

Theoretical Framework of Agricultural Scientific and Technological Competitiveness

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Abstract. In the very paper we introduce the brief review about the study of the agricultural scientific and technological competitiveness in China. For constructing the theoretical framework, we provide a logical model and a process model to explain the origin and the formation of agricultural scientific and technological competitiveness. Based on the above related research, we propose new definition and research perspectives of the agricultural scientific and technological competitiveness.

1. Introduction

In 2012 the central government of China announced the No. 1 Central Document ‘Suggestions about the Stimulation of the Agricultural Scientific and technological Innovation for Guaranteeing the Agricultural Products’ Supply’, which pointed out that the sustainable agricultural development and the efficient supply of agricultural products depended on the technological innovation; the science and technology was the basis of the state food security and the rational employment of natural resources; in the process developing Chinese agriculture the science and technology possessed following characteristics, such as publicity, fundamentality, and sociality [1]. At the period from the Eleventh Five-Year Plan to the Twelfth Five-Year Plan, the Chinese agricultural policies focused on the agricultural modernisation. Because of the historical background, since 2012 in Chinese academia the agricultural scientific and technological competitiveness, as simply ASTC, has become the highlight of the scientific research.

2. The Brief Review of Agricultural Scientific and Technological Competitiveness in China

In 1989 PRCSRES (The People’s Republic of China State Commission for Restructuring the Economic System) contacted with WEF (World Economic Forum) and IMD (International Institute for Management Development) first time. In 2010 the School of Economics of Fudan University published ‘World Competitiveness 2009-2010’. From the PRCSRES’s first attempt contacting with WEF and IMD to the publication ‘World Competitiveness 2009-2010’ is about 20 years. During the very 20 years, there was argue, precipitation and innovation about the Competitiveness Theory in Chinese academia. Since the Chinese participation in WTO the competitiveness has suddenly become a research highlight, numerous research organizations have focused on the competitiveness evaluating methods and system; but synchronously the theoretical framework of the competitiveness is not valued. Based on the academic experiences, the latest economic theory evolves from the existed theories. By collating the existed literature, we found out that in China the earliest description of the terminology ‘Competitiveness’ appeared in Dixin Xu’s ‘Political Economy Dictionary (1980 version)’: the typical economic characteristic of the pre-monopoly capitalism is the free competition. At the stage, the capital flows among the enterprises and economic sectors freely. The competition forces the capitalists to promote the technology, to raise the productivity, to exploit labours, and finally, to enhance the competitiveness [2].

In 2011 MSTPRC (Ministry of Scientific and technological of the People’s Republic China) announced ‘National Twelfth Five-Year Scientific and Technological Development Plan’, in the very plan MSTPRC emphasised that China should enhance the competitiveness by strengthening independent innovation [3]. As the primary sector of the economy, the agriculture plays an important

role in guaranteeing the efficient supply of agricultural products, and finally, in the stabilising the Chinese economic reform. Meanwhile, the modern agriculture is a complicated system, also requires the interdisciplinary research. As an important part of the modern agriculture, the ASTC obtains the theoretical and practical significance. By calculating the common rules of various subjects and processes mathematically, and discovering the similarity of the common rules theoretically, therefore, it is possible to make a more profound and universal concept [4]. By collecting, analysing and summarising the existed foreign and domestic related literature about Competitiveness Theory, the author tries to enrich the research methods and perspectives to study the ASTC based on the Chinese agricultural conditions, and in the future research the author will try to construct a more logical evaluation system of the ASTC, subsequently, will help the agrarian practitioners with optimizing the competitive environment and reducing the unfair competitions. The ASTC theory may be employed by three groups, such as the policy makers, the agricultural enterprises, including co-operatives, and the researchers. With the help of the ASTC theory and its derivative evaluating tools, the policy makers could assess a region's developmental level of the agricultural science and technology, evaluate the economic performance of RD projects and the related supporting policy, correspondingly amend and make the predictive supporting policy. With the assistance of the ASTC theory, by promoting the agricultural science and technology, the agricultural enterprises can make more rational marketing and investing strategies, which provide the core competitiveness to improve the efficient production management and profitable commercial operations. The very research is a beneficial addition for the Competitiveness Theory, and more than this, also provides new methods and perspectives.

3. The Hypothetical Definition of Competitiveness

Nowadays the terminology 'Competitiveness' is abused and even overused not just in the academia, but generally in all fields. There is still a sharp argument about the Competitiveness Theory. Nowadays in Chinese academia there are various research perspectives about Competitiveness, such as national competitiveness, regional competitiveness, industrial competitiveness, technological competitiveness, enterprise competitiveness, products competitiveness, and service competitiveness. The scholars always try to extend the borders of the study of Competitiveness. By collecting literature, we analyse the existed publications about Competitiveness Theory, and then found out that the above-mentioned research perspectives were not separated, among them there was an important logical connection. By processing the very connections between various materials and works, we make a logical model to explain the ASTC's origin (Fig. 1).

Although Competitiveness emerges various characteristics from different perspectives, the definition of Competitiveness is the ruler to define its all subsets. So the research of the ASTC should start with defining 'Competitiveness'. The generally accepted definition of Competitiveness is a competitor's performance in the competitive activity, in another words, is the ability to utilise competitive resources rationally and efficiently. According to the classical economic theory, Competitiveness is compounded of the macroscopic definition and the microscope definition. In recent years the academia reaches a consensus about the macroscopic definition of Competitiveness: Competitiveness is an economic tool, obtains the theory and the evaluation system, and is employed by a government or an enterprise to allocate the resources in harmony, in order to get a country's prosperity or an enterprise's profitability. Concerning the microscopic definition of Competitiveness there is still an argument; the economists have totally different definitions. Among them, in M. E. Porter's opinion, Competitiveness is the national productivity; in IMD's opinion, Competitiveness is not just about the productivity, but also refers to economic performance, government efficiency, business efficiency, and infrastructure. M. E. Porter's and IMD's opinions, which explain the formative factors of Competitiveness, are very important for Competitiveness Theory. Meanwhile, it is seemed that the above-mentioned scholar and organisation do not pay sufficient attention to the formative process of Competitiveness.

In the very paper, based on the study of the literature of Competitiveness Theory, it is necessary to start the study of the formative process of Competitiveness, as it is unheeded in the existed Competitiveness Theory. The Competitiveness formative process is consisted of 4 stages: competitive target, competitive decision, competitive efficiency, and competitive resources. According to the general principles of subjects' developing process, the 4 stages form a self-perpetuating cycle to generate the competitiveness ceaselessly. Competitive target is the 1st stage to form the competitiveness, which defines the subject of the competitiveness and the origin of the competitors. In the macroeconomic perspective, Country is a subject of the competitiveness, which sets the competitive target according to its economic and the social conditions. For example, a LDC (less developed country) is eager to supply citizens with foods and residences primarily; a developed country gives priority to the education and environmental protection instead. In the micro-economic perspective, an enterprise always sets the competitive target – chasing the maximum profits. Competitive decision is the 2nd stage to form the competitiveness. A country or an enterprise gains the competitiveness by making the most favourable decision. This is the reason why the strategic decision exists as a serious systemic science. The 3rd stage of the competitiveness's formation is competitive efficiency. If all competitors compete in absolutely same conditions, the efficiency will become the most important factor to influence in the winning and losing critically. In the management science the competitive efficiency is an important part, which determines the next stage of competitiveness. The final stage to form the competitiveness is competitive resources. In the very stage a country or an enterprise distributes and employs the resources to accomplish the established competitive target. Here the competitive resources are not only the natural resources, but also supporting policies, infrastructure, education, business environment, even culture and traditions. When a competitive target is accomplished, the competitor will evaluate the competitiveness's formation, and then sets a new competitive target to employ the limited resource more rationally by amending the competitive decisions and improving the competitive efficiency. By the empirical analysis of the 4 stages of the competitiveness's formation, we can define Competitiveness: for accomplishing the competitive target, a competitor makes the competitive decision to win the competition, by distributing and employing the competitive resources rationally.

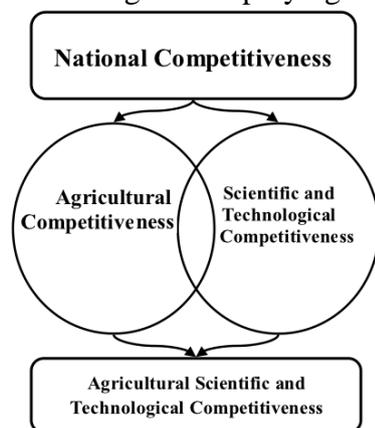


Fig. 1 Logical Model of Agricultural Scientific and Technological Competitiveness

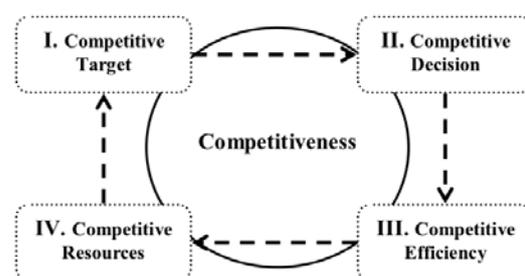


Fig. 2 Process Model of the Competitiveness's Formation

4. The Logical Relations between ASTC and National Competitiveness, Agricultural Competitiveness, Scientific and Technological Competitiveness

4.1 The Logical Relations between National Competitiveness, Agricultural Competitiveness, Scientific and Technological Competitiveness

In the Figure 1 we summarise the logical model of the ASTC, also deduce the origin of the ASTC, it means that the national competitiveness is formed by the industrial competitiveness, including agricultural competitiveness, and scientific and technological competitiveness, and the ASTC is a mixture of the agricultural competitiveness and scientific and technological competitiveness.

National competitiveness was the highlight in the research field of Competitiveness Theory. In the last decade the leading research institutions like IMD and WEF have founded the theoretical basis of national competitiveness. According to the related literature, we notice that the national competitiveness theory is evolving, as IMD's definitions of national competitiveness are totally different on different periods. In 1996 IMD held that the subject of the national competitiveness is a country. But in IMD's publication of 2008 'Top Class Competitors: How Nations, Firms and Individuals Succeed in the New World of Competitiveness' defined that the subject of the national competitiveness was enterprises, instead the country was the policy environment maker. Nowadays IMD and WEF have stopped arguing about the question 'Who makes the competitiveness?' In the academia the definition of Competitiveness has been confirmed as 'the enterprises are the maker of the competitiveness; the country can not generate the competitiveness, but it provides the policy environment to stimulate the competitiveness.' But in our opinion the terminology 'Country' is not very clear in the very definition of the national competitiveness, as the terminology 'Country' is the government exactly. So here we propose a definition of the national competitiveness as 'the national competitiveness is a kind of ability to make the prosperity, a country distributes and employs all resources efficiently by means of making the legislation and policy to win the global competition.'

In the Figure 1, we can distinguish the subjects of competitiveness: the subject of the national competitiveness is a country; the subject of the agricultural competitiveness is agricultural economic organisations and individual farmers; the subject of the scientific and technological competitiveness is enterprises and RD organisations. Among the above subjects the agricultural competitiveness and the scientific and technological competitiveness has the equal and parallel status, but obviously the national competitiveness is on higher level. In the Figure 2, it is not difficult to find out that the agricultural competitiveness and the scientific and technological competitiveness serve the national competitiveness's target, whose enhancement is influenced critically by a country's competitive decision, whose development also increases a country's competitive efficiency, that gain the competitive resources from the country.

4.2 The Logical Relations between the ASTC, Agricultural Competitiveness, Scientific and Technological Competitiveness

In the academia lots of scholars insist that the ASTC is belong to the scientific and technological competitiveness. According to our study, as in the Figure 1, we think that the ASTC should be the common subset of the agricultural competitiveness and scientific and technological competitiveness, because the ASTC possesses the basic factors of the scientific and technological competitiveness, also obtains the sub-target of the agricultural competitiveness, and similarly is influenced by the agricultural competitive decision. At the moment there are not plenty of research works about the ASTC, so the authoritative definition about ASTC does not exist. The Chinese scholar Jiali Chen makes the definition about the ASTC as 'a country's ASTC, or a region's ASTC is the scientific achievement and potential of the agricultural development by means of scientific research, technological innovation and transfer, and RD commercialisation, meanwhile, reflects the contribution and promotion of the science and technology in agriculture and the social substantial development [5]. In our opinion, in the very definition the subject of the ASTC is absent, and its target, decision, efficiency and resources are also missing as well. The subject of the agricultural science and technology is a person or an organisation on the certain historical and social stage, which obtains the professional knowledge, skills and experiences to make scientific research, technological innovation, and the employment and practice of the science and technology [6]. So we hold that the subject of the ASTC is all kinds of agricultural enterprises, rural co-operatives, individual farmers and certain RD and educational organisations. All above-mentioned subjects obtain one common target – to enhance the ASTC, but their sub-targets are different, as they are various markets participants. With one common target and various sub-targets, the subjects either chase the maximum profits or develop the domestic agriculture. Various subjects of the ASTC make totally different decisions, e.g. an agricultural enterprise, or a rural co-operative, after setting the competitive target, makes the competitive decision caring about the RD commercialisation, input-output ratio, in brief, all factors related with profits and application, but a research organisation makes another competitive decision,

focusing of the scientific research, technological innovation and theoretical breakthrough. The ASTC's competitive efficiency depends on the professional and comprehensive staff of a subject, who guarantees the efficient output, also depends on the professional training and education provided by the universities and research institutions. The competitive resources, as mentioned above, concern not only the natural resources, but also the soft resources, such as the supporting policies, environment, education, training, commercial finance, humanity, traditions and etc.. According to the preliminary study, we try to summarize the definition of the ASTC as 'the ASTC is the ability, that a competitor enhances the science and technology to develop a country's agriculture, meanwhile, increases the profitability of all kinds of agricultural enterprises and individual farmers, by making the competitive decision about agricultural science and technology, efficiently distributes and employs all scientific and technological resources, practises the agricultural science and technology, strengthens the servicing functions of agricultural science and technology, finally wins the competition of the agricultural science and technology.

5. Conclusions

In the very paper we discuss about the ASTC's theoretical framework. By studying and analysing the literature related with Competitiveness Theory, we make a logical model to explain the origin of the ASTC, also makes a process model to illustrate the competitiveness's formation. With the help of the above-mentioned innovative models, we clarify that the ASTC originates in the mixture of the agricultural competitiveness and the scientific and technological competitiveness, but does not only originates in the scientific and technological competitiveness, or in the agricultural competitiveness. By adjusting the relations between the ASTC, agricultural competitiveness, and scientific and technological competitiveness, we propose a new definition about the ASTC.

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