

PRELIMINARY STUDY ON THE MARKETING OF PICKLES IN MALAYSIA

Norhashila Ismail*

ABSTRACT

Pickles are products produced for generations as a way to preserve fruits and vegetables. The purpose of this study is to provide new base knowledge regarding the pickle industry in Malaysia. One hundred and twenty nine respondents from a group of pickle manufacturers were interviewed using questionnaires. These manufacturers obtained their supplies of raw materials from farms, supermarkets or from their own crops. However, due to the small scale production and its seasonal nature, the manufacturers also sourced raw materials from farmers' markets or night markets in small quantities according to their current manufacturing requirement. Some of the raw materials such as mango, kelubi and salak are imported from Indonesia or Thailand. The study found that 89% of the manufacturers do not use machineries when making pickle. The majority of manufacturers, that is 91.40% from the total surveyed, pickled the fruits and vegetables in brine solution. More than half of the respondents added citiric acid to the brine solution during the pickling process. From the findings of this survey, manufacturers believed that mango pickles have the potential for further development in the future and is the consumer favourite right now. Even though Sabah has its own special pickle, compared to other states in Malaysia, there are not many pickle manufacturers there.

Keywords: Pickles, supply chain management, marketing chain management, fruits, vegetables, Malaysia

INTRODUCTION

Farm produce such as fruits and vegetables have to be processed as soon as possible because they can easily spoil (Vichai, n.d.). One way to overcome this problem is to pickle them. However, this method is slowly losing its popularity. According to anthropologists, pickling activities motivate individuals for generations to participate in agriculture. These curing methods could be used in managing agricultural produce, i.e. to supply food with long shelf life or transform massive amount of agricultural products to into processed products with added value that could be commercialised (Vichai, n.d.).

In fact, food preservation methods, such as pickling, have the following benefits (Battock & Ali, 1991; Jyoti, 2011):

- i. Preserving food biologically extends the shelf life of fruits and vegetables.

* Federal Agricultural Marketing Authority.
e-mail: norhashila@fama.gov.my

- ii. It reduces the usage of refrigeration and other technologies, thus decreasing the cost of storage for stock.
- iii. It increases stock of food by transforming leftovers into something edible.
- iv. It improves the taste and gives flavour to food, and
- v. It increases income and creates employment opportunities.

LITERATURE REVIEW

Table 1 shows various types of foods from all over the world produced using fermentation or preservation methods. The term pickle in Southeast Asia is usually used for fruits and vegetables preserved with vinegar and salt. Preservation methods such as pickling is a technology that is considered the oldest technology (Battock & Ali, 1991) to add flavour and improve the taste of food biologically (Jyoti, 2011; Vichai, n.d.).

Table 1: Preserved Food from All over the World

Name and Region	Type of Product
Indian sub-continent	
Acar, Achar, Tandal achar, Garam nimboo achar	Pickled fruit and vegetables
Gundruk	Fermented dried vegetables
Lemon pickle, Lime pickle, Mango pickle	
South East Asia	
Asinan, Burong mangga, Dalok, Jeruk, Kiam-chai, Kiam-cheyi, Kong-chai, Naw-mai-dong, Pak-siam-dong, Paw-tsay, Phak-dong, Phonlami-dong, Sajur asin, Sambal tempo-jak, Santol, Si-sek-chai, Sunki, Tang-chai, Tempoyak, Vanilla,	Pickled fruit and vegetables
Bai-ming, Leppet-so, Miang	Fermented tea leaves
Nata de coco, Nata de pina	Fermented fruit juice
East Asia	
Bossam-kimchi, Chonggak-kimchi, Dan moogi, Dongchimi, Kachdoo kigactuki, Kakduggi, Kimchi, Mootsanji, Muchung-kimchi, Oigee, Oiji, Oiso baegi, Tongbaechu-kimchi, Tongkimchi, Totkal kimchi,	Fermented in brine
Cha-ts'ai, Hiroshimana, Jangagee, Nara senkei, Narazuke, Nozawana, Nukamiso-zuke, Omizuke, Pow tsai, Red in snow, Seokbakji, Shiozuke, Szechwan cabbage, Tai-tan tsoi, Takana, Takuan, Tsa Tzai, Tsu, Umeboshi, Wasabi-zuke, Yen tsai	Pickled fruit and vegetables
Hot pepper sauce	

Table 1 (continued)

Name and Region	Type of Product
Africa	
Fruit vinegar	Vinegar
Hot pepper sauce	
Lamoun makbouss, Mauoloh, Msir, Mslalla, Olive Oilseeds, Ogili, Ogiri, Hibiscus seed	Pickled fruits and vegetables Fermented fruits and vegetable seeds
Wines	Fermented fruits
Americas	
Cucumber pickles, Dill pickles, Olives, Sauerkraut, Lupin seed, Oilseeds, Vanilla, Wines	Pickled fruits and vegetables Pickled oilseed Fermented fruits and vegetables
Middle East	
Kushuk	Fermented fruits and vegetables
Lamoun makbouss, Mekhalel, Olives, Torshi, Tursu	Pickled fruits and vegetables
Wines	Fermented fruits
Europe and World	
Mushrooms, Yeast	Moulds
Olives, Sauerkohl, Sauerruben	Pickled fruits and vegetables
Grape vinegar, Wine vinegar	Vinegar
Wines, Citron	Fermented fruits

Source: G. Campbell-Platt (1987), *Fermented Foods of the World: A Dictionary and Guide*.

Pickles are traditionally processed products that could be commercialised. Vichai (n.d.) presented this information in his report of 15 traditional ways to process fruits and vegetables. Table 2 shows how mango, guava and papaya are pickled in Thailand. This process can be applied to other fruits and vegetables as well.

Table 2: The Process of Pickling Mango, Guava or Papaya

Methods	Remarks
Fruit preparation	Preparation of fruits such as mango, guava or papaya
Recovery	Add fruit into 15 to 20 percent brine solution and soak for 3 weeks.
Salted fruits	After 3 weeks, the fruits will become thoroughly salted. These salted fruits are particularly popular amongst women and are normally sold at the market after the salt is removed by soaking the fruits in water for 1 or 2 days.
Peeling and cutting	Fruits are peeled and cut into pieces.

Table 2 (continued)

Methods	Remarks
Soaking in a solution of 50% sugar and 0.6% citric acid.	The fruits are soaked for 2 to 3 weeks at room temperature.
Sweet and sour fruits	Fruits are dried and packed in plastic before being sold. To extend their shelf-life, preservative such as sodium benzoate is added into the solution.

Note: Adapted from “Traditional Processed Foods from Fruits and Vegetables and their Processing Technology in Thailand” by Vichai, n.d.

FAO (1999) also discussed the scope of pickles including fruits, vegetables, cereals, legumes and spices that have been treated and processed for consumption. However, FAO (1999) did not include cucumber pickle and kimchi in their discussion. Table 3 shows the summary of the discussion by FAO (1999).

Euromonitor (2006) also defined pickled products as fruits or vegetables preserved in vinegar or brine. However, products such as fish, shellfish or seafood are not considered pickled products. They are categorised as canned products, fermented products or frozen fish.

Table 3: Definition of Pickled Products and Criteria

Definition of Pickle Products	
(a)	Made from fruits, vegetables, cereal, legumes, spices and edible flavouring.
(b)	Subject to fermentation and processing with ingredients appropriate for the type in order to ensure that the quality of the product is maintained.
(c)	Processed in an appropriate manner in order to ensure the quality and proper preservation of the product.
(d)	Packed in suitable packaging medium compatible with the types and varieties of pickles.
Criteria for Pickle Quality	
Colour	Product must be free from any added colouring
Taste	Product must have the characteristics of the typical taste. It must be free from any unpleasant taste or flavouring

Table 3 (continued)

Specific requirements	<ul style="list-style-type: none">1) Pickles in edible oil:<ul style="list-style-type: none">a) The percentage of oil in the product must not be less than 10% of the weight.b) The basic ingredient in end product is not less than 60% of the weight.2) Pickles in brine:<ul style="list-style-type: none">a) The percentage of salt in the pickling liquid must not be less than 10% of the weight.b) The end product will not be less than 60% of the weight.3) Pickles in acidic medium:<ul style="list-style-type: none">a) Acidic medium cannot be less than 2% of the weight of the acid.b) The weight of the end-product is not less than 60% of the weight.
------------------------------	--

Source: United Nations Food and Agriculture Organization (FAO), (1999), *Codex Alimentarius Commission Procedural Manual* (11th Ed.). Rome, Italy: FAO.

In the current scenario in Malaysia, marketers and interested parties do not have enough information regarding pickle products in Malaysia for effective decision-making. Existing research on pickles is usually focussed on the technical and medical (aspects of pickles rather than on the marketing and business aspects of the pickle industry in Malaysia. Aside from that, there is little new information regarding the supply chain of fresh raw materials and marketing of pickles. Due to the fact that pickles are produced using fresh fruits and vegetables, it is also important to study the source of raw materials for the production of this product.

A study by Norsida, Nolila and Mohd Mansor (2009) found that in Malaysia, 76.2% of the supply of fruits is distributed by farmers through wholesalers, either directly or indirectly through collectors/transporters (Figure 1). Wholesalers, in turn, market 30% of their fresh fruit supplies to institutional buyers. For vegetables, 79.3% of fresh vegetable supplies from farmers are marketed directly to wholesalers or indirectly through collectors/transporters who supply to wholesalers (Figure 2). Wholesalers were found to market 27% of their vegetable supplies to institutional buyers. These institutional buyers include food manufacturers producing food such as fruit and vegetable pickles.

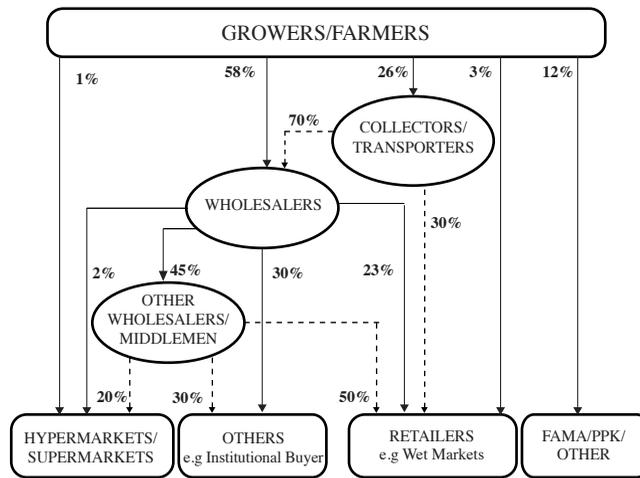


Figure 1: The Supply Chain of Fresh Fruits in Malaysia

Source: Adapted from “An Overview of Supply Chain Management of Malaysian Vegetable and Fruit Industries Focussing on the Channel of Distribution” by Norsida Man, Nolila Mohd. Nawi and Mohd Mansor Ismail, 2009, Journal of Agribusiness Marketing, 2, pp.15.

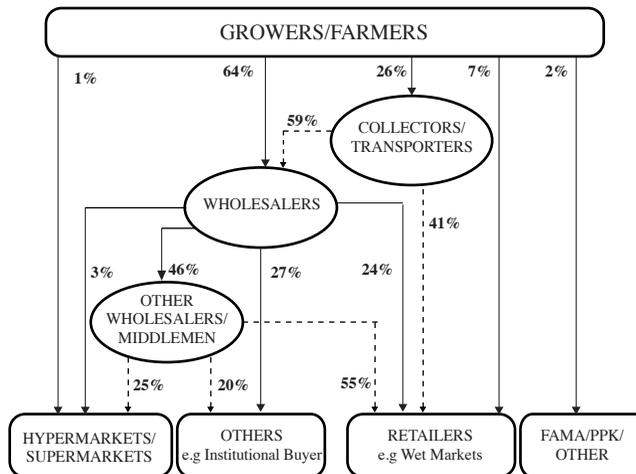


Figure 2: The Supply Chain of Fresh Vegetables in Malaysia

Source: Adapted from “An Overview of Supply Chain Management of Malaysian Vegetable and Fruit Industries Focussing on the Channel of Distribution” by Norsida Man, Nolila Mohd. Nawi and Mohd Mansor Ismail, 2009, Journal of Agribusiness Marketing, 2, pp.15.

Norjaya, Mohd Suhaimi, Norzalita and Ahmad (2008), in their study on the marketing chain for Malaysian fruit products in Europe found that exporters and wholesalers are the main players in marketing these fruits. They played an important role in logistics, storage and repackaging of these produce. In addition, supermarkets, retailers, and open markets are also the channels in the marketing chain of fruit and vegetable products to the users (Figure 3).

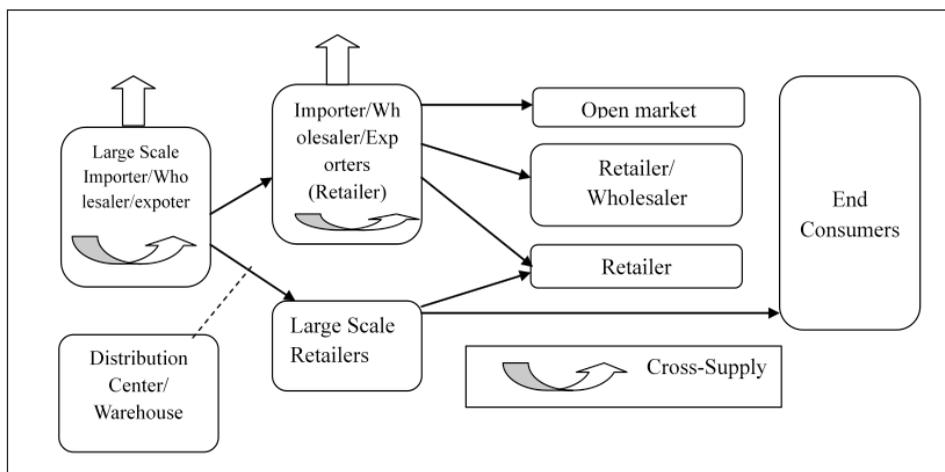


Figure 3: Summary of Distribution Channels in Netherlands

Source: Adapted from “Exploratory Study in Accessing the Market Potential and Distribution Network of Selected Tropical Fruits in Europe” by Norjaya, Mohd Suhaimi, Norzalita and Ahmad, 2008, *Journal of Agribusiness Marketing*, 1, pp.17.

The general objective of this study is to study the issues faced by the pickle industry in Malaysia. The specific objectives are to determine the source of raw materials for the pickle industry and study the supply chain for pickled products. This study is exploratory in nature because of the lack of information regarding the pickle industry in Malaysia.

METHODOLOGY

The information was collected from 129 pickle manufacturers or producers from all over Malaysia. Respondents were selected through a convenience sampling method from a list of manufacturers that was obtained from Malaysian agencies providing assistance to manufacturers or producers and research done by the Federal Agricultural Marketing Authority (FAMA). Research assistants conducting the survey used structured questionnaires when interviewing these manufacturers. Table 4 shows the state-wide distribution of respondents who agreed to participate in this survey.

Table 4: Sample Size of Pickle Manufacturers According to States

State	Sample Size of Manufacturers
Johor	12
Kedah	8
Kelantan	2
Terengganu	9
Pahang	3
Perlis	2
Perak	3
Penang	9
Selangor	5
Melaka	3
Negeri Sembilan	1
Sabah	63
Sarawak	9
Total Manufacturers	129

The questionnaire was divided into a few sections as follows:

- Section A : Enterprise Information
- Section B : Sale of Pickles
- Section C : Pickle Manufacturing Process
- Section D : Raw Material Supply
- Section E : Marketing
- Section F : Respondent's Profile

The data collected was processed and analysed with descriptive methods to arrive at the findings.

RESULTS AND DISCUSSION

Profile of Pickle Manufacturers

One hundred and twenty nine respondents, who are pickle manufacturers, agreed to cooperate in providing information regarding the production of pickles. From the total respondents, 74.22% were women and 25.78% were men (Table 5). Majority of the manufacturers surveyed (74.7%) have been involved in the production of fruit and vegetable pickles for 1 to 6 years (Table 6). However, there were also manufacturers with 10, 15, 20 or 40 years' experience in the fruit and vegetable pickle business.

Table 5: State-wise Distribution of Pickle Manufacturers' Sample Based on Gender

State	Male	Female
Johor	5	7
Kedah	4	4
Kelantan	1	1
Terengganu	1	8
Pahang	2	1
Perlis	2	0
Perak	2	1
Penang	3	6
Selangor	1	4
Melaka	2	1
Negeri Sembilan	0	1
Sabah	8	55
Sarawak	2	7
Total	33	95
Percent (%)	25.78	74.22
Grand Total	129 manufacturers	

Table 6: Years of Involvement of Manufacturers in Pickle Production

Years Involved	No. of Manufacturers	Percent (%)
1	2	1.6
2	16	12.7
3	21	16.7
4	16	12.7
5	29	23.0
6	10	8.0
7	1	0.8
8	3	2.4
10	7	5.6
11	1	0.8
12	1	0.8
13	1	0.8
14	1	0.8
15	3	2.4
16	1	0.8
17	1	0.8
20	5	4.0
29	1	0.8
30	3	2.4
38	2	1.6
40	1	0.8
Unknown*	3	2.4
Total Manufacturers	129	100.0

* Three respondents did not state the length of their involvement

All respondents manufactured pickles from fruits and vegetables. What pickle to produce would usually depend on the type of fruits or vegetables available in the market; and as such, there was no fixed type of pickles produced. Furthermore, pickles were usually mixed when sold to customers unless they were sold wholesale to processed food wholesalers or retailers. A few varieties were usually mixed together and sold by weight on the request of customers.

The Method and Technology of Pickle Production

The manufacturers reported that the recipes they were using for production are handed down from generation to generation. However, some manufacturers used new tools such as a wok for making syrup and fruit-cutting machines. Nevertheless, in most places, pickles were produced manually. These producers believed that pickles tasted better when produced manually or traditionally because they would retain their characteristics. In addition, the process created job opportunities for the local community. The machines that were usually utilised to produce pickles were syrup-making and product-packaging machines such as vacuum packing machine and cup sealer. Table 7 shows that 89% of the manufacturers do not use machines when making pickles.

Table 7: Machine Usage in Production of Pickles

State	Machine		Total	Type of Machine
	Yes	No		
Johor	5	7	12	Wok, packaging machine, fruit cutter, bottle steriliser, grinding machine
Selangor	4	1	5	Packaging machine, grinding machine, wok
Sabah	-	63	63	-
Sarawak	-	9	9	-
Perak	2	1	3	Amra fruit cutter, syrup stirring machine
Negeri Sembilan	-	1	1	-
Melaka	-	3	3	-
Pahang	-	3	3	-
Kelantan	-	2	2	-
Terengganu	-	9	9	-
Kedah	-	8	8	-
Penang	3	6	9	Machine for making syrup, grater, grinding machine
Perlis	-	2	2	-
Total	14	115	129	-
Percent (%)	11	89	100	-

For the ingredients, most of the manufacturers used coarse salt during the fermentation and pickling process. Table 8 shows that 91.47% of producers used brine and 69.77%

used an acidic solution. They usually added the salt and acid during the pickling process. The fermenting process takes one day to two months according to the type of fruits and vegetables. Most of the fruits and vegetables are normally fermented for one to two weeks. However, *kelubi* is fermented longer, from two weeks to two months to improve its taste. Some manufacturers used permitted preservatives such as Malic Acid, Sodium Benzoate and Sodium Hydroxide, pickle yeast, fungicide and rock sugar. Fruits or vegetables that have been soaked in brine will be drained and washed before syrup is added and then packed and marketed. Some manufacturers added honey into the syrup but this is not widely done because of the high cost which will increase the price of the final product.

Table 8: Ingredients Used in Pickle Manufacturing

State	Ingredients			
	Salt	Acid	Others	Not Disclosed
Johor	6	7	-	3
Kedah	8	2	-	-
Kelantan	1	-	1 (Pickle yeast, fungicide)	-
Terengganu	9	-	-	-
Pahang	3	-	2 (Rock sugar)	-
Perlis	2	-	-	-
Perak	3	3	-	4
Penang	5	5	-	-
Selangor	5	-	-	-
Melaka	3	1	1 (Rice water)	-
Negeri Sembilan	1	-	-	-
Sabah	63	63	-	-
Sarawak	9	9	-	-
Total	118	90	4	7
Percent (%)	91.47	69.77	3.10	5.43

Market Potential of Pickle Varieties

Table 9 shows the varieties that have potential for future development according to manufacturers interviewed. Manufacturers from Sabah believe that the *tuhau* pickle has the highest potential in Sabah. For other states, mango and *kelubi* pickles were often cited. Generally, the most popular pickles are mango and *kelubi* pickles as shown in Table 10.

Table 9: Varieties of Pickles with Market Potential According to Manufacturers

Varieties	State *													Total
	JH	KD	SL	PR	ML	PH	KL	TR	PP	PL	SB	SR	NS	
Guava	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Lime/Musky Lime	2	-	2	-	-	-	-	-	-	-	-	-	-	4
Pelam	1	-	1	1	-	-	-	3	-	-	-	-	-	6
Cherry	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Mango	1	3	2	1	1	-	-	-	2	2	-	-	-	12
Kelubi	-	5	-	1	-	1	1	5	-	-	-	-	-	13
Hog Plum	-	-	-	-	-	1	-	-	-	-	-	1	-	2
Sweet Bamboo Shoot	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Strawberry	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Leucaena/Petai	-	-	-	-	-	-	1	-	-	-	-	1	-	2
Cleome	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Nutmeg	-	-	-	-	-	-	-	-	3	-	-	-	-	3
Tuhau	-	-	-	-	-	-	-	-	-	-	63	-	-	63
Gelugor	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Total	6	8	5	3	2	3	2	9	5	2	63	3	-	111

*JH=Johor; KD= Kedah; SL= Selangor; PR=Perak; KN = Kelantan; TR =Terengganu; PP=Penang; PL=Perlis; SB=Sabah; SR=Sarawak; ML=Melaka; PH=Pahang

Table 10: Most Popular Current Pickle Varieties

Varieties	State*													Total
	JH	KD	SL	PR	ML	PH	KL	TR	PP	PL	SB	SR	NS	
Prune	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Guava	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Cherry	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Hog Plum	1	1	1	-	-	-	-	-	-	-	-	3	-	6
Lime/Musky Lime	1	-	-	-	1	-	-	-	-	-	-	-	-	2
Pelam	2	-	1	1	-	-	-	1	-	-	-	-	-	5
Mango	-	2	-	1	1	-	1	-	3	2	-	1	-	11
Kelubi	-	4	-	1	-	1	-	6	-	-	-	2	-	14
Salak	-	1	-	-	1	-	-	1	-	-	-	-	-	3
Fruits Achar	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Papaya	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Leucaena/Petai	-	-	-	-	-	-	1	-	-	-	-	-	-	1
Cleome	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Nutmeg	-	-	-	-	-	-	-	-	2	-	-	-	-	2
Gelugor	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Total	7	8	2	3	3	3	2	9	5	2	-	8	-	52

*JH=Johor; KD= Kedah; SL= Selangor; PR=Perak; KN = Kelantan; TR =Terengganu; PP=Penang; PL = Perlis; SB=Sabah; SR=Sarawak; ML=Melaka; PH=Pahang

The Marketing Chain of Fruit and Vegetable Pickles

Figure 4 illustrates the marketing chain of fruit and vegetable pickles in Malaysia. Table 11 shows that 88 manufacturers or 68% sold all their products directly to consumers. Almost 95% of the manufacturers were involved in selling their products directly to the consumer, but in varying percentages. However, they also sold their products to wholesalers. There were four manufacturers who marketed their products online. Grocery shops and supermarkets were less popular outlets for pickles.

Some of the reasons stated by manufacturers for using intermediaries to market their products were to increase sales, expand markets, overcome transportation problems, widen the distribution area and added advantage in carrying out bulk sales. They also mentioned their own weaknesses in terms of time constraints and the lack of manpower to carry out marketing efforts.

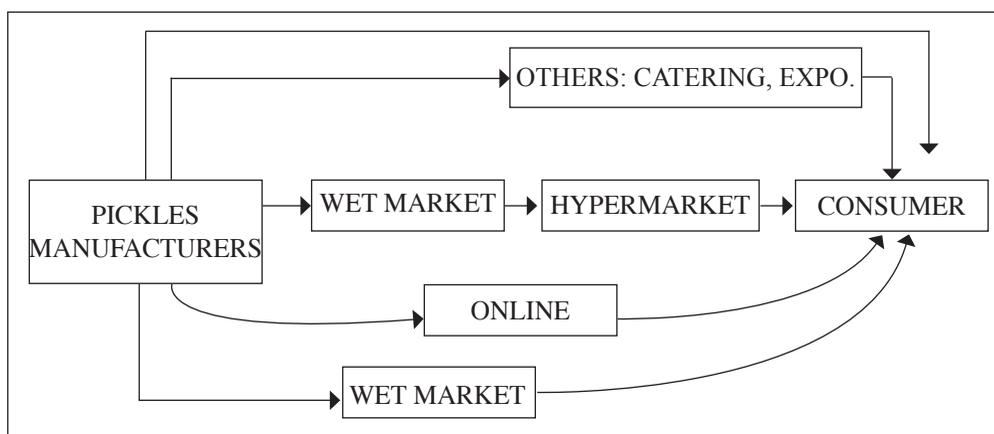


Figure 4: Marketing Chain for Pickles

Source of Raw Materials for Fruit and Vegetable Pickle Production

Pickle manufacturers obtained their supply of raw materials from various sources, including their own crops, night markets, farmers' markets, weekend markets, contract farming, fruit/vegetable suppliers, wet markets and hypermarkets. The sources of raw materials supplies for the production of pickles are shown in Table 12. The majority of manufacturers, i.e. numbering 66 from the total of 129 respondents, obtained raw materials entirely from their own crops. The 63 manufacturers in Sabah planted *bambangan* and *tuhau* on their own farm. Meanwhile 15 manufacturers or 12% obtained their supplies from suppliers of fruits and vegetables and 5 manufacturers or 4% sourced entirely from night/farmer markets as they are not large-scale manufacturers.

Table 11: Pickle Marketing Chain by Manufacturers

Marketer	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%	15%	10%	5%	0%	Total
Selling on his own	88	-	1	-	4	1	10	1	2	-	2	-	1	-	4	1	4	-	2	-	-	121
Wholesaler	2	-	-	-	1	-	-	-	-	-	1	-	1	-	-	1	3	1	2	1	-	13
Grocery Shop	3	-	-	-	-	-	-	-	-	-	3	-	1	-	3	1	8	1	3	-	-	23
Supermarket	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	3
Online	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	1	-	4
Wet Market	-	-	-	-	-	-	-	-	-	-	1	-	-	-	3	1	1	-	-	-	-	6
Others	-	1	-	-	2	-	1	-	1	-	1	-	-	-	2	-	4	-	1	1	-	14

Table 12: Sources of Raw Materials for Pickle Manufacturing

Source of Raw Materials	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%	15%	10%	5%	0%	Total
Own Farm	66	-	1	-	1	-	-	-	1	-	1	-	-	-	1	-	1	-	3	-	-	75
Fruits/vegetables Suppliers	15	-	2	-	3	-	3	-	2	-	7	-	1	-	2	-	-	-	3	-	-	38
Night markets/farmers market/weekend market	5	-	-	-	-	1	-	-	-	-	11	-	-	-	-	-	1	-	-	-	-	18
Imported	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	4
Contract Farm	1	-	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	4
Wet Market	2	-	1	-	-	1	-	-	-	-	3	-	1	-	-	2	2	1	-	-	-	13
Hypermarket	-	-	-	-	-	-	-	-	-	-	1	-	2	-	2	1	-	-	-	-	-	6
Others	6	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	2	1	1	-	-	13

The Quality and Quantity of Supplies

Pickle production needs fresh produce from farms or fresh produce markets. These sources must meet certain criteria such as grade, price and quantity. However, in pickle production, the study found that grade is not an important procurement criterion because the product's shelf life would be extended and product taste improved after the pickling process. The study also found that the reason why there is no specific grade for raw material selection is that the fruits or vegetables do not have to be uniform in shape or size when they are processed. No machineries are used in the process to retain the traditional way the product is prepared. With manual labour used during the peeling, cutting and cleaning process, the size and cut of the pickles are not standardised; hence measurement is only by weight.

In terms of quantity of raw materials purchased, most manufacturers could not provide the exact numbers because the source of fruit and vegetable supplies is seasonal. Festive seasons affected the demand and supply at the source. However, major manufacturers such as in Kedah and Penang most likely obtained their supplies on a monthly basis as shown in Table 13. The purchase price is the price paid by the manufacturers when they buy from suppliers or hypermarkets in bulk.

Table 13: Case Studies on Purchase Price and Quantity in the Pickle Industry

State	Type of Fruit/ Vegetable	Buying Quantity	Price/Kg	State / Country
Johor	Pineapple	150 - 200 pcs	RM1.50	Johor
	Guava	100 kg	RM2.50	Johor
	Water Guava	100 kg	RM2.00	Johor
	Hog Plum	100 kg	RM1.50	Johor
	Papaya	100 kg	RM2.00	Johor
	Jicama	200 kg	RM2.00	Johor
	Musky Lime	2 kg	RM22.00	Johor
	Prune	2 kg	RM28.00	Johor
Selangor	Lime	50 kg	-	Selangor
	Prune	-	RM32.00	Selangor
	Marrow Glacé	-	RM16.00	Selangor
	Mango	-	RM13.00	Selangor
	Cherry	-	RM14.00	Selangor
	Kana	-	RM17.00	Selangor
	Chinese Dates	-	RM16.00	Selangor
	Raisin	-	RM15.00	Selangor
	Mango	25 kg	-	Selangor
	Guava	25 kg	-	Selangor
	Hog Plum	25 kg	-	Selangor
	Papaya	10 kg	-	Selangor

Table 13 (continued)

State	Type of Fruit/ Vegetable	Buying Quantity	Price/Kg	State / Country
Perak	<i>Kelubi</i>	-	RM1.80	Perak
	<i>Cermai</i>	-	RM2.00	Perak
	Milk Guava	-	RM1.00	Perak
	Mango	Not Fixed	RM1.20	Perak
	<i>Kelubi</i>	Not Fixed	RM1.80	Kedah
	<i>Mempelam</i>	500MT/Year	RM1.00-2.00	Kedah/Perak
	Papaya	2 MT/Week	RM1.00	Perak
	Hog Plum	200 MT/Year	RM0.90-1.30	Perak
	<i>Kelubi</i>	200 MT/Year	RM3.50-3.80	Perak
	<i>Cermai</i>	200 MT/Year	RM1.50-2.00	Kuantan
	<i>Cermai</i>	5-7 MT/Year	RM1.50-1.60	Perak
	Guava	100 MT/Year	RM0.90-1.10	Perak
	Jicama	80 MT/Year	RM0.70-1.30	Perak
	<i>Mempelam Padi</i>	50 MT/Year	RM1.20-1.50	Perak
Negeri Sembilan	<i>Asam</i>	2 kg	RM3.50	Negeri Sembilan
	Chili	2 kg	RM2.50	Negeri Sembilan
	Onion	2 kg	RM2.50	Negeri Sembilan
	Kana	2 kg	RM3.00	Negeri Sembilan
	<i>Mempelam</i>	2 kg	RM3.50-4.50	Negeri Sembilan
	Cherry	2 kg	RM8.00	Negeri Sembilan
Melaka	Hog Plum	Based on Demand	Based on Market	Melaka
	Sweet Bamboo Shoot	Based on Demand	RM0.80	Melaka
	Bird Chili	20 kg	RM18.00	Melaka
	Lime	50 kg	RM7.50	Melaka
	Green Chili	15 kg	RM7.50	Melaka
	Pahang	<i>Kelubi</i>	600 g	RM2.00
<i>Mempelam</i>		600 g	RM1.50	Perlis
Hog Plum		600 g – 1 kg	RM1.00 -2.00	Pahang/Perlis
Guava		350 g	RM1.50	Perak
<i>Cermai</i>		250 g	RM2.00	Perlis
Grapes		250 g	RM2.00	Perlis
Papaya		350 g – 1 kg	RM1.00 -1.50	Pahang/Perak
Jicama		200 g	RM1.50	Perak

Table 13 (continued)

State	Type of Fruit/ Vegetable	Buying Quantity	Price/Kg	State / Country
Kelantan	Leucaena/Petai	50 kg	RM15.00	Thailand
	<i>Kelubi</i>	12 kg	RM5.00	Thailand
	Grapes	12 kg	RM6.00	Thailand
	<i>Bidara</i>	12 kg	RM5.00	Thailand
	Small Mango	12 kg	RM7.00	Thailand
Terengganu	<i>Kelubi</i>	40 kg -10,000 kg	RM1.20 – 3.00	Johor/ Terengganu/ Pahang
	Hog Plum	30-100 kg	RM 1.00 – 4.00	Johor / Terengganu/ Perak
	<i>Mempelam</i>	20 - 2,500 kg	RM 1.00- 4.00	Terengganu
	Guava	50-60 kg	RM 2.80	Terengganu
	Cleome	120 kg	RM2.00	Terengganu
	<i>Cermai</i>	20 -300 kg	RM2.00-8.00	Terengganu
	<i>Sentol</i>	20 kg	RM3.00-4.00	Terengganu
	Papaya	50 -1,500 kg	RM1.40-2.50	Terengganu/ Johor
	Water Guava	50 -83 kg	RM 2.00-2.30	Terengganu
	<i>Salak</i>	300-3,000 kg	RM 1.50 - 3.00	Kelantan
	Papaya	1,000-1,500 kg	RM 1.80 -2.50	Terengganu
	<i>Cermai</i>	20 -1,500 kg	RM 1.00-2.00	Terengganu
	Tamarind	20 -30 kg	RM 4.00	Terengganu
	Jicama	100 kg	RM 1.20	Perak
	Kedah	Mango	30 -800 kg	RM0.50-3.00
<i>Kelubi</i>		40 - 800 kg	RM2.00-6.00	Pahang/Kelantan
Papaya		30 - 800 kg	RM1.00 – 2.00	Kedah
Hog Plum		20 - 400 kg	RM1.00-2.00	Perak/Kedah
<i>Cermai</i>		10-400 kg	RM1.00-2.00	Thailand/Kedah
Nutmeg		20 - 400 kg	RM4.00-6.00	Thailand/Kedah
<i>Salak</i>		200 - 400 kg	RM4.00-8.00	Thailand
<i>Setoi</i>		30-60 kg	RM1.00-1.50	Kedah
Grapes		20 kg	RM4.00	Kedah
Jicama		15 kg	RM1.50	Kedah
Mango		50 kg	RM2.00	-
<i>Kelubi</i>		40 kg	RM1.50	-
<i>Setoi</i>		30 kg	RM1.00	-
Papaya		40 kg	RM2.00	-
<i>Cermai</i>		30 kg	RM1.50	-
<i>Ambra</i>	20 kg	RM1.00	-	

Table 13 (continued)

State	Type of Fruit/ Vegetable	Buying Quantity	Price/Kg	State / Country
Penang	<i>Salak</i>	20 kg	Not Fixed	Indonesia
	Mango	20 kg	Based on Market	Thailand/ Perak
Perlis	Mango	30 – 500 kg	RM0.80 – 1.80	Perlis
	<i>Cermai</i>	50 - 250 kg	RM1.00 - 1.50	Perlis
	<i>Kelubi</i>	10 - 300 kg	RM2.50 - 5.50	Perlis/Kedah
	Hog Plum	10 kg – 300 kg	RM0.80- 1.00	Perlis
	Papaya	300 kg	RM1.00	Perlis
	Grapes	200 kg	RM2.50	Perlis / Thailand

Issues in Pickle Production

The pickles producers/manufacturers highlighted several problems that they faced in producing this product. Twenty manufacturers from the total respondents said they had problems with the price of supplies, 26 respondents had problems with supplies and three faced other problems apart from price and supplies (Table 14).

Table 14: Issues with Procurement and Sourcing of Raw Materials

Issues	Number
Price	20
Supplies	26
Others	3

Some of the key issues highlighted by the respondents regarding price, supplies and others are:

1. Supplies:
 - a. Difficulties in getting supplies: Some of the fruits such as *Salak* have to be imported from Indonesia or Thailand.
 - b. Dependency on the fruit season: The varieties of pickles are not consistent every month because it depends on what fruit is in season.
 - c. Supply is not continuous: The supply of fruits from suppliers is not consistent.
2. Price: Raw material prices fluctuate rapidly affecting pricing of final products.
3. Other Problems:
 - d. Marketing: The main problem faced by the producers/manufacturers was in pricing of their products due to the volatility in raw material prices. However, they had a price margin that they set. Manufacturers who are unable to operate within the set margin would be forced to raise the price.
 - e. Shortage of workers: Manufacturers also faced worker shortage.

Focusing on issues on marketing; five respondents have problems with the price, eight respondents have problems with market share, and four are dealing with problems other than price or market (Table 15). On issues regarding price, respondents shared that they are having problems in setting the price because of the volatility of raw material prices. They have to decide whether to maintain prices with small profit margins or raise the price. In terms of market share, they could not look for opportunities to expand their market share because they depend on the availability of raw materials.

Table 15: Issues with Marketing of Pickles

Issues	Number
Price	5
Marketing Space	8
Others	4

Increase in Demand for Pickles

Factors that cause increased demand include school holidays or public holidays because during these seasons there are many weddings which contribute to the increase in demand (Table 16).

Table 16: Factors that Increased the Demand of Pickles from Manufacturers

State	Season	% of Increase	Season	% of Increase
Sarawak	Weddings (Wedding Orders)	30%	-	-
	School Holidays	25%	Weekends	25%
	Saturday & Sunday	50%	-	-
	School Holidays & Saturday and Sunday	10%	-	-
Johor	Wedding Season	60%	-	-
	Wedding Season	200%	-	-
	Fasting Month	20%	Wedding Season	10%
	Festival	400%	Wedding Season	50%
	School Holidays	15%	-	-
	School Holidays	30%	Weekends	20%
	School Holidays	25%	Weekends	10%
	School Holidays	10%	-	-
	School Holidays	25%	Weekends	10%
	Haj Season	30%	Wedding Season	50%
School Holidays	50%	-	-	

Table 16 (continued)

State	Season	% of Increase	Season	% of Increase
Selangor	Festival	40%	-	-
	Festival	100%	School Holidays	50%
	Fasting Month	30%		-
	School Holidays		Fasting Month	-
	Eid	70%	Festival	30%
Perak	School Holidays	200%	-	-
	School Holidays	30% - 50%	-	-
Negeri Sembilan	Festival	40%	-	-
Melaka	School Holidays	50%	-	-
	Festival	10%	-	-
	School Holidays	10%	-	-
Pahang	School Holidays/ Weddings	10-30%	-	-
	School Holidays	30%	-	-
	Festival	30%	-	-
Terengganu	School Holidays	20-30%	Holidays	10%
	Fasting Month	50%	School Holidays	30%
	Fasting Month	70%	-	-
Kedah	School Holidays	70%	-	-
	School Holidays	20%	Festival	10%
	Festival	10%	School Holidays	20%
	School Holidays	20%	Festival	10%
	School Holidays	10%	New Year	10%
	School Holidays	10%	Festival	5%
Penang	School Holidays	50%	-	-
	School Holidays	50%	-	-
	School Holidays	30%	-	-
	School Holidays	50%	-	-
	School Holidays	50%	-	-
	Festive Season	50%	-	-
	Fasting Month	70%	-	-
	Fasting Month	50%	-	-
Perlis	Fasting Month	30%	-	-
	School Holidays	100%	-	-
	School Holidays	100%	-	-
	School Holidays	100%	-	-
	School Holidays	100%	-	-

Table 17 illustrates the bulk selling price and the expiry date for each pickle variety sold by manufacturers in the market.

Table 17: Varieties and Bulk Selling Price by Manufacturers

Nos.	Varieties	RM/Kg		Expiry Date	
		Minimum	Maximum	Minimum	Maximum
1.	Fruit Achar	20.00	30.00	2 months	18 months
2.	Amra	4.00	8.00	2 months	18 months
3.	Grapes	7.38	14.00	2 months	12 months
4.	Sour Plum	-	24.00	-	6 months
5.	<i>Asam Gelugor</i>	-	10.00	2 months	3 months
6.	<i>Asam Kelubi</i>	-	15.00	2 months	36 months
7.	Tamarind	-	12.00	2 months	3 months
8.	<i>Bambangan</i>	-	7.05	-	12 months
9.	Garlic	-	8.00	-	2 months
10.	Star Fruit	-	3.20	12 months	36 months
11.	Papaya	3.20	13.00	1 week	18 months
12.	<i>Cermai</i>	3.20	25.00	12 months	36 months
13.	Kana	-	24.00	-	6 months
14.	Cherries	7.00	25.00	-	2 months
15.	Green Chili	-	4.00	-	-
16.	Marrow Sweets	-	24.00	-	-
17.	Guava	6.13	14.00	-	-
18.	Plum Skin	17.00	24.00	-	-
19.	Lime	4.50	10.00	-	6 months
20.	Plum	4.00	40.00	-	-
21.	Jicama	5.63	12.00	2 months	18 months
22.	Hog Plum	3.20	20.00	-	-
23.	Gandaria	5.70	15.00	-	-
24.	Chinese Dates	-	24.00	-	-
25.	Sweet Radish	7.00	7.50	-	12 months
26.	Chinese Pear	-	8.00	-	6 months
27.	Nau	-	7.00	-	2 months
28.	Nutmeg	6.20	7.00	2 months	12 months
29.	Bamboo Shoots	-	3.00	-	1 week
30.	<i>Salak</i>	8.60	15.00	2 months	8 months
31.	<i>Sentol</i>	5.70	15.00	2 months	8 months
32.	<i>Setoi</i>	4.00	6.00	2 months	12 months
33.	Strawberry	-	5.00	4 months	5 months
34.	<i>Tuhau</i>	-	6.00	-	3 months

CONCLUSION

Pickle production is an established industry in Malaysia and is still popular among food producers. It is observed that from the emergence of manufacturers with two to five-years' experience, there are new entrants in this industry. Those that have been in the industry for more than 20 years still prevail. Demand for this product will normally increase during school holidays and wedding seasons. The study found that majority of manufacturers marketed their products directly to consumers, and usually obtained the services of wholesalers or retailers to a lesser extent. The source of raw materials is from domestic sources, normally from their own crop. However, some fruits such as *salak* and *kelub* do not have adequate supplies domestically and have to be imported from Indonesia or Thailand. This may open opportunities to plant more *salak* and *kelubi* domestically. Unlike other states in Malaysia, Sabah has its own traditional pickles, namely *tuhau* and *bambangan* made by the Kadazan indigenous community. The supplies of raw materials for these pickles are from their own farms. The pickle industry has good potential to be developed further with the support of the relevant agencies by addressing the problems of inconsistent raw material supply, logistic and marketing as well as issues on lack of man power.

There are several limitations to this study. The major problem faced was in obtaining information from the manufacturers since pickle production is seasonal in nature and there was poor record-keeping. Issues on hygienic in the production areas are also important to address and more studies should be carried out to identify other issues and constraint faced by the industry.

Acknowledgement

We would like to thank all FAMA staff from various states involved in the collection of data during the field work.

References

- Battock, M. & Ali, S.A. (1991). Fermented fruits and vegetables: A global perspective. FAO: Rome.
- Campbell-Platt, G. (1987). Fermented foods of the world: A dictionary and guide. London and Buston: UK.
- Euromonitor (2006). Packaged food in Malaysia. London: Euromonitor International.
- FAO (1999). Codex Alimentarius Commission Procedural Manual (11th Ed.). Rome, Italy: FAO.
- Jyoti, P. T. (2011). Prospects of Asian Fermented Foods in Global Markets. The 12th ASEAN Food Conference 2011, 16-18 June, 2011. BITEC Bangna, Bangkok, Thailand.

- Norjaya M.Y., Mohd Suhaimi A., Norzalita A.A., & Ahmad K.A.D (2008). Exploratory Study in Accessing the Market Potential and Distribution Network of Selected Tropical Fruits in Europe, *Journal of Agribusiness Marketing*, 1, 1-16.
- Norsida M., Nolila M.N & Mohd Mansor I. (2009). An Overview of the Supply Chain Management of Malaysian Vegetable and Fruit Industries Focussing on the Channel of Distribution, *Journal of Agribusiness Marketing*, 2, 1-17.
- Vinchai H. (n.d.). Traditional processed foods from fruits and vegetables and their processing technology in Thailand. Department of Product Development, Faculty of Agroindustry, Kasetsart University, Bangkok, Thailand.