Construction of BDS Spatiotemporal Information Agricultural Product Digital Credit System

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Abstract　Spatiotemporal information, positioning and navigation services have become important elements of new type infrastructure. The rapid development of global digital trade provides a large-scale application scenario for the use of Beidou Navigation Satellite System (BDS) spatiotemporal information to support the certification of origin of agricultural products. The BDS spatiotemporal information agricultural product digital credit system uses such modules as BDS, spatiotemporal information collection, spatiotemporal coding, and spatiotemporal blockchain. It incorporates multi-level joint supervision mechanisms such as government, associations, and users. Starting from the initial production link of agricultural products, it realizes the correspondence and locking of online and offline products, effectively improves the integrity and credibility of information in the production process, finished product quality and circulation process of products, effectively manages the green production and anti-channel conflicts of producers, and provides credible information for consumers, thus realizing the digital credit certification of products. The successful practice of characteristic agricultural products in Yunnan Province has verified the application ability of the BDS spatiotemporal information agricultural product digital credit system. This system has played a significant role in promoting the online and offline locking, credible information, effective supervision and high quality and high price of characteristic agricultural products from the field. The BDS provides services for global digital trade and contributes to the further enhancement of the global application scale of GNSS.

Key words　Beidou Navigation Satellite System (BDS), Spatiotemporal blockchain, Digital credit of agricultural products, Digital trade

1　Introduction

　　The Beidou navigation satellite system (BDS) spatiotemporal information agricultural product digital credit system, supported by the China Association for Trade in Services (CATIS), is oriented towards tangible and intangible products such as trade in goods and services at home and abroad. It is a digital, spatiotemporal collaboration and service platform for the whole process from production, trading to consumption. The data of each important link in the process is stored in the spatiotemporal blockchain node hosted by CATIS, so that no party can tamper with it arbitrarily. Through more extensive cross-chain applications, it forms the credit value of a single commodity, accordingly providing digital marketing, e-commerce, supply chain finance and other services. Spatiotemporal information, positioning and navigation services have become important elements of new type infrastructure. BDS global service provides global spatiotemporal reference information, which provides new space for global spatiotemporal information applications, especially in global commodity flow services. The vigorous development of the global digital economy has given birth to digital trade with data as the key factor of production, digital services as the core, and digital ordering and delivery as the main characteristics[1-2]. In 2022, China's service trade scale that can be delivered digitally will reach 2.5 trillion yuan, an increase of 78.6% over five years ago[3]. Spatiotemporal information continues to drive high-quality development[4]. It has played a unique role in the enforcement of rules of origin, commodity circulation, customs clearance, and transaction settlement, helping digital trade break the spatiotemporal nature of traditional trade and become a new driving force for China's "Link the World"[5].

　　Determining the origin through spatiotemporal information can be an important means to support the implementation of rules of origin in the digital economy era. Origin is the place where the goods originate, namely, where the products are produced, gathered, raised, extracted, processed, and manufactured. For goods obtained wholly in one country, the country of origin shall be that country; for goods produced or manufactured in two or more countries, the country of origin shall be the country in which the goods were last substantially transformed[6]. The rule of origin has a basic legal status in international trade, and is widely applied to the implementation of trade measures such as anti-dumping, anti-subsidy, government procurement, trade statistics, and country quotas, and has become an important factor influencing the development of a country's foreign economy. Since the current foreign trade policies and regulations of various countries stipulate different treatment for products from other countries or regions, such as most-favored-nation treatment, Generalized System of Preferences (GSP) treatment, duty-free treatment, national treatment, quantitative quotas, etc., the country of origin of imported goods is clarified, so that the importing country can give appropriate treat-

ment according to its place of origin. At present, rules of origin have become a means of trade policy and an important basis for a country to implement preferential treatment or restrictive measures[7]. On January 1, 2022, the *Regional Comprehensive Economic Partnership* (RCEP) came into force, and the "cumulative rules of origin" became a highlight of the agreement on trade in goods[8-9]. According to the relevant rules, when determining the origin qualification of products, the raw materials of RCEP member countries can be calculated cumulatively to meet the origin standard of final export products and significantly reduce the threshold of tariff enjoyment. Therefore, the implementation of cumulative rules is more complex than that of bilateral rules of origin, which requires more sophisticated spatiotemporal information to support the whole process, and the relevant agencies reach and confirm consensus through the same credible information.

In order to obtain the preferences brought by origin, trade transfer occurs from time to time, which is very important for the determination of the origin and value of goods in FTA member countries. Therefore, it is necessary to build a trusted data platform to track all raw material inputs that meet the requirements of the rules of origin for each final commodity, so as to link each intermediate commodity with the final product and realize the whole process evaluation and supervision[10]. China's customs supervision has started to build a blockchain platform to try to share information such as the source and flow direction of specified goods in real time and the whole process, realize the automatic comparison of the declaration of origin and other trade document information, and ensure the authenticity and reliability of data information such as origin[11-13].

The certification of origin of agricultural products has an urgent and huge demand for digital trade, especially cross-border trade. Since the formal implementation of RCEP on January 1, 2022, by the first half of 2023, the number of RCEP certificates of origin issued by China's National Trade Promotion System and the amount of certification had increased by more than 25% year-on-year[14]. The major countries implementing RCEP in China are ASEAN countries, in which cross-border trade of agricultural products is also the main point[15]. Because of the wide variety of agricultural products and the different biological characteristics of different varieties, it is necessary to find the characteristics that can be identified by consumers according to different product categories. Certification and branding can identify agricultural products, provide a basis for consumers to identify products, and also impose legal constraints on producers' actions[16-17]. Therefore, it is of great practical significance for promoting the smooth implementation of RCEP, facilitating trade for enterprises and benefiting regional people to lock agricultural products offline and establish a digital credit system considering the global application needs of spatiotemporal information. Digital information traceability for the origin of agricultural products has been applied in many ways, such as product traceability based on blockchain, anti-counterfeiting of products using image recognition and biometric recogni-

tion[18]. However, almost all applications are based on the implementation of digital information collection and credible information circulation in an intermediate link such as product processing or logistics. The technical means of spatiotemporal information have not been adopted for the original credible data sources of origin, online and offline corresponding locked data and other issues. As a result, the application of spatiotemporal information from the initial source has not been integrated into digital trade, and the corresponding and locking of online and offline products in the whole process has not been carried out. Therefore, the research on BDS spatiotemporal digital credit system of agricultural products supported by spatiotemporal information and spatiotemporal blockchain came into being. Spatiotemporal information can play the role of data collection in all relevant links in the whole trade process and data locking of items that change with position, and ensure that the information can not be tampered with and that the information of all trade related parties is consistent through spatiotemporal blockchain technology.

2 Framework of the BDS spatiotemporal information agricultural product digital credit system

The BDS spatiotemporal information agricultural product digital credit system provides digital and tracking services for the whole process of domestic and foreign trade in services. Several core nodes of spatiotemporal blockchain form the main operation center of the alliance chain, completing the functions of spatiotemporal blockchain unified item coding certificate, spatiotemporal data sharing, cross-chain application and value realization, and digital credit evaluation management, forming a digital cloud warehouse system and supply chain financial service platform to provide digital warehouse receipt trading and online transaction settlement support for domestic and foreign trade of agricultural products. Its main framework consists of seven modules (Fig. 1).

2.1 Agricultural product monitoring data center The data center of agricultural production growth monitoring and yield estimation establishes a large data center of agricultural spatial information, integrates all kinds of agricultural products data, and provides data support for the whole process certification of products from origin to sales. The traditional advantage of spatiotemporal information technology is to obtain and manage data related to agricultural products. The relevant data are mainly as follows. (i) Characteristic indicator data. The characteristics of agricultural products lie in the unique geographical environment in which they grow or exist. By means of remote sensing, Beidou and geological survey, geological, geochemical, land use, land cover, digital elevation model (DEM), slope, slope shape, soil type, climate and meteorological data, we can comprehensively analyze the quality guarantee capability of the growth process. (ii) Biological characteristic indicator data. The biological characteristic indicator data of agricultural products are obtained by means of biological monitoring. (iii) Planting (breeding) and processing production process data. The real-time dynamic monitoring is implemented by

means of Internet of Things (IoT) such as video, image and sensor to collect data such as light, temperature, water and gas. The monitoring data center uses satellite remote sensing, UAV remote sensing and ground video surveillance system to form multi-scale, multi-band dynamic monitoring and yield estimation data. It monitors the temperature, humidity, consistency and other key indicators during the production and storage of products. Besides, it makes record of all kinds of information of processing and logistics enterprises.
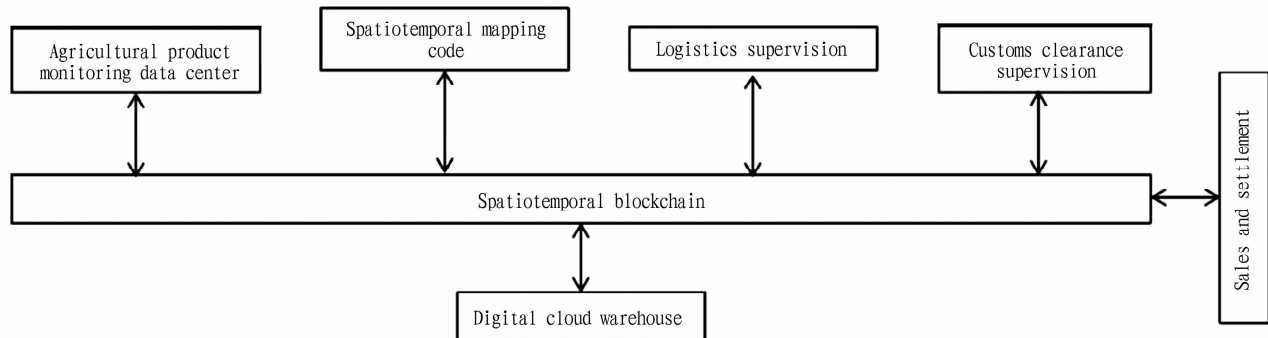

Fig. 1   Framework of BDS spatiotemporal information agricultural product digital credit system

2.2 Spatiotemporal mapping code

The spatiotemporal mapping code is to synchronize to the spatiotemporal blockchain CATIS node by using the positioning, navigation and timing data provided by the satellite navigation system and the never-repeated code compatible with the international mainstream commodity code. The code has been issued by CATIS as the group standard *Technical Specifications for Spatio-Temporal Origin Coding Mechanism and Digital Depository of Non Fungible Digital Credit* (T/CATIS 012-2022). The spatiotemporal mapping code has the following characteristics: using the unique global time and space reference provided by the satellite positioning technology, and convenient coding; using electronic fence to ensure that the corresponding code can be generated only at the real place of origin and consensus time, and implementing in-situ coding to prevent counterfeiting by location and time; combining with spatiotemporal blockchain, multi-party consensus coding quantity and process supervision to prevent tampering; convenient to record the location and information of product circulation according to the time axis, and realize the supervision of the whole process of production, transportation and sales.

The spatiotemporal mapping code can more conveniently endow objects with recognizable digital identities in the era of Internet of Everything (IoE). In the digital world, a mapping code can represent a real physical entity and event. Through the code-code association between different spatiotemporal multi-type codes of the same object, the digital mirror image of spatiotemporal changes of everything is realized in the form of code, forming a digital object corresponding to and locked by online and offline products.

2.3 Spatiotemporal blockchain

The spatiotemporal blockchain system combines spatiotemporal information with blockchain. The spatiotemporal mapping code is uniquely associated with the blockchain hash value through the spatiotemporal information protocol, improving the running efficiency of spatiotemporal information on blockchain. The spatiotemporal blockchain takes the blockchain alliance chain composed of several server nodes at home and abroad as the foundation and core to realize cross-border services, and regularly packages and uploads the block information on the

alliance chain to the global public chain, so as to achieve the cross-validation between the alliance chain (private chain) and the public chain, and ensure that the information on the blockchain of agricultural products is true, reliable and non-tampering. Based on spatiotemporal blockchain, a blockchain supply chain financial support platform is also built to provide financial support for strengthening and expanding the agricultural products industry. Spatiotemporal blockchain is a credit endorsement platform established for characteristic agricultural products to ensure that the products purchased by consumers are reliable, credible and traceable; companies with poor product quality or service will be excluded from the product blockchain ecosystem, and their bad records will always be recorded on the blockchain and can not be modified, thus playing a supervisory and deterrent role for companies; through blockchain, the supervision of products by management departments and consumers becomes convenient and transparent.

2.4 Logistics supervision

Trading entities belonging to different customs areas conclude transactions through e-commerce platforms, pay and settle accounts, and deliver goods and complete transactions through cross-border logistics. There are three main logistics modes for cross-border logistics: (ⅰ) international parcel and express delivery, which are mainly provided by postal agencies and international express companies. For many enterprises that are not large, international parcel and express delivery are almost the only logistics mode to choose; (ⅱ) overseas warehousing, where a warehouse is rented abroad in advance, the goods are delivered to the warehouse by sea or air, and then delivered directly from the warehouse after receiving the customer's order; (ⅲ) Goods collection and transportation, including goods collection and transportation by enterprises themselves, goods collection by foreign trade enterprise alliances, and goods collection in different ways and then delivered to buyers through logistics operation centers[19]. No matter what kind of logistics, it can realize the navigation and positioning supervision service of warehousing, logistics tools, drivers and goods through the application of satellite navigation system, and realize the full record of the process of goods circulation.

These data will also form a shared service between nodes through spatiotemporal blockchain.

2.5 Customs clearance supervision Tianjin, Shanghai, Qingdao and other customs have used blockchain and other systems to facilitate customs clearance services. For example, in the customs of Qingdao area of China (Shandong) Pilot Free Trade Zone, China-South Korea cross-border e-commerce can be uploaded to the blockchain through more than 10 links such as orders placed by Chinese consumers, delivery and delivery by Korean brand suppliers, packaging and consolidation, customs declaration and export, international transportation, and entry customs clearance, so as to realize the mutual recognition of the whole process of information flow, logistics, capital flow, and customs flow, and the closed-loop digital operation of the whole trade chain, so as to make it more convenient for cross-border imported goods to clear customs while maintaining authenticity, so as to achieve a new breakthrough in the field of digital trade[20]. By building a trusted and shared blockchain platform for international trade, the customs authorities have strengthened data sharing and business collaboration, and built a new supervision model with trust as the core. It maximizes the dividends of innovative regulatory policies and optimizes the business environment through data-driven, automated trade processes and trade enabling services backed by trusted data. In addition, the blockchain platform also supports other related industries, such as logistics and financial service providers, to provide services more safely and efficiently. The spatiotemporal blockchain supports cross-chain applications, so it can achieve good docking with the blockchain system of various professional applications, thus ensuring the acquisition and credibility of the whole process information.

2.6 Digital cloud warehouse Digital cloud warehouse is to generate digital warehouse receipts based on spatiotemporal mapping codes and blockchain certificate information, and support online and remote transactions of digital warehouse receipts. The digital cloud warehouse consists of a physical warehouse and a digital warehouse receipt based on the physical warehouse. The physical warehouse is the physical storage warehouse of goods or the production plot of agricultural products. Through the IoT, indoor and outdoor seamless positioning, artificial intelligence image recognition and other spatiotemporal information applications, it ensures that the physical goods can be controlled and supervised, and can not be lost or replaced, thus ensuring the safety of goods[21]. Digital warehouse receipts are digital documents for online transactions supported by trusted data on physical goods. The transaction of digital warehouse receipts ensures the credibility of origin through spatiotemporal mapping code and warehouse management system, and uses spatiotemporal blockchain to ensure that online data is credible, reliable and can not be tampered with, so as to ensure that warehouse receipts can be attached to property rights and can be checked and verified. Digital warehouse receipts fully support the supply chain financial business based on digital credit, transform the traditional circulation spot into standardized short-term assets, deliver the underlying assets based on real economic activities and real trade background to financial institutions, and greatly improve the efficiency of production turnover and capital operation

through financial support for small and medium-sized enterprises (SMEs) in the supply chain[22].

2.7 Sales and settlement The spatiotemporal blockchain technology is used to track and record the full cycle data of production and marketing in the supply chain, so as to ensure the online and offline correspondence, the authenticity, validity, and non-tampering of the data. Through the digital cloud warehouse, the original non-standard movable property forms standardized digital documents on the blockchain network. Using the authenticity and non-tampering of blockchain + spatiotemporal information, the digital documents can meet the risk control threshold of financial institutions, make the chattel pledge feasible, realize the integration of logistics, capital flow, information flow and bill flow in the supply chain, effectively connect the supply chain alliance, financial institutions and government regulatory departments, and build a supply chain ecosystem of mutual trust and win-win. Based on the digital deposit information of commodities, digital warehouse receipts can realize remote online transactions. It supports the integration of multimedia digital marketing, supports product distribution and promotion, and carries out online sales for consumers. In addition, it supports consumer market analysis based on product traceability data. Also, it supports the whole process of circulation data recording from product production, transportation, warehousing to distribution of various outlets, and realizes the whole process management of product sales.

3 Application of BDS spatiotemporal information agricultural product digital credit system in Yunnan Province

Yunnan Province provides a good test and application scenario for agricultural products to lock in circulation and realize credit demand offline and online globally for RCEP digital trade. Yunnan Province is the province with the richest natural ecology and biodiversity in China, known as the "plant kingdom" and "animal kingdom", especially the multi-ethnic culture and farming civilization provide Yunnan Province with diverse and unique geographical agricultural products[23]. It is an important passageway in China connecting South Asia and Southeast Asia, with unique natural geographical advantages. The China-Laos Railway has been successfully opened, the new China-Myanmar corridor has been successfully tested, and a large number of silage corn feed, wine and fruits from other countries have been exported to China. Agricultural products with plateau characteristics in Yunnan Province catch the opportunity of RCEP, focusing on making full use of the rules of origin accumulation, tariff concessions, procedural convenience and e-commerce, and the total export volume ranks first in the west and in the forefront of the whole country[24]. The customs of Yunnan Province continue to deepen the research and application of technical trade measures, continuously promote the paperless customs trade and other processes, boost the circulation and sharing of information, and support enterprises to continuously expand the RCEP market. "Small, delicate, and exquisite" is the characteristic of agricultural products in Yunnan Province. Different kinds of products have different biological characteristics, so it

is necessary to find the characteristics that can be identified by consumers according to categories. The protection of independent brands and superior products is not in place, and a digital system that can not only explain its advantages to consumers, but also protect its rights and interests from infringement is needed[25]. The BDS spatiotemporal information agricultural product digital credit system has been demonstrated and applied in 23 enterprises and 80 products. A total of 550 000 spatiotemporal codes have been issued for geographical indication products including Anning Red Pear,

Shilin Ginseng Fruit, Yunnan Black Tea and Pu'er Tea, and spatiotemporal blockchain digital authentication has been carried out to demonstrate the application of digital warehouse receipt trading of genuine Chinese herbal medicine seedlings *Bletilla striata*.

The application framework of BDS spatiotemporal information agricultural product digital credit system in characteristic agricultural products of Yunnan Province is shown in Fig. 2, with Shilin Ginseng Fruit as an example.
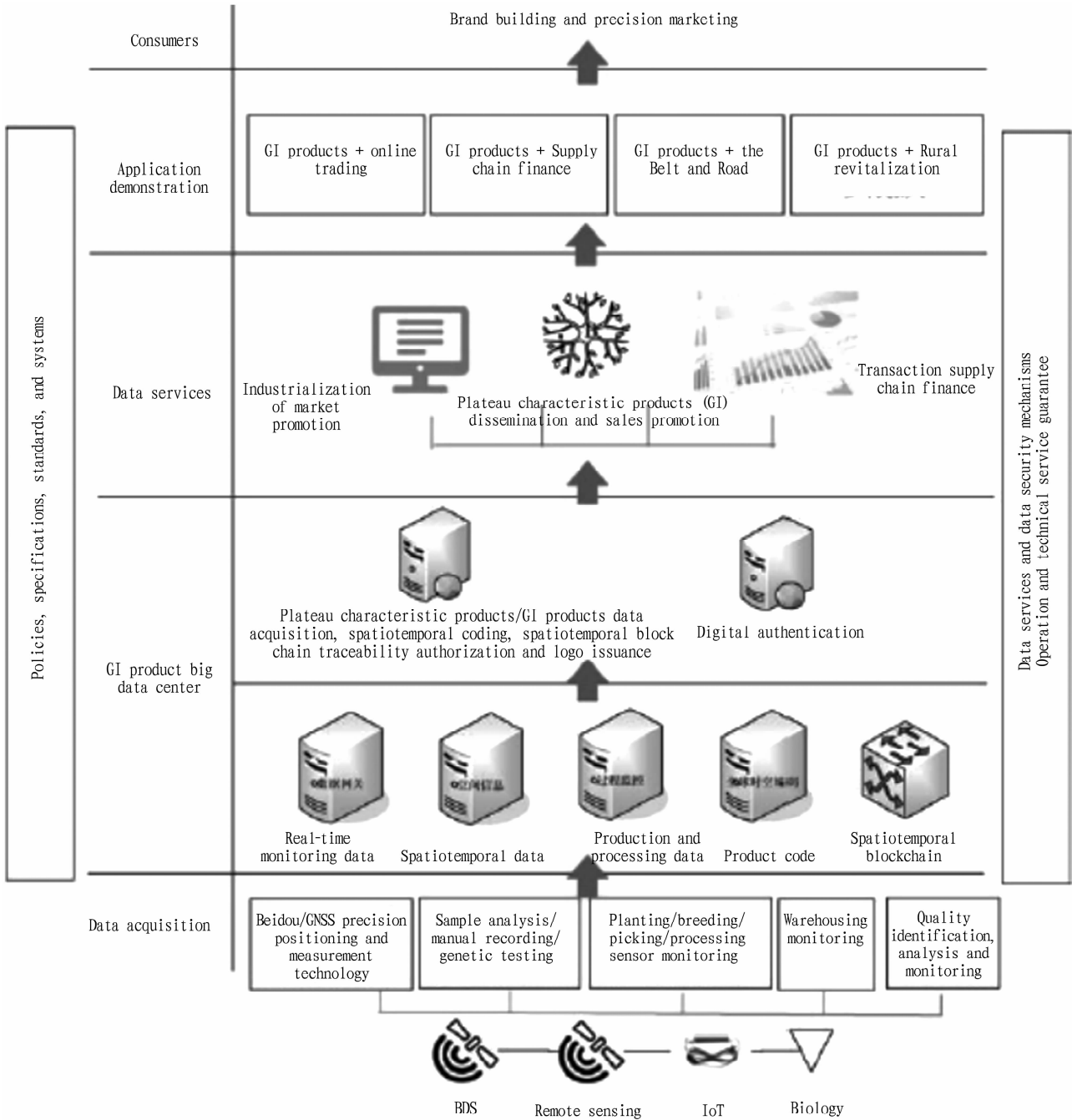

Fig. 2   Application framework of BDS spatiotemporal information agricultural product digital credit system in Yunnan Province

Shilin ginseng fruit is a specialty of Shilin Yi Autonomous   County in Kunming City, and is a national geographical indication

（GI）agricultural product. The suitable planting area is the skeletal soil and red soil in the mountain area and semi-mountain area with the altitude of 1 700 – 2 100 m, the pH is 5.5 – 7.5, the acidity and alkalinity are moderate, the soil is loose and the air permeability is good. The registration and protection scope of Shilin Ginseng Fruit covers seven townships (residential districts) under the jurisdiction of Shilin Yi Autonomous County, including Lufu Residential District, Banqiao Residential District, Shilin Residential District, Xijiekou Town, Guishan Town, Changhu Town and Dake Township. The geographical coordinates are 103° 10′ – 103°40′ E and 24°30′ – 25°03′ N. It has established BDS spatiotemporal information agricultural product digital credit system for Shilin Ginseng Fruit, mainly including monitoring its growth environment and process, government associations, farmers and other parties to manage the yield and packaging quantity. All the transaction parties lock products on spatiotemporal blockchain, promote marketing through digital marketing, protect the origin of products, establish brands, and promote high quality and high price.

（i）Space data center. We established the whole process database for Shilin ginseng fruit from planting, harvesting to processing and production, forming the acquisition and dynamic monitoring system; established the IoT acquisition systems such as soil and meteorology, as well as satellite and UAV remote sensing systems to ensure high quality and yield estimation in the growth process; established a large data platform for GI agricultural products, providing a large data service platform from precision production to precision sales, and integrating data from the Internet, sensor networks, and the IoT; established the key technologies of multi-scale spatial data integrating storage, organization and management, rapid comprehensive retrieval and visualization based on the global unified coordinate frame and spatiotemporal data; constructed a spatial information cloud database covering text, digital, map, location information, remote sensing images, on-site images, etc., to provide cloud data service support for precise planting of ginseng fruit, product traceability, Internet marketing and supply chain finance; developed high-precision grid zoning model for dynamic evaluation of ginseng fruit planting, to realize precise planting to differentiated precise sales, and improve comprehensive benefits.

（ii）*In situ* agricultural product BDS spatiotemporal locking. It is mainly the number of single ginseng fruit and the spatiotemporal coding regulated by the application. Beidou satellite positioning and planting process data have good objectivity. CATIS, the government, product holding associations, and cooperatives jointly determine the number of ginseng fruit product packages (i.e., the number of spatiotemporal codes), operating equipment (Fig. 3), electronic fence (Fig. 4), and operators according to the production status, so as to ensure that only the ginseng fruits within the range of picking time and picking location can obtain the code and enter the picking and circulation links; the unique spatiotemporal coding support for commodities is realized using the GNSS and the coding service platform. Through the indoor and outdoor ubiquitous high-precision positioning system, special coding and digital authentication equipment support can be realized to ensure that spatiotemporal coding is one object, one code and global coverage. Through

spatiotemporal blockchain, all relevant spatiotemporal codes are stored in the CATIS node and the data of all related parties are consistent, so as to realize the common limitation of online and offline product information collection and output from the original position.
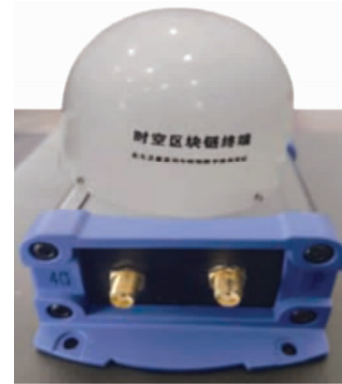
Fig. 3   Spatiotemporal encoding dedicated terminal

Fig. 4   Electronic fence for land parcels

（iii）Spatiotemporal blockchain platform. In this study, we constructed a spatiotemporal blockchain platform composed of multiple nodes in Kunming, Suzhou, Liuzhou, Singapore, and Vientiane cities. Each node is dynamic and can be expanded as needed to form a blockchain that is mutually authenticated by domestic and foreign nodes (Fig. 5). Authentication mechanism and algorithm, spatiotemporal coding and coding technology based on trusted data of BDS spatiotemporal information + blockchain (Fig. 6) supports the operation of the traceability authentication system based on spatiotemporal blockchain technology.
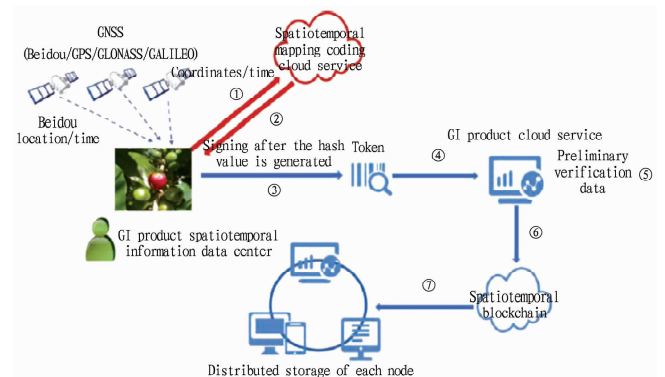
Fig. 5   Composition of spatiotemporal blockchain for characteristic agricultural products

Fig. 6 Spatiotemporal blockchain credit records

（ⅳ）Digital cloud warehouse and online trading center. Warehousing accounts for a large proportion in the production and sale of agricultural products. Some agricultural products need to be stored in physical warehouses for a long time, such as Pu'er tea, *Paris polyphylla* medicinal materials, ham and so on. However, more agricultural products need to be stored in the logistics process, and the same is true for ginseng fruit from picking to consumption, so it is very important to monitor the storage items （Fig. 7）. It is not only necessary to ensure that ginseng fruit products are stored without deterioration and substitution for other packaging, but also necessary to promote digital documents to enter the market during storage. Therefore, it is very important for digital monitoring to obtain and lock product information in real time, to ensure the authenticity of digital warehouse receipts, the consistency of specific items, and to provide digital credit. The storage time of ginseng fruit in the warehouse is very short, and it is often sent to the buyers after a certain amount of ginseng fruit is concentrated in a short time, but this process requires high storage temperature, humidity, ownership and so on, so it needs to be positioned and monitored.

Fig. 7 Warehouse monitoring based on Beidou spatiotemporal data

In the logistics process, the information of ginseng fruit, vehicles, drivers and other information is matched, and the overall logistics process is uploaded to the spatiotemporal blockchain （Fig. 8）, which realizes data sharing among production enterprises, logistics enterprises, buyers and regulatory authorities, and provides trusted data exchange and services for all links of the industrial chain.
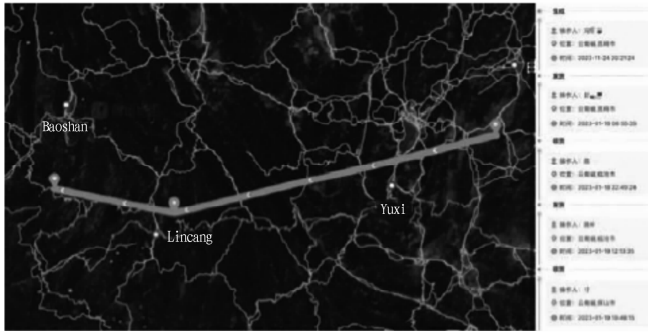
Fig. 8 Flow records and logistics trajectory based on spatiotemporal information changes

With the digital certificate information of ginseng fruit commodities, digital warehouse receipts can be traded remotely online. Data sharing and interconnection among relevant nodes of spatiotemporal blockchain （Fig. 9）, maintaining product credit, supporting users to access product information from field production to circulation and consumption through mobile App and other means （Fig. 10）, and proving the identity and quality of products. It supports the integration of multimedia digital marketing and carries out online sales for consumers. In addition, it supports consumer market analysis based on product traceability data.
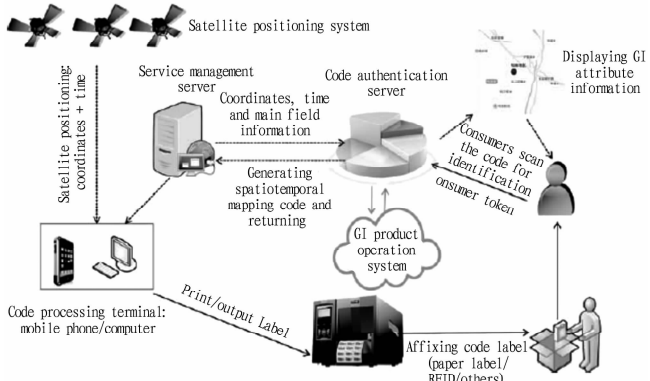
Fig. 9 Product digital identity authentication process based on spatiotemporal information

The application of characteristic agricultural products in Yunnan Province shows that the BDS spatiotemporal agricultural product digital credit system, using the functions of Beidou positioning and navigation, and spatiotemporal information acquisition, can effectively solve the problem of time and space correspondence and locking in the whole process starting from the production of agricultural products. Besides, it incorporates the multi-level joint management and supervision mechanism of the government, associations, and users. It effectively improves the credibility and coverage of information in the process of product, quality and circulation, and forms a digital service system for the whole industrial

chain of agricultural products, such as production, warehousing, precision marketing, order agriculture, online trading and product traceability, supply chain finance, *etc.* The establishment of digital authentication services from planting production, transportation, processing, warehousing to supply chain financial services and transactions will effectively restrain producers and provide more credible product information for consumers, thus implementing digital credit guarantee for products. Therefore, the digital sales of products of service enterprises are more convenient, the market is wider, the reputation is better, and the price is increased by about 30% on average, which really realizes both high quality and high price.

Fig. 10 User traceability interface

Combined with the successful practice of the application of BDS spatiotemporal agricultural product digital credit system of characteristic agricultural products in Yunnan Province, the application test of cross-border agricultural products trade was carried out by using the characteristics of many ports and wide contacts between Yunnan Province and South and Southeast Asian countries. For the cross-border trade of importing Lao coffee to China, the research group joined forces with China's Agricultural Products Trade Center and Lao Tower Coffee Co., Ltd. (That's Coffee Co. Ltd., Laos), applied BDS spatiotemporal agricultural product digital credit system started from the coffee planting area of Nonguan Village, Basson County, Champasak Province, located in the Borofin Plateau, carried out spatiotemporal information collection and physical locking, and established a full-process digital service system for coffee raw materials to Vientiane Coffee Processing Plant, CATIS "Digital Cloud Warehouse" and "Commodity Trading Delivery Warehouse" of China Commercial Agricultural Products Trading Center, and successfully completed the listing and trading of the first single tower coffee product on the trading platform of China Commercial Agricultural Products Trading Center.

4   Conclusions

The new development of global digital trade poses new chal-

lenges to the implementation of core trade provisions such as credit and rules of origin of agricultural products. Using Beidou positioning navigation, spatiotemporal information collection and other functions to correspond to and lock the time and space of agricultural products from the beginning of field production through the government, associations, users and other multi-level joint management and supervision mechanisms, BDS spatiotemporal agricultural product digital credit system can effectively solve the anchoring problem between online and offline products and information in the whole process, and effectively improve the integrity and credibility of product, quality, and circulation process information. Also, it can effectively restrict the production of producers, provide credible information for consumers, and thus implement digital credit guarantee for products. The practice of characteristic agricultural products in Yunnan Province has verified the application ability of BDS spatiotemporal agricultural product digital credit system, which can play a guarantee role in effective supervision, locking, establishing brand and reputation, and promoting high quality and high price of characteristic agricultural products.

This also provides a new application space for BDS and a new exploration idea for the global scale application of satellite navigation system. With the successful practice of BDS spatiotemporal agricultural product digital credit system, the next step will be to select and support a group of Chinese enterprises or overseas partners with the support of CATIS to build cross-border e-commerce stations overseas, and communicate and coordinate on the implementation of spatiotemporal blockchain nodes, trade data interconnection, customs and other trade link standardization and mutual recognition to promote the construction of a localized platform system for global service trade partners. It is expected to form a localized operation system, assist in the establishment of a digital credit service system for the preservation of certificates by local national trade associations and joint supervision by the government and the market, and promote the scale of BDS services through the growth of digital trade and the win-win situation of all countries.

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