

Online Training Courses on Cassava Food Processing Technology for Developing Countries

Cassava Value Chain



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Chinese Academy of Tropical Agricultural Sciences**

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中國熱帶農業科學院
CHINESE ACADEMY OF TROPICAL AGRICULTURAL SCIENCES

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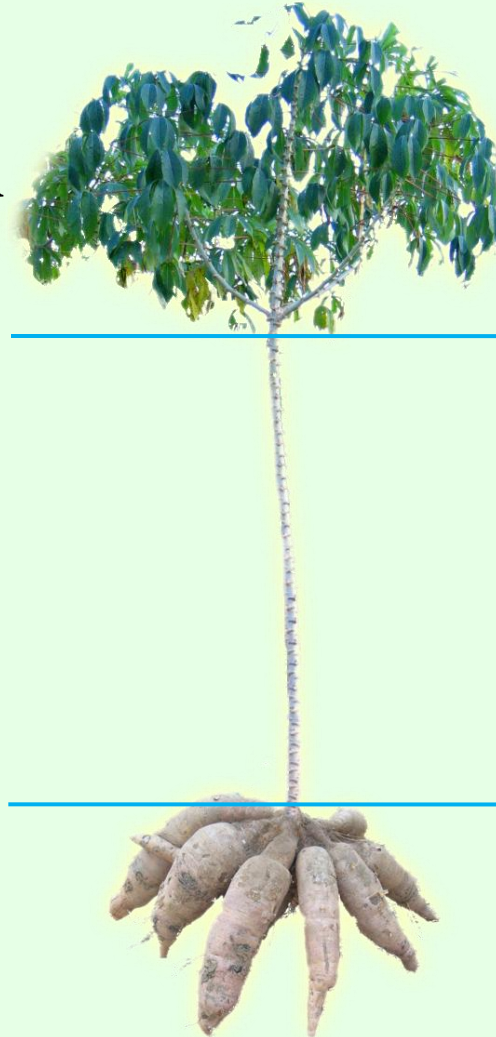
The cooperation potential in cassava between China and Africa countries

The background of the slide is a photograph of a lush green cassava field. The plants have characteristic palmately lobed leaves. In the upper portion of the image, a blue sky with scattered white clouds is visible. Overlaid on the image are two large, semi-transparent geometric shapes: a green parallelogram on the left and a blue parallelogram on the right, both slanted. The title text is positioned within the green shape, and a white arrow points from the blue shape towards the right edge of the slide.

1. Cassava background in the world

■ Cassava and its usage

- The world's sixth food crop in the tropics and subtropics;
- A multi-purpose plant;
- Major cash crop for developing countries and regions;
- Raw materials to produce starch and biofuel.



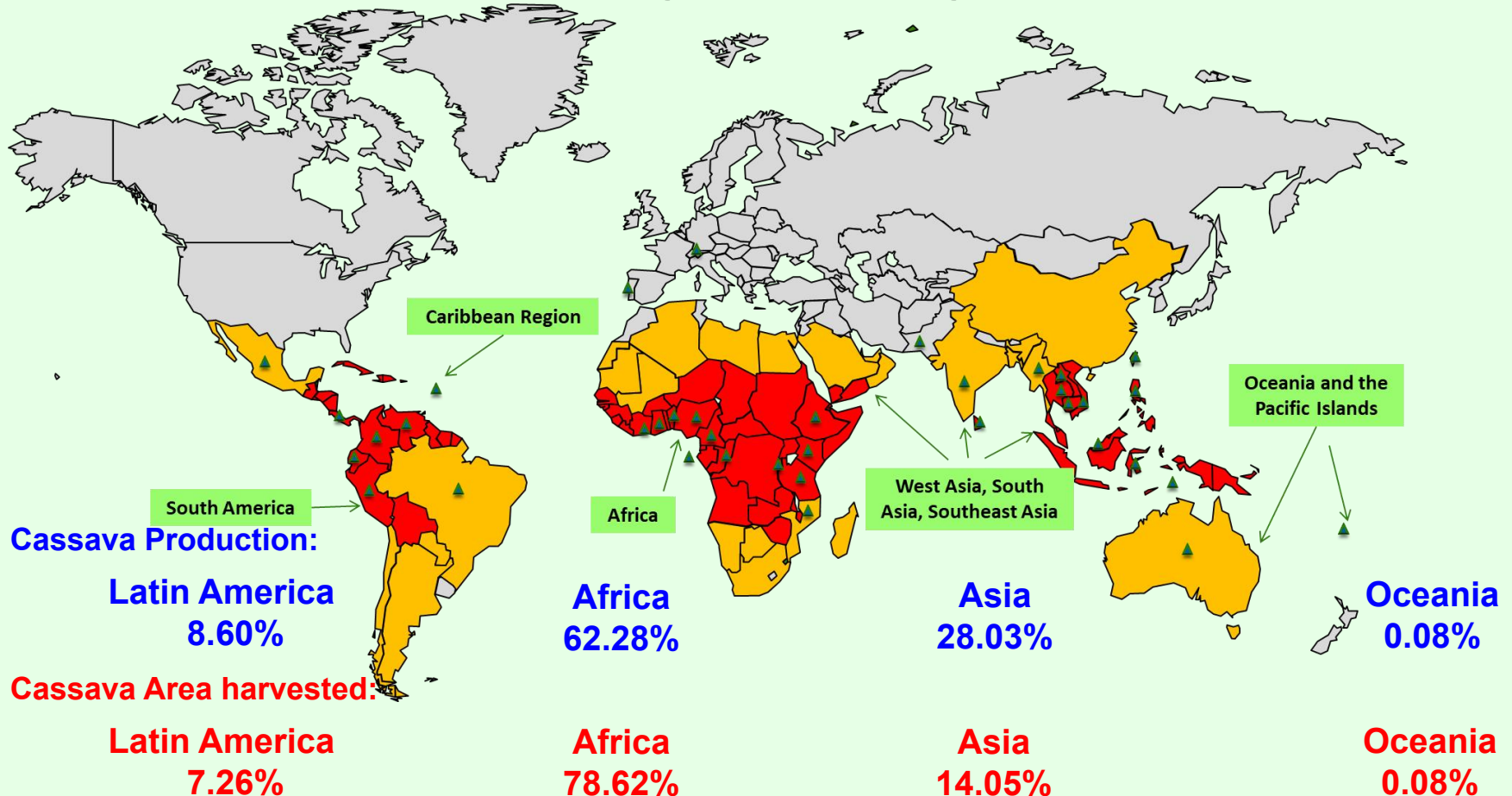
Usage of leaves:
food, feeding fish, silage,
feeding pigs, etc;

Usage of stems:
fuel, planting material,
fibrous material, etc;

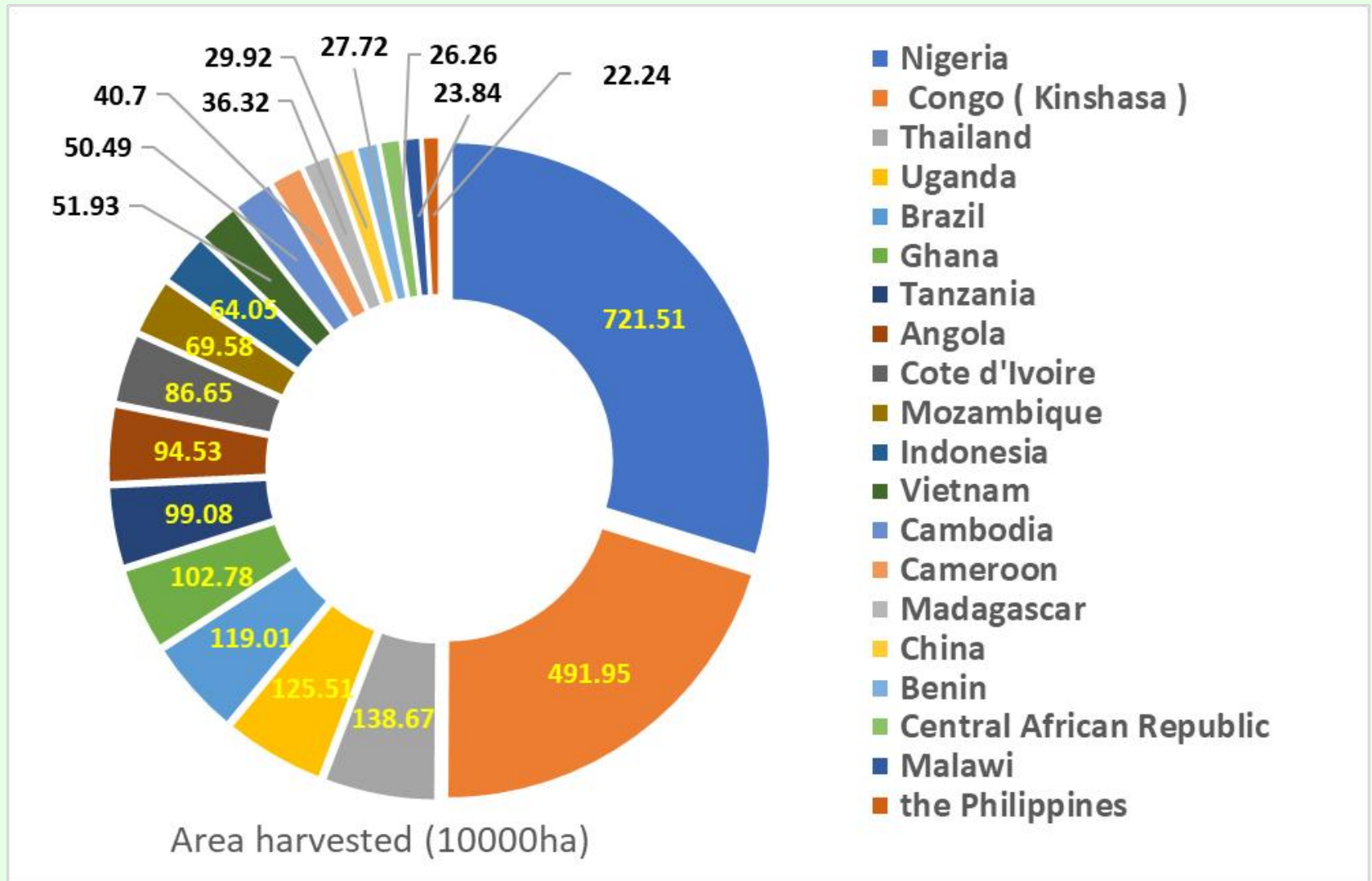
Usage of storage roots:
food, feedstuff, starch,
alcohol, etc.

Cassava growth in the world

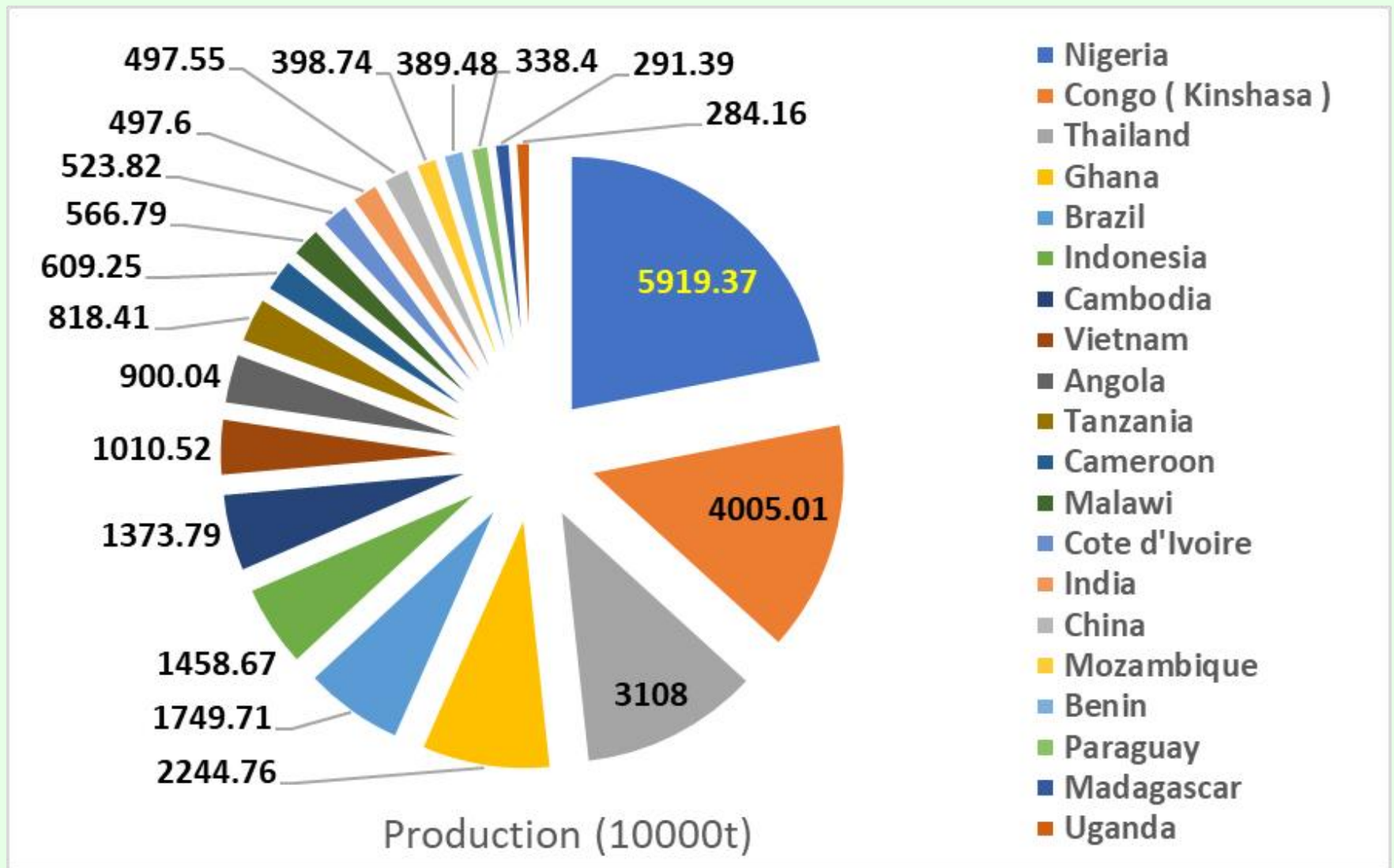
- Cassava is a major source of calories for more than 1.0 billion people in Africa, Asia, and Latin America. It plays a significant role in food security due to its beneficial traits, such as high yield and high starch content.



Cassava area harvested in the world

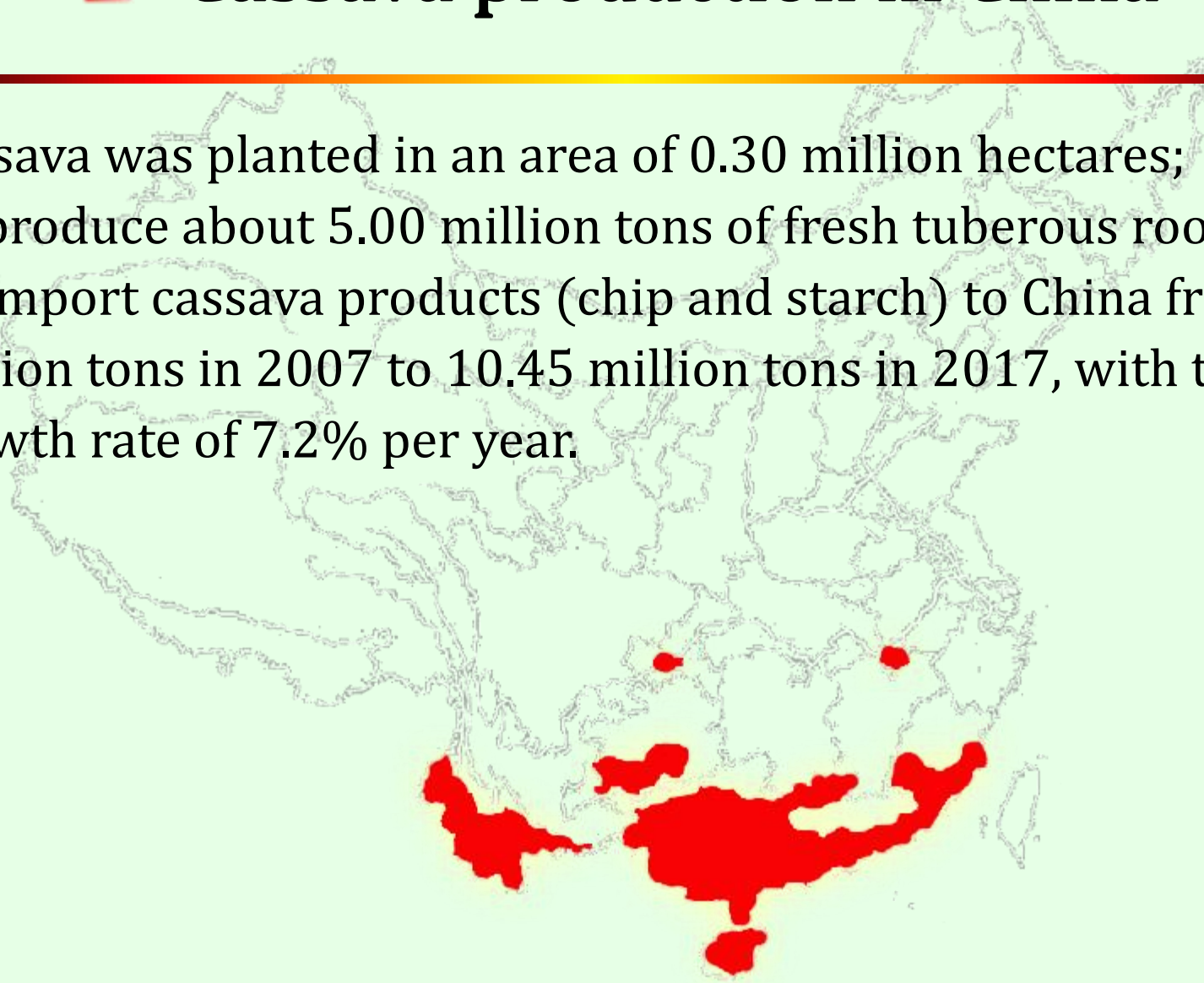


■ Cassava production in the world



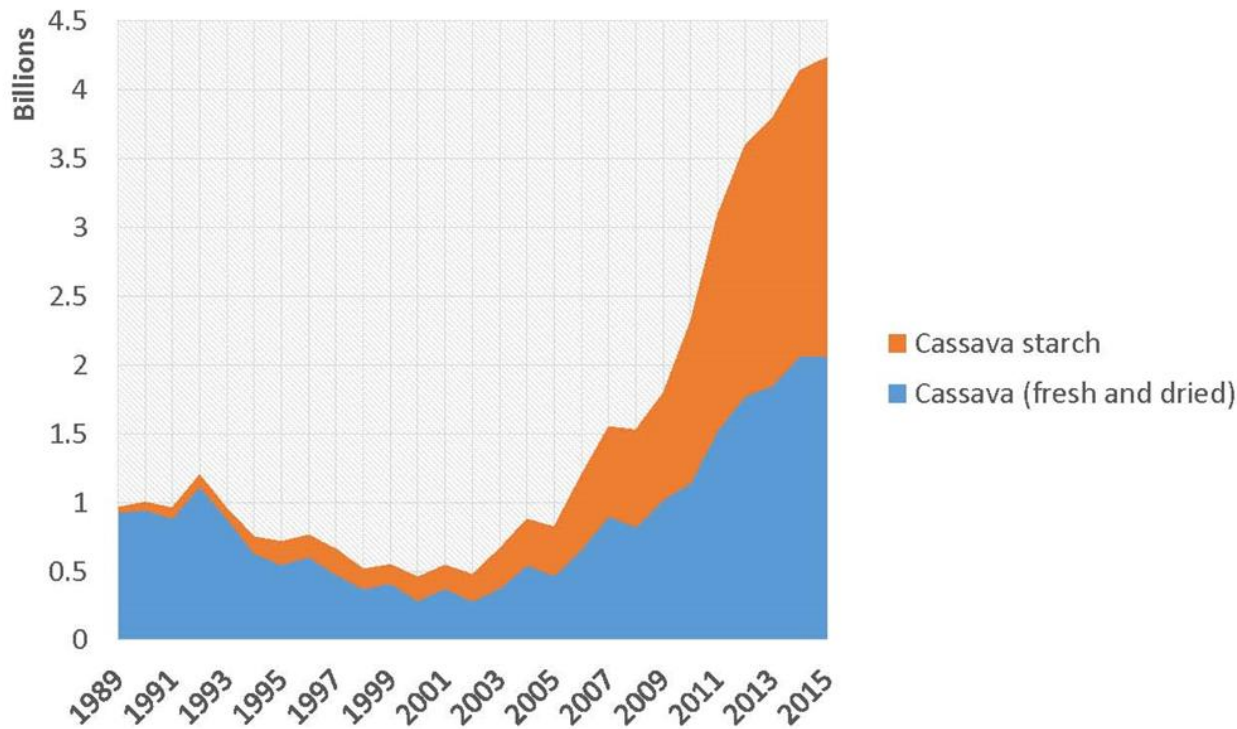
■ Cassava production in China

- Cassava was planted in an area of 0.30 million hectares;
- To produce about 5.00 million tons of fresh tuberous roots;
- To import cassava products (chip and starch) to China from 5.24 million tons in 2007 to 10.45 million tons in 2017, with the growth rate of 7.2% per year.



Cassava global market: ASEAN, East Asia and the world

Increase in production and trade (the good)



The demand for carbohydrates continues to expand as incomes in Asia grow.

Changing food preferences and changing diets

New starch applications being developed

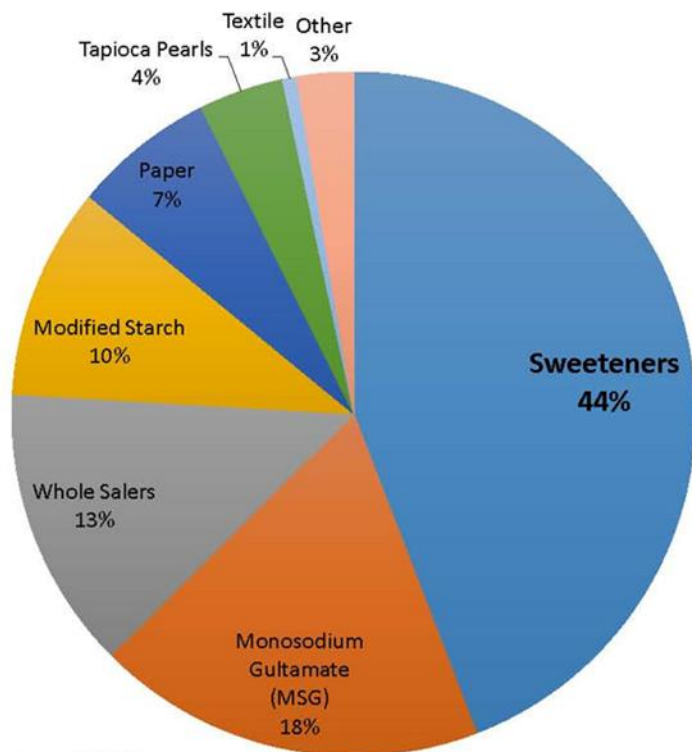
Some decline in traditional areas (such as paper)

Younger generation in changing preferences in traditional cassava eating locations

Data source: Comtrade (1989-2015)

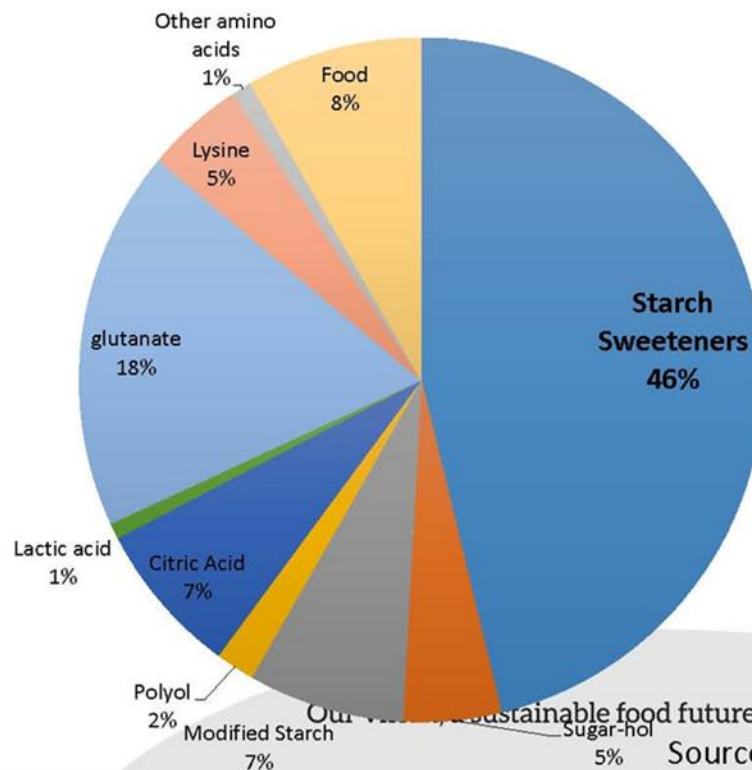
Utilisation of starch in Thailand and China

Thai Domestic use of cassava starch



Source: TTTA

Chinese use of all starch



Source: Jin Shu-ren



Source: from Dr. Jonathan Newby (CIAT)

Why Chinese market outlook matters

	Cassava (fresh, dried)		Cassava starch		Total	
	World	To China	World	To China	World	To China
All exporters	2,059 M	1,910 M	2,175 M	1,360 M	4,234 M	3,269 M
	100.0%	92.8%	100.0%	62.5%	100.0%	77.2%
Thailand	1,539 M	1,536 M	1,191 M	539 M	2,729 M	2,075 M
	74.7%	74.6%	54.8%	24.8%	64.5%	49.0%
Vietnam	399 M	360 M	914 M	808 M	1,312 M	1,168 M
	19.4%	17.5%	42.0%	37.2%	31.0%	27.6%
Thailand + Vietnam	94.1%	92.1%	96.8%	62.0%	95.5%	76.6%

*Reported by exporters

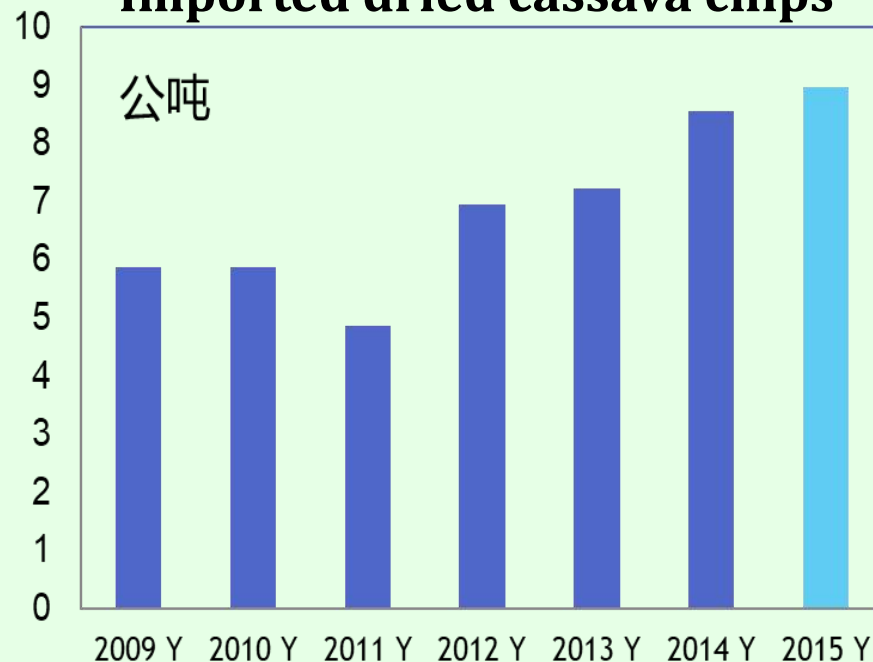
Data source: Comtrade 2015

Imported starch



- From 2009 to 2015, China imported about 8.50 million tons of cassava starch; it cost about \$420 million in 7 years;
- In 2020, the import volume of cassava starch was 2.757 million tons and cost \$1.130 billion, rising 16.05% and 9.63% over levels of a year ago, respectively.

Imported dried cassava chips



- From 2009 to 2015, China imported about 48.30 million tons of dried cassava chips; it spent about \$1.38 billion in 7 years;
- In 2020, the import volume of dried cassava chips was 3.30 million tons and cost \$779 million, rising 20.63% and 22.80% over levels of a year ago, respectively.

Cassava starch: Currently largely an Asian market

Importer Rank	Country	Import trade value (US\$)	% of imports	Cumulative %
1	China	781 M	50%	50%
2	Indonesia	256 M	16%	66%
3	Other Asia, nes	138 M	9%	75%
4	Malaysia	75 M	5%	80%
5	USA	70 M	4%	84%
6	Japan	58 M	4%	88%
7	Philippines	35 M	2%	90%
8	Singapore	27 M	2%	92%
9	Rep. of Korea	11 M	1%	93%
10	Netherlands	10 M	1%	93%
11	Germany	8 M	1%	94%

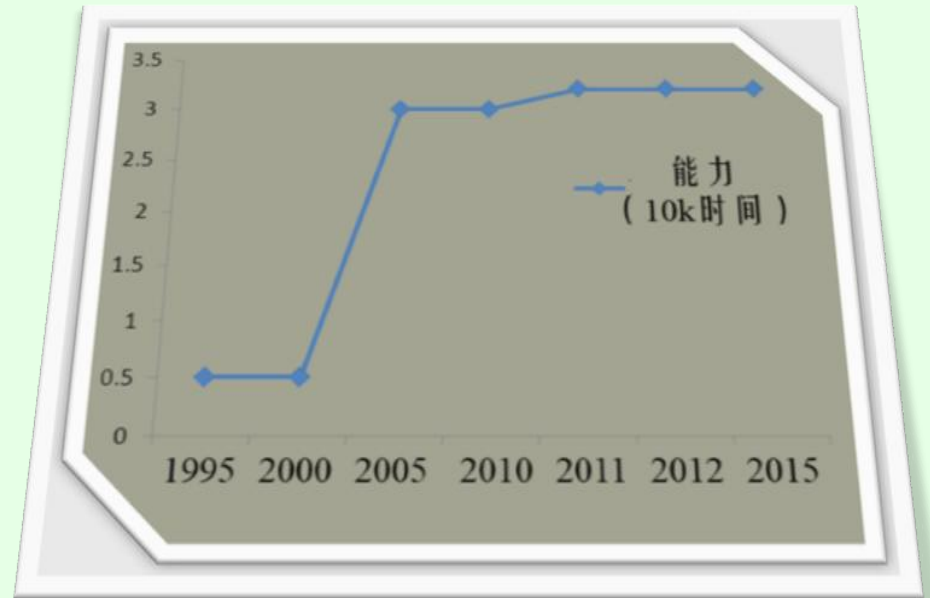
Data source: Comtrade 2015



2. Set up a Chinese Cassava Agro-technology Research System (CCARS) team for cassava industry

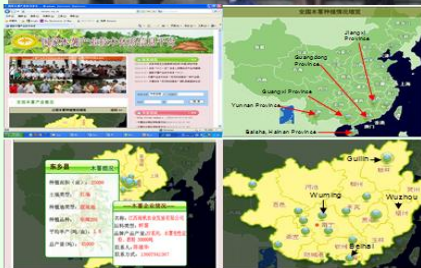


■ Cassava value chain development in China



- Cassava value chain: the stage of development from 1995 to 2000;
- Cassava value chain: the stage of rapid and stable development from 2005 to 2020.

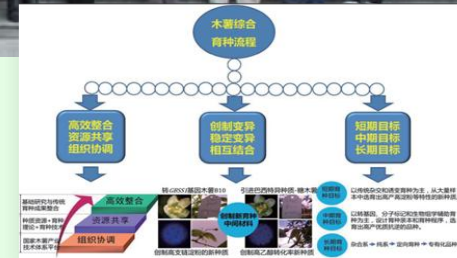
■ CCARS team adding value to cassava



Website of CCARS



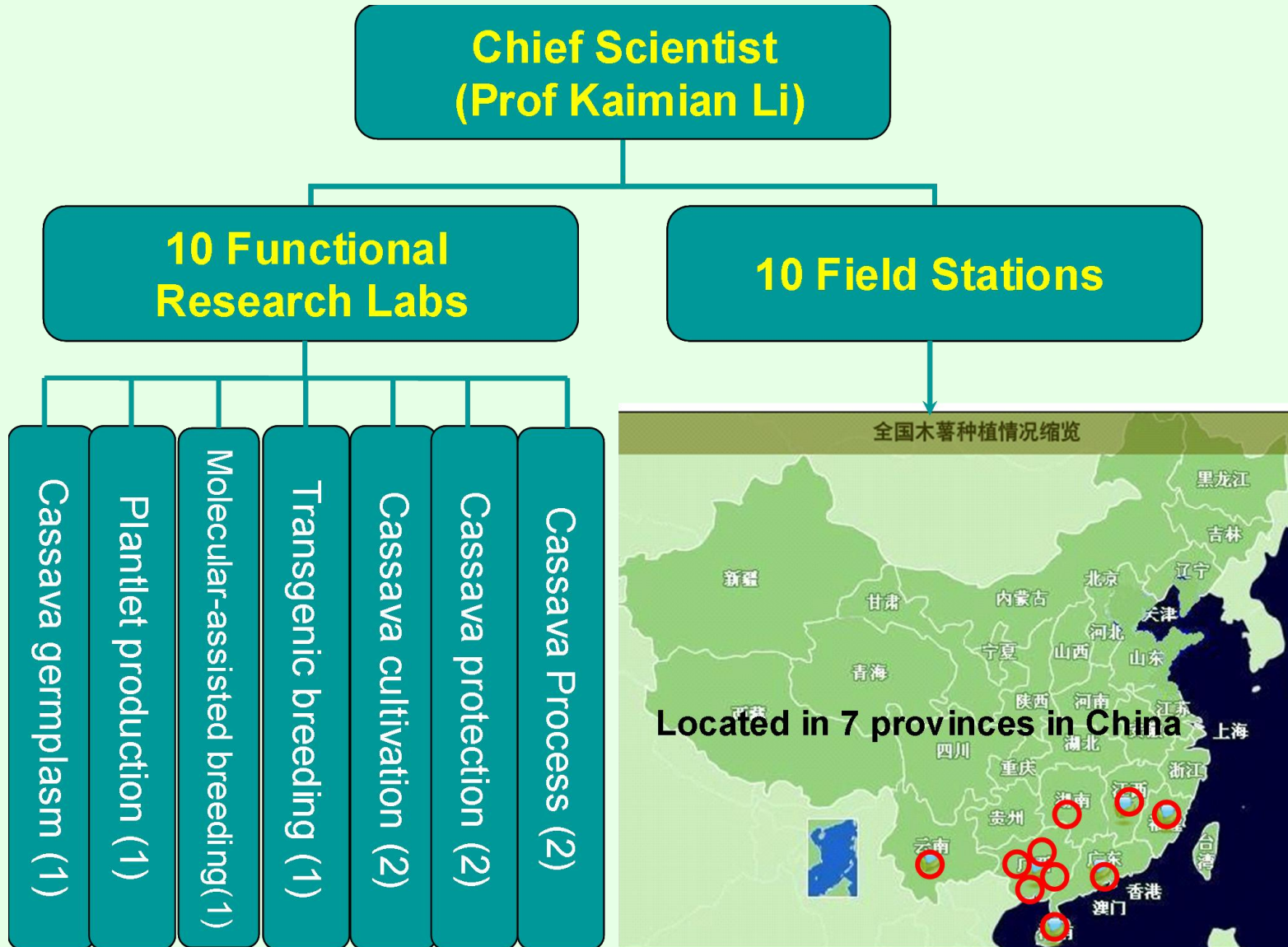
Cambodia Cassava Planting Training Course in TCGRI, CATAS



Cassava integrated breeding

To use CCARS as a platform to share the cassava genetic materials and breeding information such as breeding methods and strategies.

■ CCARS Structure



■ The Responsibilities of CCARS

- The actual problems and technical requirements coming from cassava smallholders will be investigated and collected into the database of CCARS.
- Different cassava researchers in different institutions would be effectively organized and cooperated together to improve the efficiency of cassava breeding according to the missions of CCARS and avoid research duplication and unproductive competition.



■ Self-supervision

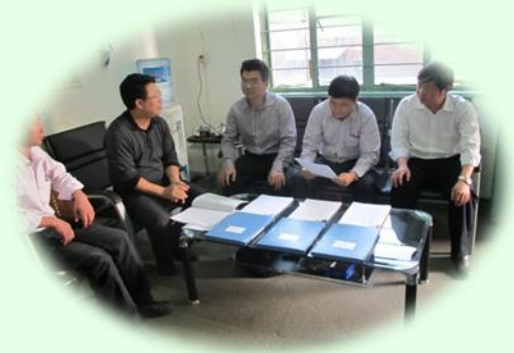
- ❑ CCARS secretariat will organize experts to carry out systematic investigation and inspection in the functional labs and field stations to make sure the system has efficient operation.



In Hunan



In Jiangxi



In Fujian



In Guangxi



In Yunnan



In Hainan



3. Technological innovation is a key driver for cassava value chain



Technological innovations

- (1) Cassava germplasm accurate evaluation;**
- (2) Cassava breeding and variety improvement;**
- (3) Cassava cultivation models and mechanization;**
- (4) Cassava processing;**
- (5) Cassava by-product diversified utilization.**

(1) Cassava germplasm accurate evaluation

Cassava germplasm accurate evaluation supported by National Key R&D Program of China



Wild cassava



Dwarf cassava



Sugar cassava



Pink Cassava



Yellow cassava



Cold resistant cassava



CBB resistant cassava



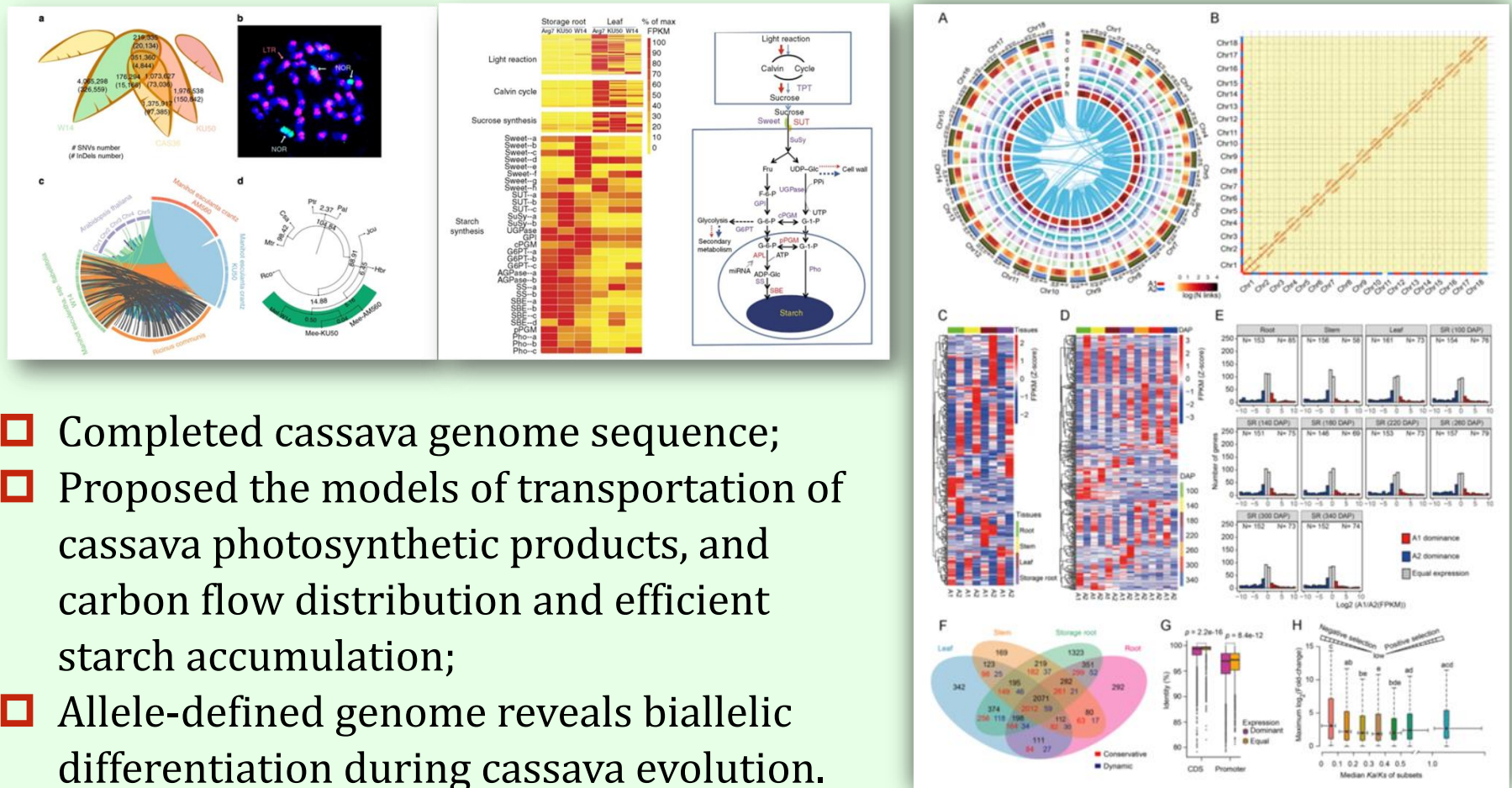
CMD resistant cassava



PPD resistant cassava

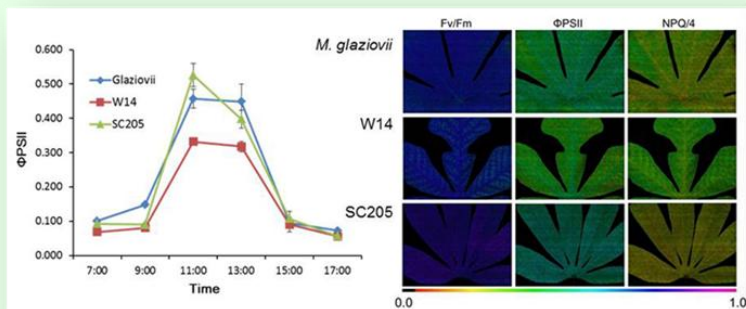
Accurate evaluation of germplasms is the basis of the development of cassava value chain. More than 3,000 copies of cassava germplasm resources introduced from CIAT, Embrapa, Thailand and so on are preserved.

An overview of whole a genome shotgun sequencing and assembly

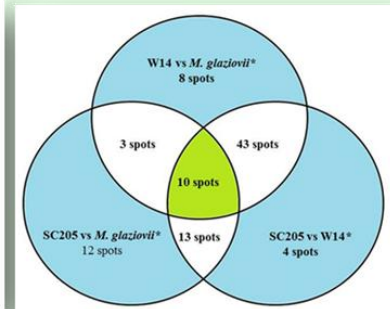
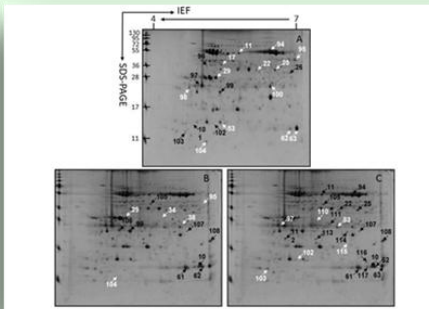


Wang et al. Nature Communications, 2014; Hu et al. Cassava molecular Plant, 2021.

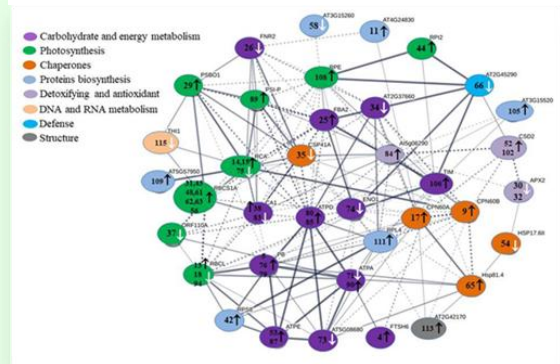
Cassava proteome



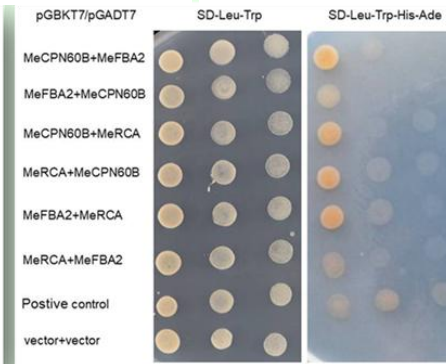
Photosynthetic rate in Cultivar SC205 is more than that in wild species



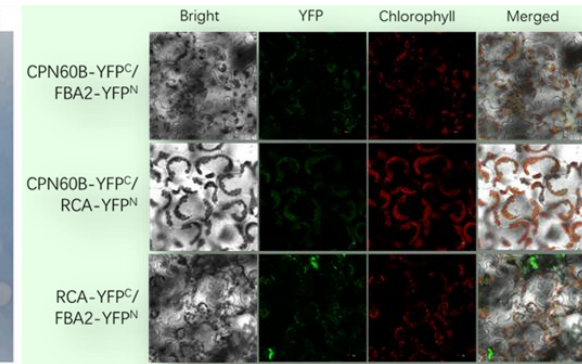
Photosynthetic rate in cassava SC205 is more than that in wild species speculated from the chloroplast proteome



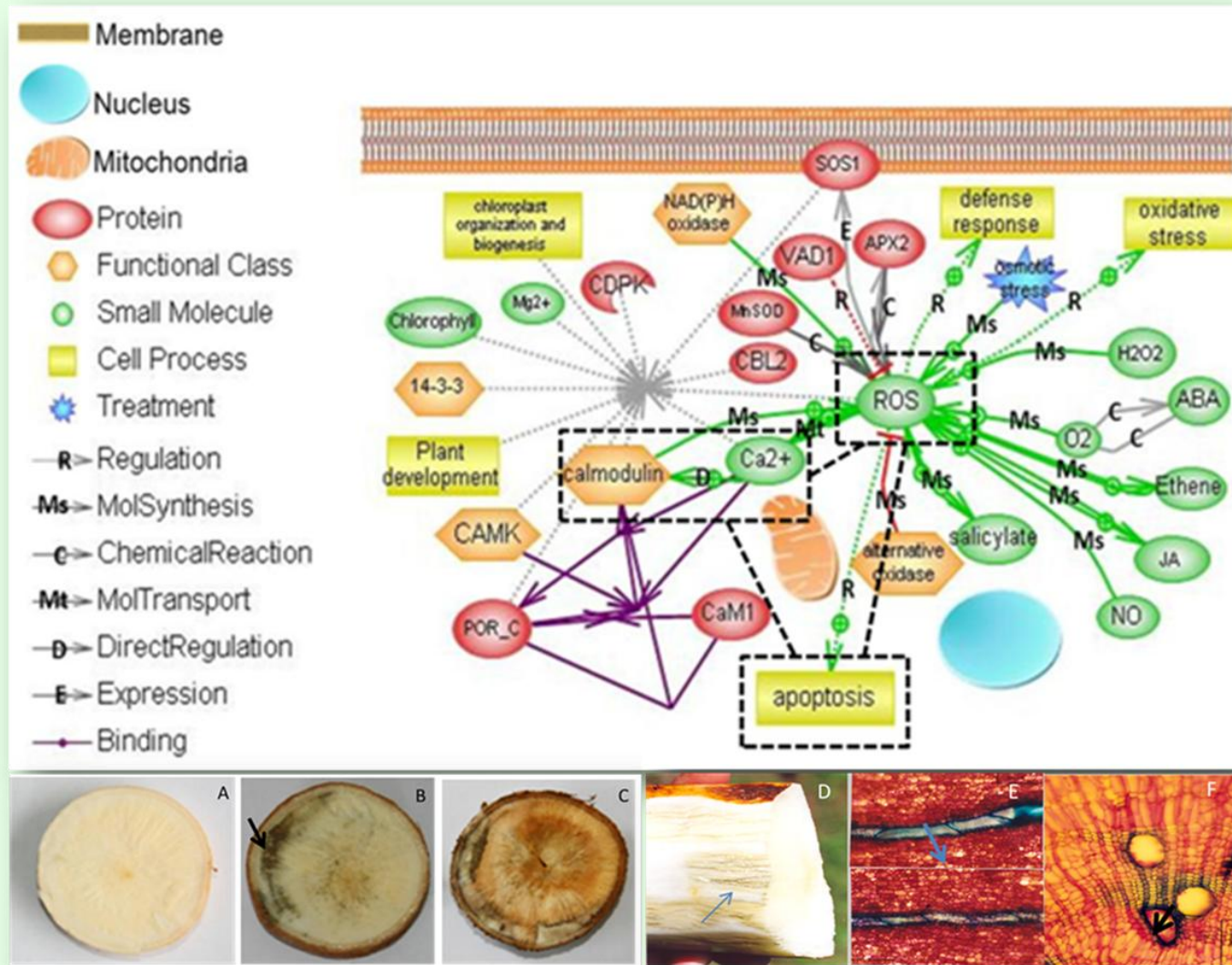
The network of protein-protein interaction showed high photosynthetic rate in Cultivar SC205



Yeast Two-Hybrid Bimolecular Fluorescence Complementation showed the relationship of protein-protein interaction between RCA, CPN60B and FBA2



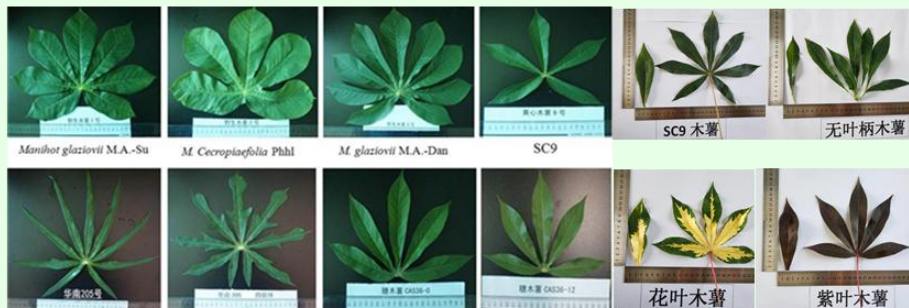
Protein interaction response reveals the molecular mechanism of high photosynthetic rate of cultivated cassava, and provides a theoretical basis for the breeding of high-biomass cassava varieties.



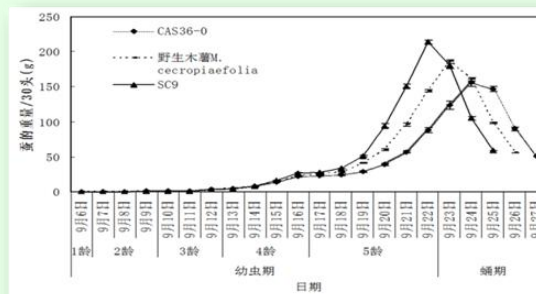
Determined the whole cassava proteome to analyze the mechanism involved in postharvest physiological deterioration (PPD).

Djabou et al. 2017. Cassava postharvest physiological deterioration: a complex phenomenon involving calcium signaling, reactive oxygen species and programmed cell death. *Acta Physiologiae plantarum*

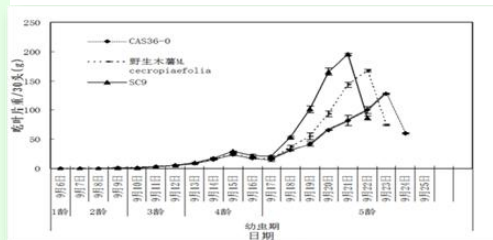
Cassava metabolome



Analysis of crude protein, starch, anthocyanin and hydrocyanuric acid content in different cassava varieties



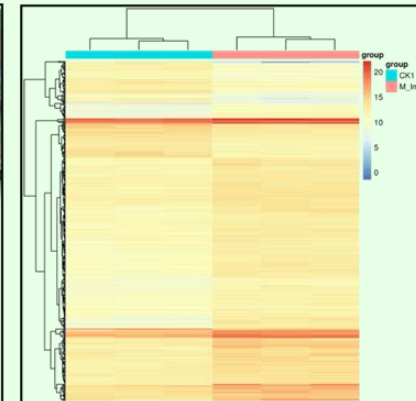
Analysis on the growth of castor silkworm fed with different cassava varieties



Castor silkworm has the best and development fed with SC9



Castor silkworms were fed with Purple-leaf, mosaic and short petioles cassava varieties

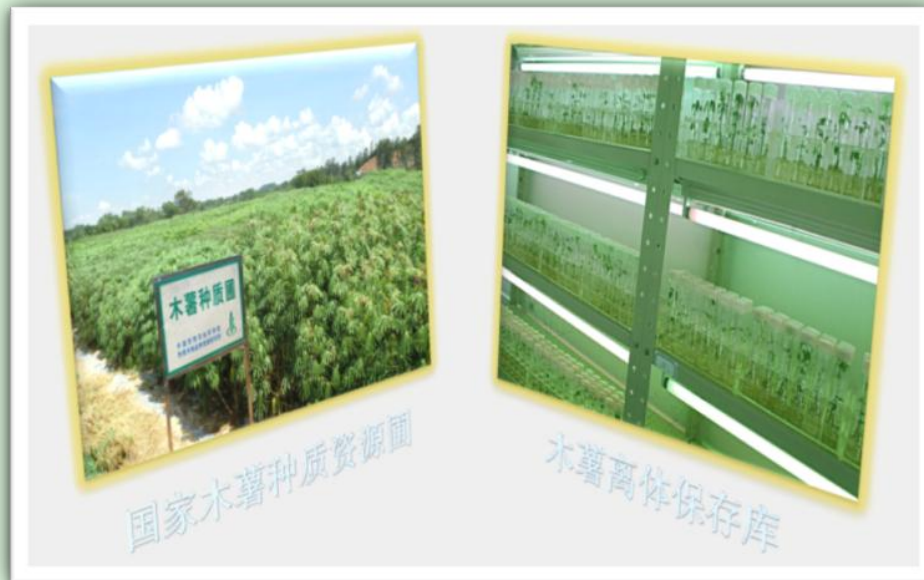


Leaf metabolite analysis of cassava varieties

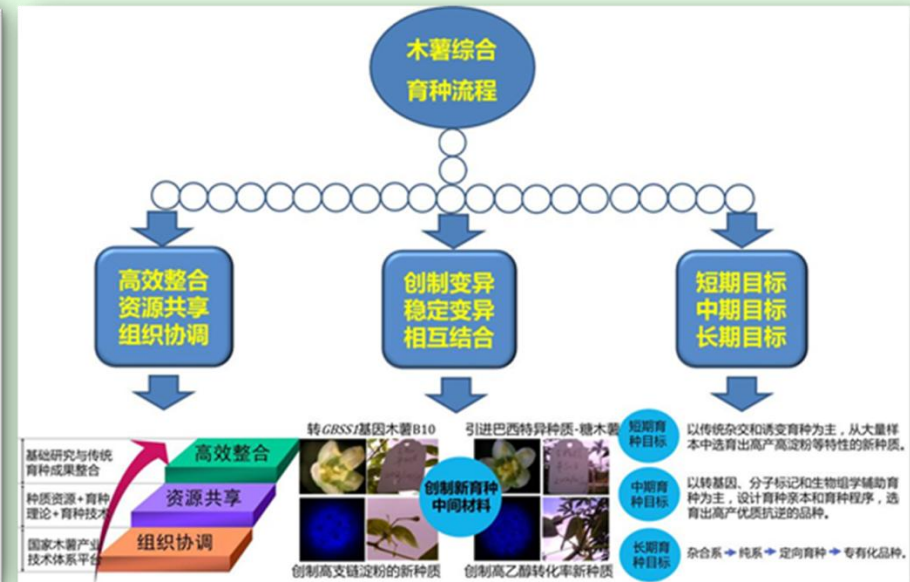
Cassava metabonomics data indicated different metabolites in the leaves of SC9, mosaic-leaves mutation, petiole-free mutation and purple-leaf mutation (high anthocyanin). It would be helpful to select what kind of leaves is much better to feed livestock and silkworm.

Cao Mengmeng. The effects of cassava leaves' nutrient content on the development of eri-silkworm based on metabolomic analysis. Nanjing Agricultural University for Master Degree in Crop Science. 2016

(2) Cassava breeding and variety improvement



Established a National Cassava
Germplasm repository



Developed Cassava Integrated
Breeding System

This system included cassava crossbreeding, mutation breeding, molecular breeding, and other breeding together

■ Farmer participation in breeding and extension



The key to achieving adoption of more sustainable cassava varieties and their production practices on Sloping Land in Asia and their impacts on farmer's income;

Releasing 42 varieties with high yield, high starch, and high β -carotene contents.

■ Farmer participation in breeding and extension



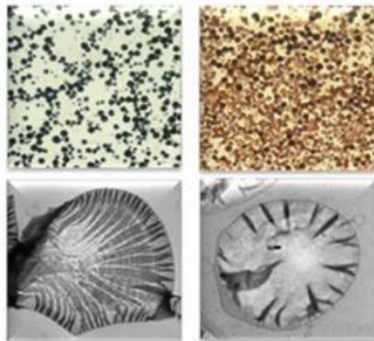
This high-yield cassava variety introduced by a Thailand Company from China, called "dragon scales", yielding 120tons/ha in Thailand, exceeding the theoretical value of cassava output calculated by CIAT (90 tons/ha).

Creation of new cassava varieties

淀粉合成基因的RNAi表达载体

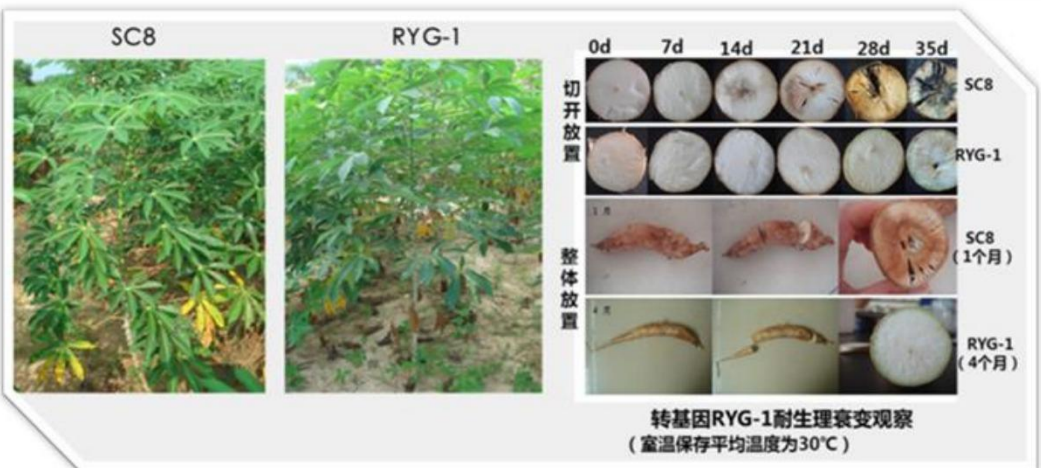
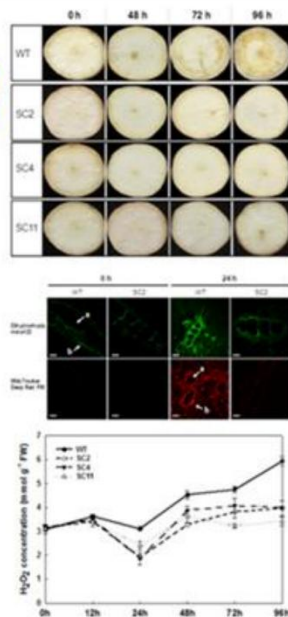


转基因木薯淀粉品质发生明显变化



野生型

转基因



品种	株高/cm	茎粗/cm	薯数/个	单株产量/kg	干物质含量	淀粉率%
RYG-1	108.00	2.00	6.33	2.30	0.42	29.6
SC8	102.33	2.30	5.33	1.73	0.37	29.5

To improve the characters of starch to create waxy cassava, and remove ROS to decrease the phenomenon of PPD, and to test the contribution of *AtGloS2* gene to decrease the phenomenon of PPD (Provided from the teams of Profs Zhang Peng and GUO Jianchun)

(3) Cassava cultivation models and mechanization



The technical measures of formula fertilization and soil and water conservation

Cultivation diversified patterns increased the profits to 10%-30%



Mechanized cultivation covered cassava sowing, fertilizing and harvesting

■ Cassava nutrient diagnostic for fertilization

Diagnostic for
fertilization
increases yield by
20%-30%

Control

Producing 100kg cassava storage roots:

Need N: 0.48kg, P_2O_5 : 0.11kg, K_2O : 0.58kg

Ratio of NPK: 5:1:6

In general, cassava crop to yield 30T/h storage roots:

Need 100kg N, 20kg P and 120 K

Environmental condition:

Soil temperature $>18\text{ C}^\circ$

Air temperature $>15\text{ C}^\circ$

Nutrient diagnosis for
fertilization

■ Cassava harvest by machine

By hand

400 Kg/day/people



By half-machine

800-1000kg/hour/people



■ A simple tool for cassava harvest

By a simple tool
2,000 Kg/day/people



Cultivation patterns for expanding benefit



Planting cassava for farmers is a low value, solving this problem is to introduce the intercropping of cassava and soybean/peanut, and mechanized cultivation. Photos provided from Prof. CHEN Yuan, GAAS

Cassava intercropping with soybean

Name of Smallholder	Plant model	Planting space for cassava (cm)	Plant density per Mu		Yield (kg/Mu)	
			Soybean	Cassava	Soybean	Cassava
Li Handong	Cassava control	110	/	936	/	2716.6
	Planting 1 line cassava intercropping with 2 line soybean	110	13700	971	161.7	2649.2
Li Hanming	Planting 1 line cassava intercropping with 1 line soybean	90	10205	1123	107.0	2537.2
	Planting 1 line cassava intercropping with 2 line soybean	105	17809	983	133.2	2329.4
	Planting 1 line cassava intercropping with 3 line soybean	120	23345	855	152.2	2322.5

Wuming, Guangxi Province (2018)

(4) Cassava processing

Increase starch reclamation by more than 25% and decrease energy consumption by more than 20%



Traditional groove processing



Latest processing

Participation of enterprises is the key point for improving cassava value chains in China

■ Modified starch products



Increase of cassava value chain

Fresh roots
650-700 yuan/t



Starch
3800 yuan/t
Output value
increase to 35.7%



Modified starch for food 6000 yuan/t
Output value
increase to 104.1%



■ An effective ethanol processing

In the modern process of producing ethanol, the utilized rate of facility was increased 20-30%, and decreased the energy consumption 10-20%.



The world biggest Cassava Ethanol Factory COFCO Guangxi;
Guangxi Mingyang Biochemical Company.

Cassava flour processing system

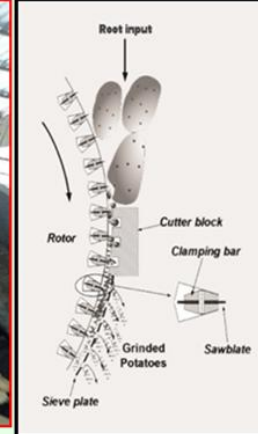
1. Tuber washing



2. Tuber peeling



3. Tuber rasping 4. Cyclone de-sanding



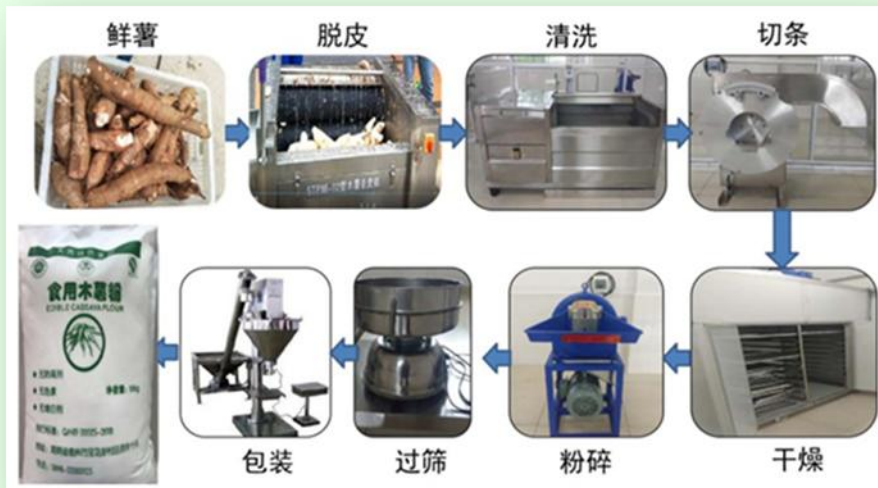
5. Starch milk dewatering 6. Flash drying 7. Sifting and packaging



This process has been designed by prof. Gu Bi. It is the cleanliness in food processing industry, in the high quality cassava flour: HCN $\leq 10\text{mg/kg}$.

Guangxi Anning Starch Company

■ The small-sized process of cassava flour



The small-sized processing of cassava flour



This small-sized process of cassava flour was designed by prof. ZHANG Zhenwen. It is the cleanliness in food processing industry

Increase of cassava value chain

Fresh roots
650-700 yuan/t



Cassava flour
8000 yuan/t
Output value
increase to 185.7%



Cassava flour based food
15000 yuan/t.
Output value increase to
435.7%



**500 cassava
cakes/t**



■ A variety of foods made by cassava flour in China



Prof. Bi GU

All kind of foods were designed by prof. Bi Gu



Cassava juice were produced using storage roots of sugar cassava



Cassava Moon Cakes



Cassava food menus

Cassava Moon Cakes were designed by assistant prof. Kun Cai



Cassava banquet

Photos provided from Prof. GU Bi and Mr. WU Chuanyi

Increase cassava value chain through multiple uses for multiple markets



葡萄糖
Glucose



Fructose



Maltose



Monosodium glutamate



Crystal
fructose



Sorbic acid



Instant noodles



Facial cleanser

(5) Cassava by-product diversified utilization



Stem-cutting for planting



Stems for producing fiberboard



■ Multiple uses for cassava stems



Stem comminution for
growing mushroom



■ Integrated utilization of cassava waste



Producing mushroom using cassava waste



Cassava waste in starch factory was used as raw material for producing organic fertilizer and livestock feed

Three-dimensional cultivation model to grow mushrooms under the forest



Under the rubber trees, cassava stems were used as media to produce mushroom

- The income was 16,500 yuan RMB according to 10,000 bags/mu in rubber trees.
- A cassava adding value for smallholders, that was “cassava by-products—black fungus cultivation — black fungus utilization”.

Multiple uses for cassava leaves



**Cassava leaves for
silkworm feeding**



**Cordyceps militaris cultivation
using silkworm pupae**

In order to increase the benefit for smallholders, cassava leaves were used to raise cassava silkworm, and pupae, inoculated and cultivated *Cordyceps sinensis* into cassava silkworm pupae. Cordyceps is a high quality of materials for maintain people health.



4. The Participation of Smallholders and Enterprises Promotes the Development of Cassava Value Chain



Small cassava but a big industry



木薯粉条制作2



木薯粉条制作3



木薯机制细粉丝



木薯手工粉条



木薯机制粉条2



木薯机制宽粉条



食用木薯1



食用木薯2

Cassava based noodle produced by sweet variety SC 9 in Hunan province

■ Noodle products made smallholders get rich

Small cassava but a big industry



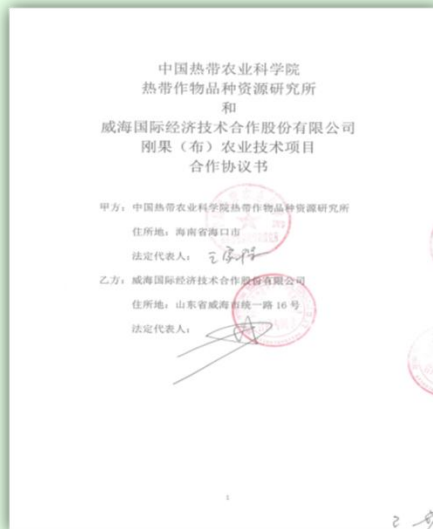
■ Cassava soup products made smallholders get rich

Small cassava but a big industry



■ Beer produced using cassava storage roots
(Technology was provided by Dr. SUN Haiyan)

CATAS developed a number of replicable and transferred cassava simplified technologies, which have laid a solid foundation for the construction of Hainan Free Trade Port and the development of rural revitalization



- Cooperating with domestic enterprises such as Bifa Food company to develop cassava edible products, such as canned cassava, cassava soup and cassava biscuits;
- Cooperating with foreign-related enterprises to establish a foreign cassava processing base and jointly implementing international cooperation projects.

The feed process of cassava degradation fermentation for cattle and sheep

- (1) Crushing of cassava plants;
- (2) Treatment with high temperature;
- (3) Adding bacteria, soybean and other materials;
- (4) Stirring;
- (5) Compressing into block;
- (6) Sealing and packing.

Biological Fermentation Feed
factory, Hainan Shengxu
Biotechnology Company



These photos were provided by Profs. OU Wenjun and YANG
Jingsong



5. The recent situation of China cassava international cooperation with Africa countries



International cooperation models

- (1) Diversified modes of international cooperation;
- (2) Strengthen agricultural technology transfer;
- (3) Establishing China–Aided the Republic of Congo Agricultural Demonstration Center.

(1) Diversified modes of international cooperation



WCRTC in Nanning, 18-23/01/2016

The 1st China-Africa Forum on Tropical Agricultural Science and Technology Cooperation



The 1st China-Africa Forum on Tropical Agricultural Science and Technology Cooperation held in BOAO, China on August 30, 2018. So far, CATAS has held 41 training course for 2300 trainees coming from 43 Africa countries. CATAS has sent more than 50 experts to 10 Africa countries to carry out Technical Guidance and Agricultural Industry development Planning.

■ Collaboration between CIAT and CATAS



CATAS-CIAT Collaborative and Cooperative Office was established on Dec 4, 2011



Chinese scientists received training courses on cassava breeding at CIAT in 2010



The Journal of Tropical Grassland Co-sponsored by CATAS, CIAT and ACIAR in 2012



Training Course on Tropical Forage organized by CATAS and CIAT

■ Collaboration between IITA and CATAS



In May 23, 2011, IITA delegation discussed the cooperative agreement with CATAS experts at Haikou CATAS headquarter.



In May 24, 2011, IITA delegation visited Chinese Cassava Germplasm Bank in Danzhou campus of CATAS.

The agreement between CATAS and IITA included:

- 1) The tropical natural resources investigation and evaluation in Africa;
- 2) Cassava molecular breeding by design;
- 3) Developing gene resources resisted to pests and diseases;
- 4) Setting up agricultural technical training courses;
- 5) Setting up demonstration basin;
- 6) Conducting exchanges in tropical germplasm resources and information.



FEDERAL REPUBLIC OF NIGERIA

MEMORANDUM OF UNDERSTANDING

BETWEEN

**THE FEDERAL MINISTRY OF AGRICULTURE
AND WATER RESOURCES**

AND

**CHINESE ACADEMY OF TROPICAL
AGRICULTURAL SCIENCES**

FOR

**ESTABLISHMENT OF NIGERIA – CHINA CENTRE
FOR CASSAVA (NC³)**

Prepared by:
Legal Unit
Ground Floor, Room 21,
Federal Ministry of Agriculture and Water Resources,
Area 11, Garki,
Abuja.

■ **Setting up**

Nigeria China Cassava Center



**MOU regarding cooperation in
tropical crops was signed**



The first seminar regarding NC3



The second seminar regarding NC3



Setting up NC3 Opening ceremony



The Vice Minister of Ministry of Agriculture, China, Prof. Zhang Taolin gave a summing-up talk at the meeting held on June 13, 2011 at NABDA, Abuja, Nigeria

■ Collaboration between CATAS and University of Yaounde I, Cameroon in Ph.D student training



Prof. Songbi Chen collaborated with Associate Prof. Nicolas Niemenak, who works at University of Yaounde I, for Ph. D student's supervisor.



Ms Astride, a Ph. D student jointed trained by CATAS and UYI, conducts her experiments for Ph. D thesis at Danzhou campus of CATAS during 2013-2015.



■ Holding training course and conducted talent-scientist system for developing countries



Train course on cassava cultivation techniques for developing Countries



Implemented talent scientist system for developing countries

Training Course in China on Cassava production & processing for African Countries



Training course on cassava production and processing for African Countries were performed at CATAS, Haikou, China from July 26 to Aug 16, 2012. 21 trainees coming from 10 African countries including Uganda, Nigeria, Ghana, Ethiopia, Benin and et al participated this course.





The Opening Ceremony of Seminar on Cassava Production and Processing Technology for African Countries on August 31, 2018. There were 21 trainees coming from Gambia, Namibia, South Sudan and Uganda, respectively.



Training course on cassava processing and capsicum cultivation techniques in Nigeria implemented by CATAS cassava team on September 4, 2018

(2) Strengthen agricultural technology transfer

The limitations of cassava production in Africa

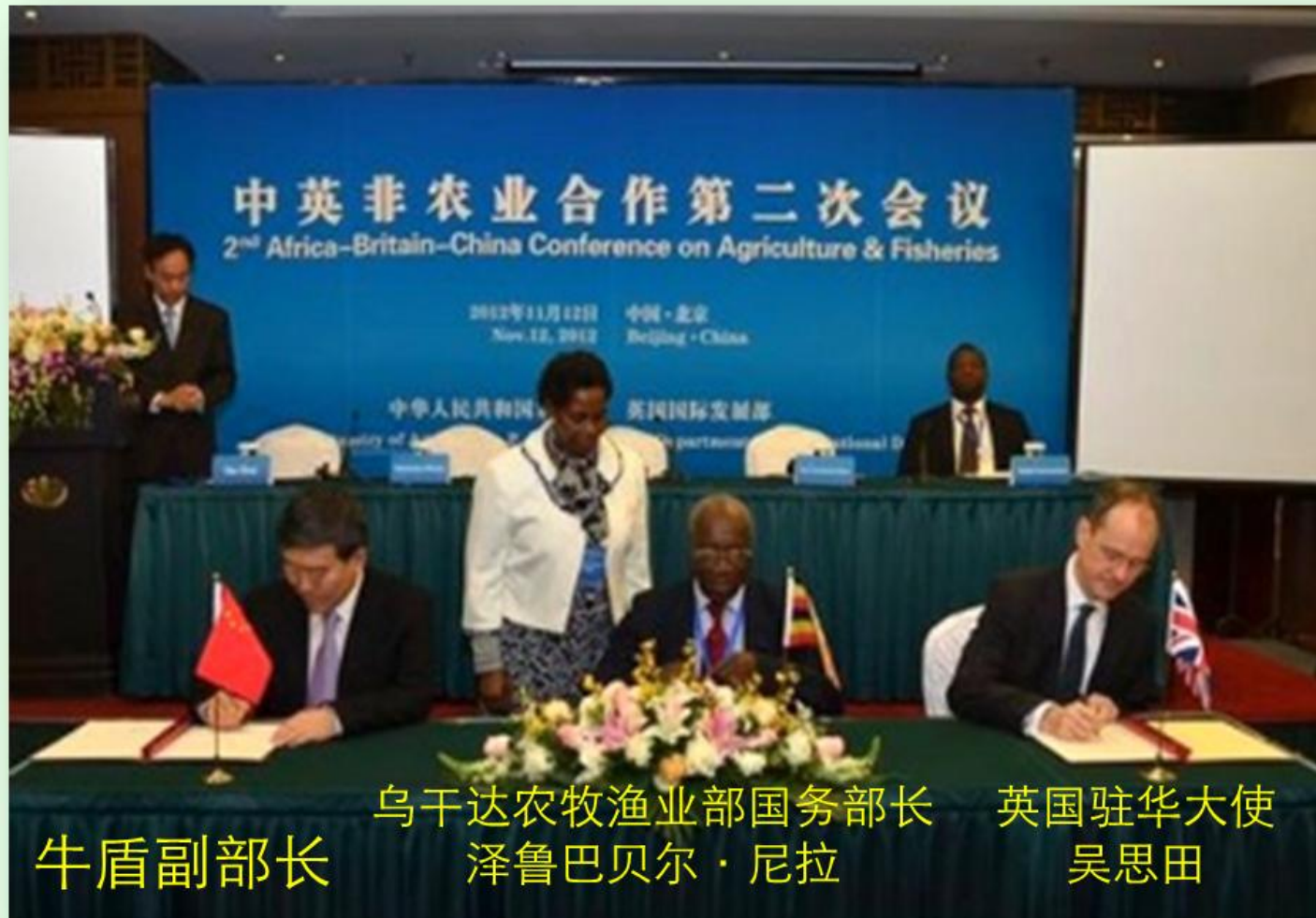
- ❑ Cassava plants are severely affected by viral diseases, in which 35-38% of cassava plants were mainly infected by cassava brown streak and mosaic virus diseases.
- ❑ Facility cultivation conditions are poor and low cassava yield with an average of 11 t/ha;
- ❑ Cassava rapid postharvest deterioration;
- ❑ Lack of small cassava production machinery;
- ❑ Small-scale processing and lack of cassava based-products.



■ The status of cassava crop in African countries



A. Cassava-tuber transport by bike; B. Cassava-tuber transport by truck; C. Handed peeling; D. Squeezing into serosity by machine; E. sifting and precipitation; F. Sun drying; G. powder production; H. Machine drying.



Uganda, UK and China signed Memorandum of understanding on Cooperation in Agricultural Technology transfer in Beijing on November 11, 2012.



Farmer Training-Hoima

	NAME	DESIGNATION	CONTACT	SIGNATURE
20	Tunyamukhe Benson	Farmer	077542666	Benson
21	SEANKUNDA MURUN	"	0782356365	Seankunda
22	MUSOKO MUKANDU	"	077618763	Musoko
23	ABUDARAKA Musingiri	"	0785-291565	Abudarak
24	Kavungwa Amet	"	"	
25	Kavungwa Fatima	"	"	
26	Kyakuhane Harriet	"	0784830008	Harriet
27	Sseguya Tuzo	"	0782-38888	Sseguya
28	Wiksau Kadas	"	071186415	Wiksau
29	Moses Ndaganyi	Farmer	0772422893	Moses
30	Klamuzi Stanley	Farmer	0778328668	Klamuzi
31	Bamukama Francis	Farmer	0782-267273	Bamukama
32	Baguna Robert	Farmer	072279976	Baguna
33	Ogipo malko	Farmer	077720932	Ogipo
34	Binka Hayuma	Farmer	0781564000	Binka
35	MASARA ALISON	FARMER	0775038097	Masara
36	Mugisa Yahoy	Farmer	0772464006	Mugisa
37	JUNJUN J. WILLIAM	Reflex	0782-38888	Junjun
38	BAKIZA PHOENIX BAKIZA	PO	0772 39677	Bakiza
39	Kusomunwa Gladys	PRODUCTION	077323602	Kusomunwa
40	Mukabagwa Haumal	C-15C	0782-800810	Mukabagwa
41	BIRUGI SWABURA	FARMER	0773461852	Birugi
42	WABYONA YASINI	"	0775232090	Wabyona
43	AMINAH NASURU	FARMER	0779023359	Aminah
44	ABUKABWA ABUKABWA	"	0785337685	Abukabwa
45	BALUKAGA ABUKAGA	"	0779400120	Balukaga
46	ATUKUWIRI AUCHA	"	077	Aucha
47	Karungi Saffinaki	"	"	Karungi
48	Kunihwa Zalina	"	"	Kunihwa
49	WANDERA RONALD	Farmer	0785467271	Wandera
50	Kabujungu Jordan	"	07721287385	Kabujungu

Established 8 demonstration bases of cassava mechanized production in Kiryandongo, Masindi, Buliisa and Hoima ;
Implemented 7 training courses for 421 trainees from different areas in Uganda.



The advantage of cassava-mechanized demonstration bases:

- Improved work efficiency: a machine can grow or harvest cassava 3 hectares per day, equivalent to 50 to 60 workers per day;
- Reduced labor intensity;
- Used machine to plant cassava, it would be helpful to loosen the soil, ventilated and well drained, which is beneficial to cassava growth and increase cassava root yield.

■ Learn the experience from AgriTT project in Uganda



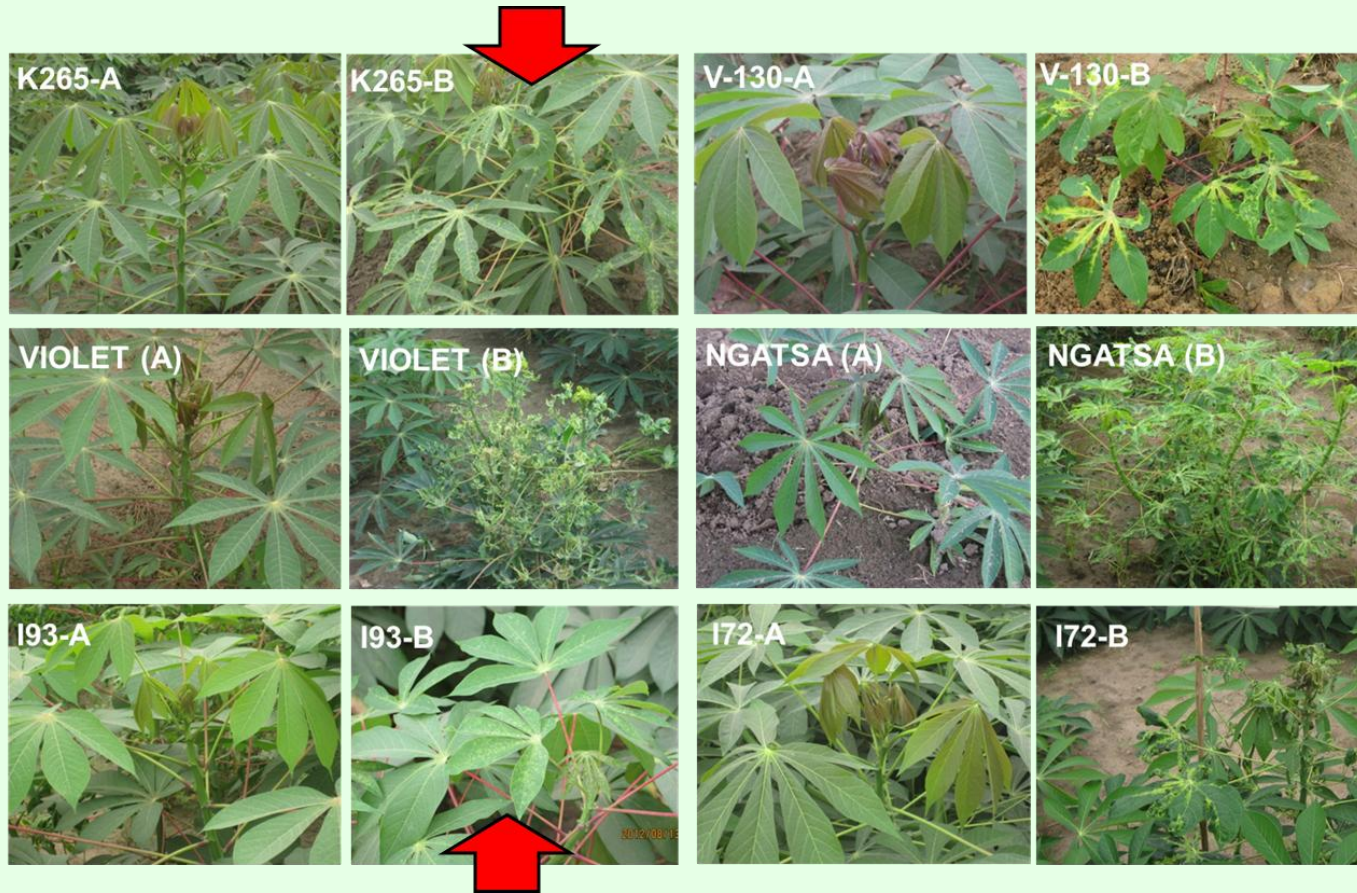
- ❑ Using the CMD and CBSD tolerant varieties of cassava;
- ❑ Improved the planting and harvesting patterns, mechanized cultivation has replaced working by hands;
- ❑ Adding cassava processing to increase the value for enterprises and smallholders.

(3) Establishing China –Aided the Republic of Congo Agricultural Demonstration Center (CCADC)



Establishing international cooperation platforms to promote rural revitalization in Asian and African countries

Selecting resistant varieties to CMD



Seventeen cassava varieties included 6 cultivars of South China series were induced into China-Aided the republic of Congo Agricultural Demonstration Center to carry out the adaptation experiments for selecting out the varieties with resistance to CMD





cassava varieties of virus-resistance
adaptive experiments



The selection of cassava varieties to
virus resistance

Cassava yield increase planted in China –Aided the Republic of Congo Agricultural
Demonstration Center

Local cultivars: Average 9 tons/ha; New varieties : K265 (42 tons/ha,
20% virus infected plants); I93 (26 ton/ha, No any virus infection)

Training course in CCADC on cassava for the farmers from Congo (Brazzaville)



Experts from CATAS give cassava training course for the trainees from Congo (Brazzaville) at CCADC in 2014



Completion ceremony of cassava training course for Congo (Brazzaville) trainees was conducted at CCADC in 2014



Cassava training course at Oyo,
Congo (Brazzaville) in 2014



The trainee showed her cassava
storage roots



CATAS experts gave cassava training course at CCADC in Congo
(Brazzaville) on June 16, 2018



The background of the slide is a photograph of a lush green cassava field. The plants have characteristic palmately lobed leaves. Above the field, there is a bright blue sky with scattered white clouds. Overlaid on the image are two large, semi-transparent geometric shapes: a green parallelogram on the left and a blue parallelogram on the right, both pointing towards the center. The title text is placed within the green shape, and a white arrow is located within the blue shape.

6. The cooperation potential in cassava between China and Africa countries



- Building sustainable cassava value chains through surveillance and control of Cassava Mosaic Disease and Cassava Brown Streak Disease in Africa;
- Breeding new cassava varieties based on genome and proteome helps increase yields and disease resistance;
- Creating cassava value addition for smallholders based on small-sized solar drying system;

- Human resource development. Exchange MSc & PhD students and younger talent scientists;
- Set up Cooperative Interdisciplinary Platforms (IDPs), such as an united laboratory or base of cassava breeding, and processing technology;
- Establish a demonstration center for cassava multiuse production;
-



**Thanks
For Your Attention !**

Email: songbichen@catas.com