

Effects of Food Traceability Applied in Fresh Vegetable Supply Chain in China

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Abstract—A unique traceable code can often be found on the label of high value fresh produces, such as organic, environmental friendly, and green fresh vegetables. Consumers are able to use the traceable code to search product information in a searching system. It has been found out from questionnaire survey that although high percentage of consumers think traceable code based searching system is an effective approach for getting information about food producing and product test, only limited number of consumer actually use the searching system. Also, number of consumers think is too expensive to buy traceable fresh vegetables. The results from sample test present the traceable fresh vegetable information in the searching system is very limit. The information about field history and product testing need to be added into the system, and government, media and companies need to encourage consumers to buy more traceable foods and to use the searching system more effectively.

Keywords-*food traceability; fresh vegetable; supply chain; searching system.*

I. INTRODUCTION

Food traceability (hear after "FT") is the ability to track any food through all stages of production, processing and distribution[1]. Identify the units and batches of all raw materials and products; understand transfer and movement details; an effective data connection system are three main features of FT [2]. On one hand, companies use FT to promoting supply chain management, ensure safety and quality of food and to distinguish the food quality attributes to their competitors [3]. On the other hand, FT can increase consumers' confidence on food quality and safety [4]. In order to make FT system work effectively, all members in food supply chain need to contribute their efforts.

Although FT well applied in developed countries, it only draw Chinese government's attention since 2002. Due to the benefits of adopting FT, it was assumed the system would be successful and widely promoted. However, it still develop at emerging stage in China, which mainly because limited promotion by governments and/or organizations, high price of traceable foods and consumers' knowledge limitations [5-7].

There are many science researches reported the technologies and applications of FT, however, not many researches test the authenticity, practicability and comprehensiveness of the traceability information, and the effect of FT applied in fresh vegetable supply chain in China [8-9].

The research used questionnaires to collect data in finding out the effects, and used obtainable samples to test the traceability information of traceable foods in China. These can fill the gap of the existing literatures.

II. FOOD TRACEABILITY SYSTEM IN CHINA

From 2000 to 2013, there are numbers of food safety accidents happened in China. China has realized the important of introducing FT since 2002. It has been found out the heavy metals level contain in green house grow vegetables did lower than open-filed grow vegetables [10]. It is useful for buyers to know the growing statutes of foods they buy. However, many influences has limited the development of FT in China. Firstly, government and relevant organizations did not make strong promotions on FT system, consumers have limited knowledge about it. Secondly, the education level of food buyers has limited the development of FT. Finally, the price of traceable foods is much higher than the ordinary product, which make consumers not willing to pay [5-7].

It has been found out from a survey that most consumers are concerned about the food quality and safety, but many of them do not know what is FT. Only 1.9% of consumers familiar with FT system and care about traceability information. The purchase of traceable food is strongly influenced by food price, 86.4% of consumers want to buy traceable food if regardless of prices, but this number drop to 46.6% when it connected to prices [11].

III. RESEARCH METHODOLOGY

In China, a unique traceable code is addressed on the label of fresh produces, especially organic/environmental friendly/green fresh produces. This code is mainly for buyers to find out growing information of the vegetable through a online terminal system. The system offers public service which allows producers to issue growing information for consumers' online checking with computers and/or from machines in supermarkets. The research use questionnaire and sample test to evaluate the effect of traceable code based traceability system applied in fresh vegetable supply chain in China. The questionnaire is designed for understanding the consumer attitudes towards the application of the system. The sample test is aimed to identify the effectiveness of the food traceability system. 945 valid questionnaires have been used in the data analysis, with a percentage of 51% male and 49% female interviewees joint. 148 obtainable samples of fresh vegetable products sold via supermarkets or farm

markets have been collected for checking information presence in the food traceability system via each traceable code. SPSS software has been used for data analysis.

IV. FINDING AND DISCUSSION

A. Consumer recognition towards the traceable code based searching system

The questionnaire survey results of consumer recognition towards the traceable code based searching

system can be seen from Table I. High proportion of consumers think the Traceable code based searching system is an effective approach for getting information about food producing and product test

TABLE I. CONSUMER RECOGNITION TOWARDS TRACEABLE CODE BASED SYSTEM

	Traceable code based searching system is an effective approach for getting information about food producing and product test				Sum
	Agree	Neither	Disagree	Unknown	
Count within all samples	747	111	10	77	945
% within all samples	79.0%	11.7%	1.1%	8.1%	100.0%
Count within samples concern of produce freshness	624	66	8	51	749
% within samples concern of produce freshness	83.3%	8.8%	1.1%	6.8%	100.0%
Count within samples concern of food hygiene and safety	522	79	8	28	637
% within samples concern of food hygiene and safety	81.9%	12.4%	1.3%	4.4%	100.0%
Count within samples concern of produce/expire date	502	49	9	23	583
% within samples concern of produce/expire date	86.1%	8.4%	1.5%	3.9%	100.0%
Count within samples concern of growing information	116	19	0	4	139
% within samples concern of growing information	83.5%	13.7%	0.0%	2.9%	100.0%

B. Attraction of traceable vegetable

Food traceability is an approach for food safety management through supply chain. However, the cost of the system is high, which cause by offering the food traceability

techniques. Consumers' expectations would be increased when they spent high cost. The survey (Table II) indicated that the system has not achieved consumers' expectations.

TABLE II. PURCHASE EXPECTATION * PURCHASE REFUSAL CROSS TABULATION

		Purchase refusal due to higher cost			Total	
		Agree	Neither	Disagree		
Purchase expectation due to food safety assurance	Agree	Count	299	266	121	686
		% within purchase expectation	43.6%	38.8%	17.6%	100.0%
		% within Purchase refusal	85.2%	73.7%	88.3%	80.8%
		% of Total	35.2%	31.3%	14.3%	80.8%
	Neither	Count	48	92	12	152
		% within purchase expectation	31.6%	60.5%	7.9%	100.0%
		% within Purchase refusal	13.7%	25.5%	8.8%	17.9%
		% of Total	5.7%	10.8%	1.4%	17.9%
	Disagree	Count	4	3	4	11
		% within purchase expectation	36.4%	27.3%	36.4%	100.0%
		% within Purchase refusal	1.1%	0.8%	2.9%	1.3%
		% of Total	0.5%	0.4%	0.5%	1.3%
Total	Count	351	361	137	849	
	% within purchase expectation	41.3%	42.5%	16.1%	100.0%	
	% within Purchase refusal	100.0%	100.0%	100.0%	100.0%	
	% of Total	41.3%	42.5%	16.1%	100.0%	

C. Use of searching system via traceable code

It can be seen from the following Table III, the use rate of the searching system is very low. Although there are many channels for consumer to know the searching system,

many consumers who purchased traceable foods but not search frequently, only 2.7% interviewees often use traceable code to search information via searching system. This indicated that the promotions are inadequate to

encourage and guide consumers in using the searching system.

TABLE III. THE USE OF SEARCHING SYSTEM

	Activity of search information in food traceability system after purchase of traceable produce				Sum
	No purchase	No search	Some search	Often search	
Count within totals	114	321	391	23	849
% within totals	13.4%	37.8%	46.1%	2.7%	100.0%
Count within samples unaware of the search system available to be used	48	52	0	0	100
% within samples unaware of the search system available to be used	48.0%	52.0%	0.0%	0.0%	100%
Count within samples aware of the search system via newspaper/magazine	28	146	220	12	406
% within samples aware of the search system via newspaper/magazine	6.9%	36.0%	54.2%	3.0%	100.0%
Count within samples aware of the search system via television	40	131	248	13	432
% within samples aware of the search system via television	9.3%	30.3%	57.4%	3.0%	100.0%
Count within samples aware of the search system via internet	14	115	238	14	381
% within samples aware of the search system via internet	3.7%	30.2%	62.5%	3.7%	100.0%
Count within samples aware of the search system via supermarket	15	45	65	8	133
% within samples aware of the search system via supermarket	11.3%	33.8%	48.9%	6.0%	100.0%

D. Effectiveness of the searching system

Based on the sample test of the 148 available samples from market, researchers have tested each sample's traceable code in the searching system. It has been found out (Table 4) that the traceable information in the searching system is very

limit for most samples. Except of 8% samples present the information of fertilizer using, for other samples, there are no information about field history and product testing. This can be one of the reasons why consumer undesired in using the searching system.

TABLE IV SAMPLE TESTING RESULTS OF TRACEABLE INFORMATION IN SEARCHING SYSTEM

Type of information	Item	Number of sample	Proportion
Basic information	Presence of product name appropriately	129	86.0%
	Presence of producer name	148	100.0%
	Presence of date of packaging	148	100.0%
	Presence of Shelf-life	88	58.7%
	Presence of Batch number	12	8.0%
Field history information	Presence of planting time	0	0.0%
	Presence of pesticide using	0	0.0%
	Presence of fertilizer using	12	8.0%
	Presence of pollution of the environment information	0	0.0%
Product testing information	Presence of product qualified information	0	0.0%
	Presence of microbial qualified	0	0.0%

V. CONCLUSION AND RECOMMENDATIONS

Consumers have realized there is a unique traceable code addressed with high value fresh produces in market. High proportion consumers believe the traceable code based searching system should be an effective approach for getting information about food producing and product test. However, not many consumers use the searching system. Consumers also think the cost of buying traceable fresh vegetables is high. The traceable information for fresh vegetable is very limit in the searching system. There nearly non information relate to field history and product testing for most products. Therefore, it is recommended the field

history information and product testing information need to be added into the system. Government needs to educate consumers about the traceability system and traceable information; and to give supervision to the searching system in order to make sure the authenticity and comprehensiveness of the information in the system. Companies and growers can use wider medias to make consumers know the benefits of traceable foods, to encourage consumers to buy more traceable foods and use the searching system more effectively. For food safety concerns, it is essential to involve more detailed traceable products information in the system.

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