# Postprint: The "Scientific Heart" of Chinese Academy of Sciences Assisting Shuicheng, Guizhou in Poverty Alleviation and Revitalization

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## Abstract

Shuicheng, Guizhou is located in the Wumeng mountainous area, a contiguous area of extreme poverty across Sichuan, Yunnan, and Guizhou provinces. It was once a key county in the national poverty alleviation and development program, with a poverty incidence rate of 18.9% by the end of 2016. As the designated assistance unit for Shuicheng, the Chinese Academy of Sciences (CAS), during the poverty eradication campaign period, focused on the local ecological environment, resource endowment characteristics, and industrial foundation to promote the transfer and transformation of numerous scientific and technological achievements, helping Shuicheng develop characteristic industries tailored to local conditions and successfully exit the list of impoverished counties in March 2020. In 2020, Shuicheng embarked on the path toward rural revitalization. In 2023, after conducting field research in Shuicheng, the author' s team found that CAS continues to uphold the scientific spirit, assisting Shuicheng in industrial upgrading and quality and efficiency improvement, thereby enabling Shuicheng to achieve steady and sustainable progress on the revitalization path.

## Full Text

### The "Scientific Heart"of Chinese Academy of Sciences in Assisting Shuicheng, Guizhou to Escape Poverty and Achieve Revitalization

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**Abstract**

Shuicheng County in Guizhou Province is located in the Wumeng Mountain region, a contiguous area of extreme poverty spanning Sichuan, Yunnan, and Guizhou provinces. Once a national key county for poverty alleviation and development, Shuicheng had a poverty incidence rate of 18.9% by the end of 2016. As the designated support unit for Shuicheng, the Chinese Academy of Sciences (CAS) leveraged the region' s ecological environment, resource endowments, and industrial foundation during the poverty alleviation stage to promote the transfer and transformation of numerous scientific and technological achievements. By helping Shuicheng develop characteristic industries tailored to local conditions, CAS facilitated the county' s successful removal from the list of impoverished counties in March 2020. In 2020, Shuicheng embarked on the path toward rural revitalization. In 2023, our research team visited Shuicheng and found that CAS continues to uphold the spirit of science, boosting industrial upgrading and quality improvement to ensure steady progress on the revitalization journey.

**Keywords:** rural revitalization, technical assistance, industrial upgrading

## 1. The "Commitment" of Assistance: A Holistic Roadmap for Revitalization

CAS' s scientific and technological assistance in Shuicheng has harnessed the collective strength of scientific teams, coordinating economic development with ecological protection while injecting technological vitality into the revitalization process. Every development plan for Shuicheng has been guided and coordinated by Professor Xia Yong, a researcher at the Institute of Geochemistry, CAS, and leader of the CAS Shuicheng targeted assistance team.

During the poverty alleviation stage, Shuicheng successfully met the criteria for "lifting the poverty cap" through joint efforts from the government, farmers, and CAS. As the county entered the rural revitalization phase, it articulated a clear demand for assistance in industrial transformation and upgrading. According to

Qi Wei, associate researcher at the Institute of Geographic Sciences and Natural Resources Research, CAS, and project leader for Shuicheng' s planning, "The primary demand is transformation, and the second is upgrading." In the transition to rural revitalization, Shuicheng' s foremost concern was how to improve its industries to provide more employment opportunities and income growth for residents, consolidate poverty alleviation achievements, prevent relapse into poverty, and connect effectively with rural revitalization.

### 1.1 Responsive to Every Request

Shuicheng possesses a significant advantage—it has CAS assistance. Qi Wei noted that Shuicheng District, located in Liupanshui City, bears distinct characteristics of a mining-industrial legacy. Following the traditional lifecycle of resource-based cities would severely jeopardize development prospects. Qi Wei and his planning team made numerous trips between Shuicheng and Beijing to align with government needs and conduct field research. Based on scientific foundations including local natural resources, environmental conditions, socioeconomic principles, and geographical positioning, they consulted with academicians and research teams with long-term assistance experience in Shuicheng to develop the *Shuicheng Industrial Transformation and Upgrading Plan*, covering all industrial categories from coal, new materials, and characteristic agriculture to cultural tourism and information industries.

Beyond "macro-level" planning, Qi Wei' s team also completed specific "micro-level" revitalization schemes upon request. Lanjiaotian, comprising several natural villages under the jurisdiction of Baichehe Community Committee in Panlong Town, hoped to participate in Guizhou Province' s special rural revitalization pilot demonstration program. After receiving the commission, Qi Wei and his team determined an "agriculture-science-culture-tourism integration" development approach based on local characteristics. Centered on the existing "two reds" —red-heart kiwifruit and agate red cherry—they established standardized modern orchards, complemented by high-quality understory economy and cultural tourism industries, and built a CAS industry-academia-research base for long-term technical training and science education. This tailored, non-convergent industrial plan ultimately helped Lanjiaotian successfully enter the provincial pilot program, making it an important demonstration site for CAS assistance in Shuicheng [Figure 2: see original paper].

With the arrival of agricultural machinery teams, high-tech mechanization groups, new drinking water projects, and farmer-built homestays, this once-overlooked area named "lan" (meaning "excessive" or "chaotic" ) has gradually embarked on a development path. "We basically receive a planning task every year," Qi Wei explained. In 2022, Associate Researcher Tian Yifu from the Institute of Geochemistry, CAS, and deputy magistrate of Shuicheng District, led a task force to complete the *Shuicheng Wellness Development Plan*, a crucial direction for industrial upgrading. In 2023, they focused on compiling the *Shuicheng District Development Plan for Village Collective*

*Economy*. Through this step-by-step, foundation-solidifying approach, CAS has continuously elevated Shuicheng' s development.

Thus, upholding the assistance credibility and commitment spirit of "helping onto the horse and accompanying the journey," CAS has blueprinted a comprehensive roadmap for Shuicheng' s rural revitalization. Under this guidance, researchers share the joys and hardships with Shuicheng in industrial upgrading and development.

### 1.2 Scientific "Blueprinting"

Qi Wei' s work is not solitary. Throughout CAS' s assistance to Shuicheng, he has emphasized comprehensive, scientific planning guidance, living up to Shuicheng' s trust and shouldering assistance responsibilities [2]. During the poverty alleviation period, CAS compiled the 200,000-word *Report on Science and Technology Support for Precise Poverty Alleviation in Shuicheng County Townships*, analyzing poverty conditions, causes, and industrial development bottlenecks, and proposing comprehensive S&T support recommendations that became the action guide for CAS' s poverty alleviation work in Shuicheng.

Entering the rural revitalization stage, CAS conducted resource-environment carrying capacity assessments, industrial transformation and upgrading plans, small town and village development plans, and poverty relocation urbanization plans. They also formulated industrial plans for kiwifruit, prickly pear, and Chinese medicinal materials, promoting Shuicheng District' s economic and social transformation during the 14th Five-Year Plan period. "Science and technology should play a tremendous role at every stage," noted Tian Yifu, associate researcher at the Institute of Geochemistry, CAS, and deputy magistrate of Shuicheng District. During poverty alleviation, targets were very clear, requiring quick-results industrial projects, with S&T being a crucial booster behind efficiency. In the current transition period and future long-term rural revitalization, S&T assistance must consider sustainable development more thoroughly.

## 2. The "Toil" of Development: The Transformation of Shuicheng' s "Three Cool Treasures"

Rural industrial revitalization begins with agriculture. Shuicheng' s karst terrain makes it unsuitable for large-scale grain cultivation, and traditional corn farming offered low added value. Based on suitable crops for karst regions, the CAS assistance team started from Shuicheng' s traditional "Three Cool Treasures" (kiwifruit, prickly pear, and tea) to address development bottlenecks, upgrade technological structures, and help Shuicheng build more economically and ecologically valuable "flagship" planting industries.

### 2.1 Kiwifruit "Upgrading"

Karst soils are prone to erosion. As a vine plant, kiwifruit allows rainwater to flow along its vines rather than rapidly washing away soil from exposed areas. Being a perennial plant, kiwifruit cultivation causes less soil damage than annual crops. Kiwifruit was a traditional cash crop in Shuicheng, but due to single varieties, limited suitable altitude range (800-1,200 meters), and insufficient pruning and cultivation techniques, it had not formed a scaled industry, with planting area under 20,000 mu. For both industrial development and soil conservation, CAS decided to help upgrade Shuicheng' s kiwifruit industry.

In 2012, Professor Zhong Caihong from Wuhan Botanical Garden, CAS, led a team to Shuicheng. Establishing long-term cooperation with Liupanshui Municipal Government in 2013, they introduced scientifically integrated cultivation techniques from Wuhan Botanical Garden and the self-bred, extremely storage-tolerant red-heart kiwifruit variety "Donghong" [3]. This variety effectively resists soft rot disease, offers excellent flavor and quality, and can be planted at altitudes up to 1,400 meters, or 1,500 meters in some microclimates, enabling high-altitude farmers to participate and diversifying Shuicheng' s kiwifruit varieties to reduce monoculture risks [Figure 3: see original paper].

Over a decade from 2013 to 2023, Zhong' s team conducted systematic investigations on pest and disease occurrences, promoted bagging technology to maximize protection against fruit flies, and introduced labor-saving "one trunk, two vines, multiple lateral vines" pinnate pruning techniques, green pest control, fruit bagging, and scientific fertilization. After severe hail disasters in 2016 and 2017 affected kiwifruit yields, the team began promoting anti-hail nets [Figure 4: see original paper], establishing three demonstration sites at different altitudes. By early 2018, the nets proved effective not only against hail but also in blocking high-temperature sun damage. Liupanshui City promoted the technology citywide, with nearly 10,000 mu of kiwifruit orchards now equipped. This technological vitality has transformed the traditional kiwifruit industry, making red-heart kiwifruit a renowned Shuicheng agricultural "name card" with domestic and international acclaim.

Zhong Caihong remains unsatisfied. Her team plans to continue developing prevention and control technologies for soft rot disease in Shuicheng' s traditional "Hongyang" variety, research ulcer disease control in high-altitude areas, and implement new safe fertilizer solutions this year to improve yield and quality from a scientific perspective. "As a fruit science worker, helping local agricultural economic development through fruit trees means making a contribution to supporting agricultural development," she said.

### 2.2 Prickly Pear "Value-Adding"

Like kiwifruit, prickly pear is suitable for karst mountainous areas. In Shuicheng, this uniquely Chinese fruit previously grew wild without scientific management or efficient harvesting and processing channels. Professor Lin Jian and Senior

Engineer Yu Deshun from the Institute of Geochemistry, CAS, both serving as technology commissioners for Liupanshui City, worked with the CAS assistance team to find solutions for the prickly pear industry.

Lin Jian explained that site selection, variety selection, and field management (including pruning, pest control, and fertilization) all require scientific guidance. CAS researchers helped villages identify the most ecologically suitable areas and the best variety "Guinong No. 5," providing technical training to enable farmers to master key cultivation techniques for building "thousand-jin orchards" (high-yield orchards) [Figure 5: see original paper]. Currently, Shuicheng District has completed 55,000 mu of prickly pear "thousand-jin orchards," with initial results from S&T guidance. The goal of building 120,000 mu of "thousand-jin orchards" with total industrial output value exceeding 700 million yuan by the end of the 14th Five-Year Plan now has technical guarantees.

Prickly pear' s sour and astringent taste requires timely deep processing after harvest. Yu Deshun introduced that when Guizhou Chuhao Agricultural Technology Development Co., Ltd. was established in 2018, the Institute of Geochemistry, CAS, dispatched research backbones and technical teams who had undertaken Guizhou' s major S&T support project for prickly pear. After transforming scientific achievements into industry, standardization, scaling, and branding levels continuously improved, developing products like prickly pear sparkling water and puree that effectively enhanced industrial value. Now, the company has opened channels with farmers, with specialized vehicles purchasing fresh prickly pear at a protective price of 6 yuan/kg during harvest season, ensuring same-day harvesting and processing.

Lin Jian stated that CAS will next target common key technical challenges faced by Guizhou' s prickly pear processing enterprises, enrich product forms, develop high value-added products, and build high-value, ecological prickly pear S&T demonstration parks to help Shuicheng achieve sustainable, high-quality development and practice the concept that "lucid waters and lush mountains are invaluable assets."

### 2.3 Tea "Transformation"

Tea, another of Shuicheng' s "Three Cool Treasures," also faced awkward challenges. With over 100,000 mu of tea plantations, Shuicheng District planned to develop high-altitude selenium-enriched organic tea based on selenium resources in the soil, but the produced tea failed to meet "selenium-enriched" standards in testing. Professor Shao Shuxun from the Institute of Geochemistry, CAS, helped identify the problem.

As a CAS team member, Shao first conducted a survey of selenium resource distribution in Shuicheng' s soils. His team collected over 200 rock, soil, and tea samples from nearly 10,000 mu of tea plantations through geochemical surveys. Scientific analysis revealed that the southern park area had abundant selenium-rich geological resources and soils suitable for selenium-enriched tea

development. However, after determining planting locations, they analyzed selenium absorption and transformation in tea plants. "Although Shuicheng' s tea plantation soils are rich in selenium, severe acidification results in low bioavailability of selenium, affecting tea plants' absorption," Shao explained. Targeting this issue, they established a 4-mu experimental tea garden in the southern park to test soil acidification improvement and selenium biofortification techniques [Figure 6: see original paper]. The research yielded suitable technical solutions for local acidified soils, adjusting pH to the optimal 4.5-6.0 range for tea growth, reducing heavy metal activity while increasing selenium bioavailability to enhance absorption and enrichment.

Currently, Shao' s team has helped establish 20 mu of selenium-enriched tea demonstration parks, with significantly improved tea growth and 10% higher yields. The team will help Shuicheng build 4,000 mu of tea "ten-thousand-yuan fields" (with spring tea output value over 6,000 yuan/mu and summer/autumn tea over 4,000 yuan/mu) in 2024, while conducting research on technical operation procedures for Shuicheng spring selenium-enriched tea cultivation to provide theoretical guidance and technical support for scientific, standardized, and scaled development.

The transformation of the "Three Cool Treasures" has laid a solid foundation for Shuicheng' s agricultural industry, while researchers have turned their attention to new fields.

## 3. New Industries: Expanding the Revitalization Chain

As the "national team," CAS must focus on "national matters" and shoulder "national responsibilities." Participating in S&T assistance for poverty alleviation and rural revitalization represents active engagement in "national matters." Senior Engineer Yu Fuqiang from Kunming Institute of Botany, CAS, and deputy director of the Germplasm Bank of Wild Species in Southwest China, leads the edible fungi assistance project for Shuicheng District, having witnessed and promoted the industry from scratch.

### 3.1 New Industry: Edible Fungi

Since edible fungi cultivation is labor-intensive and can help more people escape poverty, Shuicheng expressed interest during the poverty alleviation stage in developing this entirely new industry. With gathered experts, Yu Fuqiang' s team helped Shuicheng build a production line with daily capacity of 500,000 spawn bags within three years through site selection, spawn farm construction, and variety selection. They also designed a "high-altitude cool climate edible fungi development model" based on market feedback, leveraging regional climate advantages to fill seasonal gaps in the national market for higher economic returns. Currently, Shuicheng' s spawn production and rare fungi cultivation scale rank among the top in Southwest China [Figure 7: see original paper]. "Most Shuicheng farmers had no edible fungi cultivation experience. With local

government leadership and our support, we' ve driven their development," Yu said. Entering the rural revitalization stage, the industry has reached a point of transitioning from quantitative to qualitative growth, requiring branding and long-term sustainable planning. His team will continue S&T support to consolidate existing varieties, develop spawn cultivation, and focus on basic science and underlying key technologies—"the areas CAS excels at and should research."

### 3.2 New Seeds: Upland Rice and Medicinal Materials

Food security is crucial in rural revitalization. Due to natural conditions, Shuicheng has long lacked conditions for rice cultivation. Senior Engineer Liu Guizhou from Xishuangbanna Tropical Botanical Garden, CAS, brought a "new seed" —upland rice.

Upland rice, with strong terrestrial adaptability, was bred by Xishuangbanna Tropical Botanical Garden and promoted in Yunnan's Lincang, Pu'er, Xishuangbanna, and Wenshan. "Shuicheng is a mountainous city with limited arable land but abundant forest resources. We tried intercropping upland rice under fruit trees to establish a forest-grain model," Liu explained. Developing understory upland rice cultivation represents a "win-win" for understory economy and food security. This "from scratch" industry features simple cultivation, water and fertilizer savings, and labor efficiency—ideal for drought-prone, labor-scarce Shuicheng [Figure 8: see original paper]. Current trial fields show average yields of 370-420 kg/mu, offering effective food security for Shuicheng, which relies on external sources for over 90% of its grain.

Concurrently, Liu's team promotes Chinese medicinal material cultivation based on the "Wellness Shuicheng" plan. Previously, Shuicheng' s medicinal materials suffered from mixed varieties and non-standardized management, with many species not listed in the *Chinese Pharmacopoeia*, preventing entry into trading systems. After intervention, the team strictly controlled variety selection and cultivation systems based on the *Chinese Pharmacopoeia*, ensuring produced materials meet requirements. Currently, cultivation focuses mainly on *Polygonatum kingianum* and *P. cyrtonema* [Figure 9: see original paper], with farmers earning income through cultivation or cooperative employment.

### 3.3 New Materials: Basalt Fiber

In developing new productive forces, new materials are essential. In Shuicheng, common "stones" are transforming into "high-precision" fiber materials through S&T empowerment [4]. Shuicheng has abundant basalt ore, previously processed into crushed stone for construction with low added value. Researcher Ma Pengcheng from Xinjiang Technical Institute of Physics and Chemistry, CAS, quickly combined existing research to prepare basalt fiber through melting, drawing, and coating with sizing agents [Figure 10: see original paper], promoting regional new materials industry development.

The team collaborates with local enterprise Guizhou Shixin Basalt Technology

Co., Ltd. to research basalt fiber high-performance 化. Addressing unstable sizing agent performance and poor film formation, they developed new specialized sizing agents that increased single-filament strength of 17-micrometer basalt fiber from 1,260 MPa to 1,670 MPa (32% improvement) and tow strength (400 filaments) from 0.16 N/tex to 0.52 N/tex (235% improvement). The team also discovered Shuicheng' s basalt contains high iron (Fe) and titanium (Ti) content, making fiber drawing difficult. They researched homogenization of ore composition and crystallization behavior control during melting and drawing to achieve homogeneous melts, controlled viscosity, and suppressed crystallization, obtaining functional continuous basalt fiber with excellent mechanical properties and photosensitivity for fiber-reinforced composites, improving UV and weather resistance. Applications range from aerospace to wood-plastic profiles, automotive lightweighting, fireproof clothing, and anti-stab apparel. "Basalt fiber production releases no pollutants; even waste can be discarded like stones without environmental harm. It' s a green industry with broad market prospects," said team member Dr. Xing Dan.

### 3.4 New Equipment: Water Collection Systems

Drought is Guizhou' s most common meteorological disaster. In typical karst areas with thin soil layers, most sloping land loses water, soil, and fertilizer, making multi-stage water pumping extremely costly. Professor Peng Tao, director of the Puding Karst Ecosystem National Observation and Research Station, CAS, explained that karst slopes can be seen as "sieves" where rainfall easily infiltrates surface karst zones, making surface runoff difficult. Agricultural water conservancy projects must include surface collection facilities. However, most existing facilities are ponds built on slopes that cannot effectively collect rainwater, which locals describe as "holding the sun by day and the moon by night."

The station proposed using "village-to-village" roads and "industry roads" as collection surfaces. The plan involves building hardened farm roads (3-4 meters wide) along contour lines, with water barriers on both sides and low-cost, prefabricated storage ponds built underneath, connected by diversion ditches and sedimentation tanks. This "road-pond integrated" irrigation system has built 7 sets in Shuicheng demonstration areas, with 700 cubic meters of storage capacity and 2,100 cubic meters of annual water collection (based on three refills) [Figure 11: see original paper]. With guaranteed irrigation and improved production conditions from hardened roads, farmers can plant high-value, water-consuming crops like cherries, increasing incomes.

### 3.5 New Business Forms: Ecological Fisheries

S&T has also "innovatively empowered" and "improved quality and efficiency" in Shuicheng' s ecological fishery industry. Professor Duan Ming from the Institute of Hydrobiology, CAS, and project leader for ecological and factory fish farming, explained that based on large-water-surface ecological fishery technol-

ogy, his team rationally planned and utilized Shuicheng' s reservoir resources. Through demonstration effects from Guanyinyan and Wanying reservoirs, they successfully promoted over 10 ecological fishery reservoirs, partnering with local leading enterprises to create an integrated whole-industry-chain combining experimental research, water quality protection, fishery production, and leisure tourism, achieving "one reservoir, one policy," "one fish, one code," and "one factory, multiple supplies" [Figure 12: see original paper]. Demonstration reservoirs yield 12 kg/mu, generating 15 million yuan in direct economic benefits while protecting drinking water quality.

The development of facility fisheries has also made Shuicheng' s fishery industry more three-dimensional and efficient. Intelligent monitoring, feeding, and decision-making systems have greatly improved aquaculture efficiency and product quality, effectively solving the difficulty of breeding rare aquatic products in mountainous areas. This year' s California perch breeding is expected to yield 300,000 jin (150,000 kg) with over 5 million yuan in revenue. Energy conservation and emission reduction are also highlights, truly achieving environmental friendliness and attracting more participation to realize "empowering industries with intelligence and people with skills."

## 4. The "Joy" of Harvest: Farmers' Income Accounts

### 4.1 The Responsibility of "Large-Scale Farmers"

In Panlong Town, Yan Tingyin was posting on social media—this year's red-heart kiwifruit is ripe! This large-scale farmer estimates his output at 2,000-2,500 kg this year, with per-mu income reaching about 35,000 yuan, "20 times what corn farming would yield." Beyond wealth, Yan gained scientific cultivation concepts through CAS assistance. He strictly follows technical guidance on pruning, fruit thinning, bagging, and fertilization, and installed anti-hail nets. "Through experts from Wuhan Botanical Garden, I've learned a lot. Yield and quality keep improving. Scientific methods make a difference—some farmers who didn't follow scientific approaches have already soft fruit, while mine remain healthy on the trees," he said. His orchard has monitoring equipment for real-time surveillance by Wuhan Botanical Garden, which provides timely guidance. Now a Guizhou Provincial People's Congress delegate, Yan's vision is to "organize fellow villagers to produce high-quality red-heart kiwifruit, technically and ideologically unite everyone for unified planning, management, and sales."

### 4.2 New Cooperative Practices

In Misuo Town, Guizhou Yukun Yancheng Technology Co., Ltd. and Misuo Balang Community Cooperative transferred over 80 mu of orchard land to plant lemon oranges and tangerines using seeds from Xishuangbanna Tropical Botanical Garden, intercropping upland rice under the trees. Company director Wang Lei noted that wide tree spacing left land underutilized, and intercropping improves land use efficiency. "From planting to now, we only weed the rice when

weeding the orchard—no watering or fertilizing like paddy rice, just some labor for harvest," he said. The 30+ mu trial planting yielded an additional 40,000-50,000 yuan after selling at 4 yuan/kg, becoming "unexpected income" beyond fruit revenue.

In Yushe Town, Shuicheng Guizheng Yi Farmers' Professional Cooperative transferred 60 mu to trial-plant 150,000 *Polygonatum kingianum* plants. Technical director Chen Aihua explained that the area employs over 300 farmers annually. From March to October, farmers do weeding and field management for 120 yuan/day (150 yuan for skilled work). Intercropping upland rice in orchards and medicinal materials has proven successful. "Seedlings were provided by Xishuangbanna Tropical Botanical Garden experts who regularly guide planting and field management. We can consult them anytime via text messages, and they visit monthly to solve technical problems on-site," Chen said. Annual income from *Polygonatum kingianum* exceeds 6,000 yuan/mu.

### 4.3 Their True Words

Tan Gang from Yingtian Village, Shaomi Town, abandoned migrant work to stay home and plant prickly pear, caring for his elderly parents and two school-age children. Under CAS technical guidance, his 40+ mu of prickly pear produced excellent fruit this year. He harvested about 16,000 kg, earning nearly 100,000 yuan at the protective purchase price of 6 yuan/kg—similar to migrant work income. He plans to expand next year to stay close to family.

Zhu Yunyun from Xiangshi Village, Yezhong Township, has cultivated *Morchella* (morel mushrooms) since 2017. Previously suffering losses due to technical deficiencies, she persisted in learning and got opportunities to study at Kunming Institute of Botany, CAS, through the assistance program. "Morel cultivation is high-risk without proper technology. Yu Fuqiang' s team has continuously supported me," she said. After training, her cultivation skills improved dramatically. She rented incubation sheds and processing services, reducing costs. This year, she planted about 200 mu with 1.5 million yuan profit, inspiring neighboring farmers. "When I succeed, they watch and follow. This year I want to expand into other high-end edible fungi," she said confidently.

## 5. Reflection: The "Heart" of Science—Benefiting the People, Assisting the Region

When visiting Wang Lei' s intercropped orchard and Chen Aihua' s medicinal material field, I checked my phone: nearly 10,000 steps, consuming almost 500 calories. The reason was simple: reaching these sites required climbing steep, lengthy slopes, winding through towering cornfields, and navigating vegetation without paths while avoiding twisted ankles. As I arrived panting and sweating, Liu Guizhou, walking lightly ahead, naturally remarked, "These are our two most accessible trial sites."

Such natural expressions appeared on Yu Deshun' s face while navigating prickly pear branches, on Zhong Caihong' s face bending through kiwifruit orchards, on Yu Fuqiang' s face discussing farmers' caution···on every CAS team member' s face we encountered. They are no longer the stereotypical "spotless" scientists. In Shuicheng' s harsh natural conditions, they understand farmers' difficulties, willingly apply their knowledge to help local people, and integrate with this land.

Lin Bin, business director of CAS Bureau of Retired Cadres and current first secretary of Yuanba Village, Shuicheng District, said his greatest realization from participating in S&T assistance is a deeper understanding of national rural revitalization policies—how "paper" policies are implemented in villages, what farmers truly need, and how to execute them. Every researcher is continuing to plan a brighter revitalization future for Shuicheng.

This is perhaps the "heart" of science.

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*Note: Figure translations are in progress. See original paper for figures.*