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Research on the Antecedent Configurations of Tea Agricultural Heritage Systems for Sustainable Development from a Symbiotic Perspective

Liyu Mao [1,2,*,†], Jie Ma [1,2,†], Wenxin Wu [1,2], Wenqiang Jiang [3,4] and Shuisheng Fan [1,2,5]

1 College of Rural Revitalization, Fujian Agriculture and Forestry University, Fuzhou 350002, China; 1126majie@fafu.edu.cn (J.M.)
2 Multifunctional Agricultural Application Research Institute, Fujian Agriculture and Forestry University, Fuzhou 350002, China
3 College of Economics & Management, South China Agricultural University, Guangzhou 510642, China
4 Guangdong Research Center for Rural Policy, Guangzhou 510642, China
5 College of JunCao Science and Ecology, Fujian Agriculture and Forestry University, Fuzhou 350002, China
* Correspondence: my686@fafu.edu.cn
† These authors contributed equally to this work.

Abstract: Based on the theories of symbiosis and configurational analysis, this study constructs a theoretical framework for exploring the sustainable development of tea agricultural heritage systems, with an empirical investigation of 40 typical cases in China. Utilizing fuzzy-set qualitative comparative analysis (fsQCA) and integrating multi-source data, this study delves into the intricate mechanisms underlying its sustainable development. The findings indicate that the sustainable development of tea agricultural heritage systems is not determined by a single factor but results from the interplay of multiple conditions. Specifically, ecological protection performance and regional driving capacity serve as necessary conditions, while research resource allocation, industrial comprehensive strength, and heritage site development level act as sufficient conditions. Furthermore, the sustainable development pathways can be categorized into two types, namely "dual-cycle drive" and "total-factor drive", encompassing four configurations. The "dual-cycle drive" emphasizes the mutually beneficial symbiosis between ecological and socio-economic sustainability, involving ecological protection, research resources, regional driving capacity, and industrial strength. The "total-factor drive", on the other hand, reflects the synergistic symbiosis of ecology, socio-economy, and culture, incorporating various combinations of factors such as ecological protection, regional driving capacity, tea culture inheritance, and heritage site development. Lastly, the driving combinations leading to non-sustainable development exhibit asymmetry, suggesting that the formation of non-sustainability is not merely the reverse outcome of sustainable conditions. The absence of key conditions, such as ecological protection or regional driving capacity, results in the emergence of non-sustainable configurations. In conclusion, this study unveils the complexity and multidimensionality of the sustainable development of tea agricultural heritage systems, providing a scientific basis and practical pathways for formulating effective protection and sustainable development strategies.

Keywords: symbiosis theory; tea agricultural heritage systems; sustainable development; configurational analysis

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1. Introduction

As a manifestation of the harmonious integration of human wisdom and nature, the agricultural heritage systems embodies profound historical, scientific, and humanistic significance [1,2]. Within this context, the tea agricultural heritage system stands out as a distinguished exemplar in globally important agricultural heritage systems (GIAHS), renowned for its unique natural landscape, rich cultural connotations, and significant

economic value [3]. These heritage sites are often located in environmentally sensitive and critical areas, thus not only shouldering the heavy responsibility of ecological protection but also carrying the dual missions of cultural inheritance and economic and social development [4].

In response to this complex backdrop, China has actively echoed the call for the protection of globally important agricultural heritage systems (GIAHS), elevating the conservation and sustainable development of tea agricultural heritage systems to a national strategic priority [5,6]. A review of existing research revealed several notable limitations despite the progress made in this area. First, studies on the symbiotic dimensions and conditions of tea agricultural heritage systems tend to remain superficial, lacking in-depth theoretical exploration and empirical analysis, which hinders a comprehensive understanding of the symbiotic mechanisms [3,7]. Second, the spatial scope of the research is often confined to case studies on a district and county level, with limited macro-level analysis and synthesis, thus restricting the universality and applicability of the findings [8,9]. Furthermore, research on the institutional mechanisms and dynamic protection paradigms for the sustainable development of tea agricultural heritage systems is relatively scant [10]. There has been insufficient exploration and practice regarding how to achieve a balanced approach between ecological protection, cultural inheritance, and socio-economic development, posing a significant challenge in current studies.

In light of these challenges, to achieve the sustainable development of tea agricultural heritage systems, researchers must holistically consider multiple facets and identify a balance between ecological protection, cultural inheritance, and socio-economic development. The strategy of sustainable development, with its emphasis on comprehensive, coordinated, and enduring growth, offers an effective pathway for addressing this complex issue [11]. Moreover, the sustainable development of tea agricultural heritage systems deeply resonates with the core of symbiosis theory, representing a dynamic evolution of a multi-faceted, multi-layered symbiotic system. This provides a new perspective and methodology for the protection and development of tea agricultural heritage systems [3,12].

Based on the perspective of symbiosis theory, this study systematically investigates the internal logic, external environmental conditions, and multidimensional development paths of the sustainable development of tea agricultural heritage systems. To achieve this objective, this study employs fuzzy-set qualitative comparative analysis (fsQCA) and examines 40 exemplary cases of tea agricultural heritage systems from various provinces in China. This study focuses on several key questions. Firstly, it explores whether the symbiotic single dimension of tea agricultural heritage systems and its constituent conditions constitute necessary conditions for sustainable development, thereby enhancing our understanding of the foundational role of symbiotic relationships for sustainable development. Secondly, this study endeavors to identify the antecedent configurations that effectively promote the sustainable development of tea agricultural heritage systems. Through comparative analysis of different cases, this study identifies key antecedent configurations such as dual-cycle drive and total-factor drive, which play crucial roles in advancing sustainable development. Furthermore, this study explores the complex interaction mechanisms among these antecedent configurations. Through systematic analysis, it uncovers the interrelationships among these configurations and their comprehensive impacts on the sustainable development of tea agricultural heritage systems.

In terms of specific research design, this study is structured into six core sections. Section 2 establishes a research and analytical framework encompassing ecological, socio-economic, and cultural dimensions, providing a solid theoretical foundation for subsequent research. Section 3 details the specific application of the fsQCA method and data sources to ensure the scientific and rigorous nature of the study. Section 4 reveals the key factors and antecedent configurations for the sustainable development of tea agricultural heritage systems through necessary condition analysis and configurational analysis. Section 5 comprehensively discusses the frontiers, limitations, and future directions of this study on the antecedent configurations of sustainable development of tea agricultural heritage

systems, compared to other studies. Finally, Section 6 synthesizes the overall research and presents strategic policy recommendations based on the findings.

In summary, this study not only deepens the understanding of tea culture inheritance, but also contributes Chinese wisdom and solutions to promoting the harmonious coexistence of society, economy, and environment, as well as the protection and sustainable development of globally important agricultural heritage systems (GIAHS).

2. Theoretical Foundation and Research Framework

2.1. Theoretical Foundation

The concept of the symbiotic system originates from biology and was initially used to describe the coexistence and interactions among different organisms. Introduced by German mycologist De Bary, this concept gradually evolved to encompass philosophy, economics, and social evolution. From an organizational perspective, symbiotic relationships can be classified into point, intermittent, and continuous symbiosis, and they can be parasitic, commensal, asymmetrical, or symmetrical in behavior. In the biological realm, the symbiotic relationship is regarded as one of the important sources of species innovation. When applied to the socio-economic field, the symbiotic relationship is similarly regarded as a key factor in promoting the innovation of the social management system and optimizing the ecological regulation method, alongside competitive relationships as key forces for development [13–15].

The fundamental elements of symbiotic relationships—collaboration, reciprocity, permanence, dependence, and interaction—build a stable and efficient interacting network within ecosystems. These elements are particularly significant in agricultural heritage sites, where effective collaboration among various entities not only ensures the survival and growth of all involved parties but also facilitates optimal use of resources. The mutual benefits arising from these collaborations enhance the stability and resilience of these relationships through interconnection and interdependence, thus promoting the sustainable development of agricultural heritage sites. Typically, these sites are situated in environmentally delicate and significant ecological function zones, facing the triple tasks of ecological protection, cultural preservation, and socio-economic advancement [16]. Comprehending and managing the symbiotic relationship in these areas is essential for achieving sustainable development. The core framework of sustainable development consists of three fundamental principles: economic sustainability, socio-economic sustainability, and environmental sustainability. Its objective is to guarantee that human activities meet present requirements without jeopardizing the capacity of future generations to fulfill their needs [17]. For tea agricultural heritage systems, its unique cultural value necessitates the inclusion of a cultural dimension in the sustainable development framework. More precisely, the sustainable development of tea agricultural heritage systems involves not just economic, social, and environmental sustainability but also a particular emphasis on the ongoing evolution and preservation of culture. Therefore, the sustainable development of tea agricultural heritage systems can be characterized as a holistic framework of "ecological, socio-economic and cultural sustainability". This framework integrates traditional economic and environmental elements while prioritizing the incorporation and protection of cultural factors. Specifically, this implies that ecological functions support socio-economic and cultural activities, whereby socio-economic and cultural functions, in turn, encourage ecological preservation and sustainable resource use.

Utilizing the concept of symbiotic relationships to tea agricultural heritage sites allows for more accurate coordination and optimization of the connections between ecological preservation, cultural heritage, and economic growth, achieving a state of harmonious symbiosis and mutual development. This symbiotic relationship enables the ecological, socio-economic, and cultural functions to jointly adapt to each other's attributes, promoting cooperative development and establishing a dynamic, interactive unit structure [18]. In other words, the sustainable development of tea agricultural heritage systems is a dynamic process consisting of three symbiosis units: ecological, socio-economic, and cultural aspects.

These units, adhering to the concept of sustainable development, collaborate to ensure both inheritance and progress, forming a reciprocal symbiosis mode. This mode functions as a sequential and interconnected system, resulting in a closed-loop process where the foundation of ecological sustainability is supported by socio-economic variables, which in turn exert positive effects on tea-related industries. Meanwhile, an enabling socio-economic environment promotes the development of culture, while the continuous evolution of tea culture further facilitates ecological sustainability. This recurring "sustainable development phenomenon of tea agricultural heritage systems" ensures that, over time, each element improves and contributes to the progress of others, establishing a positive, enduring path for symbiotic development. The application of symbiosis theory in this context not only demonstrates its practical effectiveness but also uncovers intrinsic mechanisms and potential for the sustainable development of tea agricultural heritage systems. It provides novel perspectives for academic examination and practical applications in relevant fields.

In brief, based on symbiosis theory, this study explores the configuration pathways and multiple concurrent relationships that affect the sustainable development of tea agricultural heritage systems. Concretely speaking, this study will examine three dimensions: ecological sustainability, socio-economic sustainability, and cultural sustainability, by developing an analysis of their interconnections and overall impacts, as illustrated in Figure 1.

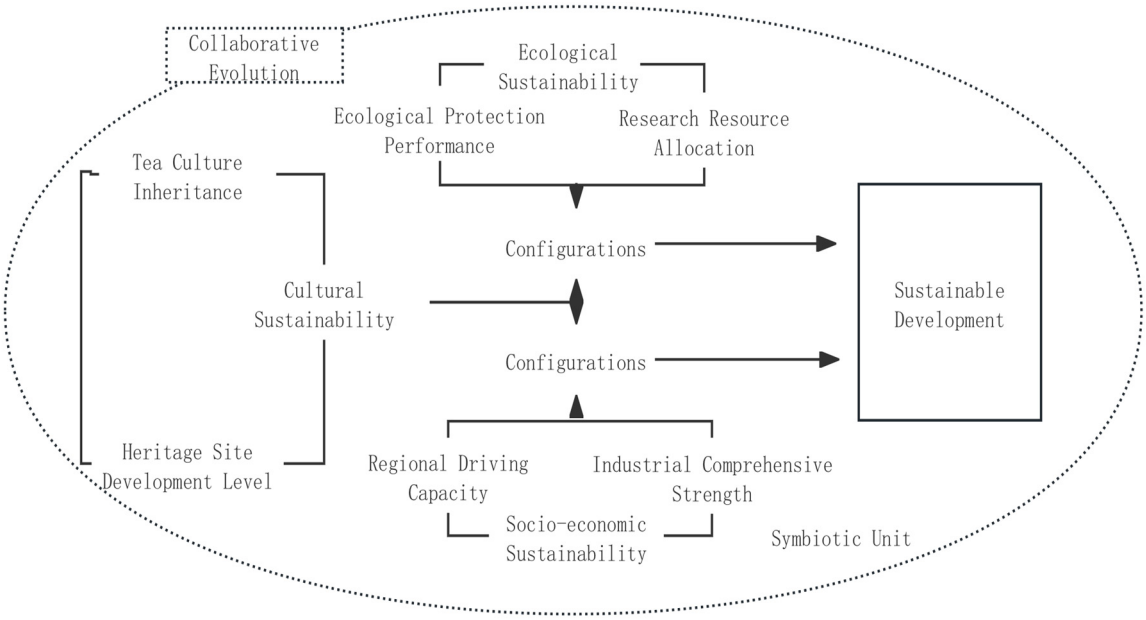

Figure 1. Research model on sustainable development of tea agricultural heritage systems based on symbiosis theory.

2.2. Research Framework

2.2.1. Ecological Sustainability

The sustainable development of tea agricultural heritage systems contributes to ecological conservation. The growth and quality of tea leaves are directly affected by the environment in which tea trees are cultivated, making the protection of these natural resources essential for maintaining the quality and productivity of tea. In this context, ecological conservation and allocation of scientific research resources emerge as two key elements that together form the foundation and driving factors behind the sustainable development of tea agricultural heritage systems.

Firstly, ecological protection holds a pivotal position in sustainable development strategies [19]. The implementation of environmental protection measures and green standards not only balances the relationship between economic development and environmental preservation, but also reduces negative environmental impacts and safeguards the health and sustainability of ecosystems [20]. Tea garden evaluation activities have elevated the

profile of ecological protection practices, motivating more tea gardens to adopt proactive measures. However, despite the superficial success of these measures, current research and practices often lack in-depth theoretical exploration and empirical analysis. For instance, the existing literature on green standards, tea garden evaluation activities, and eco-friendly management models (such as restoring natural vegetation and implementing ecological agricultural techniques) largely remains descriptive, failing to comprehensively unveil the underlying mechanisms of these measures and how they genuinely contribute to ecosystem health and sustainability. Therefore, future research necessitates a more profound investigation into the theoretical foundations and practical outcomes of these measures to better guide the sustainable development of tea agricultural heritage systems.

Concurrently, the allocation of scientific research resources is crucial for the sustainable development of heritage sites. Scientific research support, such as soil improvement and biodiversity maintenance, lays the foundation for the long-term sustainable development of tea agricultural heritage systems. These measures provide scientific evidence and technical support that integrates traditional tea culture with modern needs. National attention to the tea industry has propelled advancements in tea plant varieties and green and smart tea garden development, fostering efficient resource utilization and ecosystem stability [21].

In summary, ecological conservation and scientific research resource allocation jointly ensure the ecological health and economic benefits of tea agricultural heritage systems, securing the long-term transmission of traditional tea culture and forming an effective mechanism that maintains ecological balance while promoting economic development. Looking ahead, there is a need to deepen theoretical and practical research on ecological protection measures and optimize the allocation of scientific research resources to better direct the sustainable development of tea agricultural heritage systems.

2.2.2. Socio-Economic Sustainability

Enhancing the sustainable development of tea agricultural heritage systems fosters both social and economic progress. The advancement of the tea industry not only increases the financial earnings of tea producers but also stimulates the growth of related industries, thus promoting economic progress. Therefore, the regional driving capability and comprehensive strength of the industry serve as critical intermediaries in the socio-economic sustainability of tea agricultural heritage systems. These two factors synergistically contribute to the advancement of the sustainable development of heritage and establish a basis for the transmission of cultural sustainability into future generations [22].

Firstly, strategies such as brand value enhancement and attracting industrial investments have strengthened the regional driving capacity, thereby promoting the sustainable development of tea agricultural heritage systems. Specifically, through the careful formulation of brand enhancement strategies, the region has expanded its market influence and reputation, effectively boosting the sales of tea and related products. This, in turn, has attracted a wide range of consumers and investors, infusing new vitality into local economic growth and cultural inheritance. Furthermore, the region actively sought large-scale industrial investments and committed to infrastructure construction and industrial chain integration, such as establishing modern processing plants and efficient logistics centers. These initiatives not only elevated the level of regional economic development but also facilitated the process of industrial modernization, introducing advanced production technologies and management experiences, thereby significantly improving production efficiency. Ultimately, the stable growth of the regional economy has created numerous job opportunities and improved the living standards of residents, further attracting more external investments and promoting economic diversification and sustainable development. This, in turn, provides a more solid environmental foundation for the sustainable development of tea agricultural heritage systems.

Secondly, the industrial comprehensive strength reflects the competitive advantage of tea agricultural heritage systems. As a major economic crop, tea not only increases farmers' income but also propels the development of related industries such as processing, packag-

ing, and sales, and stabilizes the local economy. Moreover, collaboration mechanisms with local institutions for talent development enhance technological levels, although technology transfer and popularization necessitate further enhancement. Meanwhile, tax incentives and financing support policies alleviate the burden on enterprises, facilitating technological upgrades and competitiveness enhancement. However, ensuring these benefits are fairly and effectively extended to all enterprises, avoiding excessive resource concentration, remains a pressing issue.

Overall, the effective integration of the regional driving capacity and industrial comprehensive strength not only guarantees the economic foundation of tea agricultural heritage systems but also propels its cultural and socio-economic sustainable development. Nevertheless, in the process of advancing the sustainable development of tea agricultural heritage systems, continuous refinement and optimization of relevant measures are imperative to ensure comprehensive sustainable development across economic, socio-economic, and cultural dimensions.

2.2.3. Cultural Sustainability

The sustainable development of tea agricultural heritage systems facilitates the preservation and transmission of cultural legacy. In addition to providing a concise overview of the safeguarding and exploitation of tea agricultural heritage systems, this document also serves as a crucial element in attaining its enduring sustainable growth. The effective implementation of this phase will ascertain the quality of legacy preservation and the effect of cultural transmission, thereby impacting the overall success of the whole sustainable development process. Therefore, the ultimate components in the cultural sustainable development of tea agricultural heritage systems are the inheritance of tea culture and the level of development of heritage sites. Collectively, these two elements facilitate the sustainable growth of tea agricultural heritage systems and influence the ecological sustainable development in the following cycle.

The inheritance of tea culture is the core of the sustainable development of tea agricultural heritage systems. The spiritual significance and cultural memory embedded in tea culture provide enduring momentum for the sustainable development of agriculture, invigorating the inner vitality of rural residents and guiding the industrial chain that combines rural culture with agriculture [23]. However, despite the increasing number of inheritors year by year and the positive development trend in tea culture, numerous challenges persist in the process of its protection and inheritance. Key issues include ensuring the effective implementation of relevant laws and regulations to genuinely fulfill their protective role; enhancing the social recognition and influence of traditional skills to promote the comprehensive development of cultural tourism and local economy; and maintaining traditional essences during modernization while avoiding excessive commercialization. These challenges necessitate careful consideration and resolution. Therefore, to promote the inheritance of tea culture, it is necessary to continuously improve protective measures, strengthen social publicity, and ensure the continued prosperity and development of tea culture.

The level of heritage site development is another crucial factor driving the cultural sustainability of tea agricultural heritage systems. This process aims to protect and inherit the heritage while promoting local economic development and cultural transmission, balancing economic, social, and environmental needs, and supporting the sustained development of culture [24,25]. By organizing special cultural activities, such as tea art performances and tea culture festivals, the attractiveness of tea culture is enhanced, facilitating cultural dissemination and tourist participation. The establishment of ecological leisure and sightseeing gardens offers tourists diversified tea garden experiences, elevating the fame of the heritage site. The exploration and utilization of themed tea cultures, religious customs, and folk customs enrich cultural connotations and create unique cultural experiences.

In summary, the inheritance of tea culture and the level of heritage site development jointly form the two pillars of the cultural sustainability of tea agricultural heritage sys-

tems. They mutually reinforce each other, collectively propelling cultural preservation, dissemination, and economic growth, ensuring the long-term sustainable development of tea heritage. However, in the promotion process, continuous refinement and optimization of relevant measures are imperative to address challenges and achieve comprehensive, sustainable development of tea agricultural heritage systems.

3. Research Methods and Data Sources

3.1. Research Methods

The core essence of configurational analysis, as a powerful tool in social science research, lies in considering the research phenomenon as a comprehensive aggregate, and the various factors triggering these phenomena as distinct subsets within this aggregate. Rooted in the logical foundation of Boolean operations, this method conducts an in-depth examination of large datasets to explore the common affiliations among different sets, thereby uncovering the complex correlations between condition combinations and outcomes [26]. Compared with methods relying on counterfactual reasoning, configurational analysis can directly address the issue of limited data diversity, effectively revealing singular causal structures and gaining insights into the intricate networks of causality woven from causal chains and common cause structures. The unique charm of this method is that it provides a fresh perspective for examining and understanding social phenomena, enabling researchers to deeply mine the underlying patterns and regularities hidden within the data [27].

Building on the theoretical foundation of configurational analysis, the fuzzy-set qualitative comparative analysis (fsQCA) further breaks through the constraints of traditional binary and multi-value conditions, equipping researchers with a more flexible and powerful analytical tool. The fsQCA not only inherits the advantages of interval variables, allowing for a more nuanced quantitative treatment of the variables, but also retains the operational capabilities of set theory, enabling researchers to precisely calibrate the partial membership degree of sets [28]. The introduction of this method has greatly expanded the application scope of qualitative comparative analysis, allowing researchers to accurately reveal the intrinsic connections between condition combinations and outcomes, even in complex and diverse data environments [29].

When exploring the antecedent conditions and influence paths for the sustainable development of tea agricultural heritage systems, the choice of fuzzy-set qualitative comparative analysis is primarily based on two considerations. On the one hand, given that relevant data on tea-related agricultural cultural heritage has not yet formed a unified and continuous quantitative database, it is difficult to comprehensively assess its value through simple quantitative data analysis. Compared with the limitations of single-case studies, multi-case qualitative comparative analysis can significantly enhance the explanatory power and generalizability of research results. On the other hand, configurational analysis adheres to a holistic and systematic analytical approach, focusing on configurations at the case level rather than single independent variables. This characteristic demonstrates significant advantages in analyzing complex issues such as strategic management [27]. This method emphasizes deep analysis of the research object, enabling a more comprehensive and in-depth revelation of its inherent laws and unique attributes.

Therefore, fuzzy-set qualitative comparative analysis allows for a more precise exploration of the antecedent conditions and influence paths for the sustainable development of tea agricultural heritage systems. It uncovers the complex causality and internal operational mechanisms behind this development, providing strong theoretical support and practical guidance for the protection and sustainable development of tea agricultural heritage systems.

3.2. Data Sources

In utilizing qualitative comparative analysis (QCA) methodology for research, particularly when dealing with small- to medium-sized datasets composed of dichotomous

variables, this study meticulously selected 40 samples from China's rich tea agricultural heritage systems. This selection strategy adhered strictly to the principles of scientific rigor and precision.

Initially, this study conducted a preliminary screening of samples based on the list of "China's Nationally Important agricultural heritage systems(NIAHS)" and its supplementary material, the "Census of China's agricultural heritage systems" (data sourced from: https://www.gov.cn (accessed on 15 July 2024)). Although the list originally contained 65 potential samples, incomplete data from certain regions precluded their inclusion in subsequent analysis. However, through in-depth exploration of available data and meticulous consideration of sample distribution, the 40 eventually selected samples not only covered all data-accessible regions but also exhibited high heterogeneity and appropriate homogeneity, ensuring comparability among samples in key characteristics and diversity in case studies.

Specifically, this study initially included 18 tea projects that have been listed in the scope of the "Census of China's agricultural heritage systems" and "China's Nationally Important agricultural heritage systems (NIAHS)". These projects not only carry profound historical and cultural significance but also play a pivotal role in local socio-economic and cultural development, serving as exemplary models for the protection of China's tea agricultural heritage systems. Furthermore, to more comprehensively explore the sustainable development pathways of tea agricultural heritage systems, this study additionally selected 22 tea projects that have been included in the "Census of China's agricultural heritage systems" but have not yet been listed in "China's Nationally Important agricultural heritage systems (NIAHS)". These projects also possess significant historical, cultural, and ecological value.

In summary, through the 40 carefully selected samples, this study not only ensured the sample size requirements, but also, by comparing different types of tea agricultural heritage systems, further enhanced the explanatory power of the research findings, providing an empirical foundation for a deeper understanding of the sustainable development of China's tea agricultural heritage systems (Table 1).

Table 1. Sample cases.

Province	Sample Name
Zhejiang	Zhejiang Tiantai Yunwu Tea Culture System; Zhejiang Hangzhou West Lake Longjing Tea Culture System; Zhejiang Jiande Bao Tea Culture System; Zhejiang Fenghua Quhao Tea Culture System
Anhui	Anhui Jixi Jinshan Shiyu Tea Culture System; Anhui Taiping Monkey Kui Tea Culture System; Anhui Yixian Graphite Tea Culture System
Fujian	Fujian Fengze Qingyuan Mountain Tea Culture System; Fujian Wuyi Rock Tea Culture System; Fujian Yongchun Bergamot Tea Culture System; Fujian Wuping Green Tea Culture System; Fujian Longyan Xiebai Tea Culture System; Fujian Fuzhou Jasmine Planting and Tea Culture System; Fujian Anxi Tieguanyin Tea Tea Culture System; Fujian Fuding White Tea Culture System
Jiangxi	Jiangxi Lushan Yunwu Tea Culture System; Jiangxi Suichuan Gougunao Tea Culture System; Jiangxi Fuliang Tea Culture System; Jiangxi Xiushui Ning Black Tea Culture System
Hubei	Hubei Chibi Yanglou Cave Brick Tea Culture System; Hubei Enshi Yulu Tea Culture System; Hubei Zigui Jiuwanxi Silk Brocade Tea Culture System
Hunan	Hunan Guzhang Maojian Tea Culture System; Hunan Anhua Black Tea Culture System; Hunan Baojing Huangjinzhai Ancient Tea Garden and Tea Culture System
Guangxi	The Jasmine Tea System of Heng County, Guangxi; The Liubao Tea Culture System of Cangwu, Guangxi; The Baimao Tea Culture System of Babu Kaishan, Guangxi

Table 1. *Cont.*

Province	Sample Name
Sichuan	Sichuan Famous Mountain Mengding Camellia Culture System; Sichuan Chongzhou Loquat Tea Culture System; Sichuan Qionglai Huaqiao Tea Culture System; Sichuan Beichuan Taizi Tea Culture System; Sichuan Yucheng Tibetan Tea Culture System
Yunnan	Yunnan Mangshi De'ang Sour Tea Culture System; Yunnan Pu'er Ancient Tea Garden and Tea Culture System; Yunnan Shuangjiang Mengku Ancient Tea Garden and Tea Culture System
Guizhou	Guizhou Puding Duobei Tea Culture System; Guizhou Huaxi Ancient Tea Tree and Tea Culture System
Jiangsu	Jiangsu Wuzhong Biluochun Tea Fruit Composite System
Guangdong	Guangdong Chao'an Phoenix Dancong Tea Culture System

3.3. Measurement and Calibration

Guided by symbiosis theory, this study selected and assigned values to variables to achieve diverse settings of antecedent conditions and outcome variables. The proposed antecedent conditions for elucidating the sustainable development of tea agricultural heritage systems included ecological protection performance, research resource allocation, regional driving capability, industrial comprehensive strength, tea culture inheritance, and heritage site development level. More precisely, the empirical data for these variables served as the basis for conducting fuzzy-set qualitative comparison analysis.

3.3.1. Outcome Variables

To ensure the long-term viability of tea agricultural heritage systems, this study sets out the criteria for evaluating their sustainability: "whether it is officially recognised as China's Nationally Important agricultural heritage systems(NIAHS); whether it has received the ecological low-carbon tea certification; and whether it has achieved consistent development and standardisation across the whole industry chain". These indicators were chosen based on the following rationale:

An essential consideration is whether the tea agricultural heritage systems have been formally recognized as China's nationally important agricultural heritage systems (NIAHS). This designation signifies a substantial level of historical, cultural, and ecological significance. This recognition not only indicates its importance at the national level but also implies that tea agricultural heritage systems must be prioritized for safeguarding and promoting environmental sustainability. At the national level, recognition often involves the endorsement of policies and the provision of resources, which are crucial for promoting the sustainable development of tea agricultural heritage systems. Furthermore, it is crucial to ascertain whether the tea has acquired the ecological low-carbon certification, as this certification validates the extent of environmental conservation applied throughout the production process. Such certification ensures that the industrial procedures related to tea agricultural heritage systems adhere to environmental protection standards and reduce negative impacts on the environment. Consequently, this enhances the attractiveness and long-term economic sustainability of tea agricultural heritage systems. Finally, the fundamental inquiry is whether it has achieved consistent progress across the whole industrial chain, including all stages from tea growing, processing, packaging, and sales to consumption. The implementation of standardized development across the whole industry chain ensures that each stage conforms to sustainable development criteria. A standardized industry chain improves production efficiency, ensures product quality, and promotes the prudent utilization of resources, which are crucial for safeguarding the economic benefits and sustainable development of tea agricultural heritage systems.

A comprehensive analysis from multiple perspectives, including the priority of cultural heritage preservation, ecological and environmental factors, and the standardization

of the industry chain, facilitates a more scientific evaluation of the operational efficiency and degree of advancement of tea agricultural heritage systems. Consequently, the establishment of these indicators not only ensures the sustainability of tea agricultural heritage systems in various aspects such as cultural protection, ecological and environmental protection, and industrial development, but also fosters long-term, healthy growth.

3.3.2. Variable Measurement

In terms of variable measurement, this paper compiles Table 2, based on the exhaustive literature review conducted in Section 2, to systematically present the critical factors influencing the sustainable development of tea agricultural heritage systems. Table 2 strictly follows the academic norms and summarizes the key factors in multiple dimensions such as ecological sustainability, socio-economic sustainability, and cultural sustainability. Specifically, ecological sustainability emphasizes ecological protection performance and scientific research resource allocation, aiming to balance economic development and environmental protection while ensuring tea quality and yield. Socio-economic sustainability focuses on regional driving capacity and industrial comprehensive strength, with the goal of promoting tea industry development and economic growth. Cultural sustainability, on the other hand, underscores the inheritance of tea culture and the development level of heritage sites, aiming to protect and transmit tea culture while facilitating local economic development. These factors comprehensively cover multiple key dimensions of sustainable development for tea agricultural heritage systems, providing an important basis for formulating scientific and reasonable protection measures and sustainable development strategies.

Table 2. Variable measurement.

Type	Variable		Measurement Standard
Outcome Variables	Sustainable Development		Whether it belongs to China's nationally important agricultural heritage systems (NIAHS); whether it passes the ecological low-carbon tea certification; and whether it achieves the standardized development of the whole industry chain construction. If the heritage site has the above three items, it is assigned a value of 1; if it has two items, it is assigned a value of 0.67; if it only has one item, it is assigned a value of 0.33; if it does not have any of them, it is assigned a value of 0.
Precedent Conditions	Ecological Sustainability	Ecological Protection Performance (EPP)	Whether to establish relevant green standards; whether to be selected as "China Beautiful Tea Mountain"; and whether the coverage rate of ecological tea gardens is more than 50%. If the heritage site has the above three items, it is assigned a value of 1; if it has two items, it is assigned a value of 0.67; if it only has one item, it is assigned a value of 0.33; if it does not have any of them, it is assigned a value of 0.
		Research Resource Allocation (RRA)	Whether the support of relevant scientific research departments has been established; whether there are new tea tree products cultivated through scientific research innovation; and whether the development of green and standardized smart tea gardens has begun. If the heritage site has the above three items, it is assigned a value of 1; if it has two items, it is assigned a value of 0.67; if it only has one item, it is assigned a value of 0.33; if it does not have any of them, it is assigned a value of 0.
	Socio-economic Sustainability	Regional Driving Capacity (RDC)	Whether the value of the brand between 2013 and 2023 is higher than the reported average; whether it attracts investment from related large-scale industries; and whether the regional economic development (comprehensive GDP) shows an increasing trend year by year. If the heritage site has the above three items, it is assigned a value of 1; if it has two items, it is assigned a value of 0.67; if it only has one item, it is assigned a value of 0.33; if it does not have any of them, it is assigned a value of 0.
		Industrial Comprehensive Strength (ICS)	Whether it is one of the main economic crops in the local area (excluding grain crops); whether a talent cooperation mechanism has been established with local universities to ensure labor force; and whether policies such as tax incentives and financing support are provided for tea-related agricultural enterprises. If the heritage site has the above three items, it is assigned a value of 1; if it has two items, it is assigned a value of 0.67; if it only has one item, it is assigned a value of 0.33; if it does not have any of them, it is assigned a value of 0.

Table 2. *Cont.*

Type	Variable		Measurement Standard
Precedent Conditions	Cultural Sustainability	Tea Culture Inheritance (TCI)	Whether relevant laws and regulations on the inheritance and protection of tea culture have been implemented; whether the number of local inheritors has been increasing year by year; and whether the local tea-making process has been rated as provincial-level or above intangible cultural heritage. If the heritage site has the above three items, it is assigned a value of 1; if it has two items, it is assigned a value of 0.67; if it only has one item, it is assigned a value of 0.33; if it does not have any of them, it is assigned a value of 0.
		Heritage Site Development Level (HDL)	Whether there are cultural activities with distinctive features; whether ecological leisure and sightseeing parks have been established; and whether themed tea culture, religion, and folk customs resources have been explored. If the heritage site has the above three items, it is assigned a value of 1; if it has two items, it is assigned a value of 0.67; if it only has one item, it is assigned a value of 0.33; if it does not have any of them, it is assigned a value of 0.

Note: The data sources for this study are as follows: A. Government website public data. Data provided by various official government websites. B. Professional reports: "China's Nationally Important agricultural heritage systems(NIAHS)", Eco-friendly and Low-carbon Tea Channel Report, "China Tea Regional Public Brand Value Assessment Report". C. First-hand interview data. Data obtained through telephone interviews. D. Statistical yearbooks: Relevant statistical data. These data sources effectively ensure the accuracy and reliability of this study.

3.3.3. Variable Calibration Explanation

In the fuzzy-set qualitative comparative analysis, each condition and outcome is treated as an independent set in which each case has an affiliation score [30]. The values allocated to qualitative textual descriptions are transformed into affiliation scores by utilizing a fuzzy set including four distinct values: 0, 0.33, 0.67, and 1. These numbers represent "totally unaffiliated", "partially unaffiliated", "partial affiliation", and "complete affiliation", respectively. Therefore, a database table including four sections was created and then imported into the FsQCA 3.0 software (FsQCA 3.0, Charles Ragin and Sean Davey, Chicago, IL, USA) for analysis.

4. Results and Analysis

4.1. Necessary Condition Analysis

From the perspective of set theory, configurational analysis aims to examine the various antecedent conditions that impact the outcome variable and to analyze whether these antecedent conditions constitute the various types of conditions for the outcome variable. In general, a consistency score greater than 0.9 indicates that an antecedent condition is a necessary condition for the outcome variable. By contrast, a consistency score ranging from 0.8 to 0.9 suggests that the antecedent condition is sufficient on its own for the outcome variable [27].

According to the data in Table 3, the levels of consistency for each antecedent condition ranged from 0.7 to 1.0. Among them, the satisfaction of two antecedent conditions exceeded the threshold of 0.9, indicating that ecological protection performance and regional driving capacity are necessary conditions to constitute the sustainable development of tea agricultural heritage systems. Therefore, the guaranteed long-term development of tea agricultural heritage systems depends on achieving a significant degree of ecological protection and regional capacity for management. The three remaining antecedent conditions provided a consistency level that exceeded the threshold of 0.7, indicating that the research resources allocation, industrial comprehensive strength, and heritage site development level are all sufficient prerequisites for the sustainable growth of tea agricultural heritage systems. These findings suggest that while these conditions are not autonomously necessary, their presence and enhancement are crucial for fostering the sustainable development of tea agricultural heritage systems.

Finally, the results of these analyses indicate that the sustainable development of tea agricultural heritage systems is not determined by a single element but rather relies on the combined effect of several antecedent configurations encompassing ecological, socio-economic, and cultural aspects. Various antecedent conditions work together to influence

the sustainable development of tea agricultural heritage systems within their respective areas, demonstrating the complexity and multidimensionality of the process.

Table 3. Necessity analysis.

Antecedent Conditions	Sustainable Development		Non-Sustainable Development	
	Consistency	Coverage	Consistency	Coverage
EPP	0.944	0.737	0.342	0.336
~EPP	0.149	0.152	0.732	0.943
RRA	0.812	0.784	0.237	0.288
~RRA	0.262	0.214	0.823	0.847
RDC	0.925	0.756	0.341	0.351
~RDC	0.206	0.198	0.763	0.928
ICS	0.793	0.794	0.251	0.318
~ICS	0.319	0.252	0.837	0.836
TCI	0.660	0.855	0.222	0.362
~TCI	0.508	0.341	0.911	0.772
HDL	0.774	0.806	0.251	0.330
~HDL	0.357	0.274	0.852	0.826

4.2. Configurational Analysis

Employing the fsQCA 3.0 software (FsQCA 3.0, Charles Ragin and Sean Davey, Chicago, IL, USA), this study conducted configuration analysis and then analyzed the truth table obtained from the data calibration results. The present study set the consistency frequency threshold at 0.8 and the case frequency threshold at 1, drawing upon operational criteria proposed in other research and considering the very small sample size [31]. The criteria have been deliberately set to ensure the accuracy and effectiveness of the analysis, using established research methodology and operational specifications. Utilizing standardized analysis, this work obtained difficult solutions, parsimonious solutions, and intermediate solutions [32]. Complex solutions provide the most comprehensive combinations of conditions; parsimonious solutions streamline these combinations while preserving their explanatory power; and intermediate solutions achieve a compromise between the complex and parsimonious solutions. To further clarify the core and peripheral conditions [33], this study analyzed parsimonious and intermediate solutions. The aim of this approach was to determine the relative importance of each previous condition in the configuration to improve the comprehension of the operational processes of the system. Having carefully assessed the consistency and coverage, this study chose to use the intermediate solution for configurational analysis to provide the most clarifying results. This choice enabled the analysis of the complex causal relationships in the sustainable development of tea agricultural heritage systems and enhanced our understanding of the key factors that contribute to its sustainability. The relevant data are shown in Table 4.

4.2.1. Antecedent Configurations Leading to Sustainable Development

1. Dual-cycle Drive: The dual-cycle driven configuration, corresponding to H1 in Table 4, features ecological protection performance, scientific research resource allocation, regional driving capacity, and industrial comprehensive strength as core conditions, while tea culture inheritance and heritage site development level have relatively minor impacts on the final outcome, rendering them non-essential variables. Within this configuration framework, ecological sustainability and socio-economic sustainability exhibit mutually beneficial coexistence, jointly playing a pivotal driving role in promoting the sustainable development of tea agricultural heritage systems. According to rigorous analytical results, this dual-cycle driven pathway can explain about 68.0% of the sustainable development cases of tea agricultural heritage systems, with about 22.8% of these cases only explainable through this specific pathway. This finding robustly demonstrates the dominance of the dual-cycle driven pathway in advancing the sustainable development of tea agricultural

heritage systems, where the combined effects of its core conditions play a crucial role in elucidating related cases. This pathway emphasizes the synergetic advancement of ecological protection and socio-economic development, which is in line with the basic principles of sustainable development and provides a robust support for the long-term stable development of tea agricultural heritage systems.

Table 4. Configuration analysis results.

Antecedent Conditions	Sustainable Development				Non-Sustainable Development	
	H1	H2	H3	H4	NH1	NH2
EPP	★	★	★	★		◎
RRA	★	◎	★	★	○	○
RDC	★	★	★		◎	
ICS	★			★	○	○
TCI		◎	•	•	◎	◎
HDL		★	★	★	○	○
Primary coverage	0.680	0.132	0.509	0.471	0.645	0.584
Net coverage	0.228	0.076	0.057	0.019	0.105	0.045
Consistency	0.924	1.000	1.000	1.000	1.000	0.952
Consistency of solution	0.832				0.689	
Coverage of solution	0.937				0.959	

NOTE: ★ Indicates that the corresponding variable exists in the corresponding configuration as a core condition, ○ indicates that the corresponding variable is missing in the configuration as a core condition, • indicates that the corresponding variable exists in the corresponding configuration as a peripheral condition, ◎ indicates that the corresponding variable is missing in the configuration as a peripheral condition; blank indicates that the conditional variable is irrelevant to the result.

2. Total-Factor Drive: The total-factor driven configuration corresponds to H2, H3, and H4 as indicated in Table 4 and embodies the seamless incorporation of ecological, socio-economic, and cultural principles.

H2 signifies a configuration where ecological protection performance, regional driving capacity, and heritage site development level exist as core conditions, while scientific research resource allocation and tea culture inheritance are present as peripheral conditions, and industrial comprehensive strength is deemed irrelevant to the outcome. Under such a configuration, the sustainable development of tea agricultural heritage systems can still be achieved. This pathway can explain about 13.2% of sustainable development cases, with about 7.6% of these cases uniquely explainable only through this pathway. This indicates that even with incomplete conditions, ecological protection and regional development can effectively drive sustainable development.

H3 represents a sustainable development path where ecological protection performance, scientific research resource allocation, regional driving capacity, and heritage site development level are core conditions, tea culture inheritance is a peripheral condition, and industrial comprehensive strength remains irrelevant to the outcome. This path elucidates about 50.9% of sustainable development cases, with approximately 5.7% of these cases explainable only through this path. This demonstrates that sustainable development is significantly promoted under the combined influence of all key factors.

H4 is similar to H3 but swaps the positions of regional driving capacity and industrial comprehensive strength in the H3 configuration. This path accounts for about 47.1% of sustainable development cases, with around 1.9% of these cases uniquely explainable only through this path. This path emphasizes the crucial role of industrial comprehensive strength in achieving sustainable development.

In summary, the total-factor driven configuration is grounded in sustainable development theory, which emphasizes the coordinated development of economy, society, and environment. This theory advocates balancing social and environmental needs while pursuing economic growth, avoiding the sole pursuit of economic interests at the expense

of environmental and social sustainability. Its ultimate goal is to achieve harmonious coexistence among economy, society, and environment.

Configurational Analysis: According to the data in Table 4, this work used configurational analysis to reveal the complex pathways for the sustainable development of tea agricultural heritage systems. More precisely, the consistency of the intermediate solution in meeting sustainable development requirements was 0.832, and its solution coverage was 0.937. Thus, it is evident that the constructed analytical framework possesses high parsing ability, which is in line with the defined criteria for qualitative comparative analysis in the domains of organization and management. In addition, the analysis uncovered four configurational pathways, all of which demonstrated a consistency greater than 1.000, indicating that all of these combinations of antecedent conditions are sufficient conditions for the sustainable development of tea agricultural heritage systems. The primary coverage rates for each pathway consistently surpassed the net coverage rates, therefore providing confirmation of the existence of multiple causal pathways. The operational role of a certain condition varies among the four configuration routes, and the magnitude of influence of different circumstances within the same route also varies. The results indicate that the attainment of the sustainable development of tea agricultural heritage systems is supported by the interaction of several antecedent conditions, which in turn reflect the impact of different components on the paths towards sustainability. Furthermore, it suggests that the sustainable development of tea agricultural heritage systems depends on specific stages and needs. To attain the sustainable development of tea agricultural heritage systems, it is imperative to adjust and enhance the combinations of antecedent conditions at every level and in all environments, considering specific circumstances. Conclusively, this study illustrates that the sustainable development of tea agricultural heritage systems is shaped by the combination of several core conditions and unique combinations of antecedent conditions. The impact of these conditions varies across different environmental and developmental stages, requiring flexible adjustments appropriate to specific conditions to ensure the long-lasting sustainable development of tea agricultural heritage systems.

4.2.2. Antecedent Configurations Leading to Non-Sustainable Development

The antecedent configurations of non-sustainable development are NH1 and NH2, which refer to the emergence of non-sustainable development configurations when ecological protection performance or regional driving capacity does not exist, and when there is a lack of sufficient conditions to lead to sustainable development. This study conducted a thorough examination of non-sustainable development, elucidating two separate configurations. The findings provide evidence that the formation of non-sustainable development is not merely the result of a reverse derivation of the conditions for sustainable development. The asymmetry between sustainable and non-sustainable development is sufficiently significant that the mere reversal of the conditions of sustainable development does not fully explain non-sustainable development. This asymmetry reveals that, in constructing effective sustainable development pathways, special attention must be paid to which lack of conditions leads to the failure of sustainable development. Concisely, the configurational analysis of this study illustrates that ecological preservation performance and regional driving capacity are essential conditions for achieving the sustainable development of tea agricultural heritage systems, the absence of which can significantly hinder sustainable development. This further implies that promoting the sustainable development of tea agricultural heritage systems requires comprehensive consideration of these core conditions and effective measures for targeted protection and improvement.

4.3. Robustness Test

The current study utilizes the robustness testing approach in qualitative comparison analysis, as suggested by Du Yunzhou et al. [27]. The consistency threshold is raised from 0.8 to 0.85 and 0.90 while keeping all other parameters unchanged. The present methodology employs further tests to assess the stability of the configuration pathways.

The results suggest that the configuration procedures for the sustainable development of tea agricultural heritage systems have not been modified, and the degrees of regularity and comprehensiveness of the solutions have also remained unchanged. The results indicate that even when stricter threshold requirements are implemented, the configuration routes established remain feasible, therefore validating the robustness of this study's conclusions. The relevant data are shown in Table 5.

Table 5. Robustness test.

Model	Analysis Threshold	Configuration	EPP	TRR	RDC	CIS	TCC	HDL	Configuration Subset Relationship
Increase consistency threshold	1/0.85	W1	★	★	★	★			Same as H1
		W2	★	◎	★		◎	★	Same as H2
		W3	★	★	★		•	★	Same as H3
		W4	★	★		★	•	★	Same as H4
Increase consistency threshold	1/0.90	V1	★	★	★	★			Same as H1
		V2	★	◎	★		◎	★	Same as H2
		V3	★	★	★		•	★	Same as H3
		V4	★	★		★	•	★	Same as H4

NOTE: ★ Indicates that the corresponding variable exists in the corresponding configuration as a core condition, ○ indicates that the corresponding variable is missing in the configuration as a core condition, • indicates that the corresponding variable exists in the corresponding configuration as a peripheral condition, ◎ indicates that the corresponding variable is missing in the configuration as a peripheral condition, blank indicates that the conditional variable is irrelevant to the result.

5. Discussion

This study delves deeply into the issue of the sustainable development of tea agricultural heritage systems, primarily identifying multiple key antecedent conditions such as ecological protection performance, allocation of scientific research resources, regional driving capacity, comprehensive industrial strength, inheritance of tea culture, and development level of heritage sites. It also clarifies their significant impacts on sustainable development. A review of previous research reveals that while scholars such as Haisong Guo, Chen Fuqiao, Min Qingwen, and MIN Qingwen have emphasized the importance of these conditions from different perspectives [34–37], and Wang Z et al. have highlighted the core status of ecological protection [19], none of these studies have fully demonstrated the complex interactions among these conditions and their comprehensive effects on sustainable development.

To address this gap, this study innovatively adopts the fsQCA method to comprehensively analyze the aforementioned antecedent conditions from multiple dimensions. This method not only further confirms the core status of ecological protection and cultural inheritance but also, through more refined analytical means, deepens the explorations of domestic scholars such as Xu Songling and Min Qingwen in areas such as the balance between protection and utilization of cultural heritage and the value assessment of agricultural heritage systems [38–40]. Compared with qualitative analysis and coupling coordination models, this study not only quantitatively analyzes the intricate interactions among antecedent conditions but also explores different configurational paths for the sustainable development of tea agricultural heritage systems.

Furthermore, this study conducts an in-depth analysis of the impact of regional, type, and developmental stage differences on the sustainable development of tea agricultural heritage systems. Through cross-regional and cross-type comprehensive analysis, it verifies the importance of these differences and reveals their interactions with other antecedent conditions, jointly shaping the sustainable development path of heritage sites. This finding addresses the limitations of previous studies, particularly when compared with research by INAGAKI Hidehiro et al. that focused on specific localized areas, providing a more systematic and comprehensive analysis [41].

However, this study also has its limitations and deficiencies. Firstly, due to data availability constraints, the sample size is relatively small, currently at 40. Future research can follow up on the progress of tea agricultural heritage systems selections to increase the sample size as much as possible, thereby enhancing the robustness and universality of the results. Secondly, this study does not fully consider the dynamic changes in tea agricultural heritage systems across different time periods and future developments. Future research can introduce time-series data and dynamic models for in-depth analysis. Thirdly, this study faces challenges in measuring cultural factors. This study currently uses "inheritance of tea culture" and "development level of heritage sites" to measure cultural sustainability. Future research can explore more scientific and comprehensive evaluation dimensions.

In summary, this study advances the discourse on the sustainable development of tea agricultural heritage systems, enriching theoretical research findings and providing valuable guidance for practice. Compared with existing research, this study not only emphasizes the core status of ecological protection and cultural inheritance but also, through the application of the fsQCA method, reveals the complex interactions among antecedent conditions and the configurational pathways for achieving sustainable development. Future research should deepen the understanding of the dynamic changes in heritage sites, optimize the measurement standards for cultural factors, and expand the sample scope to drive research on the sustainable development of tea agricultural heritage systems towards a broader and deeper direction, while continuing to maintain the forward-looking and original nature of the research.

6. Conclusions

This study employs symbiosis theory and fuzzy-set qualitative comparative analysis (fsQCA) to conduct an in-depth exploration of the multifaceted antecedent conditions and complex mechanisms underlying the sustainable development of tea agricultural heritage systems. The findings reveal that factors such as ecological protection performance, regional driving capacity, allocation of scientific research resources, comprehensive industrial strength, inheritance of tea culture, and the level of heritage site development exhibit significant interactive effects and variability within diverse configurational paths, collectively contributing to the sustainable development of tea agricultural heritage systems. The key findings and recommendations are as follows:

The foundational roles of ecological protection performance and regional driving capacity are prominent. Ecological protection not only pertains to the preservation of the natural environment and the continuation of traditional agricultural practices but also provides a stable foundation for the inheritance of tea culture. The enhancement of regional driving capacity effectively promotes the aggregation and upgrading of the tea industry, significantly bolstering the economic vitality and social influence of cultural heritage sites. Therefore, policymakers should continue to strengthen ecological protection measures to ensure the proper protection of the natural environment in tea agricultural heritage sites. Additionally, by supporting policies and increasing financial investments, regional driving capacity should be enhanced to foster the aggregation and upgrading of the tea industry.

The allocation of scientific research resources, comprehensive industrial strength, and the level of heritage site development serve as essential conditions for the sustainable development of tea agricultural heritage systems, playing an irreplaceable role. Effective allocation of scientific research resources provides robust support for technological innovation and industrial upgrading; the enhancement of comprehensive industrial strength notably boosts the competitiveness and profitability of the tea industry; and the elevation of heritage site development levels facilitates the deeper exploration of the cultural value of heritage, enhancing the reputation and prestige of these sites. Governments should increase support for research projects related to tea agricultural heritage sites, encouraging technological innovation and industrial upgrading. Concurrently, they should promote the integration and upgrading of the tea industry, enhance comprehensive industrial strength, and strengthen the development and protection of heritage sites to fully explore their underlying values.

Through configurational analysis, this study unveils multiple pathways for the sustainable development of tea agricultural heritage systems, including dual-cycle driven configurations and total-factor driven configurations. These configurations emphasize the harmonious symbiosis between ecological sustainability and socio-economic sustainability, as well as the comprehensive synergies among ecological, socio-economic, and cultural dimensions. Policymakers should fully consider multidimensional pathways for the sustainable development of tea agricultural heritage systems and formulate comprehensive policy measures. Moreover, collaboration among governments, research institutions, enterprises, and communities should be encouraged to jointly advance ecological protection, cultural inheritance, optimization of resource allocation, and enhancement of regional driving capacity.

Furthermore, this study highlights the antecedent configurations leading to non-sustainable development, emphasizing the severe impediments posed by the absence of ecological protection performance and regional driving capacity to sustainable development. Policymakers should prioritize the core positions of ecological protection performance and regional driving capacity in sustainable development, avoiding the failure of sustainable development due to the lack of these conditions. Monitoring and early-warning mechanisms for non-sustainable development pathways should be strengthened, with timely measures taken to prevent their occurrence.

In terms of policy and practical implications, policymakers should prioritize the importance of sustainable development of tea agricultural heritage systems and adopt comprehensive measures to ensure equal emphasis on the protection and development of cultural heritage. Cooperation among governments, research institutions, enterprises, and communities should be enhanced to jointly advance ecological protection, cultural inheritance, optimization of resource allocation, and enhancement of the regional driving capacity. The implementation of these measures will provide a solid foundation for the protection and development of tea agricultural heritage systems, revitalizing them in the context of the new era and achieving the harmonious unity of economic, social, and cultural benefits. Additionally, the findings of this study offer valuable insights for the protection of other types of agricultural heritage systems. Policymakers should actively incorporate relevant research outcomes into concrete policy measures and practical actions.

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