

Improvement of processing technology research and utilization of sweet potato and its derived foods

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Production and yield of Sweet-potato In Sichuan Province, P.R. China

In Sichuan, China,

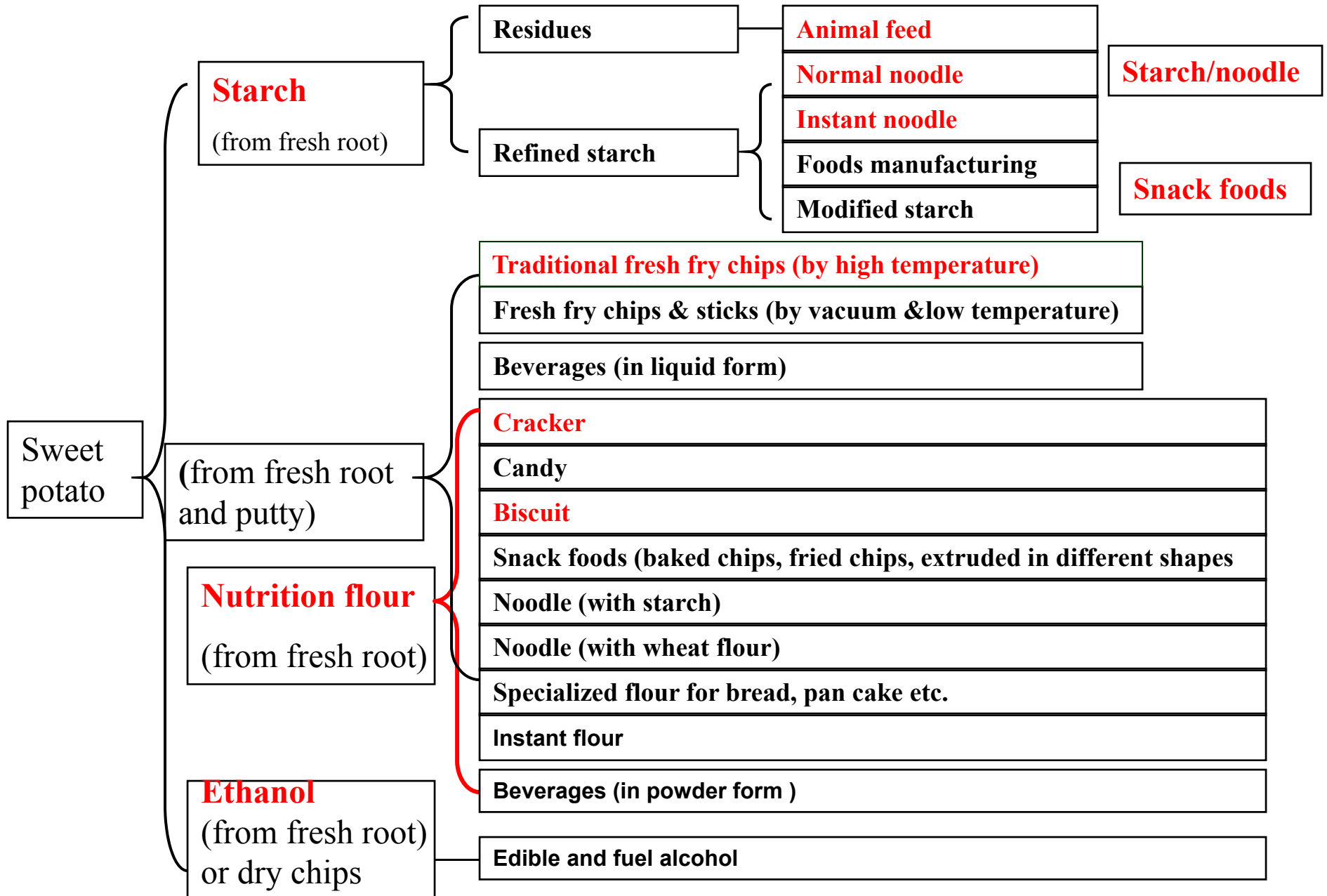
SP ranks first both in China and in the world;

Favorite natural condition with hilly land and mountain area;

Agro-industry processing has been set up successfully

Name	Area (million ha)	Production (million ton)
In Sichuan Province, P.R. China	0.87	15

Main products from potato and sweetpotato



1. Puree technology and machine

2. Flour technology and machine

3. Starch technology and machine

4. Noodle technology and machine

5. Snack foods technology and machine

1) fresh frying

2) extruding

3) baking

4) re-constructed

Processing in Rwanda

Flour processing



Puree processing



Progress in product development

Old technology

Farmer sorting out SP roots



Manual biscuits making



Biscuits



Biscuits packaged



A variety of products made

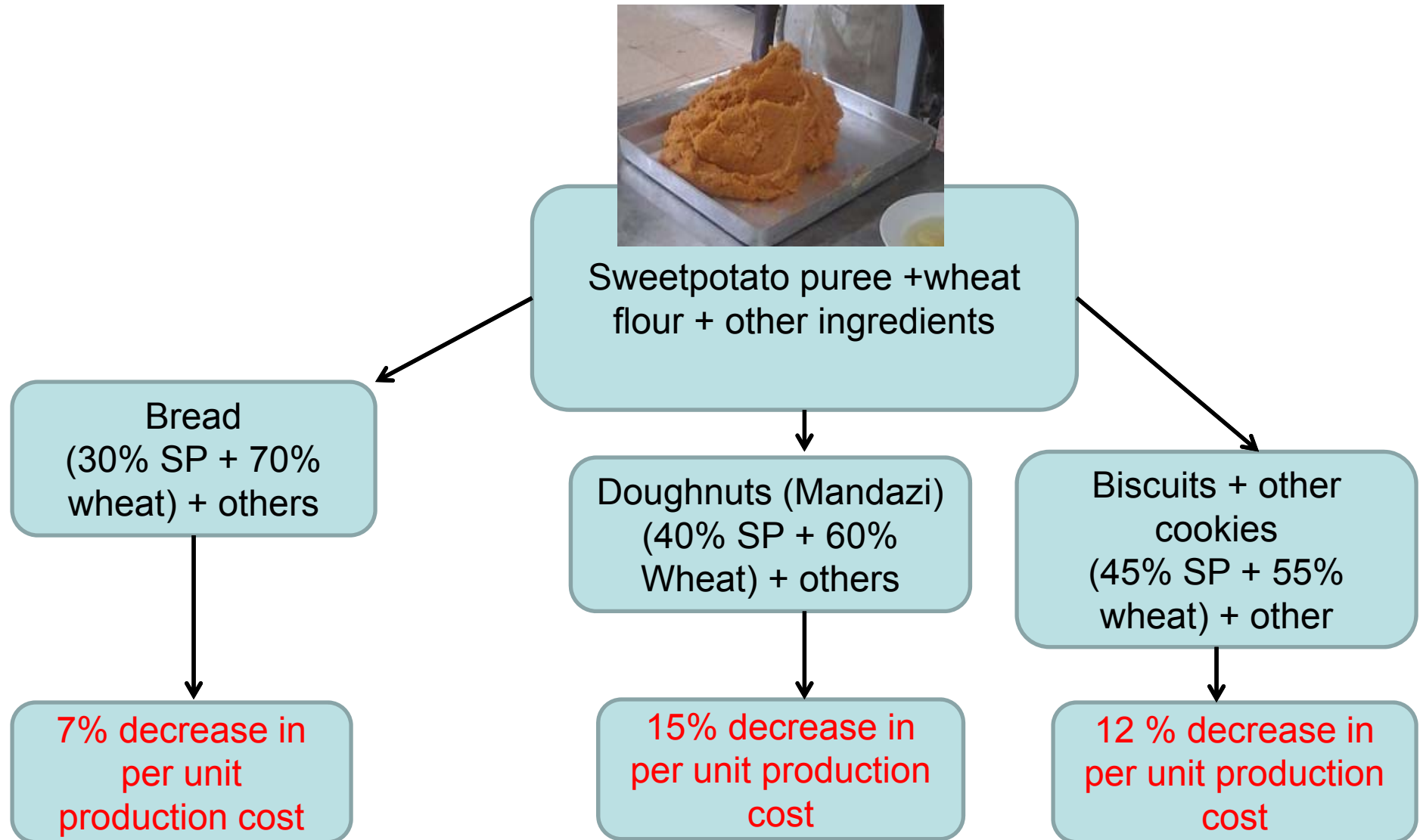
Some of final products

High end Vit A rich biscuit packages

New technology



Does it make economic sense to incorporate sweetpotato puree into bakery products? A look at 3 commercial products in Rwanda



Sweet potato puree and its use

1. Energy saving
2. Wide use (similar use as flour)
3. Key improvement in technology
 - 1) machine:
peeling, mud extruder, sealed container
 - 2) mix and ingredients to keep color and nutrition
 - 3) sterilization method to keep longer (compare with freezing method)

What are the necessary conditions for sweetpotato products to be successful?

- It only makes sense to incorporate SP into products if:
 - Processors can increase their incomes
 - Have a marketing edge due to nutritional content or any other desirable attributes
 - Technology is easy to adopt
- The products have to be better or as good as the 100% wheat based products

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Sweet potato flour

New Technology for Flour Production System

- 1) Chip drying technology (fresh, semi-gelatinized, full-gelatinized)
- 2) Hot air current drying technology (beverage, food industry)
- 3) Drum drying technology (flake products)

Key points:

color , flavor, production drying, cost, final derived products)



Ways of processing sweetpotato flour in China



Workshop in construction



Pre-treatment-1



Pre-treatment-2



Microwave



Hot air drying



Smashing

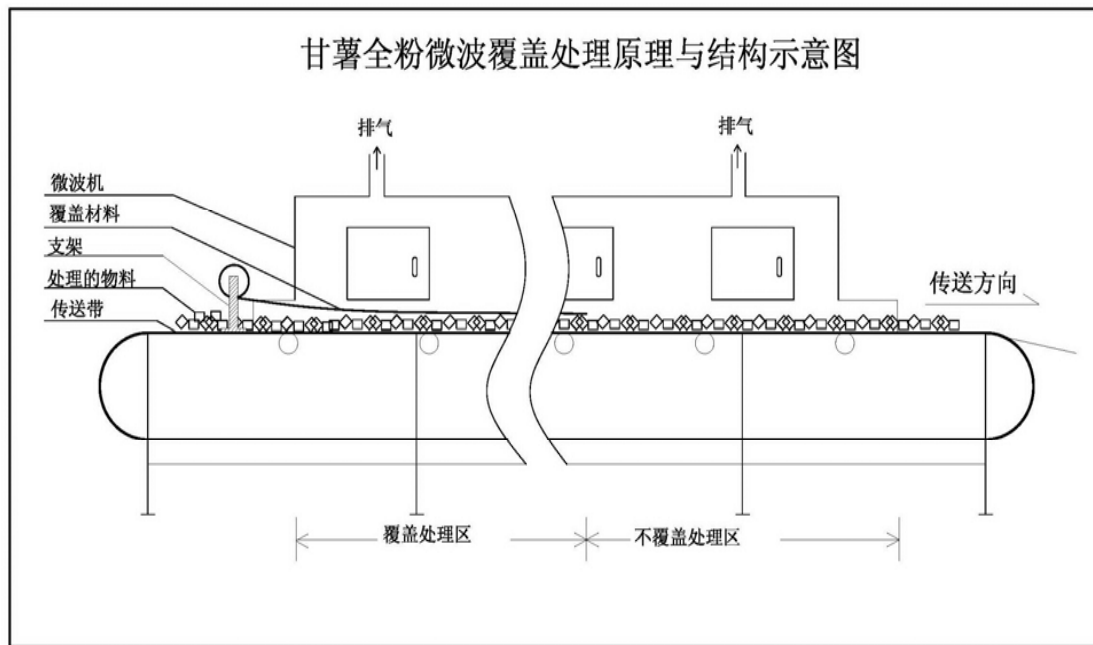
Products made with SP Flour



New technology for Sweetpotato flour (& Puree)

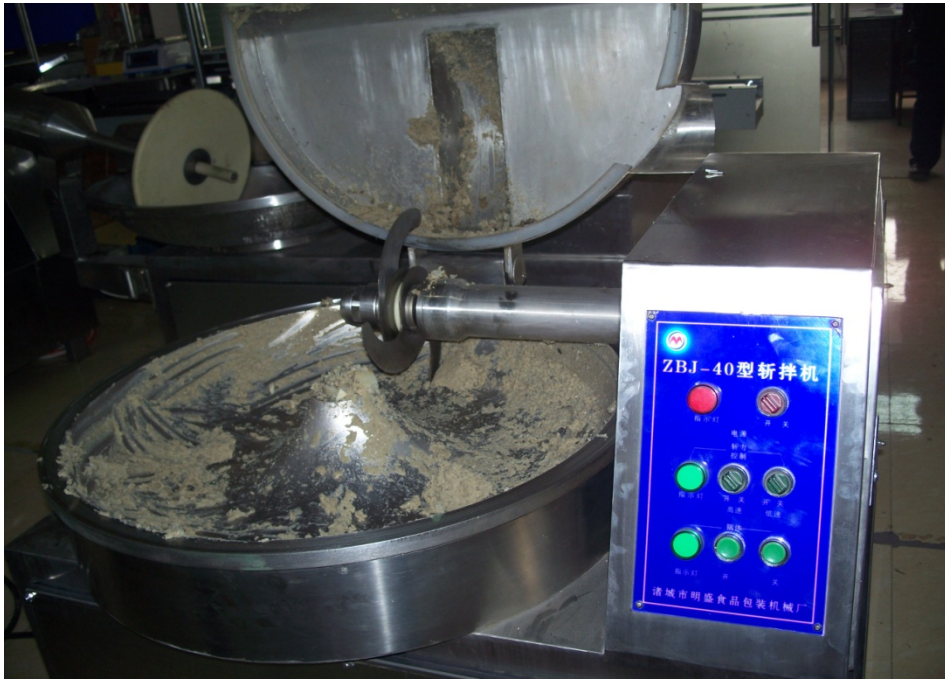
Method -1 Microwave +hot air drying

Method -2 Microwave +Current drying



1. Fresh –cut---microwave—hot air drying –sieve—packing--products

2 Fresh –cut---microwave—hot air drying –sieve—packing--products



Sweet potato puree and its use (yellow and purple)



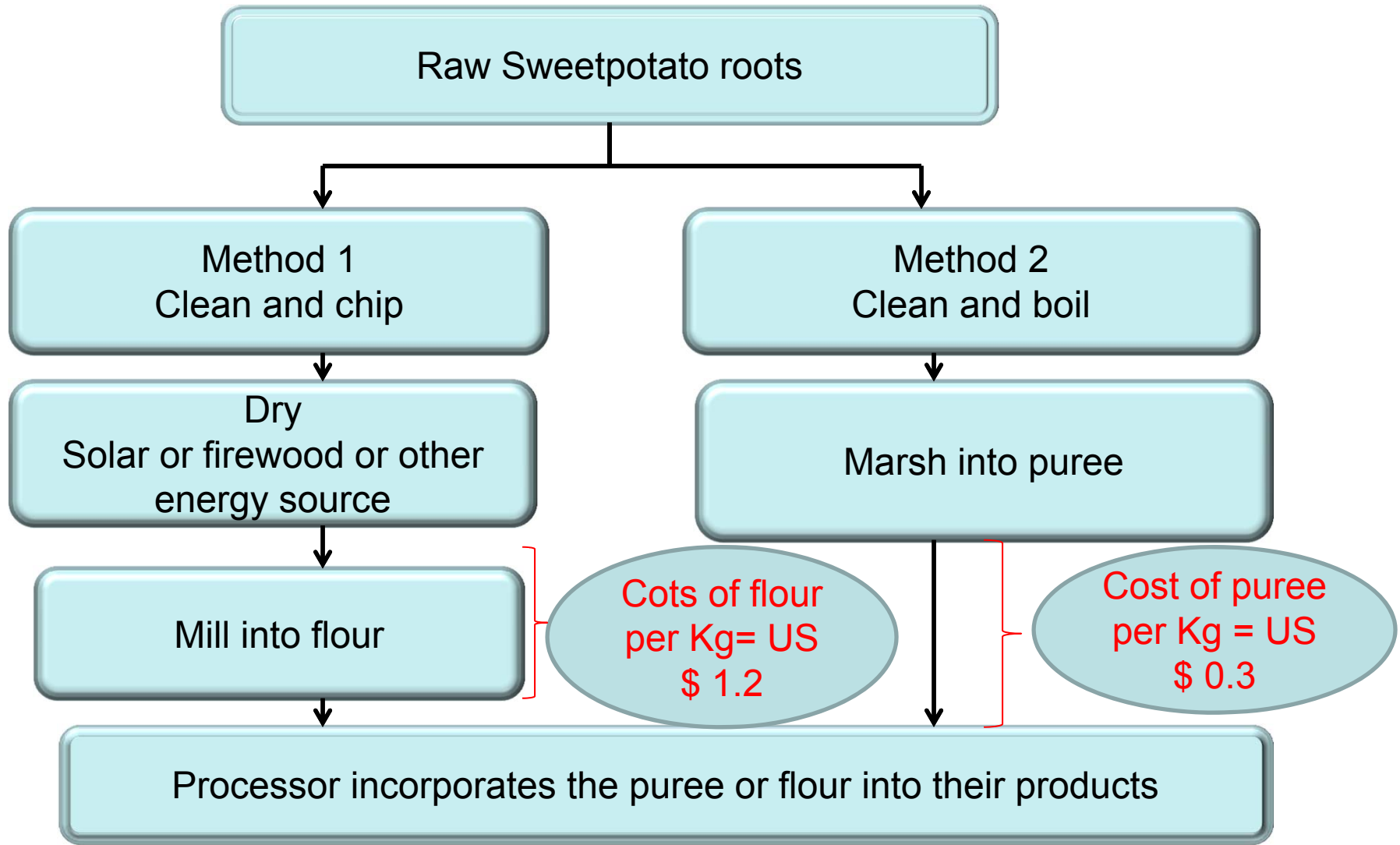
Comparison between sweet potato flour and puree

	<i>sweet potato flour</i>	<i>sweet potato puree</i>
1) Energy & cost	larger	small (no drying) save US\$ by 100 , no sterilization
2) Nutrition	loss some	full (especially fresh method)
3) Flavour	loss a little	very few loss
4) Derived use	see later	see later

Sweet-potato flour and puree derived products

- 1) biscuit
- 2) instant flour
- 3) instant noodle (with corn etc.)
- 4) cooking noodle
- 5) cracker
- 6) sweet potato candy (re-structured)
- 7) complex chips
- 8) restructured sweet-potato rice
- 9) beverage (in the form of flour)
- 10) specialized flour for dumping, steamed bread etc.

Processing technology development and cost comparison between SP flour and Puree



1. Puree technology and machine
2. Flour technology and machine
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 - 4) re-constructed

R & D by SAAS in processing

1. Advanced processing technologies and machines in starch R & D by SAAS since 1990s'

<p>1. Starch series refined starch, modified starch, noodle, instant noodle, They have formed an agro-industry processing</p>	<p>With: 1. Sweet-potato and other root & tuber crops of cassava, canna etc., 2. together with corn, wheat flour etc.</p>
<p>2. Other products (foods) Instant food, canned food, beverages, dehydrated products etc.</p>	<p>With: Fruits, Vegetables, Meats</p>

Potato and Sweet potato starch processing system

Coarse starch (medium scale or small scale by farmers)



Refined starch (medium and large scale)



Series products

Instant noodle	45%
Noodle (for cooking)	35%
Food industry	10%
Family cooking	8%
Modified starch	2%

Various starch processing machine and facilities



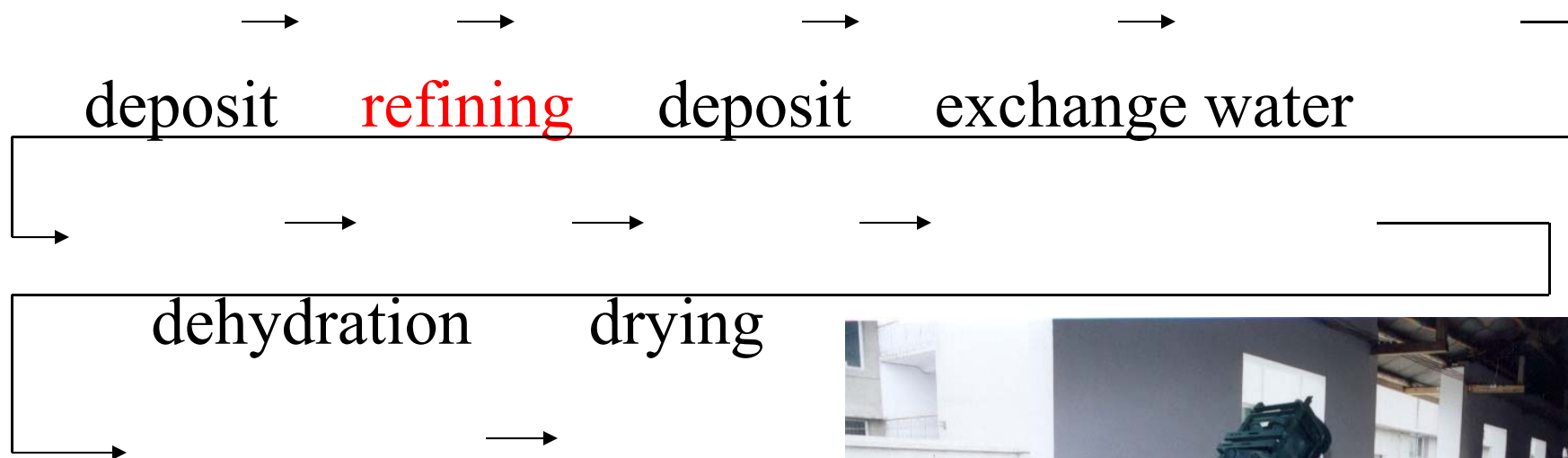
Starch processing machine and facilities



Potato and Sweet potato starch processing procedure

Improved starch procedure, machine and its operation:

Fresh root wash **smashing** filtration “**sour liquid**”



Starch machines

Main improved machines

- **washing machine** (cage washer, vertical washer inclined lifter,)
- **smashing machine** (multi-function hammer machine, saw-drum machine)
- **separating machine**
- **refining machine** (centrifuge, cyclone)
- **drying machine** (hot current machine)



Medium scale Starch processing machine and facilities

Refined starch for Cooking



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Noodle processing new technology

1. *Extruding method (popular)*

(by extruder with single or double screws, quality of tolerance)

2. *Heated extruding method (popular)*

(heated by water)

3. *Hot water gelatinizing method (popular)*

a) Mixing & beating by hand by manual

b) Mixing & beating by hand by machine

4. *Sheeting method (in large scale)*

with the sheeting noodle machine line



Heated and non-heated extruding method

starch → mixing → extruding

cutting → cooling → separating

freezing → drying → packing

Starch instant noodle

1) Production chain

coarse starch → refined starch

(starch quality, starch quantity, profit to farmers, bigger processors and sellers)

2) It is the same convenient as wheat instant noodle

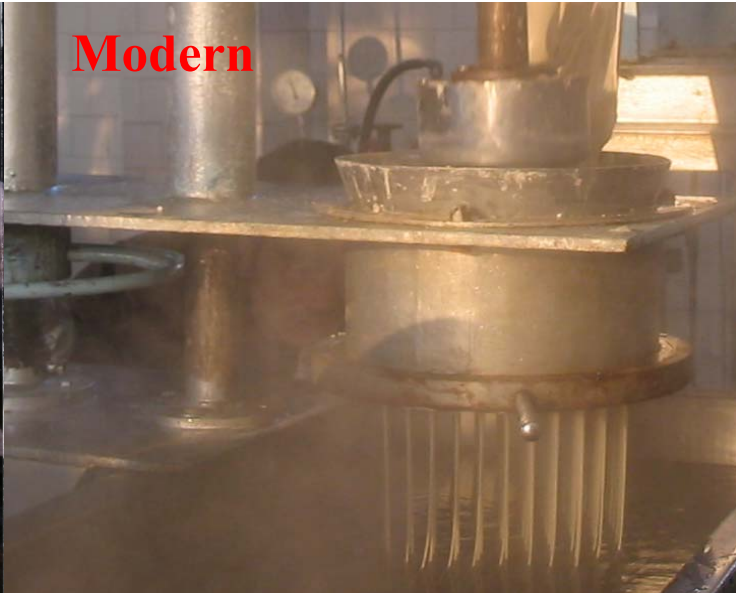
3) special mouth feeling and nutrition:

special tolerant characteristics come from sweet potato and potato starch

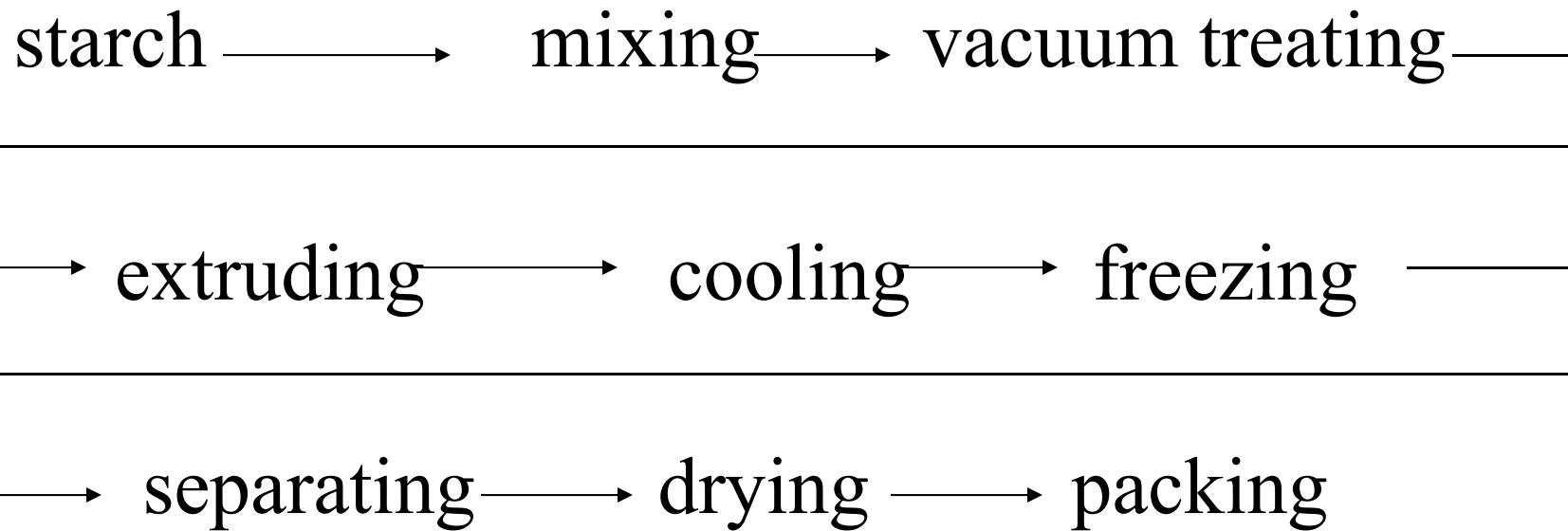
whole nutrition instant noodle---by fresh roots

have been made into varies of instant foods ----by combining with rice, other crops etc.





Hot water gelatinizing method



Sheeting method

starch → mixing → sheeting → steaming

→ cooling → aging → cutting

→ shaping → drying → packing



Possibilities of working as a family enterprise and modern factory making noodles



Family enterprises



Modern factory



Modern factory for noodle processing



Heat based drying chamber



Sun Drying



Various noodle products

Noodle series



1

2

3

4

5

6

7

8




Sheeting method: 1, 2, 6, 7, 8

Extruding method: 4

Manual method: 5

Analysis of starch and noodle processing economy effect

In sweet potato planting area: an ordinary farmer family, 10ton fresh root/year, 1.5ton starch/year, net profit 1600 RMB (about US\$246)

Form	Average unit Price	Total amount/Price (RMB Yuan)	Added value (compared with the fresh root)
Fresh root of sweet potato	0.5RMB Yuan/Kg	1 ton/500 RMB (US\$ 82.6) 	
Coarse starch	4.0RMB Yuan/Kg	160Kg/640RMB(US\$ 105.7) 	0 %
Refined starch	6.0RMB Yuan/Kg	152Kg/912 RMB(US\$ 150.7) 	42.5%
Instant noodle	15.0 RMB Yuan/Kg	137Kg/2055 RMB(US\$ 339.7)	221 %

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Some Snack Food Processing Methods in China

1. *High temperature frying products (chips)*

Fresh roots → washing → peeling → cutting → heating
→ drying → frying → seasoning → packing

2. *Vacuum frying products (chips, sticks)*

Fresh roots → washing → peeling → cutting
→ drying → frying → seasoning → packing

Feature of technology and products :

- 1) lower temperature
- 2) better quality (in color, crisp, nutrition)
- 3) medium and small production scale

Products (chips & sticks):

sweet potato, potato, taro,
vegetables, fruits, etc.







Vacuum frying machine
(frying,





Potato

Sweetpotato



Potato chip/crisp

Snack foods
made through
vacuum frying
method



French fries



Potato



alibaba.com.cn



Broad bean

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Sweet-potato snack
food (re-structured)

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Baking

1. Sweet potato candy

- 1) fresh root → sugar soaking and boiling → drying
- 2) fresh root/flour → mixing-shaping → baking



1. Sweet-potato candy
(re-structured)



2. Biscuit from fresh roots & flour

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Re-constructed

2. Restructured chips

- 1) sweet potato cracker from fresh roots & flour
- 2) Fried chips from flour and fresh roots
- 3) Biscuit from fresh roots & flour



1. sweet potato cracker from fresh roots & flour



2. Fried chips from flour and fresh roots

2. Derived products of Sweet-potato flour



Sweet-potato biscuit



purple sweet potato noodle
with wheat flour



Dumping flour from sweet potato
and waxy rice



Purple sweet-potato complex rice
by re-structured method

Sweet-potato beverage production



Future fields of research

1. Pre-harvest field

- New varieties for special processing products with specific characteristic
- Better and large storage facilities and technology for prolonged processing materials storage

Other areas of research

- Changing tastes and preferences of eating habit
- Development of new products and processing technology
 - Products rich in β -carotene and [anthocyanin](#)
 - Non-oil method by baking products

Other areas of development

- International cooperation in R & D from variety to storage and processing
- Better policy framework and effective investment to promote processing

Thank you