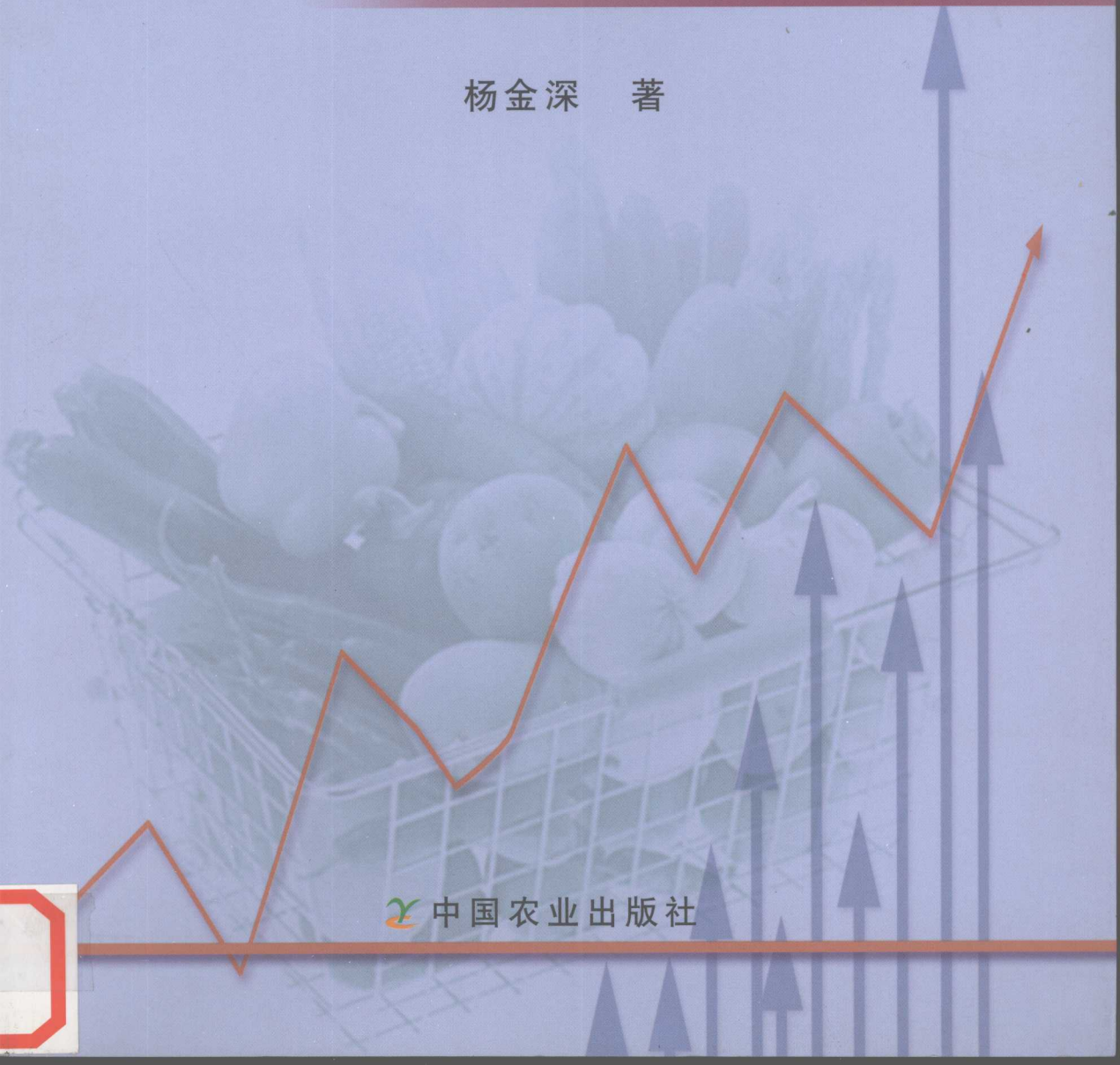



ECONOMIC STUDIES ON THE PRODUCTION AND CONSUMPTION OF SAFE VEGETABLES

安全蔬菜生产与消费的 经济学研究

杨金深 著



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杨金深 男，1964年生于河北省献县。1979年考入河北农业大学农学专业，1983年毕业并获学士学位；同年8月至1987年1月先后在承德、沧州农业研究所工作；1987年2月调入河北省农林科学院工作；1996—1997年赴加拿大农业与食品部列桥研究中心进修农业经济；1999年7月获中国农业大学农学硕士学位；2002年考取中国人民大学计划内在职博士研究生，2005年6月获该校管理学博士学位。2002年任河北省农林科学院副院长，研究员，现兼任河北省耕作学会理事长、河北农业大学兼职教授、硕士生导师。

先后从事农学研究、经济研究、科研管理、企业管理、基建管理、国资管理、外事管理、财务管理、后勤管理等。取得8项科研成果；主编、副主编、翻译、主译著作5部，发表学术论文60余篇；参加国家科技部《中国农业科学技术政策》及省内有关法规、政策、规划制定，各类文字著述累计200万字以上；领办创办了河北科润农业技术有限公司。目前主持财政部、河北省财政厅、科技厅资助的科研与产业化项目及省博士基金课题4项。

早春開懷納晨風
拓荒耕耘花更紅
立志容易矢志難
科技險峰勇者登

為祝賀楊金深博士論文發表而作

二〇〇五年八月二十九日

趙鐵練

(題詞作者為河北省政協副主席趙鐵練)

序

食品安全实质上是食品质量问题。随着现代农业的发展和农业投入品的广泛应用，食品安全问题日益被全世界所普遍关注。欧美澳等发达国家率先兴起和日益发展的有机农业，为提高食品质量开辟了新路径。我国党和政府十分重视食品安全和人民身体健康，并致力于解决与之相关的技术、经济和制度问题。1990年，国务院批复全国农垦系统倡导发展绿色食品产业，2001年农业部开始在全国实施“无公害食品行动计划”。

无论是国外兴起的有机食品，还是我国倡导发展的绿色食品和无公害食品，都以技术进步为基点。但是，一个产业的发展不仅是个技术问题，更重要的是一个经济问题。我国的安全食品产业尚处于起步阶段，产业内部还存在着许多深层次的矛盾，产业发展的经济社会环境还不够理想，技术供给、要素配置、市场体系、法律制度等方面还存在欠缺。因此，从经济学角度研究安全食品发展的客观规律，更能把握产业经济的实质。“技术上的先进性与经济上的可行性统一”，这是作者研究这一问题的基本立论。广而言之，这也是任何产业成长壮大的客观依据。

当前，我国经济整体上正处于转型期。安全蔬菜作为新型产业，能否快速发展，取决于其内在的经济规律，最终取决于人的利益、价值和选择。以生产者和消费者作为这个产业体系中最基本的“经济人”，研究他们的价值取向、行为选择及其对产业的影响，从而实事求是地反映客观经济规律，是作者在研究立意上的科学之处，也是本书的特点之一。

转型经济除了遵循基本的经济规律以外，更注重现代经济要素，

这正如作者论述的那样——包括了管理体制、法律制度、道德伦理和文化意识，实际上这已触及到生产关系的较深层面。本书专辟一章研究管理体制问题，揭示制度、文化等现代经济要素对产业发展的深刻影响，不仅对于安全蔬菜产业，而且对于研究其它产业问题和深化体制改革也有启示意义。

当我们走进经济生活的深层时，发现实践远比我们掌握的理论 and 知识丰富得多。本书运用大量的调查数据进行实证研究。无公害蔬菜与常规蔬菜相比，成本结构、成本收益、生产决策、价格变动以及如何影响市场效率，又如何反作用于生产消费过程，有哪些制度要求等，所有这些都体现了在大量实证分析基础上的客观判断。

这本书的作者杨金深同志是河北省农林科学院副院长。2002年，他通过公开选拔，走上了副厅级领导岗位，同年他考取了中国人民大学计划内在职博士研究生。领导干部在职攻读学位，是建设学习型社会的组成部分。杨金深同志坚定地走了一条务实、理性的求学之路，从这本书——也是他的博士学位论文中，我们不难感受到他的勤奋和严谨。

宋恩华

二〇〇五年九月八日

(本书作者为河北省人民政府副省长宋恩华)

Economic Studies on the Production and Consumption of Safe Vegetables

Abstract

Since the mid-1990s, vegetables have been taking more and more important place in the food structure, with the ending of the short supply of basic agricultural products and the improvement of the national economy and the public living standard in China. As a big power for vegetable production and consumption, China is laying more influence than before on the world vegetable industry. But the speeding up of the agricultural modernization, especially the great input of the fossil energy in agricultural production and the discharge of wastes to the environment, has made the quality of agricultural products including vegetables a public concern in the world. The overuse of chemical fertilizer and pesticides and the contamination from irrigation water have resulted in the quality decline of the vegetables and the environment problems such as soil secondary salinization and contaminants accumulation as well.

Safe food is the general term for organic food, green food and pollution-free food widely used in and out of China, which, taking the insurance of food safety and the protection of ecological environment as target, has specific product quality standards and technical regulations, and implements logo management system. Accordingly, safe vegetable is the general term for organic vegetable, green vegetable and pollution-free vegetable. During the developing course of

the safe vegetable industry, a series of quality standards and technical regulations of organic vegetable have been formed based on ISO9000 and ISO14000 internationally, while China has also established a series of standards for green vegetable and pollution-free vegetable including standards for production environment, factor inputs, technical regulations and product quality, which have applied on the practice. However, the development of safe vegetable industry is more an economic issue than a technical one. The technical progress and the economic feasibility are the objective basis for the existence and development of safe vegetable industry. Therefore, making theoretical and empirical study on the production and consumption from the economic point of view, seeking for its inner economic rules of the new industry, explaining the current situation and problems of China's safe vegetable industry, and further more, proposing policy suggestions for promoting the sound development of the industry, have great importance in upgrading the safe vegetable production and public health, and promoting agricultural efficiency and farmers' income.

Based on the characters of safe vegetable industry, this paper studied cost-benefit and consumption willingness to explore the behavior of producers and consumers; studied the inner economic rule followed in safe vegetable market through price analysis. Besides, institutional and cultural effects on industrial efficiency and the necessity of government interference were also studied with the help of extended research in management system and ideology aspects. Moreover, the paper proposed a series of practical suggestions for institutional reform and policy design based on the theoretical and empirical study. The main results of this study could be concluded into the following 6 aspects:

1. On technical standard

The author made a survey on pollution-free and conventional

production with spinach, leek, tomato and cucumber in four counties of Hebei province in 2002—2003 and 2003—2004, involving 506 farmers and collected 24 thousand basic data. With the survey, the technical behavior of the safe vegetable production process in China has been studied and the main conclusions are as following:

1.1 The technical standard applications of safe vegetables are evaluated. Through the analysis on the technical standard of the fertilizer and pesticide application—the critical points affecting the quality of the vegetables, it was found that the fertilizer input was all higher than production standard of the four pollution-free vegetables, while the organic N / inorganic N ratio could meet the needs on the whole, and the pesticide application on spinach and leek was most canonical. Compared with the technical regulations of the four pollution-free vegetables, the production standardization of the four vegetables in terms of fertilizers and pesticides application ranks as spinach > leek > cucumber > tomato.

1.2 The contradiction between the technical standards and their application in safe vegetable production is revealed. The survey showed the application amount of fertilizer in 4 pollution-free vegetables production was all exceeded the standards in some degree, while their quality passed the export examination and the domestic quality standards respectively, indicating the current technical regulations and fertilizer application guidelines for pollution-free production do not suit the production practice well. Some of the vegetables with serious overuse of fertilizer entered the market in the name of pollution-free agro-product, showing the problems in quality standard management and market access of pollution-free vegetables.

1.3 Pollution-free production help improve vegetable quality in all. The input cost of organic fertilizer in the pollution-free production of the four vegetables was all higher than that of the same vegetable in the conventional production; Leek pollution-free production

used safe, less toxic and more expensive pesticide, and the average unit cost was higher than that in conventional one, while the pesticide cost of the other 3 pollution-free vegetables was lower than that in conventional production. These trends indicate whether or not the technical regulations and quality standards are strictly implemented, more attention is being paid to the rationality of technology and the safe quality in pollution-free vegetable production than in conventional production in general. The pollution-free food program is in favor of increasing the quality of vegetables objectively.

2. On Producer behavior

Cost-benefit, technical efficiency and key factor affecting benefit were studied in pollution free vs. conventional production of spinage, leek, tomato and cucumber in four counties of Hebei province, and the following conclusions were reached:

2.1 It is difficult to reach accordant conclusion whether there are differences in variable material cost, variable cost and total cost between the pollution-free and conventional production of the four vegetables. In spinage production, there are no obvious differences with the three costs, while in leek pollution-free production the three costs are notably higher than in conventional production. In tomato and cucumber, the three costs showed more complicated changes in pollution-free vs. conventional production. Therefore, the viewpoint that the production cost of pollution-free vegetables is higher than that of conventional production should be studied according to the concrete situation.

2.2 There might appear conflict between technical standard and economic benefit in safe vegetable production. All the cost-benefit ratios in pollution-free production of spinage and tomato are remarkably higher than in conventional production, so are the variable and total

cost-benefit ratio of leek. However, when based on the comparable labour price, the variable cost-benefit ratio in pollution-free leek production is equivalent to that in conventional one. All the cost-benefit ratios of pollution-free cucumber are remarkably lower than that of conventional one. The fact that the cucumber pollution-free production is closer to the technical standard with less profit than tomato pollution-free production revealed the conflict between technical standard and economic benefit.

2.3 Price is the leading factor affecting the benefits of safe vegetable production. The comparative analysis on yield and price shows that the producer price of the four pollution-free vegetables is higher than that of conventional vegetables. There is no obvious difference in the yields of spinach and leek between pollution-free and conventional production, and the producer's selling price directly affect the gross benefit. The price of pollution-free cucumber is higher than that of conventional cucumber, but the increase of the price cannot cover the loss in gross earning brought by yield decrease in pollution-free production, causing obvious drop in cost-benefit ratio. The economic sensitivity analysis shows that the product price is the critical factor affecting the cost-benefit whether in pollution-free or conventional production.

2.4 The existence of safe and conventional vegetable production is economically analyzed. Under the condition of short-term firm equilibrium and perfect competition, the economic principle $MR=MC=P$ and the value relationship among average price P , average variable cost AVC and average total cost AC determine the optimal choice and persistence of production. All average prices of pollution-free spinach, leek and tomato in this study are higher than the AC , leading to excess profit and production sustain; Although the technical regulations were not strictly implemented in tomato pollution-free production, the profit-seeking made the technical principle give place to the

economic principle, and the worse regulated production could exist and develop when the production supervision and market access were not very strict.

2.5 Using Cobb-Douglas production function and frontier production function, the technical efficiency of the vegetable pollution-free vs. conventional production is estimated. The results show that, compared with conventional production, the technical efficiency of leek pollution-free production is higher, indicating technique application, factor allocation and output efficiency are higher and consistent among farmers. Tomato pollution-free production shows lower technical efficiency than that of conventional production, indicating the factor input is illogical, and thus, inefficient though economic benefit is higher. The technical efficiency of cucumber pollution-free production is higher and the farmers master the technical standard better than conventional production.

3. On consumer behavior

In order to study the consumer behavior for safe vegetables, related data and references in China and abroad were studied. For the sake of getting first-hand materials, 1100 selling data of 5 pollution-free vs. conventional vegetables were collected in SM supermarket of Shijiazhuang in 2003; 109 basic price data of pollution-free vs. conventional vegetables were obtained in Hebei province and Shandong province; 913 questionnaires were provided to 5 groups of people including random consumers in Shijiazhuang SM Supermarket, officials working in the governmental institutions of Hebei province, medical staff in provincial and municipal hospitals in Shijiazhuang, the random consumer in Qingxian County of Hebei Province and the village heads in developed rural regions of Hebei province with 59 thousand data collected; 144 pesticide residue determination data were got in

Qiaoxi vegetables wholesale market in Shijiazhuang in 2003. With the study on these data, the following conclusions were drawn:

3.1 Compared with conventional products, the price of organic, green and pollution-free vegetables is higher both in China and abroad.

The price premiums of safe vegetables show great difference from countries, regions, times, seasons, varieties, markets, and even supply sources or distributors in the same market of the same city. This study shows that price premiums of safe vegetables vs. conventional ones are higher in developed regions such as Beijing than in developing regions as Shijiazhuang and retail price premiums are higher than producer price premiums.

3.2 Different consumer group showed varied price payment willingness and relative consumption willingness to pollution-free vegetables. Of the 5 consumer groups investigated, the acceptable price premium for pollution-free vegetables is 35%~46%, and the total value that consumers are willing to pay for is equal to 63%~110% of the conventional ones. Consumers' personal and social characters play an obvious influence on their purchasing behavior. Generally speaking, in comparison of women vs. men, young vs. the aged, people with higher income or better education vs. people with lower income or poor education, social superior vs. ordinary citizen, inhabitants in larger cities and towns vs. those in towns of county level, the former in each group have higher price payment willingness and relative consumption willingness than the later.

3.3 The acceptable price premium for pollution-free vegetables in consumers is usually lower than the real price premium in market, while the theoretic consumption willingness is higher than the market demonstration. These indicate that the higher market price restricts the consumption of pollution-free vegetables, and the moderate price decrease will stimulate the consumption demand to grow. The acceptable price premium for pollution-free vegetables varies among

consumers in different regions, which depends on regional economic development and consumers' paying capacity.

3. 4 The framework of consumer behavior theory for safe vegetables is built up including price determinism, income determinism, utility determinism and cognition determinism. When other terms are fixed, ① The increase of price or the price premium of pollution-free vs. conventional vegetables leads to the decrease of pollution-free vegetables consumption. ② The higher consumers' income, the more the demand for pollution-free vegetables. When the income reaches to a certain level, the pollution-free and even higher-standard safe vegetables will completely take the place of conventional ones to consume. ③ The greater the consumers' utility expectation to pollution-free vegetables, the higher their consumption preference, and therefore, the more consumption. ④ The higher the consumers' recognition, or in other words, the more information available to consumers, the greater the demand for pollution-free vegetables.

4. On management system

4. 1 Transaction cost and external effect provide the economic theory basis to study the current management system of safe vegetable production in China. The patterns as enterprise operation, contract production, company + farm household, production base + farm household, five-household unified superintendent production can save transaction cost in production management. Long-term contract, by way of internalizing the positive and negative external effect brought to the land and environment by the producers, closely bands the producers' benefit and the land together so as to evade producers' moral risk.

4. 2 China's current certification system for safe vegetables would not help much the improvement of market efficiency. The overcharge

of certification increases the producer's fixed cost. Inefficient supervision on the marketing products causes the problem that low quality products elbow with high quality ones, reducing the producer's benefit expectation. The official-run certification agencies make the monopolistic interest privatized or the producer's interest transferred to their own, which disagree with the principle of Pareto optimality. It's suggested in this paper that the government cover the certification fee, so as to invest to the resources and environment with the traits of public goods on one hand, and reduce the producer's cost and the price of the safe vegetables on the other, in favor of the combination of the right, responsibilities and interests in the certification institutions.

4.3 The producer's game theory based on cost-benefit is a tool model to study the producer behavior under the market access principle of safe vegetables. With this model, whether the producer implements the technical regulations and quality standards in production will be decided by production cost, product price and the supervision on and punishment to the bastard maker. Converse choice under the condition of asymmetric information is the theoretical explanation of the phenomenon that inferior goods expel the high quality goods in input-factor market. No matter input-factors or vegetables are concerned, the government is responsible to exert the function of the market supervision, which is determined with the attribute of external economy of market supervision.

4.4 The economic accordance and policy for the government to financially support safe vegetable production are put foreword. The actual price premia of pollution-free vs. conventional vegetables in the market is higher than the consumer's acceptable price premium. Giving financial subsidies to the producers is an effective way to improve the market efficiency. China should take off the fee charges on the enterprises for certification of product, environment monitoring and

product examination. Instead, government provides financial support. The economic significance of the subsidy to the producers is to compensate the production cost added to the producer for resources and environment protection, which is also decided by the attribute of resources and environment as public goods.

4.5 Different distribution channels of safe vegetables will produce different market effects. Exclusive distributorship, direct sale and distribution chain can reduce the distribution cost, and the brand effect of the product or the producer's credit fame is equivalent to providing perfect information to the consumers, which can enhance the consumers' willingness for repeated consumption, and make the producer get a better price. The basic strategies in constructing integrated and efficient consumption market for safe vegetables includes: to find and serve consumers groups demanding various grades of quality of safe vegetables, to set up direct sale channels or exclusive distributorship, to upgrade the public understanding to health, safety, and environment protection, and to improve the market environment of safe vegetables.

5. Overall cognition

5.1 The unification of advanced technology and its economic feasibility is the inner rule for the development of safe vegetable industry. Made up of a series of standards, rules and regulations in production and quality management, the safe vegetable quality standard system demonstrates the progress of technology. The unification of technological advancement and its economic feasibility, the increase of consumption requirement and supply capability are the inner economic rules and basic economic motility deciding safe vegetable industry development. When the advanced technology could not bring enough benefit for the producer, the production would consequentially go to