would be made available only to those farmers that required spraying, and training sessions would be scheduled for them on application techniques. To address the issue raised, especially extension agents and farmers, is necessary to increase on lack of communication, a local field supervisor has recruited Thiel cluster to support the ANCAR agent and provide effective communication and substantial assistance during the season. These supervisors would also serve as information dissemination channels for potential visits by the project team. Regarding equipment, measurement tools and individual protective gear would be provided for both the demonstration plots and the technology park where necessary.

Photo 2: Cross section of the participants during training sharing their experience 2022 agricultural season in Thiel cluster

2.1.3.   Meouane Cluster

Farmers identified delayed seed distribution and shortage in the quantity of seed provided as constraints during the last season, which had an impact on production. They also identified that the lead farmer trained from Ndiane village was unable to provide a proper explanation, which affected the establishment of the demonstration plots. To address this situation, the CERAAS team clarified that a local supervisor is currently being recruited for the Meouane cluster to support the ANCAR agent in successfully establishing the demonstration plots. Additionally, individual protective equipment will be provided to the farmers. They emphasized that this year, there has been anticipation, and the seeds are already available and will be treated with fungicides before distribution. Furthermore, Dr. Aliou Faye and Dr. Akinseye made advocacy for the effective management of the technology park, as they stated that this park is a showcase for all the communities involved, aiming to enhance the farmers' experience for better climate smart-practices adoption.

TABLE 1: Summary of farmer's experiences, opinions and observations based on the 2022 demonstration					
Cluster	CIS	Quality of Improved seed	Yield	Availability of seed	Extension service provided by CERAAS/ICRISAT
Daga Birame	Very satisfied	Excellent	Excellent	Good(not delivered on time)	Good
Meouane	Very satisfied	Excellent	Excellent millet seed(produced good couscous)	good	Very satisfied
Thiel	Satisfied	Excellent	Good	Good(but not delivered on time)	Good

Photo 3: Cross section of the participants during training sharing their experience 2022 agricultural season at Meouane cluster

2.2. Presentation of climate-resilient agricultural technologies for demonstration in different environments for target crops (millet, groundnut, cowpea, and sorghum)

Across the four clusters (Koumpentum, Daga Birame, Thiel, Meouane respectively), the presentation on climate-resilient agricultural technologies for both the on-farm and technology park was presented. Earlier, the emphasis was laid on the importance of increasing the major food crops produced in Senegal, their economic importance for human consumption and livestock, and as well as the reasons for the adoption of climate-smart agriculture technologies for increase productivity. These were projected to the farmers and interpreted in their local language for better understanding. The training further highlighted major constraints to production in the dryland areas and solutions through the adoption of climate-smart management practices. The farmers were assured that the CSA technology being promoted by AICCRA has great potential to provide solutions to low yield productivity experienced across the villages if adopted, and at the same improve soil fertility and reduce land degradation. The protocols for establishing millet and peanut production technology at the farm level were explained by the lead trainers Dr. Akinseye and Mr. Doudou Diouf, while the forage cowpea demonstration was presented by Dr Fafa Sow and Mr Adama Diouf. Additionally, these protocols were further reviewed and thoroughly explained to the ANCAR

agents, the local supervisor, and the lead farmers, who would then share this knowledge with other targeted farmers within their community. Similarly, the Tech Park agricultural innovation protocol was directed to the respective park manager, to ensure a better understanding for proper implementation, since the target is to showcase climate-smart practices to enhance better adoption.

In general, four farmers were identified in pearl millet multi-location demonstration plots per village, and two farmers per village were selected for peanut with two adapted improved varieties following last season's performance. While additional four farmers per village will demonstrate forage cowpea in three clusters (Thiel, Daga Birame, and Meouane respectively).

Photo 4: Participants listened to a presentation on CSA technology protocol at Koumpentum Cluster on the 9th May, 2023

Photo 5: Participants listened to a presentation on CSA technology protocol at Thiel and Meouane Clusters on the 16th and 17th of June 2023

2.3. Presentation of CIS generated through iSAT and installation of IoT and manual rain gauges deployment to Koumpentoum Cluster, Tambacounda region

Across the three clusters (Daga Birame, Thiel, and Meouane) that implemented climate-based agro advisory during the last season, the beneficiary farmers expressed their appreciation for the information through the Jokolante platform via SMS and voice messages in different local languages. It was confirmed that the climate-based agro-advisory better guided their decision during the cropping operations throughout the rainy season. Thereafter, the presentation of the 2023 pre-season outlook forecast indicated the expected amount of rainfall and temperature range. Thus, suggests potential crops for cultivation with maturity range as well as potential planting window for each cluster.

iSAT is a decision support tool used in seasonal climate forecast (SCF) for disseminating weather parameters useful for farmers in the growing season. Farmers in attendance were made to understand the importance of the SCF, the types of SCF and how the weather forecast messages are disseminated. The messages are delivered on their registered mobile phones which they will receive as a voice message, they listen to it in their local language "wolof" which will be easy for them to understand. Further training will be done by the disseminating partner of the AICCRA project. Examples of messages that would be disseminated to them which would be in their local language were displayed. iSAT forecast technology helps to disseminate the behavioral pattern of rainfall, give time for preparation for planting, and give the exact date, and amount of rainfall. This will help farmers plant at the exact time.

In an effort to boost the knowledge of the beneficiary and strengthen the climate-based agro advisory across our intervention communities in the Koumpentoum cluster, Tambacouda region, a training session led the selected farmers on the installation and accuracy of reading manual rain gauges. The installation of six (6) manual and 3 IoT automatic rain gauges were added to the existing seven (7) IoT automatic and 20 manual rain gauges deployed across 20 communities in Meouane, Daga Birame, and Thiel respectively clusters. Supporting CSA with climate-based advisories such as planting dates and other management would facilitate the adoption and scaling of climate-smart farming technology across AICCRA intervention areas. However, the direct beneficiaries would serve as knowledge transfer agents, both within and outside intervention

communities, while the continuous records of the climate could serve as a source of information to insurance companies.

Photo 6: Presentation of climate-based agro-advisory to participants during training at Meouane Cluster
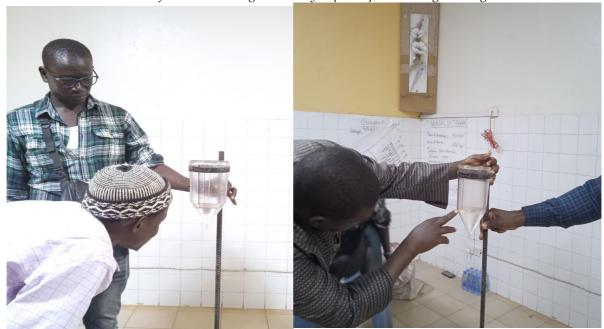

Photo 7: Practical demonstration of reading of manual rain gauge by farmers in Koumpentum cluster, Tambacounda region.

Photo 8: *Installation of both IoT and Manual Rain gauges at Bousra village in Koumpentum cluster, Tambacounda region.*

3. KEY LESSONS LEARNT AND SUCCESS STORIES

- The region where AICRA-Senegal interventions were targeted showed positive results to the CSA deployed, but broader efforts are required for scaling out the technology in order to achieve greater impact. Overall, the AICCRA project beneficiaries reported higher adoption rates of climate-smart practices, demonstrating a favourable impact of the project. Therefore, Farmers' participation in a demonstration in the upscaling of Climate-smart innovations and Climate-smart information among clusters in Senegal has shown that if smallholder farmers are well informed on adaption to climate changes, they are capable of improving agricultural productivity in Senegal for example increase in population density of pearl millet performed better than low population density of farmers adoption strategy.

- Scaling-up innovation as a means to change and ensure sustainability; farmers' participation in demonstrating various innovations and climate-smart techniques by the project across the targeted regions has shown that AICCRA intervention is a means of helping key stakeholders improve the livelihood both at community level and the country at large

- Women's involvement, a means to rural livelihood; women's involvement activities and representativeness within the demonstration of climate-smart innovation in the regions had a positive impact on women's empowerment. In addition, women were able to benefit from

the capacity of the building provided by the project, and access technologies resulting in higher production and increase incomes than before.

4. CONCLUSION

The pre-season training was successfully conducted with the objectives of enhancing the farmers' understanding and adoption of the CSA technologies, as well as promoting the success of the on-farm trials. It also provided an opportunity to identify and address the constraints faced by the farmers during last year's trial establishment with the exception of the Koumpentum cluster, which commenced implementation in 2023. At the end of the training, the following set objectives were achieved;

- Farmer knowledge of climate-based agro advisory and CSA dissemination is refreshed. Farmers in the Koumpentoum cluster were able to understand the importance of climate-based agro advisory and how CSA demonstration during the 2023 season will be disseminated to them, while DagaBirame cluster farmers had a refreshing knowledge of the importance of the seasonal climate forecast messages they received in the last season and were assured of same excellent result this season.
- The training sessions were highly participatory and facilitated a better understanding and engagement with the project activities for the upcoming 2023 season.
- Local project technicians fully understand the issues and objectives of 2023 trials and demonstrations. Tech Park managers and AICCRA extension agents for the 2023 trails were well-taught about the planting protocols and the establishment of the protocols for the season. They were able to demonstrate the knowledge impacted during the practical session.
- The implementation and monitoring of the trials in the different communities and Tech Park were well understood by all actors.

APPENDICES

Agenda of training

Time	Activities	Presentation
9h-9h30	**Arrival and Breakfast**	**All participants**
9h30 - 10 h	Opening and setting up the objective of training	CERAAS Director/Representative
10h- 11h00	Presentation of 2022 participatory demonstration and farmer's experience	Akinseye/Doudou
11h – 13h	Presentation of 2023 participatory demonstration	Akinseye/Doudou
13h- 13h30	Participatory demonstration by ANCAR	ANCAR Rep
13h30 -14h30	**Lunch**	**All participants**
14h30 – 15h	Dissemination of climate information services through iSAT in AICCRA project sites	Omar Konte and Akinseye
15h -16h	Training on the conduct of meat and milk trials	Fafa Sow
16h-16h30	**Closing of the Training**	**Aliou Faye/ Representative**

About AICCRA

Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) is a project that helps deliver a climate-smart African future driven by science and innovation in agriculture.

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