



发展菌草业 造福全人类

Develop Juncao Industry to Benefit All Humankind

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I

什么是菌草？

What is Juncao?



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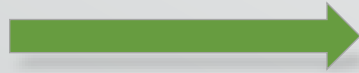
菌



真菌、菌菇
mushrooms or fungi

c a o

草



草本植物
grass or herbaceous plant



菌草:

- “菌”与“草”交叉的、新的研究领域
- 草品种的一个新类别
- 一类新开发利用的农业资源

形成菌草技术体系，拥有**51项**发明专利。

Scientific term for Juncao:

- A **new category** of grasses.
- A **new research field, an interdisciplinary science of** fungi & herbaceous plant.
- A **newly developed agricultural resource**.

“Using grass to replace wood”

Juncao technology - Juncao technical system (51 patents) - Juncao industry

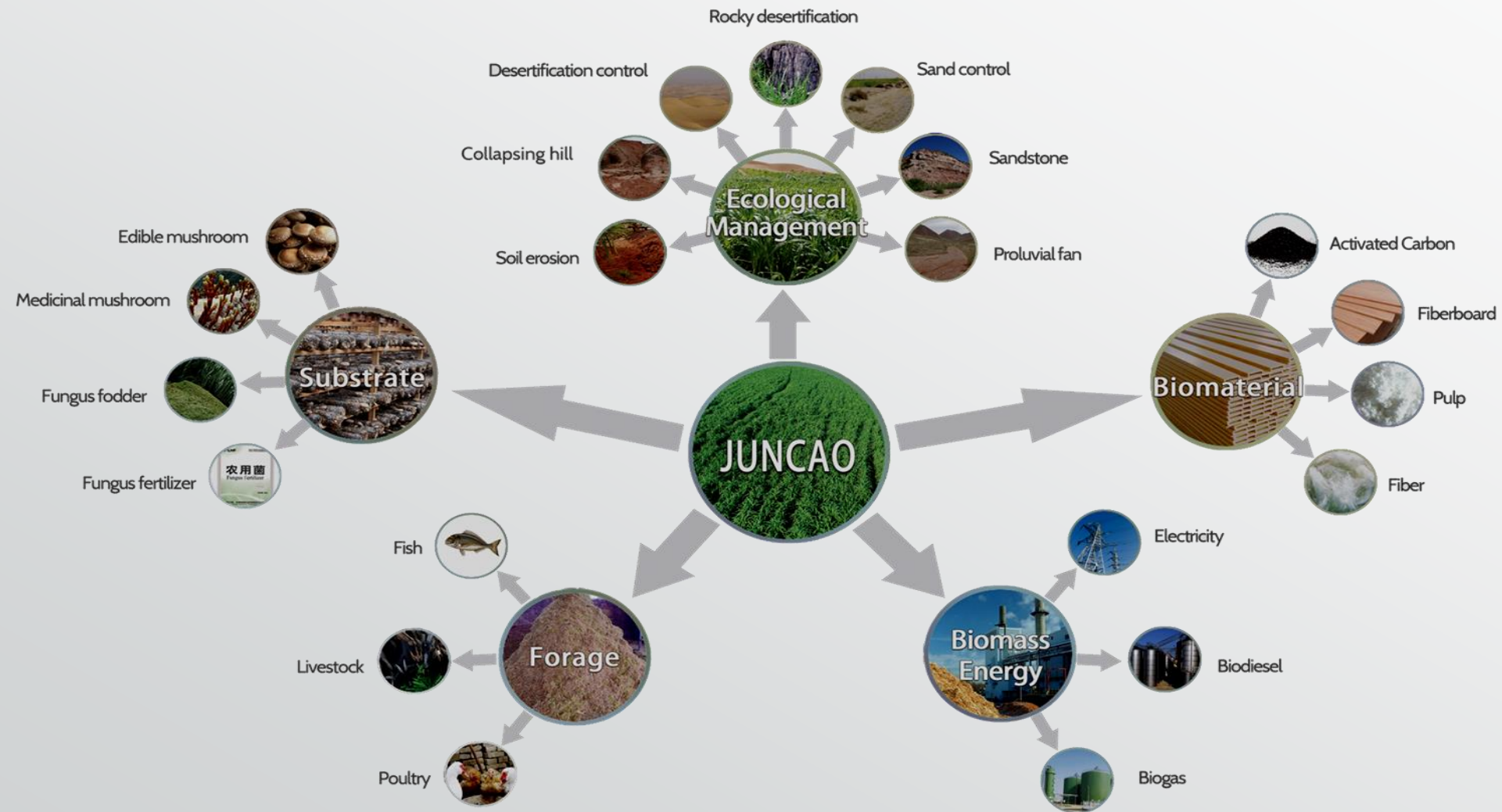


DIAGRAM OF JUNCAO INDUSTRY



建设了中国**唯一**的国家菌草工程技术研究中心。

The only one national research center –

China National Engineering Research Center of Juncao Technology established in FAFU in 2011





II

菌草技术的研究与应用

Research & Application of Juncao Technology



上世纪80年代，以筛选野生资源丰富的草本植物为主要目标。90年代起，以适宜不同气候条件下可规模栽培的草种为主要目标。

In the 1980s: wild grasses, then at the same time agricultural byproducts such as straws, bagasse, etc..

Since the 1990s: artificially planting Juncao grass species adapted to different climate conditions, more suitable for mass production



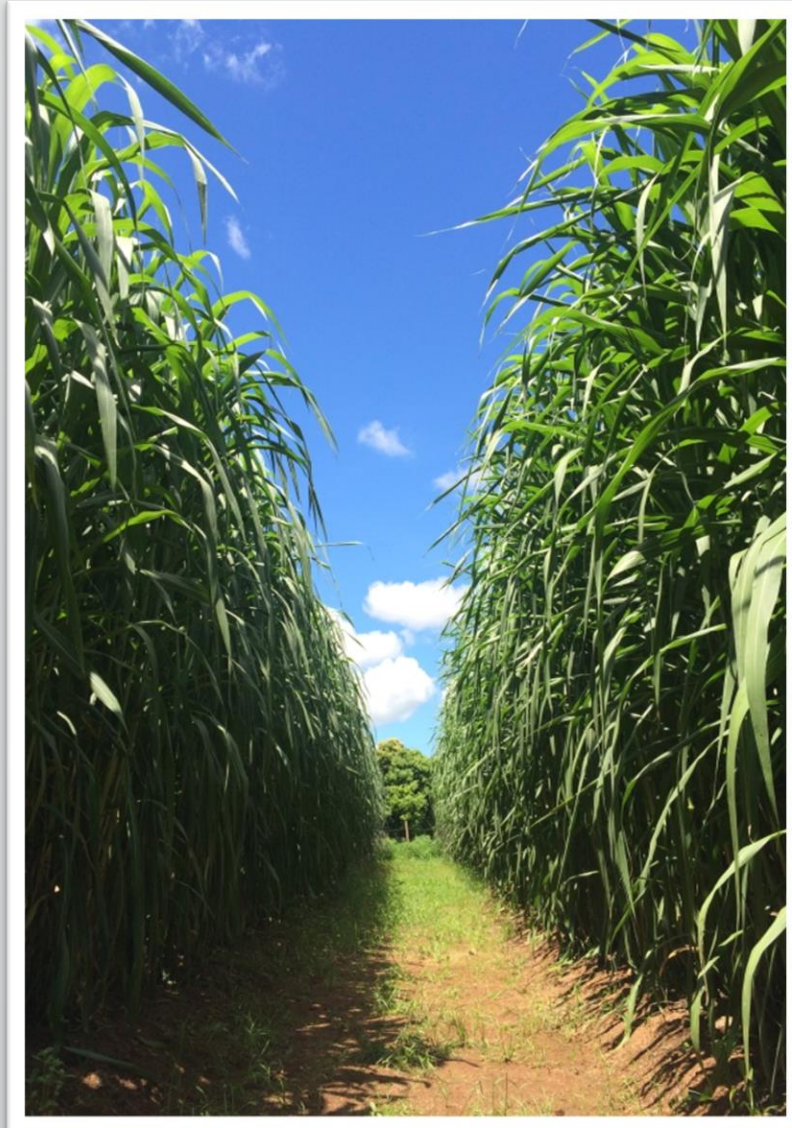




人工栽培的巨菌草鲜草年产量最高达**853**吨/公顷。

The highest annual yield of fresh Giant Juncao grass reaches **853** tons/hectare in PNG.







组培和繁育

Tissue culture & propagation

扦插育苗 Cutting propagation



1公顷菌草（鲜草300-500吨），可生产鲜菇120-150吨，不仅产量高，而且质量好，可持续发展。生产方式灵活，即可千家万户小农户参与，也能企业大规模投资生产。菌菇深加工产品如功能性食品、保健品与药品等大大提高附加值。

Advantages:

➤ **High yield, good quality, and sustainable development.**

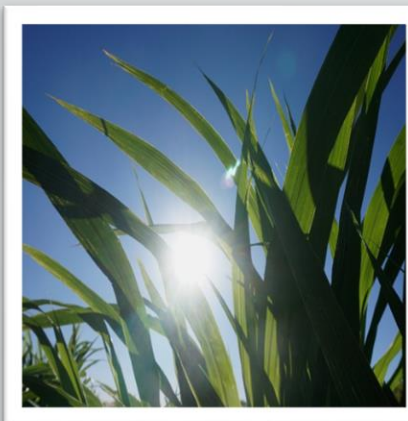
One hectare land with yield of 300-500 tons of fresh grass can produce 120-150 tons of fresh mushrooms.

➤ **Flexible production methods**

Suitable for large-scale **factory production** and **manual production** for small farmers.

➤ **High value-added products**

Deep-processing mushroom products such as tonic food products, health care products and medicines.



2.2 菌业 Mushroom Industry



Packaging



Sterilization



Inoculation



Incubation/spawn run



Mushroom Fruiting

2.2 菌业 Mushroom Industry



已筛选适用“以草代木”栽培的食药菌品种**56种**，开辟了菌业可持续发展的途径。

例：栽培香菇，若菌草替代**50%**木屑原料，年可节约木材**1000万**m³。

- **56** kinds of edible and medicinal mushrooms are cultivated.
- Eg. Xianggu (shiitake/*Lentinula edodes*) cultivation, if Juncao grass replaces **50%** wood, **10 million m³** wood will be saved per year.



Growing *Lentinula edodes* with Juncao Grass
(500g of dry material produce 350-400g of fresh mushrooms)



Growing *Ganoderma lucidum* (Lingzhi) with Juncao Grass
(Spent mushroom packs can be used as feed additives)



Oyster mushroom cultivated with Juncao grass
(The annual yield of fresh mushrooms: **120** kg/m²)



Interplanting *Dictyophora indusiata* under Bamboo Forest
(Dry *Dictyophora* yield: **1125** kg/hm²)



林下栽培菌草药用菌

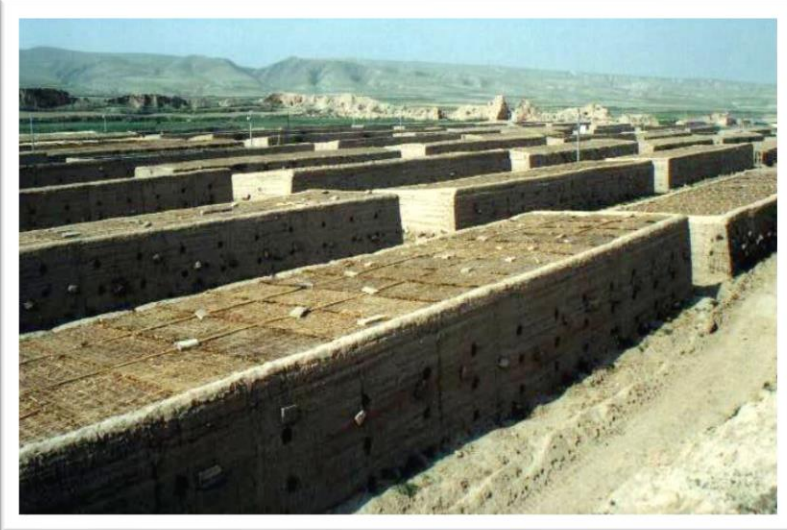
Medicinal mushroom cultivation under the rubber trees



2.2 菌业 Mushroom Industry



Production models: small household farmers, farmer co-cooperative, factory production





菌草的粗蛋白含量高，适口性好，可饲喂家禽家畜如牛、羊、鹅、鹿、兔、猪、竹鼠、鱼。

斐济 **Legalega** 研究站试验结果，生长8个月的巨菌草的粗蛋白含量是 **12.74%**，当地的传统牧草臂形草只有 **5.40%**。

High content of crude protein, good for poultry and livestock such as cattle, sheep, geese, deer, rabbits, pigs, bamboo rats and fish.

Fiji Legalega research station statistics

Crude protein content:

8-mth **Giant Juncao grass** **12.74%**

Fiji local Arm Grass **5.40%**



巨菌草营养丰富，优于苏丹草和青贮玉米，达到优质牧草标准。

Planting area in **China > 150,000 ha**

Rich in nutrients, **giant Juncao grass** is superior to **Sudan grass** and **silage corn** and reaches the standard of high-quality forage.





巨菌草收割

Harvest of Giant Juncao Grass



巨菌草青贮

Silage of Giant Juncao Grass



巨菌草青贮窖

Silo of Giant Juncao Grass



巨菌草收割

Harvest of Giant Juncao Grass



巨菌草打包

Packing of Giant Juncao Grass



巨菌草青贮包

Silage Pack of Giant Juncao Grass



巨菌草养牛

Raising Cattle with Giant Juncao Grass



巨菌草养羊

Raising Sheep with Giant Juncao Grass



巨菌草养鹅

Raising Geese with Giant Juncao Grass



菌草作猪饲料

Juncao Grass Used as Pig Feed



茵草养鹿

Raising Deer with Juncao Grass



茵草养兔

Raising Rabbits with Juncao Grass



菌草作为先锋植物建设菌草生态安全屏障：防风固沙、保持水土：种植菌草**80~100**天能有效防风固沙，在高寒地区，2013年种植的菌草到2021年仍可有效固沙。

Demonstration of the **Ecological Safety Juncao Barrier** using Juncao as **pioneer plant**

Successful wind-preventing and sand-fixing within **80 to 100** days





Location	Ulan Buh Desert
Growth period	115 days
Plant height	246.5cm
No. of tillers	68
Fresh weight above the ground	12.71kg
Fresh weight under the ground (root system)	11.04kg
The number of roots	618
The depth of root	121.5cm
Sand fixing surface area	18.85m²
Sand fixing volume	11.45m³





120d

Root length **2.12m**

Root area **15.2 m²**





改良土壤：种植一年沙地有机质含量增加**58.97%**，沙地土壤微生物和昆虫种类和数量显著提高，第二年便可种植马铃薯、花生、西瓜等作物。

Soil improvement:

1st year: the organic matter content of sandy land increased by **58.97%** , significantly enriches its soil microbes and insect species;

2nd year: other economic crops such as potato, watermelon, and peanuts could be planted.



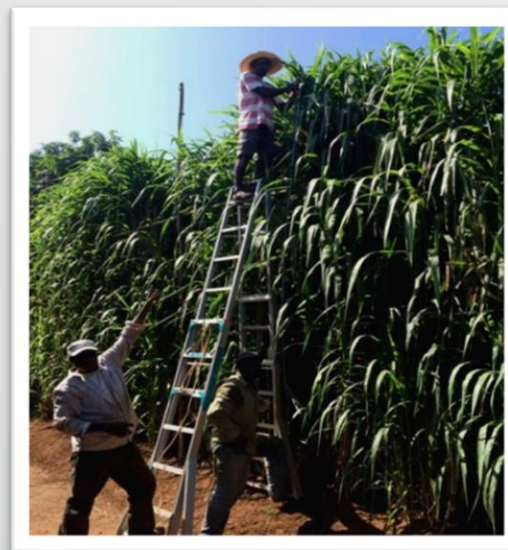


1公斤巨菌草（干物质）燃烧值为**3580** K cal，相当于0.716公斤原煤的燃烧值；可产沼气0.548立方米。

- The **combustion value of dry Juncao grass** (Giant Juncao grass) is **3580** kcal/kg, equivalent to **0.716 kg raw coal**; and it can generate 0.548 m³ biogas.



52.5-60吨原煤
52.5~60 tons raw coal



1公顷巨菌草
1ha. Jujuncao grass



7.4万立方米沼气
74,000 m³ biogas



每公顷土地年产出**450**吨鲜草计算：可以用来生产**160**m³板材或 约2万美元**45**吨的菌草纸浆。

- Taking the yield of fresh grass as **450** tons per ha. per year, it will produce **160** m³ of fiberboard or **45** tons of grass pulp.





III

菌草技术转移，服务可持续发展目标

The transfer of Juncao technology to promote the implementation of SDGs



菌草技术落实13个可持续发展目标

Juncao technology contribute to the implementation of 13 SDGs



农民种植菌袋7-10天后就有收入，10平方米土地年产1200公斤鲜菇。
Farmers can generate income in 7-10 days after planting mushroom substrate packs. 1,200 kilos fresh mushroom could be produced in a 10 square meters land in a year.

1公顷土地年产鲜草300-500吨，可生产120-150吨鲜菇，或饲喂30只牛/300只羊。
1 hectare land produces 300-500 tons fresh grass per year, which can grow 120-150 tons fresh mushroom, or feed 30 cattle / 300 goats.

福建农林大学已把菌草技术传播到106个国家，并与41个国家的71家机构建立合作关系，
Fujian Agriculture and Forestry University has disseminated Juncao Technology in 106 countries, and has established collaboration with 71 institutions in 41 countries.

菌草可栽培54种菌类，菌菇含粗蛋白30%~45%、粗多糖4%~7%以及多种有效物质，对人体健康多有裨益。
54 species of mushrooms can be cultivated with Juncao grass. The mushrooms contain 30%~45% crude protein, 4%~7% crude polysaccharides and a variety of effective substances, which are beneficial to human health.

一些菌草品种可作为先锋植物治理荒漠化，1个节的巨菌草种植100天后，约10-20个分蘖，其根系可固沙约15平方米。
Some Juncao grass species are used as pioneer plants for desertification control. After 100 days of planting, 1 node of Jujuncao (means giant Juncao) grass will grow into a clump with about 10-20 tillers, and the root system can fix sand about 15 square meters.

举办了202期国际培训班，7817名学员来自100多个国家；为11个国家21人提供菌草专业研究生奖学金。
Conducted 202 International Training Courses with 7,817 participants from over 100 countries, and offered postgraduate scholarships on Juncao Technology to 21 students from 11 countries.

1公顷菌草吸收约90吨二氧化碳。受极端气候影响情况下可快速恢复生产，并能减轻如飓风等带来的次生灾害的影响。
1 hectare of Juncao grass can absorb about 90 tons of carbon dioxide. It can quickly resume production under the influence of extreme weather and can reduce the impact of secondary disasters such as hurricanes.

促进妇女的技术教育，提供就业，特别是增强了农村缺乏土地资源与知识技能的妇女的能力。
Promote the technical education and employment of women, especially for those who are lack of land resources, knowledge and skills in the rural areas.

以草代木种菇，实现草、菌、畜循环生产。种菌草不使用杀虫剂、除菌剂、除草剂等。
By planting mushroom with the Juncao grass instead of the wood, it can create a positive production cycle of grass, mushroom and livestock. Planting Juncao grass can be free from using pesticides, herbicides and fungicide.

菌草燃烧热值3580kcal/kg。每吨菌草干物质产沼气548立方米。
The caloric value of the combustion of Juncao grass is 3580 kcal/kg. The biogas production rate of Juncao grass is 548 cubic meters per ton of dry matter.

老年人、残疾人、失业者、失地者、孤儿、寡妇、单身母亲、管教所青年，乃至最贫困的人都从菌草技术生产活动中受益。
The aged, disabled, jobless, landless, orphans, widows, single mothers, youths in correction center, and even "the poorest of the poor" have benefited from the Juncao Technology production activities.

1公顷菌草菇农场年产值约30万美元，可提供至少30个工作岗位。
The annual output value of 1 hectare Juncao mushroom farm is about US\$300,000, which can provide at least 30 job opportunities.

福建农林大学为几千名发展中国家研究人员和学生提供菌种、草种、教材和技术信息，
以支持研究活动。其海外示范基地为无数来访者提供技术咨询。
FAFU has provided mushroom strains, grass seedlings, teaching materials and technical information for thousands of researchers and students of developing countries to support their research activities. The overseas demonstration bases have also offered assistance to numerous visitors for technical consultation.



10m² Mushroom farming model

10m² mushroom trench

=300kg fresh mushroom × 4 seasons

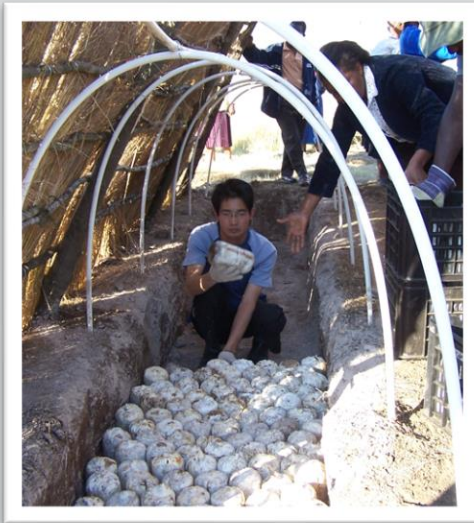
=1,200kg fresh mushroom per year

Fresh mushroom sold at 30-40 Rand/kg

Income: 36,000-48,000 Rand (South Africa) a year

Localization, Simplification and Standardization
of Juncao technology for farmers

Easy to Learn, Easy to Practice, Easy to Succeed





➤ Extension model

Demonstration Center or Base (grass seedling base)+
Flagship sites: Farmers' Association or Cooperative +
Individual Farmers

➤ Advantages: lowered technical threshold, much reduced cost, and well-controlled market risk



在福建农林大学培养菌草专业24名留学生。

为45个非洲国家培训人数总计6674人次（研究人员，学生和农户）提供技术支持。

Nurture technical personnels:

- 24 international students from Lesotho, Rwanda, South Africa, Nigeria, Ghana, Egypt, Tanzania, Kenya, Afghanistan, Malaysia and Palestine studied in FAFU (20 African students)
- FAFU provided training and technical support to 6674 researchers, students and farmers from 45 African countries including mushroom strains, grass seedlings, teaching materials and technical consultancy.





CASE 1: South Africa

- Introduced into Kwa-Zulu-Natal Province in 2005
- Established 1 research & training center, 7 flagship sites, and more than 40 demonstration sites with 10,000 beneficiaries
- Trained 34 technicians in China



Juncao Center of South Africa



KwaDindi Juncao Co-operative Flagship Site



KwaDindi Flagship Site



Nxamalala Flagship Site



Enyokeni Flagship Site



Mechanical Planting and Harvesting of Juncao Grass



Brand of Juncao Mushroom



CASE 2: Rwanda

China-Rwanda Juncao Technology Demonstration Center





Training, demonstration, & on-site technical assistance,

Directly supporting **36** cooperatives and **14** companies.

Producing & cultivating mushroom substrate packs(tubes) around **1,100,000** tubes/year, =**435** tons fresh mushroom (market value 870,000 \$)





Create jobs for poor peoples and have trained **more than 20,000** peoples.

More than 5,000 households are involved or benefited on Juncao mushroom production.





CASE 3: Lesotho

Juncao Technology Training and Demonstration Base





Teyateyaneng Flagship Site



College of Agriculture



Hammapod Women's Organization



Lesotho Middle School



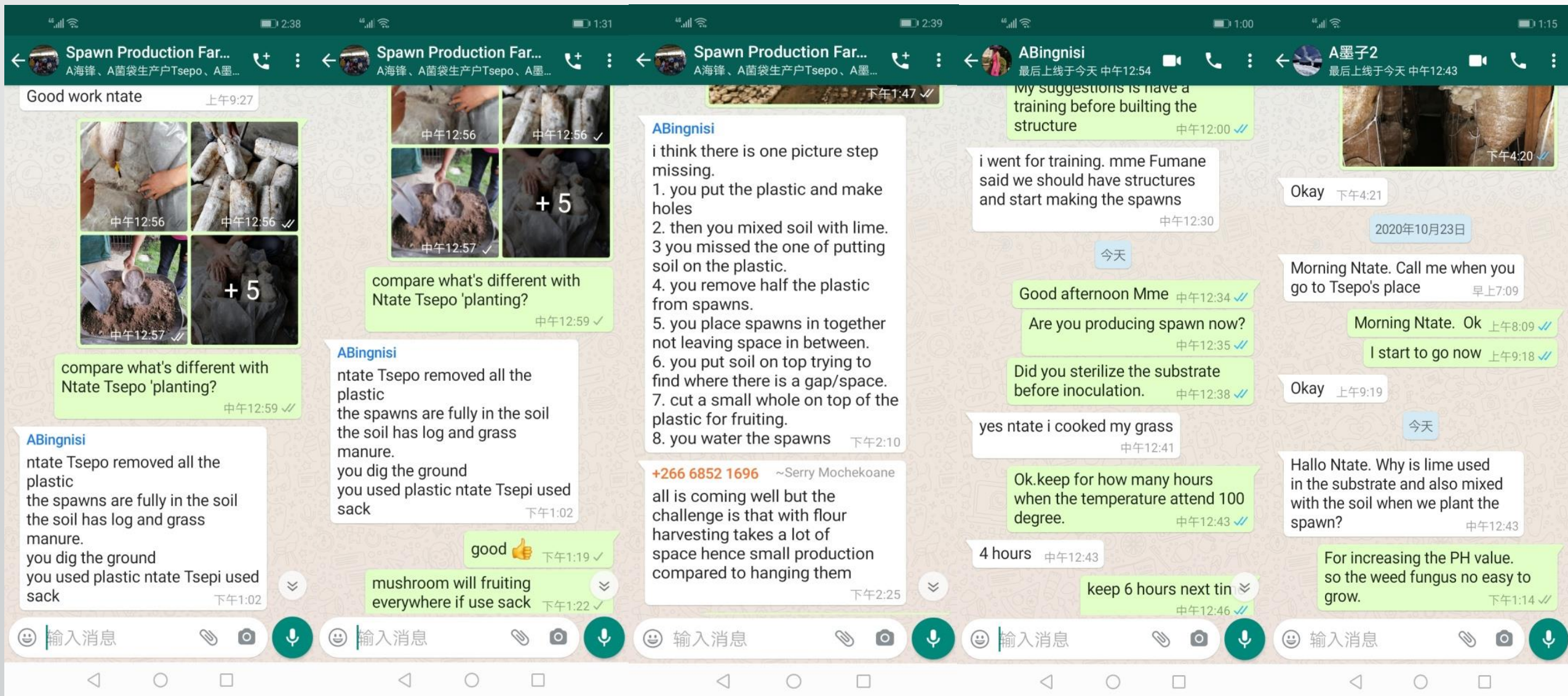
菌草养畜示范

Livestock breeding demonstration



- During the fourth phase of the project (3yrs), **920** people were trained.
- Guide students' **thesis** and provide **practice** opportunity
- Help young graduates to start their own **businesses**





Online guidance and training through social software during the epidemic



CASE 4: Central African Republic







发展菌草业 造福全人类

Develop Juncao Industry for the Benefit of All Mankind

