

GIES Case Dataset on Suining Sweet Potato Subtropical Hills in Qingfeng Village, Baima Town, Sichuan Province of China

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Abstract: Suining sweet potato is a group of traditional quality varieties which have been cultivated in Suining of Sichuan for hundreds of years. Of which, “Suining 524” has been cultivated for 60 years, it has uniform tubers and light brown skin, and contains a large amount of starch, soluble sugar, various vitamins and amino acids, and also contains protein, fat, dietary fiber and minerals such as calcium and iron. Sweet potato is one of the staple crops in Qingfeng village, Baima town, Suining city. It is planted intensively and continuously, forming a unique planting method and management mode. Over the years, Suining sweet potato has formed a cultural and geographical tradition with regional characteristics in the environmental protection and life of villagers in Qingfeng village. This case study developed five types of data of Qingfeng village: (1) case boundary (village, town, county); (2) habitat environment (climate, DEM/Slope, soil, water quality, NDVI, land use); (3) sweet potato agronomic feature, nutrition and safety; (4) enterprise and management; (5) photos and pictures. The dataset is archived in .shp, .tif, .xls, and .docx formats, and is 60 MB in size.

Keywords: Geographical indication; Suining sweet potato; subtropics; Suining city; Baima town; Qingfeng village; Case 13

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1 Introduction

Sweet potato (*Ipomoea batatas* (L.) Lam.) is an annual or perennial dicotyledonous herb of the genus *Ipomoea* in the family Convolvulaceae, commonly known as sweet potato, yam, red camp, red potato, groundnut, white potato, and white taro. It is the seventh largest food crop in the world, originating in tropical America ranging from Mexico, Ecuador to Peru. It is a thermophilic, light-loving, not cold-resistant crop. It is grown in more than 120 countries and regions from temperate to tropical regions south of 40°N latitude, and was introduced to coastal Fujian and Guangdong of China at the end of the 16th century^[1–4].

Qingfeng village is 30 km away from Suining city and 20 km away from Anju district. Qingfeng village is located in the hilly area in the middle of Sichuan province. The appearance of the region is mainly gentle hills and basins, with an altitude of 300–600 m. The overall terrain is high in the northwest and low in the south. The terrain slope is mostly about 6–15 degrees. The soil in Qingfeng village is mainly red brown purple soil and brown purple soil, which are weakly alkaline, and the soil layer has high potassium content. The soil has strong permeability, water and fertilizer retention, is conducive to the growth of sweet potato and the formation of nutrients, and has favorable conditions in improving the stress resistance of sweet potato plants. Located in the subtropical humid monsoon zone, the case area has annual average temperature of 17.6 °C, annual average rainfall of 800–1,000 mm, and annual average frost-free period of 283–300 d, all are suitable for a variety of crops.

Qingfeng village has arable land area of 4,252.86 mu (1 mu = 666.67 m²), of which 2,800 mu is for sweet potato, accounting for 65% of the total arable land. The per capita sweet potato area is 5.7 mu, mainly for the 524 variety of Suining sweet potato. The sweet potato yield of Qingfeng village in 2020 was 5,000 tons, with value of 10 million Yuan. The yield per mu was about 1,000 kg and the income per mu was about 1,500 Yuan. After the establishment of the industrial park, the village's collective income has increased by 100,000 Yuan in 2021. With 1,000 mu demonstration field, the Suining sweet potato Industrial Park is providing service to 8,000 mu of sweet potato managed by professional cooperatives, large farmers, and 5,000 small-hold households, 3,000 of which used to be poor households.

2 Metadata of the Dataset

The name, author, geographic region, data time, dataset composition, data publishing and access platform, and data sharing policy^[5] are shown in Table 1.

3 Eco Geographical Environment of the Case Area

3.1 Geographical Location and Scope

The case area is at Qingfeng village, Baima town, Anju district, Suining city, Sichuan province, with a total area of 4.29 km². Its geographical center is at 105°19'E, 35°30'27"N (Figure 1).

3.2 Climate

The average annual temperature in case area is 16.7–17.4 °C with a maximum of 39.5–40.4 °C and a minimum of –3.8––4.8 °C, and with 283–300 days of frost-free period. The

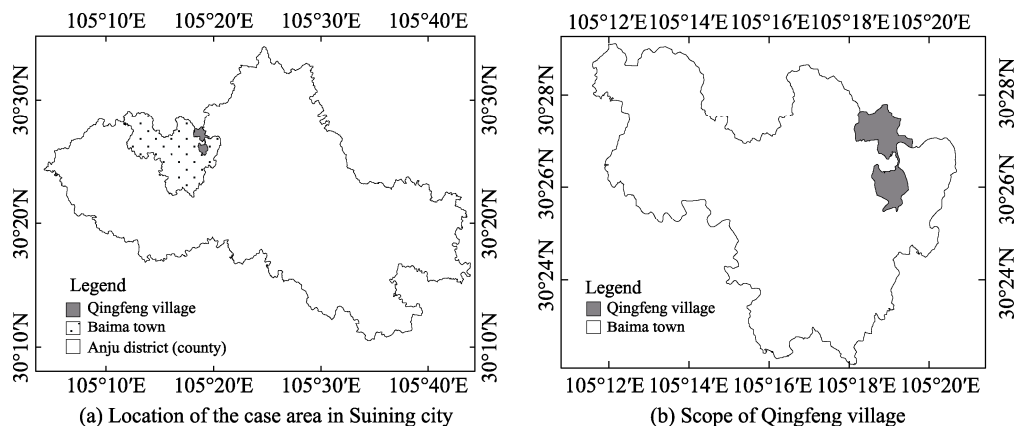


Figure 1 Location and scope of Qingfeng village

Table 1 The metadata summary of the dataset^[5]

Items	Description
Dataset full name	Suining sweet potato subtropical hills in Qingfeng village case dataset on ecosystem protection and sustainable development
Dataset short name	SuiningSweetPotatoCase13
Author	Tan, W. F., Institute of Crops, Sichuan Academy of Agricultural Sciences, zwstwf414@163.com Li, L. S., Agricultural Product Inspection and Monitoring Center, Suining City, Sichuan Province, 373086581@qq.com Yang, X. L., Agriculture and Rural Affairs Bureau of Suining City, Sichuan Province, Email: 296074762@qq.com Chen, Z., Bureau of Natural Resources and Planning, Suining City, Sichuan, Email: Dong, Y. L., Suining Longting Ecological Agriculture Co., Ltd. Zhao, R., Bureau of Agriculture and Rural Affairs, Suining City, Sichuan Province Long, X. C., Bureau of Agriculture and Rural Affairs, Suining City, Sichuan Province Li, Y., Suining Agricultural Product Quality and Safety Center Yang, S. T., Institute of Crops, Sichuan Academy of Agricultural Sciences, yost60@126.com Wang, Z. X. L-5255-2016, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, wangzx@igsnrr.ac.cn
Geographical area	Qingfeng village, Baima town, Suining, centered at 105°19'E and 30°27'N
Year	2020–2021
Data format	.shp, .tif, .xlsx, .docx, .jpg
Data size	60 MB
Data files	(1) Location data of the case area; (2) physical geography data; (3) sweet potato characteristic data; and (4) management data
Foundation	Ministry of Science and Technology of P. R. China (2020YFD1000803-2)
Publishing platform	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Data publisher address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data Sharing Policy	Data from the Global Change Research Data Publishing & Repository includes metadata, datasets (in the <i>Digital Journal of Global Change Data Repository</i>), and publications (in the <i>Journal of Global Change Data & Discovery</i>). Data sharing policy includes: (1) Data are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use Data subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute Data subject to written permission from the GCdataPR Editorial Office and the issuance of a Data redistribution license; and (4) If Data are used to compile new datasets, the ‘ten per cent principal’ should be followed such that Data records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset ^[6]
Communication and searchable system	DOI, CSTR, Crossref, DCI, CSCD, CNKI, SciEngine, WDS/ISC, GEOSS

average annual rainfall is about 887.3–927.6 mm, and variation between the maximum and the minimum is 867.7 mm. The average annual solar radiation is 87.41–93.36 kcal/cm², with 1,300.4–1,328.1 hours of sunshine per year. The average annual evaporation is 910.7–1,128.3 mm and the average annual relative air humidity is 80%–82% (Figure 2). The normal growth of sweet potato requires an air temperature above 15 °C, temperature also affects the quality of root tubers. In the range of 18–32 °C, the higher the temperature, the higher the sugar content. Figure 2a shows that the case area is suitable for sweet potato growth from April to October. There is usually no serious natural disaster of floods or winds in Suining. Sprinkler irrigation system is used in case of drought. Pests and diseases are mainly prevented by implementing physical pest control measures such as yellow boards and insecticidal lamps.

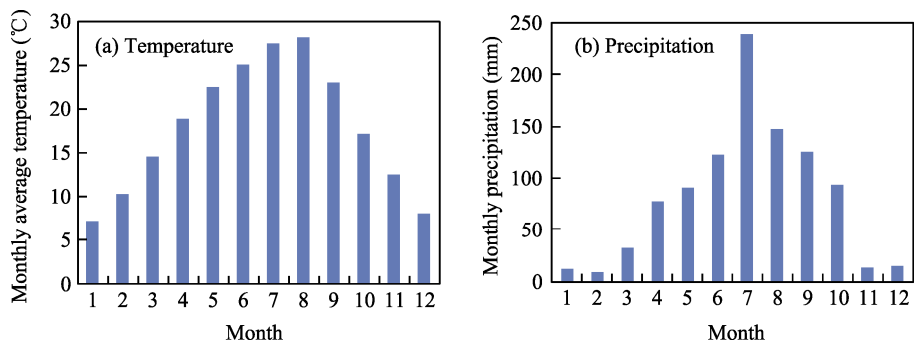


Figure 2 The average temperature and precipitation in the case area

3.3 Topography and Geomorphology

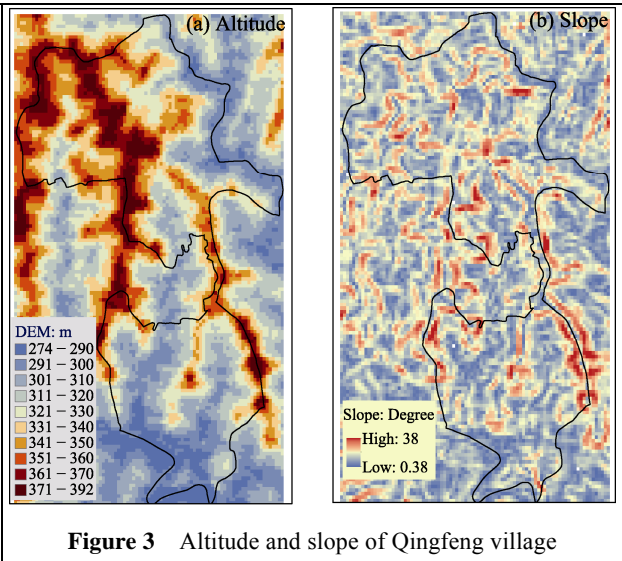


Figure 3 Altitude and slope of Qingfeng village

Suining lies in the central hilly area of Sichuan Basin, with simple geological structure and gentle folding. This hilly landform is formed by the Mesozoic Jurassic rock formation after being eroded and piled up by water system. The elevation of the hills is between 300 and 400 m. The ground is gentle, with only a few areas higher than 25 degrees. The general topographical features are: Firstly, it is high in the northwest and low in the southeast; secondly, the slope of hills is gentle; and third, the scattered alluvial flatlands lie among the hills (Figure 3).

3.4 Soil

Soil properties: According to the soil census data of Suining, the soil samples within Qingfeng village are T41 and T43, and the adjacent soil samples are T44 and T45 (Table 2). The soil in Qingfeng village is mainly reddish-brown-purple soil and brown-purple soil, and

the soil pH is 7.85–8.42, which is weakly alkaline. The soil organic matter in the case area is 15.5–21.3 g/kg, and the available potassium is 175–222 g/kg, which is beneficial to the development of sweet potatoes.

Soil safety: soil quality not only affects the growth of sweet potato, but also affects the quality and safety of sweet potato^[7,8]. The soil heavy metal contents are important indicator of environmental safety of sweet potato cultivation. The soil sample was collected in Qingfeng village and major soil metals were analyzed by implementing X-ray fluorescence method. The results of soil chemical element analysis are shown in Table 3. Compared with the national standard “Green Food—Habitat Environmental Quality” (NY/T 394—2021), the six heavy metal contents of the three soil samples all conformed to the national standard and were far below the limit values. In other word, the soil in the case area can produce sweet potatoes of green-food grade.

Table 2 Soil Nutrients of four soil samples in Qingfeng village

Soil Samples	T41	T43	T44	T45
pH	8.27	8.37	8.42	7.85
Organic matter (g/kg)	21.3	15.5	13.3	46.1
Available phosphous (mg/kg)	8.8	16.9	4	10.9
Total nitrogen (g/100g)	0.134	0.116	0.094,4	0.252
Available potassium (mg/kg)	175	222	145	168
Slow-acting potassium (mg/kg)	691	830	727	420
Alkali-hydrolyzed nitrogen (mg/kg)	98	78	70	179
Available iron (mg/kg)	9.62	3.37	2.88	119
Available manganese (mg/kg)	2.27	2.88	3.3	31.9
Effective copper (mg/kg)	0.87	0.632	0.342	2.18
Available zinc (mg/kg)	0.3	1.48	0.608	1.01

Table 3 Comparison between the soil metals in case area and the national standard (mg/kg)

Element	Abbreviation	Test results and standard limits					NY/T 391—2021	
		Site 1-1	Site 1-2	Site 1-3	Limit	Single pollution index Pi	Individual judgment	
Arsenic	As	6.67	6.98	6.64	≤20	0.33	qualified	
Cadmium	Cd	0.18	0.18	0.18	≤0.4	0.45	qualified	
Chromium	Cr	70	66	71	≤120	0.58	qualified	
Lead	Pb	22.7	24.4	21.2	≤50	0.45	qualified	
Hg	Hg	0.021	0.027	0.030	≤0.35	0.06	qualified	
Copper	Cu	23	22	24	≤60	0.38	qualified	

3.5 Irrigation Water Quality

Polluted water will not only reduce crop yield quantity, but also lower crop quality^[9,10]. Sweet potato in the case area is mainly planted in rainfed land, irrigation is needed only during the dry spell. The irrigation water sample came from the main irrigation canal of Qingfeng village, and the water quality test results are shown in Table 4. Compared with the national standard “Green Food—Environmental Quality of Origin” (NY/T 394—2021), the quality of the water sample meets the need of the current national standards. It’s weak alkaline, with strong surface activity, good permeability and strong solubility. So it is easy to participate in a series of biochemical activities of cells, enhance the ability to fix nitrogen, and be beneficial to the green production by reducing fertilizer and pesticide. No major heavy metals were detected. The irrigation water of high quality guarantees pollutant-free sweet potatoes.

3.6 NDVI

Vegetation cover is the comprehensive measure of crop development condition. Monitoring the status of vegetation cover can guide the field management of sweet potato. While the theoretical revisit time of Sentinel-2 satellite is 5 days, image with clear sky may be obtained once a month due to frequent foggy skies, which is a little rare, but it is still helpful for field management. Figure 4a shows the NDVI on June 5, 2020, showing that the

vegetation at sweet potato seedlings period is low. Figure 4b shows the NDVI on August 9, 2020, when the sweet potato is at its full coverage.

Table 4 Irrigation water quality in Qingfeng village

Items	Limit value	Test results	Single pollution index Pi	Individual judgment	Comprehensive pollution index P
pH	5.5–85	7.8	0.53	qualified	0.38
Total mercury (mg/L)	≤0.001	not detected	0.02	qualified	
Total cadmium (mg/L)	≤0.005	not detected	0.005	qualified	
Total Arsenic (mg/L)	≤0.05	not detected	0.003	qualified	
Total lead (mg/L)	≤0.1	not detected	0.0005	qualified	
Hexavalent chromium (mg/L)	≤0.1	not detected	0.02	qualified	
Fluoride (mg/L)	≤2.0	0.38	0.19	qualified	
Chemical oxygen demand (mg/L)	≤60	5	0.08	qualified	
Petroleum (mg/L)	≤1.0	not detected	0.005	qualified	
Fecal coliforms (count/L)	≤1,0000	not detected	0	qualified	

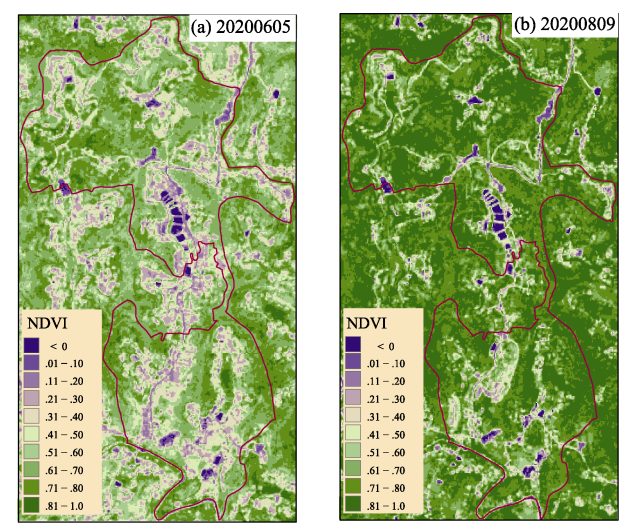


Figure 4 NDVI from Sentinel-2 satellite

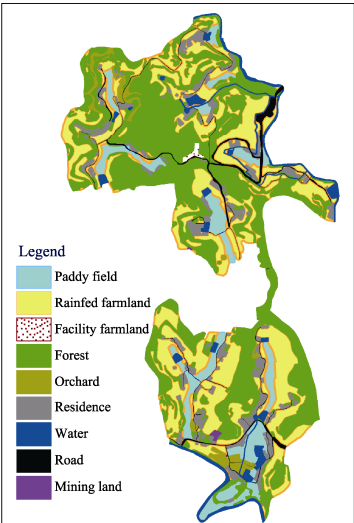


Figure 5 Land use of Qingfeng village in 2020

Table 5 Land use area and structure of Qingfeng village

CODE	Land use class	Land use area (ha)	% of the total
011	Paddy field	42.47	9.9
012	Dry farmland	148.13	34.51
013	Facility farmland	1.12	0.26
020	Garden	11.08	2.58
030	Woodland	181.51	42.29
060	Mine	0.50	0.12
070	Residence	28.58	6.66
100	Road	12.71	2.96
110	Water body	14.19	3.31
Total	Paddy field	429.20	100

grows best at the second and third steps of the dry land. A large proportion of dry land provides an ideal environment for Suining sweet potato, and the forest land above it mainly

3.7 Land Use

According to the Third National Land Use Survey Data (Figure 5, Table 5), the land types of Qingfeng village in 2020 are mainly dry land and forest land. The dry land area is 148.13 ha, accounting for 34.51%; The forest land area is 181.51 ha, accounting for 42.29%; Facility farmland is 1.12 ha, accounting for 0.26%; The mine is 0.5 ha, accounting for 0.12%. Sweet potato is a waterlogging-averse crop and it

plays the role of soil and water conservation and microclimate regulation.

4 Suining Sweet Potato Characteristics: Agronomy, Nutrition, and Safety

4.1 Agronomic Characteristics

Sweet potato is a biennial or perennial dicotyledonous plant of the genus *Ipomoea* in the family Convolvulaceae. The sweet potato vine grows more than 2 m at maturity and crawls on the ground. Sweet potato has underground root tubers, which are spindle shaped and have yellowish skin. Sweet potato varieties in the case area have uniform root size, thin skin, light skin, red color. Sweet potato leaves alternate, broadly ovate, 3–5 palmately divided. Sweet potato GAGs are axillary cymes, with small bracts, subulate, oblong sepals, unequal lengths, and corolla bell shaped, funnel-shaped, white to purple red. Capsule is ovoid or oblate, with 1–4 seeds. Sweet potato root tubers are rich in flour and can be eaten, brewed or used as feed.

The main sweet potato variety in the case area is “524 sweet potato”, which was introduced into Suining city in the early 1960s. Qingfeng village is one of the first pilot planting bases. Because the dry farmland slope in Qingfeng is mostly between 8–12 degrees, and the annual rainfall is about 1,000 mm, it can meet the water demand of red potato. At the same time, the red brown purple sandy soil has good air and water permeability, which is very ideal to sweet potato. The trial planting of this variety in Qingfeng was so successful that large-scale planting began in the next year of introduction, and almost every household planted 524 sweet potato, which has continued until now.

4.2 Nutritional Characteristics

The sweet potato samples for this quality test are collected from Qingfeng village on October 15, 2021. The analysis items include the main nutrients and amino acids (Table 6, 7). The results show that Suining sweet potato has higher soluble sugar content than other sweet potato varieties, so it has a unique taste of high sweetness. Suining sweet potato has higher starch content, which is conducive to further conversion into soluble sugar. While ensuring good taste quality, Suining sweet potato has a rich variety of amino acids necessary for human body, and no harmful heavy metals such as lead, mercury, cadmium and arsenic have been detected. The above data prove that Suining sweet potato has good taste quality, rich nutrition, and reliable food safety.

The planting area of sweet potato in Suining will expand to 150,000 mu. In the next five years, and the varieties of sweet potato will also increase accordingly. Suining city has reached an intention of cooperation with Liancheng county in Anhui province to carry out deep processing of sweet potato and will produce various sweet potato products such as starch, noodles, strips, slices, and sweet potato dries.

4.3 Safety of Suining Sweet Potato

Both indicators of heavy metals and pesticide residues of sweet potato in the case area meet the national standards (Table 6, 8).

5 Social Economy and Management of the Case Area

5.1 People and Land of Qingfeng Village in 2020

Qingfeng village is formed by two poverty-lifted villages (Qingfeng and Wolongqiao), covering an area of 5.4 km², 4,252.86 mu of which is arable land (3,615.87 mu of dry land and 636.99 mu of paddy field; 1 mu=666.67 m²). There are 8 villagers' groups, 736 households and 2,410 people in the village. “524 series” have been dominant sweet potato varieties since 60 years ago.

Table 6 Nutrition and metals of sweet potato from Qingfeng village

Item	Unit	Test result	Item	Unit	Test result
Protein	g/100g	1.11	Potassium	mg/kg	300
Fat	g/100g	0.3	Lead	mg/kg	not detected
Moisture	g/100g	65.3	Total mercury	mg/kg	not detected
Starch	g/100g	20.3	Cadmium	mg/kg	not detected
Phosphorus	mg/100g	not detected	Total arsenic	mg/kg	not detected
Soluble sugar	%	7.05	Vitamin C	mg/100g	13.6
Iron	mg/kg	6.7	Vitamin E	mg/100g	1.31
Calcium	mg/kg	135	Total carotene	mg/100g	2.13

Table 7 Amino acid content of sweet potato from Qingfeng village

Item	Unit	Test result	Item	Unit	Test result
Valine	g/100g	0.087	Glutamate	g/100g	0.136
Alanine	g/100g	0.080	Serine	g/100g	0.103
Proline	g/100g	0.044	Lysine	g/100g	0.075
Threonine	g/100g	0.074	Arginine	g/100g	0.054
Phenylalanine	g/100g	0.084	Histidine	g/100g	0.025
Leucine	g/100g	0.095	Tyrosine	g/100g	0.051
Methionine	g/100g	0.010	Aspartic acid	g/100g	0.291
Glycine	g/100g	0.058	Isoleucine	g/100g	0.055

Table 8 Pesticide residue of sweet potato from Qingfeng village

Item	Unit	Test result	Limit value	Determination
Imidacloprid	mg/kg	0.000,55	/	/
Doingling	mg/kg	0.000,12	/	/
Methamidophos	mg/kg	0.001,23	≤0.05	qualified
Omethoate	mg/kg	0.002,41	≤0.02	qualified
Dimethoate	mg/kg	0.001,9	≤0.01	qualified
Budweiser	mg/kg	0.003,27	≤0.02	qualified
Dichlorvos	mg/kg	0.01	≤0.2	qualified
Hexachlorocyclo-hexane	mg/kg	0.01	≤0.05	qualified
Chlorpyrifos	mg/kg	0.01	≤0.02	qualified
Triazolone	mg/kg	0.01	/	/
Endosulfan	mg/kg	0.01	≤0.05	
Fenvalerate	mg/kg	0.01	/	/
Deltamethrin	mg/kg	0.01	/	/

5.2 Sweet Potato Professional Cooperative: Longting Eco-Agriculture Co., Ltd.

Suining Longting Eco-Agriculture Co., Ltd. was registered in Suining in December 2012, with 330 employees and 5,000 mu of sweet potato base. The company’s business includes sweet potato variety R&D, deep processing, and sales. It is a provincial-level agricultural enterprise in Sichuan. The company improved the storage technique, invented the all-season seedling and planting technique, and realized the sales of sweet potato throughout the year.

The company uses abandoned land to expand the sweet potato planting area, and works with the Crop Research Institute of Sichuan Academy of Agricultural Sciences to lead local farmers to develop the sweet potato industry. By improving marketing, standard setting, R&D, and risk prevention, the company has been building a sweet potato products link and has improved the competitiveness of sweet potato products.

5.3 Cultivation Specifications of Suining Sweet Potato

A set of sweet potato planting techniques have gradually formed over last 60 years (Table 9).

Table 9 Specifications for cultivation and management of sweet potato

Stage	Duration	Main agricultural activities
Seedbed	Feb. –May	Double-film seedling raising in greenhouse, fertilizer and water management
Growing	Apr. –Nov.	Cuttings, artificial weeding, physical pest control, organic fertilizer
Harvest	Mid Jul.–mid Nov.	Lightly collected, graded, and transported
Storage	Mid Jul.–Next Jul.	Commodity fresh potato baskets are stored in cellars. Initially, sweet potatoes are dehumidified. Then keep the cellar conditions at temperature= 10–14 °C, moisture = 85%, and CO ₂ < 4%
Processing	Late Oct.–mid Nov.	Starch processing starts one week after harvest. Starch derivatives like vermicelli can be produced on an annual basis
Sale	Early Aug.–Next Jul.	Fresh sweet potatoes are sold after 20 days of storage, and sold by grade

Horizontal cutting and moderate dense planting method: 3–4 stem nodes of sweet potato branches are horizontally planted in the soil, and the cutting density is 60,000 plants / ha. In Suining area, commercial sweet potatoes of 50–150 g can be produced at such density.

Extend the sweet potatoes shelf life by multi-time breeding, transplanting and harvesting: The first-time breeding starts in mid and late February, the first-time transplanting completes in early April, and the last-time transplanting finishes in late June. In mid July, the first-time potatoes start to be harvested. For comparison, the late-time sweet potato begins to be harvested in November. Plus the storage time, it can be sold until next July. In other words, sweet potatoes in the case area can be sold all year round.

Sweet potato seedling raising by three-layer covering: due to the low temperature in February, the accumulated temperature required for sweet potato seedling raising is not sufficient. The three-layer covering technique is developed to uplift land surface temperature and to prevent seedlings from freezing: large arch shed, small arch shed, and surface plastic film.

Strictly control the use of chemical fertilizers and pesticides: to ensure the taste of sweet potato and control the size, Suining sweet potato specifications stipulate that chemical fertilizers and pesticides shall not be used. The quality and safety department of agricultural products and Suining sweet potato professional committee are responsible for supervising and inspecting the sweet potato producers and product sampling inspection. Once violations are found, the use of trademark “Suining sweet potato” will be suspended; if the chemical residues of the sampled products exceed the standard, the agent concerned will be punished according to the relevant laws and regulations. Since the “524 sweet potato” variety has been planted in Suining for decades without diseases and pests, no pesticide is needed. To make the “524 sweet potato” look good, taste good, and with even and moderate size, farmers have been asked to control the use of fertilizers, especially chemical fertilizers, so farmers do not use chemical fertilizers when planting sweet potatoes, and even farmyard manure is underused. Thus, compared with other crops, sweet potato can save 50 kg of compound fertilizer of 15:15:15 of nitrogen, phosphorus and potassium per mu.

5.4 Management

5.4.1 The Villagers’ Committee as an Enabler

The Villagers’ Committee has supported the sweet potato industry in Qingfeng by establishing land transfer cooperatives, labor professional cooperatives and stock economy cooperatives.

5.4.2 Richen locals

Sweet potato farmers may increase their income in the following six ways.

(1) Rent from the transferred land. (2) Salary from working in enterprises in the park. (3) The share capital obtained by investing in enterprise. (4) Income from family economy. (5) Bonuses from policy. The government provides various entities with subsidy funds to settle

in Suining Sweet Potato Park to promote the sweet potato industry. (6) Revenue from brand premium.

5.4.3 Attract and Nurture New Farmers With Professional Knowledge

It's significant to attract, nurture, and cherish talent to develop new rural economy. A total of 52 new type of highly qualified professional farmers have been introduced and trained to Suining Sweet Potato Industrial Park.

5.4.4 Assist Local Enterprises

Through training courses and symposiums about Suining Sweet Potato Park, help enterprises deal with thorny issues such as land circulation and employment, create a good environment for enterprise development. In 2021, four symposiums were held, and 12 difficult problems were solved through this mechanism.

6 Cultivation History of Sweet Potato in Suining

Sichuan province has the largest sweet potato planting area in China, and Suining city is the core area of sweet potato in Sichuan with a long planting history. Suining County Annals (1929) recorded: "There is insufficient food due to too few land and too much people in recent years, many live mainly with sweet potatoes". There was a saying: "Sweet potato is equivalent to half a year's food". Even today, sweet potato by-products are still one of the main feed for pigs. Since the late Ming dynasty, sweet potatoes have been widely planted in Sichuan.

After adaptation, evolution, cultivation and selection, Suining sweet potato has gradually formed unique characteristics. Among them, the "524 sweet potato" variety mainly planted in Qingfeng village, Baima town has a planting history of 60 years, and three generations of Qingfeng people have summarized sweet potato cultivation experience. In October 2021, "Suining sweet potato" was certified as a "Geographical Indication Certification Trademark" by the State Intellectual Property Office^[11]. It has formed a unique culture of agriculture in hilly areas of Central Sichuan, and is a valuable agricultural cultural heritage.

7 Discussion and Conclusion

Sweet potato, native to South America, was introduced to China during the Wanli period of the Ming dynasty. Over 400 years, sweet potato has been one of the staple foods in China. Suining is located in a hilly area at 30°N, with a mild temperature and abundant rainfall. The unique climate makes Suining sweet potato unique in its soft, waxy, fragrant and sweet characteristics.

Taking Qingfeng village, Baima town, Anju district as a case, this paper makes a comprehensive analysis of the natural habitat and management of Suining sweet potato. Compared with the national standard Green Food-Environmental Quality of Origin (NY/T 394—2021), Suining sweet potato has qualified sanitary indicators, meets the requirements of green food, has high nutritional indicators, and is a quality geographical product. Since Suining sweet potato is planted in dry land by rotation without pesticides and fertilizers, it has no pollution to soil and water sources, and has the potential for sustainable development. Suining sweet potato's good growth environment and standardized management ensure the sweet potato safety and provide a reliable traceability for sweet potato market and consumers. This is a win-win case to protect environment, develop local economy and promote rural revitalization.

Author Contributions

Yang, X. L. and Li, L. S. organized and coordinated the case study. Tan, W. F. and Yang, S.

T. provided information on sweet potato varieties and cultivation, and wrote the manuscript. Chen, L. P., Long, X. C., Li, Y., and Luo, C. M. analyzed the sample data of soil, water, and sweet potato. Dong, Y. L. provided the information of professional cooperatives. Zhang, S. Y. provided basic data of Qingfeng village. Wang, Z. X. and Chen, Z. developed case area boundary, DEM/Slope, soil, NDVI and land use data.

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Conflicts of Interest

The authors declare no conflicts of interest.

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