Research Article

Investigation of Traceability and Recall Plans of Food Processing Plants and Small and Medium Enterprises in Kelantan, Malaysia

Afiza Izzati Mat Aris and Jan Mei Soon

Faculty of Agro-Based Industry, Universiti Malaysia Kelantan, Locked Bag 100, 17600 Jeli, Kelantan, Malaysia

Correspondence should be addressed to Jan Mei Soon; janmei.soon@yahoo.com

Food processing plants and Small and Medium Enterprises (SMEs) need an excellent and reliable traceability system to ensure that consumers are well protected from consuming unsafe food. The traceability systems are being implemented by different food industries all around the world including Malaysia. This study aims to determine the implementation status of traceability system among food processing plants and SMEs. Another important goal is to identify the Critical Traceability Points (CTPs) in food processing and SMEs' supply chains. A survey involving 17 processing plants and 53 SMEs from Kelantan, Malaysia, on the traceability and product recall system was conducted. The findings revealed that the food processing plants and SMEs are interested in implementing traceability system but they lack information and capital to carry out the system. Receiving ($\chi^2 = 0.51$; df = 1; $P < 0.05$) and dispatching ($\chi^2 = 9.66$; df = 1; $P < 0.05$) were identified as the CTPs in food processing plants and SMEs. Only 52.9% of the participants had implemented or were interested in implementation of traceability system. Several factors resulting in the lack of traceability implementation are due to time limitation, no perceivable benefits to the company's economy and lack of clear policy guidance and support from government.

1. Introduction

The European law described traceability as the ability to track any food, feed, food-producing animal, or substance that will be used for consumption through all stages of production, processing, and distribution [1]. According to the International Standards Organization (ISO 8402:1994), the traceability is the ability to trace the history, application, or location of an item or activity by means of recorded identification [2]. Other than that, the Codex Alimentarius Commission defines traceability as the ability to follow the movement of a food through the specified stage(s) of production, processing, and distribution [3]. Traceability can be divided into two key functions which are tracking and tracing. Tracking is defined as the ability to follow the path of an item as it moves downstream through the supply chain from the beginning to the end while tracing is defined as the ability to identify the origin of an item or group of items through records, upstream in the supply chain [4]. The main objective of traceability is the identification and isolation of any potential contamination source that will enable the

return and withdrawal of such products from the market [5].

Traceability system concept recently attracted much attention as most of the country all around the world is advancing in the processing industries and many organizations are involved with the processing industries especially food products. The incident such as Mad Cow Disease, Foot-and-Mouth Disease in Europe and *Salmonella* in peanut butter in United States not only influenced the health and rights of consumers but also restricted the food industry development as well as impact of economic development and social stability [6]. Besides, the food product recall all around the world reinforces the importance of a robust traceability system to protect the safety and quality of the food supply [7]. Problems are relatively rare, but when they occur, heath and lives are at stake as well as the livelihoods of the companies, industries, and employees [8]. In recent years, traceability systems have been built and progressed by many firms as an effort towards traceability of raw materials and products [9].

Malaysia is also improving and advancing in processing industry especially the food and beverages industries. The

Table 1: Definition of Small and Medium Enterprises by size of operation [12].

Category	Small	Medium
Manufacturing	Sales turnover from USD 93,000 to less than USD 4.6 million or full time employees from 5 to less than 75	Sales turnover from USD 4.6 million to not exceeding USD 15 million or full time employees from 75 to not exceeding 200
Services and other sectors	Sales turnover from USD 93,000 to less than USD 933,000 or full time employees from 5 to less than 30	Sales turnover from USD 933,000 to not exceeding USD 6.2 million or full time employees from 30 to not exceeding 75

food processing sectors in the East Coast accounts for about 10% of Malaysia's processing output [10]. According to the Britain-based Global Food Traceability Forum (GFTF), Malaysia has much to gain from food traceability and initializing food traceability would definitely improve the living standard in Malaysia [11]. Functional food, convenience food, food ingredients, and *halal* food are the current key areas for the growth and development in the food processing industry in Malaysia [10]. Recently, the food and beverages industries are witnessing an increase in the frequency of product recalls and other food safety related threats [2]. At Small and Medium Enterprises (SMEs), Uchida et al. [9] reported that there are various issues of introducing and operating a traceability system and securing staff who have applicable skills such as bearing the cost for system operation. Practicing the food traceability system could leverage Malaysia as an exporter especially in *halal* products [11]. Small and Medium Enterprises (SMEs) in Malaysia are according to the size of operation (Table 1) [12].

There are no published reports of traceability program in food processing plants and SME in Malaysia. In Malaysia, the level of traceability and recall programs is still in the early stage as not many industries apply the traceability systems for detecting and recall of unsafe food. Traceability systems in Malaysia are still new because multi-ingredient foods may include materials from various food chains and most Malaysia's products are imported. The traceability system is an effective way to track the unsafe products supply because it is capable of identifying the problem related through records maintained by the company, the immediate supplier and customer of an identified food products [13]. Currently, under Regulation Number 10 Food Traceability System in the Food Hygiene Regulations (2009), it is stated that all food premises (which includes food processing plants and enterprises preparing and selling any food) shall have a food traceability system from production to distribution [14].

In traceability system that is applied in Malaysia, the companies and SMEs involved with food may only be able to trace the affected products by investigation through the chains. Investigation may be able to identify the source of damage that lead to the recall of the products. By identifying the source of product damage, the process can be reversed

to identify affected products for recall. Investigation by traceability systems may improve the trace of affected products as very little is still known about these programs. FAO/WHO [3] encourages the food processing industries in Malaysia to establish and implement effective food traceability and recall systems of the food product manufactured in order to respond to the food safety events. As the food processing industries are developing, the safety and quality of the products must be ensured. Hence, traceability and recall of the food products is one of the food safety managements required to overcome the harm. Traceability is needed as a way to respond to the potential risk which may arise in the food and feed in order to ensure that all the food products are safe to be consumed. Traceability is important to identify the main cause of the defects later on using the offline analysis [15]. Therefore, it is important to conduct this preliminary study to determine the traceability and recall plans of the food processing plants and SMEs. This study aims to identify the Critical Traceability Points (CTPs) in traceability and recall of food product and to determine the factors for implementation of traceability system and develop a better understanding of traceability system. Critical Traceability Points (CTPs) are similar to critical tracking events (CTE) which refer to events of product movement and transformation and have implications for both internal and whole chain traceability in the supply chain. In this case, a CTP is a point in time and location where data are needed to be collected and potentially shared. CTP will also assist in the creation of new traceable entity identification [13].

2. Method

2.1. Selection of Research Area. The study for the traceability and recall plans was carried out for the food processing industries, Small and Medium Enterprises (SMEs) in Kelantan. Ninety food processing industries and SMEs were invited to participate in the study. This study covered all kinds of food products that were processed and sold around the area. In conducting the traceability and recall plans for the food processing industries and SMEs around the area, there were several steps taken. Questionnaires were prepared for food industries to be answered and interviewed. A previsit was conducted to gain rapport and confidence from the invited companies and enterprises, followed by a second visit to collect data.

2.2. Development and Pilot-Testing of Questionnaire. A questionnaire divided into three sections with section A: personal basic information; section B: overview of traceability system implementation; and section C: detailed information and factors of traceability system was developed (available on request from corresponding author). In order to ensure the validity of the questionnaires, the questionnaires were pilot tested on 20 food industries before being used for survey to ensure the questions are clear and understood easily. The questionnaires were provided in English and Malay for the participants. The revised questionnaire was then used to gather data. Data collected were analyzed using Microsoft excel and Statistical

Package for the Social Sciences (SPSS) version 16.0. Since the data collected were in survey format, nonparametric tests, particularly Chi-square analysis (χ^2), were used to determine significance of perceptions of food manufacturing plants and SMEs towards traceability and recall plans.

3. Results and Discussion

3.1. Description of Samples. This study was conducted to determine the status of traceability through the food chain and to identify the Critical Traceability Points (CTP) of food processing plants and SMEs. The population of the study consists of workers and owners of the processing plants and SMEs. The initial total number of population was 90. The sample size was then reduced to 70 participants as the population to be studied could not give their full cooperation due to their work commitments. Thus, only 70 questionnaires were obtained for this study of which 17 were from the processing plants and 53 from SMEs. The participants consist of males and females of different ages, position, and academic backgrounds. The data for the study were collected in May to October 2013.

3.2. Validation of Questionnaire. In order to ensure that the variables used internally are consistent, a reliability assessment was performed using Cronbach's Alpha. The higher the Cronbach Alpha coefficient is, the more correlated the items are within the relevant variable which theoretically should be higher than 0.7 [16]. Reliability is the consistency of the measurement, or the degree to which the questionnaire measures the same way each time it is used under the same condition with the same subjects [6]. The pretested questionnaires were analyzed and the value of Cronbach's Alpha was 0.785.

3.3. Demographics. The following section provides an overview of the profile sample of participants. The participants represent 70 processing plants and SMEs that are involved with food products who agreed to participate in the study. The demographic information based on Table 1 indicates that there are seventeen (24.3%) male participants and fifty-three (75.7%) female participants. It clearly shows that there is an imbalance between male and female participants and the majority of the participants are female. Therefore, the result may be slightly biased towards female opinions and implementation of the system. Since this study was conducted in Kelantan and the gender demographics of representatives, for example, the general manager, from the food processing plants and the SMEs indicate the entrepreneurial attributes of the Kelantan women. According to Zarina and Mohd [17], there are more female entrepreneurs than male entrepreneurs because modern female entrepreneurs are oriented in making money and willing to create new markets. Their participation in entrepreneurial activities was encouraged as another means to improve family income. The age distribution of the participants in this study ranged from 21 to more than 61 years old. The majority of the participants, 31.4% ($n = 22$), reported to be in the age ranging between 51 to 60 years and none of the participants are under the age of twenty. This

TABLE 2: Demographics of participants from processing plants ($n = 17$) and SMEs ($n = 53$).

Demographic items	N (%)
Gender ($n = 70$)	
Male	17 (24.3)
Female	53 (75.7)
Age ($n = 70$)	
≤20	None
21–30	6 (8.6)
31–40	17 (24.3)
41–50	18 (25.7)
51–60	22 (31.4)
≥61	7 (10.0)
Current position ($n = 70$)	
General manager	50 (71.4)
Department manager	1 (1.4)
Production manager/executive	1 (1.4)
Quality assurance/executive	2 (2.9)
System operator	8 (11.4)
Others	8 (11.4)
Education background ($n = 70$)	
PMR	25 (35.7)
SPM	27 (38.6)
STPM/diploma	12 (17.1)
Undergraduate or higher	6 (8.6)
Employees number ($n = 70$)	
≤10	49 (70.0)
11–20	20 (28.6)
21–30	1 (1.4)
31–40	None
41–50	None
≥51	None
Plant/SME size ($n = 70$)	
≤50 m^2	22 (31.4)
50–250 m^2	36 (51.4)
250–500 m^2	12 (17.1)
≥500 m^2	None

group has the highest number as it indicated that this group of participants is mature and wise in decision making [17].

Table 2 also indicates that only a few of participants are undergraduates or with higher education (8.6%) while most of them studied until the SPM (Malaysia Education Certificate) level (38.6%). Generally, at this level of education, the participants are already knowledgeable as they have been in formal education for eleven years and they have the potential to be trained using structured modules to improve their ability to operate their processing plants and SMEs [18]. Also, this shows that level of education whether it is at SPM or degree level will not hinder the entrepreneurs from working in the industry. Forty-nine (70%) of the processing plants and SMEs participants have less than 10 employees. In addition, some of the processing plants and SMEs have their own family members as the employees. More than half (51.4%)

TABLE 3: Participants knowledge on food traceability system implementation.

Food traceability implementation	N (%)	χ^2	Significance
Do you know about the traceability system of food products?			
Yes	41 (58.6)		
No	29 (41.4)	2.057	df = 1; $P < 0.05$
If no, never heard of it	10 (14.3)	35.714	df = 1; $P < 0.05$
No time	8 (11.4)	41.657	df = 1; $P < 0.05$
No training	9 (12.9)	38.629	df = 1; $P < 0.05$
Not useful	2 (2.9)	62.229	df = 1; $P < 0.05$
Is it necessary to implement traceability system?			
Yes	65 (92.9)		
No	5 (7.1)	51.429	df = 1; $P < 0.05$
Do you think that the traceability system implementation is a success?			
Yes	32 (45.7)		
No	29 (41.4)		
Do not know	9 (12.9)	0.514	df = 1; $P < 0.05$
Are you interested in carrying out food safety traceability system to empower yourself and your staff to deliver a safer product?			
Yes	56 (80.0)		df = 1; $P < 0.05$
No	14 (20.0)	25.200	
At the current time, have you implemented, or do you plan to implement, a system of product traceability in the plant?			
Yes	37 (52.9)		
No	33 (47.1)	0.229	df = 1; $P < 0.05$

of the processing plants and SMEs ranged between 50 and 250 m^2. None of the processing plants and SMEs is bigger than 500 m^2. Hence, this study population does reflect the SMEs, as one of the criteria for SMEs; that is, they should be smaller than 400 m^2.

3.4. Overview of Traceability System Implementation. In the following section, relevant data about the participant's response to the different questions were recorded. This section consists of six questions which strive to capture the responses of the participants regarding the implementation of food traceability system. The responses given by the participants from the processing plants and SMEs are presented in Table 3.

Since traceability system is new in Malaysia and not widely applied by the industries, the participants were unaware of the system nor confident with the effectiveness of the system. Rohan et al. [19] also reported that industries may not been keen to apply traceability system because of lack of technological knowledge among the employees and the cost required to set up the traceability system. Most participants agreed in implementing the traceability systems because the systems provide the processing plants and SMEs with the ability to trace the product's journey.

Even though the participants agreed on the necessity of implementing traceability system, most of the participants (54.3%) still think that traceability system implementation cannot succeed (χ^2 = 0.514; df = 1; P < 0.05). The participants responded that the traceability system is unsuccessful due to limitations and problems in conducting the system. By referring to Daniel [20], the limitations in conducting this traceability system include proper recording of changes which may occur at different stages in the supply chain. Some of the problems identified from the participants are the capital for implementing the system. As it is not yet applied, it required a lot of capital to start up the system. Other than that, technology for the system to be implemented also requires high cost and requirement for experts in the system. New technology or software for the system will also require training for the employees. Those limitations and problems are supported by Rohan et al. [19], who determined that most of the processing plants and SMEs are still not using the advanced traceability systems because of the high cost of such systems and they do not have a clear idea about the advantages of using the system. Supports from government are needed in making the traceability system implementation a success in the processing plants and SMEs.

Figure 1 indicates that most of the participants (65.7%) recorded the detail of the products during the dispatch stage, and the least is at the processing stage (31.4%). Records are important because these data are required to successfully trace the product and its ingredients through all relevant critical tracing points (CTPs). Since fewer records were made during the product process making, this will make it more difficult to identify potential contamination during the processing stages. Additionally, trace-back investigations within the processing plants and SMEs will be obscure as there are fewer records of compliance or noncompliance [8].

TABLE 4: The importance of traceability system implementation ($n = 37$).

Importance of traceability system	N (%)	χ^2	Significance
To reduce product liability	Neither agree nor disagree = 9 (24.3) Agree = 28 (75.7)	9.757	df = 1; $P < 0.05$
To meet current regulatory requirements	Disagree = 2 (5.4) Neither agree nor disagree = 17 (45.9) Agree = 18 (48.6)	13.027	df = 2; $P < 0.05$
To meet anticipated future regulatory requirements	Disagree = 2 (5.4) Neither agree nor disagree = 14 (37.8) Agree = 18 (48.6) Strongly agree = 3 (8.1)	19.333	df = 3; $P < 0.05$
To reduce the risk of a product problem occurring	Agree = 27 (73.0) Strongly agree = 10 (27.0)	7.811	df = 1; $P < 0.05$
To meet current consumer requirements	Neither agree nor disagree = 4 (10.8) Agree = 20 (54.1) Strongly agree = 13 (35.1)	10.432	df = 2; $P < 0.05$
To reduce the impact when a product recall occurs	Neither agree nor disagree = 4 (10.8) Agree = 22 (59.5) Strongly agree = 11 (29.7)	13.351	df = 2; $P < 0.05$
Reduce customer complaints	Neither agree nor disagree = 6 (16.2) Agree = 21 (56.8) Strongly agree = 10 (27.0)	9.784	df = 2; $P < 0.05$
Access new markets	Neither agree nor disagree = 6 (16.2) Agree = 23 (62.2) Strongly agree = 8 (21.6)	14.000	df = 2: $P < 0.05$
Reduce spoilage or improved freshness	Agree = 20 (54.1) Strongly agree = 17 (45.9)	0.243	df = 1; $P < 0.05$
Reduce costs of production or improved yield	Neither agree nor disagree = 2 (5.4) Agree = 21 (56.8) Strongly agree = 14 (37.8)	14.973	df = 2; $P < 0.05$
Reduce risk of product recalls	Neither agree nor disagree = 3 (8.1) Agree = 19 (51.4) Strongly agree = 15 (40.5)	24.737	df = 2; $P < 0.05$
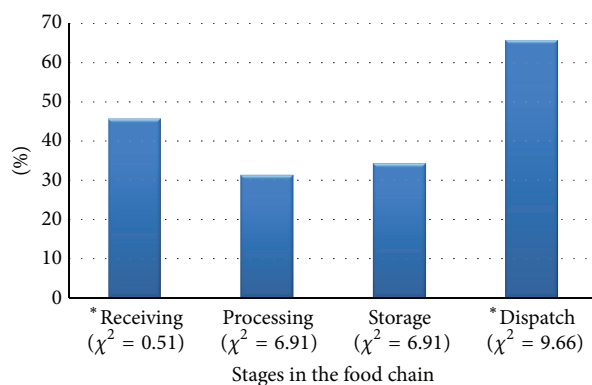
FIGURE 1: Critical Traceability Points (CTPs) of food processing plants and SMEs ($n = 70$) (*$P < 0.05$).

Differences existed between the stages especially during the dispatch stage as it enables them to identify the receiver of the products. As the product moved through the supply chain, they are subjected to specific points that define their path through supply chain. Based on the data, the participants mostly record the details during receiving and dispatching which became the CTPs for identification of product supply within the chain.

Based on Table 3, thirty-three (47.1%) participants do not plan on implementing traceability system in their processing plants and SMEs; hence the results obtained in Table 3 were only based on thirty-seven (52.9%) participants that implemented or plan to implement the traceability system. Reasons for not implementing traceability were due to (i) lack of qualified staff; (ii) cost; (iii) other investments (i.e., purchase of machineries, raw materials, and human resources) which were considered more important; (iv) changes to production processes in order to implement traceability system; (v) problems obtaining external funding or loan; (vi) being not sure if traceability system would be beneficial; and (vii) being concerned that traceability system would reduce the flexibility in production and decision making process. Additional cost due to the increment of skills needed and training cost would also be incurred to instruct the labor in the use of technology like scanners, labeling, and handling of products [21].

Table 4 indicates the participants' evaluation on the importance of traceability system implementation. Twenty-eight (75.7%) agreed that traceability system can reduce the

TABLE 5: Detail on traceability implementation ($n = 37$).

Traceability implementation	N (%)	χ^2	Significance
What types of traceability method did you use for tracing the product?			
Paper document	30 (81.1)		
Barcodes	7 (18.9)		
2D code	None		
Electronic tag/radio			
Frequency identification			
(RFID)	None	14.297	df = 1; $P < 0.05$
Have you had any product recalls/withdrawals since implementing your traceability system?			
Yes	15 (40.5)		
No	22 (59.5)	1.324	df = 1; $P < 0.05$
Have you benefited directly from the implementation of a product traceability system in the plant?			
Yes	13 (35.1)		
No	24 (64.9)	3.270	df = 1; $P < 0.05$

product liability and nine (24.3%) participants neither agreed nor disagreed ($\chi^2 = 9.757$; df = 1; $P < 0.05$). Better traceability systems do not have an impact on company's liability insurances, and the likelihood of them occurring in the companies is small [22]. Besides, eighteen (48.6%) out of thirty-seven (100%) participants agreed that the traceability system implementation is important to meet the current regulatory requirements and two (5.49%) of the participants did not agree. According to Richard [23], requirements for product traceability are included in the food legislation and in international food safety standards and guidelines. Currently, most of the processing industries are willing to implement the systems if traceability is made mandatory. The participants agreed that regulatory requirement is important because, in the process of improvement, traceability can provide significant benefits that extend far beyond simply meeting regulatory requirements [24].

The results from Table 4 also represent the evaluation of the participants on the importance of the traceability implementation to meet current consumers' requirements. Most of the participants agreed that the implementation can enable the processing plants and SMEs to meet the current consumer requirements. Instead of that, four (10.8%) of the participants are unsure of the importance of the traceability system implementation for consumer requirements ($\chi^2 = 10.432$; df = 2; $P < 0.05$).

Based on Table 5, the results clearly show that, from thirty-seven (100%) of the processing plants and SMEs participants, thirty (81.1%) participants are using paper document as a traceability method to trace the products either from supplier or to consumers. Seven (18.9%) of the participants are using the barcodes system for tracing the products within the supply chain and none of the participants are using 2D code and radio frequency identification device (RFID) system for tracing the products. Even though the RFID tags had some advantage over barcodes in the potential amount

of information held and method of reading and recording information for future tracing system but they are more costly in comparison to barcodes [20]. The main factor limiting the RFID use in the food traceability system is cost as high capital is required to set up the system and RFID tags can be difficult to read where there are high moisture levels and in metal and aluminum packaging [23]. Furthermore, twenty-two (59.5%) of the participants did not carry out any product recalls or withdrawals since the implementation of the traceability system. Meanwhile, fifteen (40.5%) of the participants had faced product recalls or withdrawals since the implementation of the system. The recalls of the product resulted from damages to the product supply before the expiry date.

Table 6 indicated the participants' response on the impact of implementing the traceability system in the processing plants and SMEs. The results are only obtained for the thirty-seven (52.9%) processing plants and SMEs participants that implemented the traceability system. Twenty-nine (78.4%) of the processing plants and SMEs agreed that a number of products recalls and withdrawals give impact on the traceability system implementation. None of the participants disagreed that the products recalls and withdrawals had impact on the system implementation in processing plants and SMEs. Twenty-five (67.6%) of the participants agreed and two (5.4%) of the participants strongly agreed that the scope of the products recall and withdrawal impacts the implementation of the traceability system for the processing plants and SMEs.

Thirty-three (89.2%) of the participants agreed that the traceability system implementation had impact on costs in the event of a product recall and withdrawal for the processing plants and SMEs. Twenty-five (67.6%) of the participants also agreed that the implementation of the traceability system had impact on the production cost of the processing plants and SMEs. The traceability system of products could provide

TABLE 6: Participants response on impact of implementing traceability system ($n = 37$).

Impact of implementation	N (%)	χ^2	Significance
Number of product recalls or withdrawals decreased			
Neutral	7 (18.9)		
Agree	29 (78.4)		
Strongly agree	1 (2.7)	35.243	df = 2; $P < 0.05$
Scope of product recalls or withdrawals smaller			
Disagree	2 (5.4)		
Neutral	8 (21.6)		
Agree	25 (67.6)		
Strongly agree	2 (5.4)	38.351	df = 3; $P < 0.05$
Reduced costs in the event of a product recall or withdrawal			
Neutral	3 (8.1)		
Agree	33 (89.2)		
Strongly agree	1 (2.7)	52.108	df = 2; $P < 0.05$
Inventory cost			
Neutral	8 (21.6)		
Agree	25 (67.6)		
Strongly agree	4 (10.8)	20.162	df = 2; $P < 0.05$
Production cost			
Neutral	1 (2.7)		
Agree	25 (67.6)		
Strongly agree	11 (29.7)	23.568	df = 2; $P < 0.05$
Ability to access new markets			
Neutral	11 (29.7)		
Agree	13 (35.1)		
Strongly agree	13 (35.1)	0.216	df = 2; $P < 0.05$
Ability to meet customer requirements			
Neutral	4 (10.8)		
Agree	21 (56.8)		
Strongly agree	12 (32.4)	11.730	df = 2; $P < 0.05$
Ability to meet regulatory requirements			
Disagree	2 (5.4)		
Neutral	9 (24.3)		
Agree	20 (54.1)		
Strongly agree	6 (16.2)	19.3	df = 3; $P < 0.05$
How company is perceived by commercial customers			
Neutral	1 (2.7)		
Agree	22 (59.5)		
Strongly agree	14 (37.8)	18.216	df = 2; $P < 0.05$
How company is perceived by rest of industry			
Agree	16 (43.2)		
Strongly agree	21 (56.8)	0.676	df = 1; $P < 0.05$

direct benefits to the processing plants and SMEs through the increase of efficiencies in management of inventories and improvements in product flow and in management of inputs while reducing the costs associated with the recall of product which may be due to possible contamination or quality assurance and access to markets where the consumers require product tracing [20]. Based on Table 6, more than half of the participants responded that some of the positive impacts of the traceability were the ability to access new markets and meet consumers' and regulatory requirements.

3.5. *Factors of Traceability System.* In the following section, the data about the response of the participants on the detailed factors of the traceability system implementation were collected. The purpose of the evaluation was to evaluate

TABLE 7: Participants' evaluation on factors that affect the traceability system.

Factors that affect traceability system	χ^2	%
Would you like to know the origins of the food you eat?	44.800 (1); $P < 0.05$	Strongly agree (10) Agree (90)
Do you consider traceability important to the consumer?	65.514 (2); $P < 0.05$	Strongly agree (15.71) Agree (78.57) Neither agree nor disagree (5.71)
Does traceability system operate easily?	29.314 (3); $P < 0.05$	Strongly agree (1.43) Agree (40) Neither agree nor disagree (40) Disagree (18.57)
Do you need policy guidance for enterprise implementing system from government?	90.800 (3); $P < 0.05$	Strongly agree (20) Agree (72.86) Neither agree nor disagree (1.43) Disagree (5.71)
Traceability system implementation being taken into corporate strategy by top management.	35.257 (3); $P < 0.05$	Strongly agree (15.71) Agree (55.71) Neither agree nor disagree (14.29) Disagree (14.29)
Could the tracking information be used to identify product approaching its due date so that it can be used or sold quickly?	35.686 (2); $P < 0.05$	Strongly agree (40) Agree (58.57) Neither agree nor disagree (1.43)
Paper recording and documentation are waste of money.	19.486 (3); $P < 0.05$	Strongly agree (7.14) Agree (44.29) Neither agree nor disagree (22.86) Disagree (25.71)

the factors that affect the traceability system. Table 7 consists of specific statements to which the participants were required to respond on the five-point scales that consist of strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree.

Sixty-three (90.0) of the processing plants and SMEs participants strongly agreed and seven (10.0%) agreed ($P < 0.05$) that it is necessary to know about the origin of the food consumed. It is important to know the origin of food consumed as it could affect the health. Rather than unwittingly resulting in disease by the food consumed, it should be contributing to health [25].

Fifty-five (78.6%) of the participants agreed that it is important to consider the importance of traceability system to the consumer. The food traceability system is designed to reduce uncertainties in food consumption by consumers as they consider safer products and consumers would like to acquire sufficient information of the quality and safety of the food they eat [26]. There is a significant difference between the participants where twenty-eight (40.0%) of the participants agreed and considered that the traceability system can be operated easily. By assigning identification codes to the specific batches of products and maintaining the integrity of the individual batch together with its information throughout its time within factory, this can reduce the time to trace harmful product and becomes the key success of the traceability system implementation [27]. Fifty-one (72.9%) of the participants agreed that policy guidance from the government is needed for the processing plants and enterprises to implement the traceability system. The enterprises agreed that policy guidance and financial support are needed in

implementing the system because certain enterprise products have low profit and workers have low wages which make it difficult to have high technology and administrative staff and government is not providing a clear policy for enterprises [6].

Thirty-nine (55.7%) ($P < 0.05$) of the processing plants and SMEs participants agreed that it is important for the top management to include the traceability system implementation into the corporate strategy of the processing plants and SMEs. The corporate brands and reputation of the processing plants and SMEs will be improved; food products are safe and well evaluated by consumers which lead to the success of the traceability implementation [6].

The majority of the participants agreed that the tracking information can be used in order to identify the product approaching its due date so that it can be used or sold quickly. By implementation of automated reporting system of traceability, the companies can easily and more quickly determine the contaminated product batch and recall only for those affected products and this system is fundamental in enabling producers to quickly identify and act regarding the problem with the products [28].

However, among the participants, thirty-six (51.4%) agreed or strongly agreed that the paper recording and documentation processes of the traceability system are waste of money. According to Beissel [28], it is an insurmountable task of using traditional paper records to track the production and distribution because, by having to flip through huge stacks of paper to identify exactly which batch number was contaminated, what plant it came from, what day, shift, and time it was produced, and to which grocery stores it was shipped, it is costly and time-consuming task with a large

margin of error. Even the participants agreed that paper recording and documentation were waste of money; they still used paper for data record keeping as other methods required high cost and technologies. Between the possibility of implementing automated traceability and the assistance of scanners, RFID, or barcodes, the large majority of the processing plants and SMEs that keep track of their product still continue to use paper recording as it is the cheapest means in the traceability system.

4. Conclusion

Since the traceability system implementation in Kelantan, Malaysia, is new and not widely implemented, it faces many challenges which lead to major barriers to the success of the traceability implementation. In this study, 70 participants of food processing plants and SMEs have some knowledge about the food safety requirements. Identification of forward and backward traceability of the products is vital part in food management system because it influenced the recall process of the products. The CTPs, particularly at the receiving and dispatching stages in the processing plants and SMEs, also provided a better traceability for detecting the affected food. However, the lack of recording during the product process stages may have profound effects as potential contamination occurring during the processing may not be identified. A better and detailed record keeping throughout the pre-, during, and postprocessing can improve the CTPs and enable a better tracing and tracking of damaged products supplied within the supply chain. The factors for implementation of better traceability system are also determined through this study. Technology advancement, government financial support and training, effectiveness of operation, and record keeping influenced the implementation of traceability system. Based on the study, it can be suggested that the participants can work together with the bigger food processing industries in order for them to develop an additional guidance related to traceability and strengthen the traceability system that had been implemented. This guidance could encourage facilities to assign a person to be responsible for responding to emergencies of food products. Besides, the participants should be involved with training and education activities can be conducted to inform the processing plants and SMEs about the importance of traceability system and provide them with knowledge and information that are related to food safety. It is also suggested that food processing plants and SMEs should seek for statutory authority in order for them to strengthen the existing record keeping with more specific information.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.
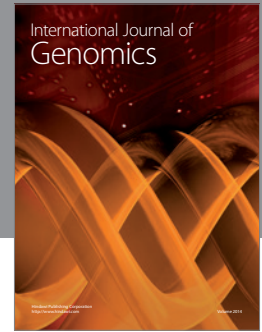
Acknowledgments

References

[1] European Commission, *Food Traceability*, Health & Consumer Protection Directorate-General, 2007.

[2] R. P. Kasthuri and K. S. Sriprada, *Product Traceability & Recall Planning*, Wipro Technologies, 2009.

[3] FAO-WHO, *FAO/WHO Guide for Developing and Improving National Food Recall Systems*, 2012, http://apps.who.int/iris/bitstream/10665/77746/1/9789241504799_eng.pdf.

[4] Z. Hu, Z. Jian, P. Shen, Z. Xiaoshuan, and M. Weisong, "Modeling method of traceability system based on information flow in meat food supply chain," *WSEAS Transactions on Information Science and Applications*, vol. 6, no. 7, pp. 1094–1103, 2009.

[5] L. Peter, F. Arpad, and N. Marta, "Present-day situation of food safety and traceability," in *Proceedings of the 2nd International Conference on Agricultural and Animal Science*, pp. 40–44, Singapore, 2011.

[6] M. Miao, *Critical success factors for implementing traceability systems in chinese food enterprises [M.S. thesis]*, University of Bedfordshire, 2010.

[7] D. Brent, "Traceability systems needed to increase trust in food safety," The Conference Board of Canada, 2012, http://www.conferenceboard.ca/press/newsrelease/12-11-02/traceability_systems_needed_to_increase_trust_in_food_safety.aspx.

[8] B. Welt and J. McEntire, *Product Tracing in Food Systems: Developing a Product Tracing Plan Using Critical Tracking Events and Key Data Elements*, Institute of Food Technologies, 2011.

[9] Y. Uchida, S. Matsimo, T. Tamaki, and T. Ito, "A new traceability system for SMEs with open source software," *WSEAS Transactions on Business and Economics*, vol. 6, no. 1, pp. 1–10, 2009.

[10] ECER, *ECER 2020: East Coast Economic Region—Kelantan, Terengganu, Pahang and Mersing District of Johor*, Malaysia's Food Processing Industry, 2008, http://ecer2020.blogspot.com/2008/07/malaysias-food-processing-industry.html.

[11] E. Mahalingam, "Food traceability can benefit Malaysia," The Star Online, March 2008, http://biz.thestar.com.my/news/story.asp?file=/2008/3/19/business/20675298&sec=business.

[12] SME Corp. Malaysia, *Guideline for New SME definition*, 2013, http://www.smecorp.gov.my/vn2/sites/default/files/Guideline_for_New_SME_Definition_7Jan2014.pdf.

[13] B. Welt and R. Blanchfield, *Food Traceability*, Scientific Information Bulletin, International Union of Food Science Technology (IUFoST), 2012.

[14] MOH, "Food hygiene regulations," 2009, http://www.moh.gov.my.

[15] B. Kvarnström, B. Bergquist, and K. Vännman, "RFID to improve traceability in continuous granular flows—an experimental case study," *Quality Engineering*, vol. 23, no. 4, pp. 343–357, 2011.

[16] J. Pallant, *SPSS Survival Manual*, Open University Press, Berkshire, UK, 2005.

[17] S. Zarina and H. M. O. Mohd, "Goal orientations and typology of women entrepreneurs," *Jurnal Kemanusiaan*, vol. 10, pp. 25–37, 2007.

[18] A. A. L. Abdul, A. Y. Siti, S. M. N. Ahmad, and H. M. Z. Nor, "Analysis of one village "one product" (OVOP) or "satu daerah satu industri in Kelantan"," in *Proceedings of the One District One Industry Workshop*, pp. 114–139, 2009.

[19] S. Rohan, N. Duminda, S. Noriyuki, and W. Manjula, "Total traceability system: a novel system by combination of horizontal and vertical traceability systems for food supply Chain," *IJCSNS*

International Journal of Computer Science and Network Security, vol. 9, no. 3, pp. 148–156, 2009.

[20] R. L. Daniel, *Traceability in the Food Supply Chain*, 2009.

[21] M. Carla, M. Jennifer, K. Kevin et al., "Traceability (product tracing) in food systems: an IFT report submitted to the FDA, volume 1: technical aspects and recommendations," *Comprehensive Reviews in Food Science and Food Safety*, vol. 9, no. 1, pp. 159–175, 2010.

[22] E. Golan, B. Krissoff, F. Kuchler, K. Nelson, G. Price, and L. Calvin, "Traceability in the US food supply: dead end or superhighway?" *Choices: The Magazine of Food, Farm and Resource Issues*, 2003, http://www.choicesmagazine.org/2003-2/2003-2-04.pdf.

[23] L. Richard, *Food Safety and Traceability Strategies: Key Hazards, Risks and Technological Developments*, Business Insights, 2010.

[24] S. David, S. Brian, C. Brian, and B. Daniel, "Can-trace decision support system for food traceability. Can-trace business case final report," in *Agriculture and Agri-Food Canada*, pp. 1–63, 2004.

[25] D. S. Paul, "We are what we eat. The origins and current legal status of "natural" and "organic" food labels," *Gastronomica*, 2012, http://www.gastronomica.org/we-are-what-we-eat/.

[26] Y. C. Choe, J. Park, M. Chung, and J. Moon, "Effect of the food traceability system for building trust: price premium and buying behavior. Information system front," in *Springer Science and Business Media*, pp. 1–13, 2008.

[27] H. Victor and S. Markus, *A Guide to Traceability within the Fish Industry*, The Humber Institute Food & Fisheries (HIFF), 2005.

[28] K. Beissel, "Automating systems is key to traceability," *Food Safety Magazine*, 2013, http://www.foodsafetymagazine.com/.

International Journal of
BioMed
Research International

Stem Cells
International

International Journal of
Peptides

Advances in
Virology

International Journal of
Genomics

International Journal of
Zoology

Journal of
Nucleic Acids

Journal of
Signal Transduction

Hindawi

Submit your manuscripts at
http://www.hindawi.com

The Scientific World Journal

Genetics
Research International

Anatomy
Research International

International Journal of
Microbiology

Biochemistry
Research International

Advances in
Bioinformatics

Archaea

Enzyme
Research

International Journal of
Evolutionary Biology

Molecular Biology
International

Journal of
Marine Biology