Investigation and research on the development of layer breeding industry based on edible eggs

【Abstract】

Eggs are an indispensable food on people's table. Whether the laying hen breeding industry can guarantee the quality of eggs and whether people can eat qualified eggs is not only a matter of public concern, but also a matter of national food security. This article intends to take the Shijiazhuang Foreign Language Education Group's "Egg Food and Layer Breeding Industry Status" social practice survey report as a basis to further explore the development status and prospects of the edible egg layer breeding industry.Based on the research on the consumption demand of edible egg products and the current situation and development of laying hens breeding, this paper points out the possible problems and puts forward some suggestions on the sustainable development of laying hens breeding.

Key words: Laying hens breeding, Egg quality, Sustainable development

1. Investigation on consumer demand for edible egg products

1.1 Current demand for egg products

1.1.1 Egg nutrition

Popular science website Baidu Encyclopedia shows that every 100 grams of eggs contains 12.58 grams of protein, and the human body's absorption rate of egg protein can be as high as 98%. Every 100 grams of eggs contains 11 to 15 grams of fat, which is mainly concentrated in the yolk.It also can be easily digested and absorbed by the human body. The yolk contains essential lecithin, sterols and trace elements of calcium, phosphorus, and iron. It also contains vitamins A, D and B.[1] The following are the survey results of 'Which eggs are more nutritious' and 'Which cooking

methods have the least nutrition loss conducted by students from Shijiazhuang Foreign Language School. A sample of 521 people who bought eggs from all walks of life were randomly interviewed.

Do you know which eggs have higher nutritional value?		
Options	**subtotal**	**The proportion**
The ordinary egg	10	1.92%
The primary egg	58	11.13%
The free-range egg	235	45.11%
The value are the same	258	41.84%
Valid number of fill in this topic	521	

Do you know which way eggs are cooked with the least nutritional loss?		
Options	**subtotal**	**The proportion**
Boiled egg	467	89.64%
Fried egg cake	11	2.11%
Poached Egg	23	4.41%
Frying egg	20	3.84%
Valid number of fill in this topic	521	

According to the survey, 45.11% of consumers think that the nutritional value of free-range eggs is high, and 41.84% of consumers think that the nutritional value of the two eggs are the same. According to the authoritative data analysis of the ‘Healthcare Times’, the

nutritional content of various named eggs on the market is almost the same.[2] The survey found that nearly 90% of consumers believe that boiled eggs have the least nutrient loss, which is consistent with the viewpoint of nutrition experts that ‘boiled eggs and steamed eggs have less nutrient loss’. Based on the above professional analysis and survey results, we recommend that the public consume rationally and not blindly. If the priority is to minimize the nutritional loss, we recommend that the egg cooking method should be ‘steamed’ or ‘boiled’.

1.1.2 Egg quality

Eggs are one of the most common foods. People expect to eat healthy and safe eggs. However, there are legends that the hormones and antibiotics in eggs raised on a large scale exceed the standard. In order to respond to the people’s concerns and doubts about the quality of eggs, students from SFL Group put forward three questions asking about"What are you most worried about when buying eggs", "What are the third-party inspection items you know about eggs," and "There are varieties of eggs,which type will you choose”.The research team designed a questionnaire, walked into the market to randomly check consumers who buy eggs and collected 521 valid questionnaires.

What do you worry about most when buying eggs?		
Options	**subtotal**	**The proportion**
Does it contain hormones?	424	81.38%
Is it overdue?	380	72.94%
Does it contain antibiotics?	362	69.48%
Are laying hens fed on feed?	246	47.22%
Valid number of fill in this topic	521	

What third-party testing items do you know about?		
Options	**subtotal**	**The proportion**
Heavy metal detection	343	65.83%
Microbiological detection	290	55.66%
Pesticide veterinary drug residue detection	388	74.47%
Nutrition detection	258	49.52%
Other forms of detection	92	17.66%
Valid number of fill in this topic	521	

What kind of eggs do you choose to buy?		
Options	**subtotal**	**The proportion**
Pollution-free eggs	263	50.48%
Organic eggs	186	35.70%
Green eggs	156	29.94%
Rural free-range eggs	298	57.20%
Ordinary eggs	295	56.62%
Valid number of fill in this topic	521	

The survey results show that the people are eagerly concerned about the safety of eggs, especially for the detection of residual pesticides containing hormones and antibiotics. 57.2% of consumers choose to buy native eggs, and 50.48% choose to buy pollution-free eggs. These consumers believed that rural free-range eggs or pollution-free eggs are more qualified. The following figure shows the various data and standards of the food inspection and supervision department.

Regulatory agencies respond to the public's demand for food safety and popular science services in the form of irregular random inspections, accountability, and public media announcements on food safety supervision. With the continuous development and progress of economy and society,

people express immediate and on-site requirements for food safety. Consumers hope that food safety can be satisfied through intelligent means. Therefore, food safety traceability systems have emerged. The food safety traceability system is established by the State Administration of Supervision, Inspection and Quarantine in accordance with the requirements of the State Council on the "Decision to Further Strengthen Food Safety Work". Ordinary consumers can scan the QR code with their mobile phones to "trace the source" of the purchased eggs and obtain production. Enterprise information can effectively promote the standardized production of production enterprises and ensure the safety and health of agricultural and sideline products such as eggs.

1.2 Demand development of egg consumption

1.2.1 Egg quality

The quality of fresh eggs is comprehensively determined from the external and internal aspects. External quality usually refers to the sensory quality classification, which mainly includes cleanliness, eggshell color, shape, and damage. Internal quality mainly includes air chamber height, egg yolk state, protein state, Hastelloy unit (Hastner unit is an indicator of the freshness and protein quality of the egg, the larger the Hastelloy unit is, the fresher the eggs will be.), the condition of the ovule or embryo, and Several indicators such as foreign matter situation.[3]

1.2.2 Efficacy requirements of eggs

(1) Nutritional requirements: Eggs can meet various nutrients required by the human body.Eggs include protein, fat, vitellin, lecithin, vitamins and iron, calcium, potassium, essential minerals for the human body, etc.

(2) Health needs:According to the data provided by Baidu Baike, eggs play an important role in human growth or repair. For example, eggs are

necessary to the development of the nervous system and body, and the choline contained in them can improve memory.The protein in eggs has a repair effect on liver tissue damage, and the lecithin in the yolk can promote the regeneration of liver cells; In 1977, Gerhard Schulazhe and others stated in a research report on 27 countries that the death rate of cancer is inversely proportional to the intake of selenium, and eggs are rich in selenium.

2. Investigation on the status quo of the development of layer breeding industry

SFL students went to Shangzhuang Town and Tongye Town in Luquan District, where layer breeding is concentrated, and walked into different types of laying hens breeding bases. The students visited and investigated through various channels,combined with pre-checked authoritative information, made the following investigation on the current situation of laying hens breeding industry.

2.1 Classification of laying hen breeding methods

2.1.1 Farmers raise free-range laying hens

Farmers raise laying hens in a small number of rural households and are mainly raised by the elderly. Because eggs cannot be kept fresh for a long time, in addition to their own family's consumption of eggs, the excess eggs will be sold through rural markets and fixed stalls.

2.1.2 Small-scale family raising

The small-scale family raising is generally selected for stocking in open areas such as pollution-free forest areas, orchards, tea gardens, barren hills, and barren slopes. In addition to the indoor feeding and drinking water in the early brooding period, the nutrition of the chickens in other periods mainly depends on the free intake of the natural stocking, making full use of the rich grass resources, insect resources, and mineral resources in nature, but it needs to be prepared for epidemic prevention. .

2.1.3 Large-scale breeding

Large-scale breeding using advanced technology, uses excellent performance of the variety; According to the nutritional requirements, the full price compound feed was prepared and standardized feeding was carried out. With the application of modern science and technology, the production field implements "all-in-all-out" and flow-line production operations; To formulate strict procedures and measures for the prevention and control of epidemics; Good environmental conditions to ensure the growth and production of chickens; Dung treatment, environmental protection measures, etc.

2.2 Three stages of large-scale layer breeding

Generally speaking, large-scale breeding is more scientific and reasonable, and the feed and immunization work are more timely in place. According to the growth stage of the laying hens, it is divided into three stages, namely, 0-6 weeks brooding period, 7-17 weeks rearing period,and after 18 weeks, eggs are laid.

0-6 weeks of age is called the brooding period. It is the initial and critical stage of cultivating high-quality laying hens. It requires careful and scientific feeding and management to cultivate robust and qualified chicken flocks that meet the characteristics of the growth and development of the breed, which will be the production performance for later laying hens. This lays a foundation for the full play of the production performance of laying hens in the future

7-17 weeks is called the rearing period. This period is the critical period for the development of bones, muscles, reproductive system, and digestive system. The quality of feeding and management directly affects the laying performance and economic benefits of adult chickens, and special bred feed is required.

After 8 weeks, it is the laying period, which can be divided into three

phases, namely, from 120 days of age to before the egg production rate reaches 5%, feed the pre-production period material, and after the egg production rate reaches 5%, to the peak feeding period. After the peak egg production period, the egg production rate gradually drops to 85%, and then is time to feed the late egg production material.

2.3 Types of diseases in laying hens and their prevention and control

Avian influenza (AI): AI is the primary disease prevention and control for laying hens. It can destroy a flock or even a chicken farm. It can be effectively prevented and controlled through vaccination;

Newcastle disease (ND): The main disease of ND is breathing difficulties, nerve disorders, mucosal and serosal hemorrhage. Newcastle disease is a common and frequently-occurring disease in the chicken industry, and it is also one of the diseases that are difficult to prevent and control clinically. Immunization is also an extremely important measure to prevent and control Newcastle disease; In the egg production process, each step must be strictly disinfected. The people, cars, and chicken coops involved are disinfected every day. The chicken farms will often screen diseased chickens for timely treatment or elimination to maintain a healthy environment for the chicken coops.

3. Problems in the development of layer breeding industry

3.1 Reasonable use of feed additives and egg safety

Due to the high breeding density, the complexity and variety of livestock and poultry diseases, and the knowlege of breeding practitioners, there are problems of excessive use and even abuse of feed additives. Are there any problems with unreasonable use of feed additives for eggs on the table? How to ensure the safety of eggs? With one question after another, the SFL research team walked into Hebei New Century Pharmaceutical Company to investigate the use of feed additives.

The research team learned that in order to meet certain special needs

of livestock and poultry, farming farms need to add a variety of micro components with different biological activity into compound feed or mixed feed.These ingredients are called feed additives ,including nutritional additives and non-nutritive additives. Trace element additives, vitamin additives and amino acid additives are nutritional additives. In addition to the nutritional requirements, the amount of addition should also consider the composition of the diet, environmental conditions (temperature, feeding methods, etc.), diseases, transportation, group transfer, vaccination, and beak cutting. Non-nutritive additives include: pharmaceutical additives, antioxidants, antifungal agents and color enhancers. Drug additives mainly include antibacterial growth promoters and insect repellent health care agents. Antioxidants are mainly used to prevent the oxidation and damage of sugars, lipids, oils, proteins, vitamins and other nutrients in feed. The antifungal agent is composed of organic acid and corresponding salt, which can effectively penetrate into the cell wall of the fungus and interfere with the interaction of enzymes, so as to achieve high-efficiency anti-fungal, antiseptic, fresh-keeping, flavoring and other functions. To deepen the color of the egg yolk to meet market demand, it is often necessary to add color enhancers to the feed. Commonly used colorants include synthetic carotenoids and lutein produced by fermentation. Both of them can be used in chicken feed to make the egg yolk more appetizing. The color is better than natural yolk.

Various additives have different effects, but the usage is strictly regulated. Less can not achieve the effect, and more affects food safety. The rational use of drugs in different growth stages of laying hens is based on rigorous and scientific production processes. The safety of eggs is guaranteed. The research team believes that: medicines containing additives serve the laying hen breeding industry, and the technicians of

breeding enterprises must grasp the dosage and be responsible to the enterprise and to the consumers.

3.2 Environmental hazards caused by large-scale layer breeding

According to data from FAO (Food and Agriculture Organization of the United Nations), global egg production will exceed 70 million tons in 2020, and at least 140 million tons of feed will be consumed a year. Every aspect of egg production, such as feed production and animal excretion, is increasing the burden on the earth's environment. FAO data shows that 9% of CO2 emissions, 37% of CH4 emissions, and 64% of NH3 emissions related to human activities come from animal husbandry. CH4 is 23 times the greenhouse effect of CO2, and NH3 is an important culprit for acid rain.[4] Therefore, it is necessary to develop the layer breeding industry appropriately so as not to affect the environment.

4. Sustainable development of layer breeding industry

4.1 Future development trend of layer breeding industry

The laying hen breeding industry in China has become one of the industries with the highest agricultural industrialization, forming a relatively complete industrial chain of production and marketing, and also driving the development of feed, veterinary drugs, vaccines, equipment manufacturing, food processing and other related industries. Economic experts conduct investigations, studies, and analysis on relevant factors of the egg industry, evaluate the investment value of

the egg industry, and put forward constructive suggestions to provide a reference for investment decision makers and egg business operators in the egg industry. The public's requirements for egg quality, environmental impact and animal welfare are getting higher and higher, and the layer breeding industry is facing huge challenges.

4.2 Layer breeding industry faces diversified consumer demand

In the process of the growth and development of the layer breeding industry, market demand and consumers play a key role. Consumers have more expectations for the way of eating eggs, such as boiled eggs, soft-boiled eggs, hot spring eggs,dried eggs, egg handmade soap, egg pudding, egg biscuits, vinegar and egg liquid and other products have been stationed in major supermarkets, giving consumers more choices. Only by continuing to expand the product processing industry and experimenting with more types of egg products can we continue to explore market demand and take the initiative in the supply-demand relationship.

4.3 Sustainable development of layer breeding industry

Affected by traditional eating habits and lagging processing technology, the Chinese market is mainly based on fresh eggs. Take processed egg products as an example. The average rate of processed egg products in developed countries has reached 20%. Eggs are widely used in the food industry and other industries. However, the rate of processed egg products in China is only about 6%. Now the proportion of deep-processed eggs is less than 2%.[5]Therefore, it is recommended that layer breeding enterprises should actively adopt a combination of production, education and research, speed up the research and development of egg processing technology, increase the speed of technology transformation, expand the production scale of new products, extend the industrial chain, and augment the added value of egg products. Farming companies are facing transformation, it is advised to give priority to

the following directions:

4.3.1 Intelligence and scale

With the development of the domestic equipment manufacturing industry, the competition in the breeding equipment industry has become increasingly fierce, and automated breeding equipment has become popular across the country. Coupled with the continuous increase of labor costs and management costs, farmers are actively developing in the direction of appropriate scale, standardization, automation, and intelligent breeding.This is the result of China's technological development in recent years. Although China is a developing country, due to its large population, it has to consider the development of automated breeding technology in advance. This is due to the national policy and the support of the people. Small-scale and high-cost breeding tools are obviously not suitable for China. "Man manages machines and machines raise chickens" will become more and more common, and intelligence will inevitably become the industry's choice in the future. In order to improve the intelligence and scale of the aquaculture industry, the governments of relevant regions should promulgate relevant policies to express support for the development of the scientific and technological level in this field, and should make specific arrangements for this. Ordinary citizens should support policies, help improve policies, and supervise government actions. At the same time, I hope that international organizations can make appropriate suggestions.

4.3.2 Safety and environmental protection

The construction of a biosafety system should be used as the basis for disease prevention and control. First of all, engineering epidemic prevention must be done well, rationally configuring from the construction plan of standardized farms, improving environmental biosafety indicators, and removing hidden dangers of epidemic prevention; secondly, attention is paid to environmental factors in the breeding stage, and comprehensive implementation is implemented. All-in or all-out or zoned breeding to reduce cross-infection; the final immunization process should be appropriately optimized, and the burden of the immunization process should be reduced through engineering control and breeding environment control. At the same time, it depends on effective vaccines, scientific immunization procedures, accurate operations, and timely monitoring. As a support, in principle, reduce vaccine injections on the basis of health of chickens.

Environmental protection has become a hot spot of concern in recent years, and the poultry industry is no exception. According to estimates, East Asia has the highest greenhouse gas emissions in the global poultry industry chain, accounting for about 50% of the world’s total; Environmentally friendly challenge. According to the most cutting-edge chemical technology development, the research team recommends to consider installing green environmental protection equipment for storing and

converting greenhouse gases in breeding sites, converting greenhouse gases into fuel gas, meeting the requirements of carbon compliance, and promoting the development of circular economy.

4.3.3 Animal welfare

With the development of society and economy, animal welfare is particularly concerned. At present, there are practices that are not in line with animal welfare in terms of breeding methods, feed delivery, and disease prevention, such as beak cutting, toe cutting, slaughter of 1-day-old chicks, forced moulting, Restriction and so on. In the past, the conventional breeding methods that helped reduce breeding costs and improve production efficiency in these breeding processes will be included in the banned list. Based on the concept of respecting the development of life, the research team actively advocates the quality of survival and growth of laying hens in each limited life stage. Relevant studies have shown that the quality of meat, egg and milk products produced by animals in a relaxed and comfortable environment will be higher. Food is the priority for the people, and the laying hen breeding industry is an important part, providing safe and healthy eggs for thousands of households. Through investigations, visits, access to materials, analysis and discussion, reports, etc., the SFL research team conducted research and analysis on the layer breeding industry from multiple perspectives, found out the problems, proposes healthy and rational consumption suggestions, and put forward that the layer breeding industry will be sustainable in the future. The development proposal calls on the whole society to pay attention to food safety, jointly help people's livelihood protection, make society more harmonious, and make people's lives happier.

【Reference Materials】

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