REPORT AFRICAN REGIONAL WORKSHOP

Applications of Juncao technology and its contribution to the achievement of sustainable Agriculture and sustainable development goals (SDGs)

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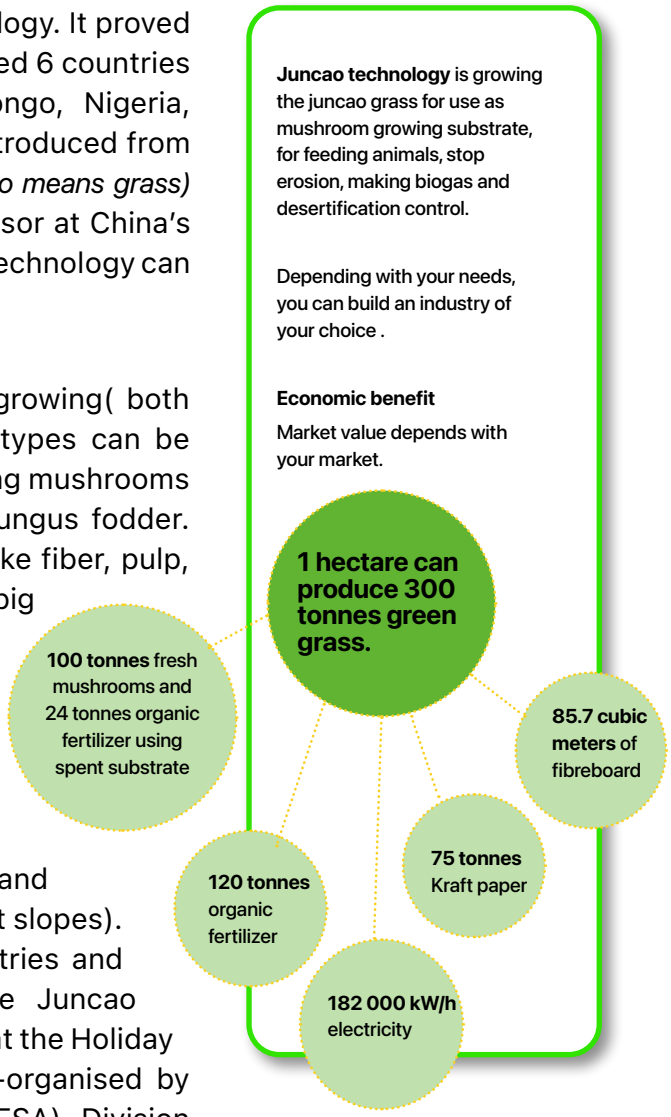
Introduction

A report on the workshop in Rwanda on Juncao technology. It proved to be an eye-opener for the participants who represented 6 countries which included Eritrea, Democratic Republic of Congo, Nigeria, Rwanda, Tanzania and Zimbabwe. Juncao is a grass introduced from China. The Juncao technology *(Jun means fungi and Cao means grass)* was invented in the 1980s by Prof Lin Zhanxi, a professor at China's Fujian Agriculture and Forestry University (FAFU). The Technology can address food Insecurity and poverty in Africa.



At the core of the Juncao Technology is mushroom growing(both edible and medicinal mushrooms), many mushroom types can be grown using the juncao grass as substrate. After growing mushrooms spent substrate can be used to make fertiliser and fungus fodder. The juncao grass can be used to make bio-materials like fiber, pulp, activated carbon and fibreboards. This has created big industries in China. For ecological management the grass can be used to stop soil erosion, collapsing hills, desertification control and sand control. Of interest to many was it's use as forage as it can be used to feed cattle, fish, sheep, pigs and poultry. It is used for preserving the environment through desertification control, stop soil erosion (Rwanda is a land of a thousand hills and as such juncao can be planted at slopes). Juncao technology has reached more than 100 countries and counting. In 2021 Zimbabwe officially adopted the Juncao technology at a workshop held on 2-4 November 2021 at the Holiday inn hotel, Harare, Zimbabwe. The workshop was Co-organised by the Department of Economic and Social Affairs (UNDESA), Division for Sustainable Development Goals (DSDG), National Engineering Research Center for Juncao Technology of the Fujian Agriculture and Forestry University (FAFU), and Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, Zimbabwe. Consequently, the location of the Juncao Demonstration site was chosen to be at Gwebi Agricultural college. In 2023 an agriculture technology demonstration centre will be established in Zimbabwe by China through FAFU which has also partnered UNDESA. It is bringing tangible benefits everywhere it's introduced, as it not only helps develop a low-cost mushroom cultivation industry, but also produces

cattle feed and minimizes soil erosion among many uses.

We had insightful presentations, farm visits and tour, networking and socialising in Rwanda. We had equal representation men and women which ensured that interactions were insightful.

The workshop was organised and facilitated by the Division for Sustainable Development Goals (DSDG) of Desa (UNDESA) of the United Nations. National Engineering Research Centre for Juncao Technology of the Fujian Agriculture and Forestry University (FAFU) of China Ministry of Agriculture and Animal Resources, Rwanda Rwanda Agriculture and Animal Resources Development Board (RAB).

A crop of juncao grass

Acknowledgements

I would like to thank the following for making this workshop a reality.

The Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, Zimbabwe in particular Ms Ottilia Mabvongwe, Mrs Hilda Manditsvara,MR Assah Mudhefi and Mr Stancillae Tapererwa of the Department of Agricultural Technical and Extension Services. for including me in Team Zimbabwe and participating in the initial workshop in 2022. Division for Sustainable Development Goals (DSDG) of Desa (UNDESA) for such a wonderful eye opening workshop, that I believe will change mushroom farming in Zimbabwe and Africa at large.

National Engineering Research Centre for Juncao Technology of the Fujian Agriculture and Forestry University (FAFU) of China for this exceptional opportunity. Prof. Lin Zhankx for inventing this amazing technology. Ministry of Agriculture and Animal Resources, Rwanda. Rwanda Agriculture and Animal Resources Development Board (RAB).

Last but not least I would like to give acknowledgments to the following for different roles in making my travel possible Lloyd Makwembere, Baynham Tanaka Goredema, Jekesai Lloyd Dexter Njikizana, Duncan Mupaso, Shingirayi Mupaso, My family and all who helped me to travel to Rwanda.

PHOTO: MEDIATRICE HATUNGIMANA

Team Zimbabwe official opening

Background

The Juncao Technology will help address Food Insecurity and poverty in Africa through growing mushrooms as food and fighting malnutrition as well as used as stock feed and ecological benefits among other things given in this report.

In 2020, Africa Centre for Strategic Studies revealed that more than 100 million Africans faced extreme levels of food insecurity with a quarter of a billion people in Africa experiencing hunger in 2019.

Over the last several decades, Food insecurity in Africa and poverty rates have grown. In 2020, Africa Centre for Strategic Studies revealed that more than 100 million Africans faced extreme levels of food insecurity with a quarter of a billion people in Africa experiencing hunger in 2019. While malnourishment and starvation are among Africa's problems, farmers and growers are unfortunately struggling to meet the food demands of the continent's growing population, with factors such as drought, instability and the COVID-19 pandemic exacerbating the situation. The Juncao technology will help farmers grow food in unfavourable environments. It's also sad to note that crop yields have not increased in Africa compared to other regions thus the challenge of hunger remains.

The Juncao technology differs from the traditional methods of growing edible and medicinal mushrooms as it does not rely on wood as a source of the substrate. Normally, when farmers grow mushrooms, they use wood logs or sawdust as a surface for the mushroom to grow and spread which is commonly known as substrate. Sawdust means people need to cut down trees, which in turn, harms the environment. In addition, trees take a very long time to grow. The Juncao technology involves its use to make biogas which can be used for sterilisation and cooking in homes. Our visit to Deyi co. ltd is a testimony that spent substrate can be used to make charcoal which reduces the cutting down of trees. Juncao technology can address the environmental problems traditional methods pose and give people the means to grow food quicker and more efficiently.

Switching to Juncao Technology

While the environmental benefits of Juncao are very noticeable, there are several other reasons why countries in Africa could benefit from utilizing this technology. One reason is that mushrooms are very nutritious. To this point, it is worth considering that there are hundreds of millions of people who suffer from malnutrition in Africa.

In 2019, World Vision reported that 234 million people living in the sub-Saharan region were undernourished, not accounting for the total number in Africa.

Though the nutritional value of mushrooms is easily recognizable, there is another appealing reason why countries in Africa may optimize Juncao technology. Mushrooms can take as little as four weeks to cultivate, meaning that wood could deplete very quickly. Juncao technology solves this issue while enabling farmers to grow an unlimited amount of mushrooms at once. The Juncao technology has the potential to address food insecurity in Africa through Sustainable agriculture and help achieve some of the United Nations' Sustainable Development Goals. More importantly, the technology allows the use of other substrates like Nyambo Farm uses (details below)

The Rwanda trip was important for the team from Zimbabwe to equip ourselves and learn about the benefits of Juncao technology as it was being used in Rwanda.

The Juncao technology has the potential to address food insecurity in Africa through Sustainable agriculture.

PHOTO: JEKESAI NJIKIZANA

Oyster mushroom cropping room at Ikaze farm

Workshop in Rwanda

It has been an eye-opening experience to travel and learn from Rwanda which is already using the Juncao technology. We had a wonderful learning experience enhancing the little knowledge we had, and interacting with other African countries was a huge opportunity. Not interacting only but learning from what they are doing in their countries as they are also using this technology. The presentations throughout the workshop involved interactive discussions and we had access to experts from all countries who participated, all had at least one participant who had been to FAFU for training. After each presentation there will be a question and answer segment involving presenters and participants. Interactions continued beyond the workshop space to the hotel rooms. Thanks to modern technology interactions are continuing even beyond the workshop through the official WhatsApp group and other social media platforms.

Opening ceremony officials from right, Amson Sibanda, Florence Uwamahoro, Ambassador Wang Xuekun,Dr Oliver Kanama, Mr Ozonnia Ojielo, Dr Dongmei Lin

PHOTO: MEDIATRICE HATUNGIMANA

We managed to build a network with other mushroom farmers, those with interest in livestock and government officials from Eritrea, Democratic Republic of Congo, Rwanda, Tanzania and Zimbabwe. We now have networks with all countries represented. We will use social media channels, emails and more. A WhatsApp group was created for networking.

PHOTO: MEDIATRICE HATUNGIMANA

A Group photo delegates attending the juncao workshop in Rwanda.

Day 1

The workshop started with **Mr. Amson Sibanda** who was the moderator, giving welcoming remarks. Mr A Sibanda is the Chief, National Strategies and Capacity Building Branch , DSDG/UNDESA. He emphasised the value of the technology in particular how it can be applied in Africa. We also watched an informative videos on the technology, most interesting was it's use to reclaim deserts and use as stock feed

He explained that growing mushrooms using Juncao technology will address food insecurity, generate household income and create employment opportunities for women and young people, and called on African countries and beyond to adopt and implement the technology in the quest for promoting economic development.

Dr. Alexandre Rutikanga Director General (RAB) gave welcoming remarks represented by the deputy director general of RAB Ms Florence Uwamahoro. She talked on how the technology has had an impact on Rwanda Agriculture. Juncao Technology has shown massive impact and great potential in promoting the implementation of 11 SDGs, including poverty eradication, food security, health, education, gender equality, affordable clean energy, economic growth with sustainable consumption and production pattern, ecological treatment, desertification control and biodiversity, combating climate change and partnership.

PHOTO: JEKESAI NJIKIZANA

Day 1 proceedings

The United Nations Resident Coordinator in the Republic of Rwanda **Mr Ozonnia Ojiello** touched on how African leaders afford buying sophisticated weapons yet failed to implement such a simple technology to eradicate poverty, create employment and achieve sustainable Agriculture, achieve sustainable development goals.

Ambassador Wang Xuekun, Embassy of the People's Republic of China in the Republic of Rwanda also talked on the history of the technology and how it will help Africa overcome pressing challenges.

The father of Juncao **Prof. Lin zhanxi**, Chief Scientist National Engineering Research Center of JUNCAO technology gave some remarks on the technology he invented and how it is impacting many countries in Africa and beyond. Prof. Lin Zhankx chronicled how this technology is helping over 100 countries in the world to overcome hunger malnutrition and other benefits, unfortunately, he could not travel so he made his speech via video.

Hon. Gerardine Mukeshimana Minister of Agriculture and Animal Resources of Rwanda was represented by **Dr. Oliver Kanama** who spoke on how the Juncao technology has made practical influence in Rwanda. And outlined the ministry's vision in the technology. He officially opened the workshop.

The Juncao technology is helping over 100 countries in the world to overcome hunger malnutrition and other benefits.

The Keynote presentation

Introduction of China-Rwanda Agriculture Technology Demonstration Center was given by Dr. Dongmei Lin. Lots of work has been done with the technology since invention to date, most interesting research is on how to use the grass to make clothes We enjoyed how she simplifies the research she has done and doing especially using diagrams that are easy to understand. Most of the things she presented we saw and experienced on our visit to the China-Rwanda Agriculture Technology Demonstration Center (C-RATDC).

Ms Dongmei Lin presentation was very simple yet very technical and had a lot of technical data:

She described the technology in detail. After her presentation it was time to have interactive discussions where she answered questions and explained further, in particular, Zimbabwe was curious how the centre in Zimbabwe will also operate. The Zimbabwean technology and demonstration centre will start operating this year 2023.

One participant asked if there was work on using it to make food, Ms Dongmei Lin said nothing was available in that end and they will look at it and she called on other researchers to find ideas on how best the grass can be used.

They also do silk worms at the center. Most interesting is that they have a processing centre, for value addition to the mushrooms, which is a missing link in many other African countries. Though oyster is the main type, many other types of mushrooms are grown.

Mr Damas Twagirayezu shared experience of mushroom industry in Rwanda which was really eye opening in the model they use as Rwanda After his presentation we had some Interactive discussions mainly on What Rwanda is doing (the focus of this report)

After lunch we went to see what they are doing in Kigali, First visit was at Ikaze mushroom (Nathan Farm) in Kabuye Sector, Kigali. Though small we learnt a lot on space utilisation where he incubated bags/tubes in the same room he crops. This was my first time to see mushroom bags/tubes buried in soil.

In short Juncao technology helps in the following ways:

- Ensuring food security
- Combating climate change
- Advancing emerging industries
- Achieving sustainable development goals
- Be used to produce stick feed

Mushrooms are grown using the following system.

Mixing substrates → **Filling in plastic bags** → **Sterilization** → **Cooling** → **Inoculation** → **Incubation** → **Fruiting** → **Harvesting**

Mushroom tubes are produced here, after incubation the bags are then put on shelves and buried in soil. They harvest in the morning and supply the morning. Mushroom is allowed to grow bigger than our market requires in Zimbabwe.

From Nathan farm we then visited DEYI Co. Ltd, located in Gasabo District still in Kabuye of Kigali. It's run by **Mr. Leonidas** Mushimiyimana, this was the last activity of the day but also most exciting not only that we had mushroom soup to eat but also saw how they makes charcoal from spent substrate which is a strong case of value addition.

Something we never saw before was the dried mushroom grinder, Very unique. He had a unique sterilisation system which we didn't see anywhere during farm visits. They provide training to youths and adults as well as selling mushroom tubes/bags/kits on contract and they also buy back mushrooms from these farmers. The most interesting thing was to see the school they built and run, initially they gave free mushroom meals to kids at break time, The kids went home and asked for mushrooms from parents and in turn the parents started buying mushrooms. What a brilliant marketing idea. The school is currently being expanded.

PHOTO: MEDIATRICE HATUNGIMANA

Day 2

Before embarking on the field trip we visited DMC in Gasabo, Kacyiru sector which is between Kigali genocide memorial road and city center. They are into value addition making mushroom powder, samoosas, boulette and brochette of mushroom. They provide training, do contracts with farmers to buy mushrooms and monitor the farmers growing mushrooms for them to ensure consistent quality.

Visit to DMC in Gasabo, Kacyiru

C-RATDC show room

PHOTO: MEDIATRICE HATUNGIMANA

Field trip

Our first Site visit of the day was at IMANZI Spectrum Company, Kamonyi District, South Province. It's 35km, 40 minute drive from Kigali. Mushrooms are grown using the same method as that used at Nathan farm. The field had a maize crop but they also grow the juncao grass. The juncao grass is ground on site using an electric powered mill. They also use other substrates. The substrate is mixed, bagged and sterilised using the Juncao technology just as they do at C-RATDC The farm buildings are well labelled, they grow mushrooms on site and also provide training to Rwandans interested.

PHOTOS: MEDIATRICE HATUNGIMANA

Obed Nyambo presenting how his farm works

Second visit was at Nyambo Farm Ltd, Kamonyi District, South Province. Mushrooms are grown using the following path however sterilisation is done in drums/barrels.

Mr Obed Nyambo uses various substrate like ground maize straw, sugar cane straw, banana leaves and other agricultural wastes. This another beauty of the technology that other substrates can be used. The mushroom houses are made of mud bricks and also plastered with mud. Bags are also covered with soil just as done at Ikaze and Imanzi.

Eight functions of a Demonstration center

1. Adaptability research
2. Breeding (Juncao grass and mushrooms)
3. Demonstration and production
4. Product processing
5. Technical training
6. Extension and consulting service
7. Science popularisation and education
8. Market promotion

Genocide Memorial tour

After the farm tours we had to visit the Genocide Memorial where we took time to remember those we lost and reflect on how to avoid the same to happen in our communities. What comforts after shedding tears is that Rwanda has managed to come out of the situation and the economy is growing in strides.

Laying flowers at genocide memorial

PHOTO: JEKESAI NJIKIZANA

The Kigali Memorial Centre, a permanent memorial to those who fell victim to the Rwandan genocide.

PHOTOS: WIKIPEDIA

Day 3

We had an early start because we had a long day and long travel about 3 hours travel from Kigali.

China-Rwanda Agriculture Technology Demonstration Center (C-RATDC). C-RATDC located in Rubona sector, Butare of Huye district in the Southern Province of Rwanda. It is one of 14 demonstration centers of Chinese agricultural technology that China has established in Africa over the years. The center occupies an area of 22 hectares of land and comprises facilities for Juncao technology for mushroom growing, rice farming, water conservation and sericulture-related technologies among other things they do.

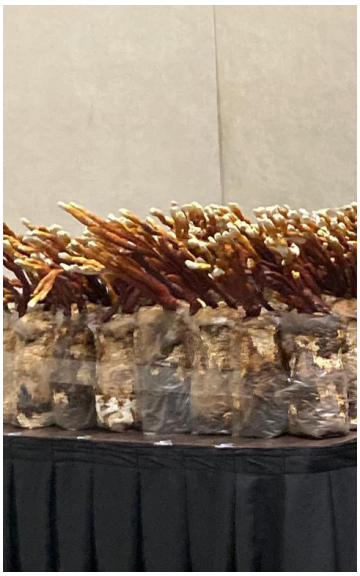


PHOTO: BATHSHEBA MCHUZA

Ganoderma lucidum mushrooms (antlers) Grown at the C-RATDC

PHOTOS: MEDIATRICE HATUNGIMANA

Group photo at C-RATDC

Dr Alexandre Rutikanga addressing participants at C-RATDC (in blue suit)

Dr. Alexandre Rutikanga the Director General of RAB also came to give moral support and shared a few experiences and future use of the technology in Rwanda.

The first thing was a cooking demonstration where we learnt a lot on cooking mushrooms in different ways. After the demo and tea it was time to learn more about the center which is not only doing mushrooms. Our focus was the juncao technology though the center does other things which we were briefed on : Rice farming, rice straw

is also used as mushroom substrate. Mulberry trees are grown, the branches are used as substrate, as soil conditioner or compost for the trees. The trees can provide shed to mushroom bags/tubes/kits that can be buried between tree rolls. They also do silk worms which was beyond our scope.

C-RATDC has supported Rwandan farmers to scale up agricultural production and led to improved lives and incomes. The center does not use Juncao grass only to grow mushrooms they use various material that farmers can get in Rwanda like banana leaves maize waste and rice straw just too mention a few.

After the lecture in the show room we had to see how mushrooms are grown.

Stages of Mushroom Growing

Substrate storage

On one side various substrates are kept while mixing and bagging is done on one side

Mixing substrates

This is where various substrates are used according to the growers preference, mixing is either by hand using shovels or by ribbon mixer machine. Main things added to substrate just as Obed Nyambo does: are water, gypsum and calcific lime

Filling in plastic

This is done by using a bagging machine. But hands can be used as we saw at Nyambo farm.

Sterilization

Sterilisation Is done u using a brilliant boiler which uses drums which are easily accessible to all. It's brilliant because it produces steam continuously. 2 bottom drums produces steam while the top drum is used for heating water that is then moved to bottom drums using installed pipe and tap. The steam is directed to the pile and sterilisation is 10 hours (others do it 24 hours). The steam produced heat the pile to 100 degrees celsius. The tubes are covered by tarpaulin and/ plastic film. Most farmers struggle with contamination, green mold in particular. Most contamination is caused by poor sterilisation.

Stages of Mushroom Growing - Contd

Cooling

Bags/tubes are allowed to cool before inoculation. If inoculation is done while they are hot the spawn will be killed. It's cooked to about 25 degrees celsius

Inoculation

The bags are inoculated in the inoculation box made of wood. Everyone anywhere can make this at low cost. Spawning method is used.

Incubation

Bags are incubated in piles which is a low cost incubation,as nothing is required but a room.

Fruiting

Fruiting is done in a cost effective cropping room made of shed cloth. The bags are also buried to preserve moisture and humidity is very high as water evaporates from the soil.

Harvesting

When the mushrooms are mature they are harvested packed and taken to the market

From the above system it is clear that it's not very expensive thus production is very sustainable, remember substrate is almost free if you grow it yourself. It's important to note that Imanzi and Nyambo farm uses the same system only that Nyambo farm sterilises in the drum and bagging/tube production is done with hands.

After going around the facility, our last stop was the Juncao grass field where mulberry trees are also grown and other crops, erosion is reduced on the slope thanks to the grass. Dr. Dongmei Lin answered some questions the participants had after which we had lunch and traveled back to Kigali.

Day 4

Interactive discussions on what we had seen on farm visits and tour and further questions. Dr Dongmei Lin took most questions while Mr Amson Sibanda also helped from UNDESA side. Most Nigerians had gone as they wanted to vote, the voting was on Saturday.

Governments must sign Mou's with FAFU before grass and cultures go out

Participants wanted to know how FAFU will help African countries on the technology? Will countries get cultures and the Juncao grass cuttings! Dr. Dongmei Lin responded that governments must sign Mou's with FAFU before grass and cultures go out this was particularly for Zimbabwe which will have a center established in 2023. As for helping she said FAFU will do the best, only limitation was funds.

Dr. Honest Kessy raised a critical point that as Africans we must work and get things moving instead of waiting for help to come from somewhere, This reminded us of Mr Ozonnia Ojielo's opening remarks that African leaders buy sophisticated weapons for wars instead of buying simple things and help fight hunger and poverty.

PHOTO: JEKESAI NJIKIZANA

Having a look at fresh ganoderma lucidum mushrooms

Reflections

Reflections on the implementation plans of Juncao technology projects was presented by heads of delegations. **Frehiwet** presented for Eritrea, **Pierre** presented for Democratic Republic of Congo, Dr. **Asimwe Rweyiguza** represented Tanzania and **Stancillae Tapererwa** for Zimbabwe. Let's help each other so that these reflections will be put into practice.

After the reflections it was time for some closing remarks and official closing of the workshop.

Mr Wang Ligui, counsellor, Mission of the People's Republic of China to the African Union gave closing remarks. We had him daily for the workshop and it was befitting that he gave closing remarks as this technology is key to sustainable agriculture being achieved on the continent for the achievement of Sustainable Development Goals. Mr Wang Ligui said China will continue supporting the juncao technology for countries to achieve Sustainable Development Goals.

Mr Wang Jiaxin, Economic and Commercial Counsellor, Chinese Embassy gave us some closing remarks and said Juncao technology is a stepping stone to success.

Dr. Alexandre Rutikanga Director General of RAB officially closed the workshop and wished us safe travel back home. He emphasised on need to implement the Technology back home.

Reflections from participants

The workshop has been very useful due to the following reasons:
1.From the workshop we have know that burying of mushroom bags help to maintain moisture content for good yield and also share of nutrients which provides quality mushrooms.
2.Juncao Technology will help to combat fighting between pastoralists and farmers.
3.Juncao will help solve the environmental problems such as soil erosion, soil salinity and also combat desertification.

Ms. Bathsheba Mchuza,
Tanzania

The workshop was really useful to bring together theory and practice. I learnt things faster from touching and feeling as well as collaborating with other growers from another country perspective. The field visits were invaluable to me.

Jekesai Lloyd Dexter Njikizana,
Zimbabwe

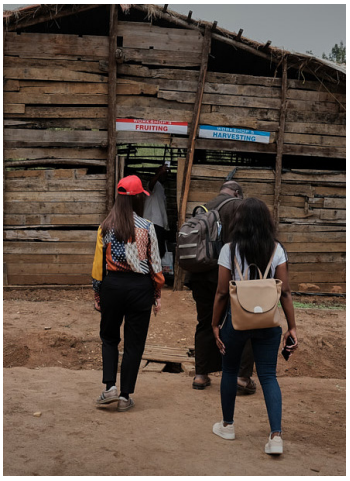
The workshop was very interesting
Which allow us to know each other, share experiences and networking. Besides, I personally have learned the multi advantage of juncao grass both on agriculture and soil erosion protection. Hence, the overall program and the field trips were well organized and inspiring.

Abrehet Gebregiorgis Gebremedhn
Rwanda

The workshop in pictures














PHOTOS: JEKESAI NJIKIZANA

Conclusion

The workshop enhanced our access to science, technology, and innovation, knowledge sharing as well as capacity building and it helps to effectively contribute to the achievement of sustainable agriculture and the Sustainable Development Goals.

The juncao technology will certainly change not only the participating countries but also their neighbouring countries and the rest of Africa. Special thank you to all participants we learnt from each other but most importantly thank you Rwanda for hosting and sharing what you have done, doing and will do with this technology in the future.

We will keep in touch through networking through the official WhatsApp group that was created and more platforms.

Nyasah Mupaso

Zimbabwe

The juncao technology will bring change not only the participating countries but also their neighbouring countries and the rest of Africa.

Thank you **UNDESA** and **FAFU** for a wonderful opportunity. Thank you for reading this report I would appreciate any feeedback through the contact details →

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