



Small-Sized Fish Paste (*Prahoc*) Processing in Cambodia

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Abstract Small-sized fish paste call *Prahoc* in Khmer is one of the most popular fermented fish products used as a condiment in Cambodia. It is the main food for Cambodian people, especially the remote poor. *Prahoc* is typically made from small fish such as the common small cyprinids (*Henicorhynchus spp.*) in Khmer *Trei Reil*. It was originated as a way of preserving fish during the longer months when fresh fish was not available in plentiful supply. *Prahoc* is traditionally produced by mixing whole fish with salt at a ratio of 3:1-5:1, and fermented for 3-12 months or longer. Moreover, some problems relating with processing were found and determined to keep for base line information for the next researchers.

Keywords small-sized fish, low value fish, fish paste (*Prahoc*), processing techniques

INTRODUCTION

Fisheries play a very significant role in providing income, employment and food security to million of rural poor in Cambodia (Zalinge et al., 2001). Hortle et al. (2004 & 2005) stated that thousands of tons of small-sized or low-marketed value fish are caught each year in the Cambodia Mekong basin and in the Tonle Sap. Otherwise, the small-sized fish are also used for producing fish, animal meal and for human consumption (Nam et al., 2005).

Prahoc is a crushed, salted and fermented fish paste made from mud fish/small-sized fish such as *Trey Riel*, *Trei Sleuk Reussey*, etc. (Hortle et al. 2004). It is used in Cambodian cuisine as a seasoning or a condiment. Because of its saltiness and strong flavor, it was used as an addition to many meals in Cambodian cuisine, such as soups. The nickname Cambodian cheese called *Prohoc* has a strong and distinct smell. *Prahoc* is usually eaten with rice in the countryside or poorer regions. Because it is easily stored and preserved, *Prahoc* is often given out for donations to victims of flood or drought by charities and other organizations (Tamimi, 2005). Despite the importance of *Prahoc* in daily food of Cambodia, its processing technologies are not yet well understood or documented. The purposes of this study are to review existing methodologies, determine problems and to analyze economic aspects of small-size fish paste production. The data that has been done is all useful and provided baseline information to improve the agricultural exploration in university and the whole Cambodia.

METHODOLOGY

The study on *Prahoc* processing techniques were conducted in four major provinces namely; Kandal (KD), Kampong Chhnang (KG Chh), Battambang (BB), Siem Reap (SR) in addition to the area in Phnom Penh. The research instrument was represented by using standard semi-open questionnaires with 100 samples (20 samples of micro, small, medium, and large-scale per province/capital). The samples are purposively selected. The collected data was analyzed through SPSS version 12. For economic efficiency, the data was installed and analyzed in Microsoft Excel and the formula of Economic Efficiency = Total Revenue (TR) divided by Total Cost (TC) was used.

RESULTS AND DISCUSSION

Based on the result obtained in the study, the types of *Prahoc* processing are divided into four scales. Those are micro, small, medium and large scale.

Micro-scale: The annual fish input is less than one ton. Production was done using a process usually by a household. The capital used is less than 100 USD. The *Prahoc* was used for home consumption and exchanged for food and other basic supplies. No license is required.

Small-scale: The annual *Prahoc* input is less than 50 tons. Fermented fish paste is made for commercial purposes. The capital is less than 10,000 USD. The permanent workers are about 3-6 persons and the casual workers are about 10-15 persons. A license to run the business is also required and is issued by either provincial or central government institutions.

Medium-scale: The annual *Prahoc* input is more 50 tons to 1,000 tons. It is being produced for commercial purposes by a hydrolysis process, and production involves large investment and relatively high operational costs. The capital is between 50,000-100,000 USD. The permanent workers are about 3-6 persons and the casual workers are about 20-25 persons. Operation requires a license from Ministry of Agriculture Fisheries and Forestry (MAFF), and Ministry of Industry Mine and Energy MIME.

Large-scale: The annual fish paste input is more than 1,000 tons. *Prahoc* is being produced for commercial purposes by a company process and production involves large investment and high operational costs. The capital is more than 100,000 USD. The permanent workers are about 10 persons and casual workers are about 25-50 persons. A license is required from Ministry of Agriculture Fisheries and Forestry (MAFF), Ministry of Industry Mine and Energy (MIME) and Ministry of Commercial (MoC). This scale has had only in Battambang province.

These four categories of *Prahoc* industries are according to the definition set by MIME (2003) on the enterprises. However, investor and laborers in these studies were not exactly numbered because the system of processing in Cambodia is not yet clarified.

Fish is the raw material for production of *Prahoc*, then salt. As shown in Table 1, fish species commonly utilized for *Prahoc* are those of *Trei Reil cyprinid henicorhynchus Trei sleuk reussey* and other fishes were also used such as bagrid catfishes (*Kanchos*), barb (*Chpin*), Thai river sprat (*Bandoul Ampov*), perchlet (*Kanhchras Thom*), carps (*Linh, Khnong Veng, Srakar Sdarm, Kros, Angkok Prak, Chanteas Phluk and Kaek*) and elephant paradiseus fish (*Kompeus*), river catfish (*Pra*). However, *Trei Kompleanh* species is only being used in Battambang and Siem Reap provinces.

Table 1 Amount of fish for *Prahoc* production

Kinds of fish	Name of provinces and capital					Total (%)
	PP	KD	KG Chh	BB	SR	
<i>Trei Reil</i> (70-95%)	20	20	20	20	0	80
<i>Trei Sleuk Reussey</i> (5-10%)	20	13	9	17	0	59
<i>Trei Kompleanh</i> (100%)	0	0	0	20	20	40
Other fishes (5-20%)	20	20	19	20	0	79

Table 2 showed the percentage of the amount of salt in *Prahoc* production per ton of fresh fish. About 45% of the producers responded that the salt appropriate for producing *Prahoc* is 300 kg per ton of fresh small-sized fish. Most of the producers (67%) obtained 450 kg net production of *Prahoc* from the fresh fish in one ton. On the other hand, 17% of producers able to produced 550 kg of *Prahoc* per ton of fresh fish.

Table 2 Salt using for *Prahoc* production

Amount of <i>Prahoc</i> Production	Amount of salt					Total (%)
	150	200	250	300	350	
≤ 350	0	7	5	2	0	14
≤ 450	3	6	11	37	10	67
≤ 550	1	4	6	6	0	17
≤ 650	0	2	0	0	0	2

Prahoc processing techniques differs depending on the location of factory and the scale of production. Beddows (1985) illustrated that method of processing is fish preservation and a concentrated form of fermented fish (Hortle, 2007). Fish are beheaded and cleaned well to prevent spoiling from their own microorganisms in the slim, gut and gills on their bodies. These microorganisms as well as the enzymes in the fish tissues, bring about putrefying changes in fish when it dies (Parry and Pawsey, 1973). Salt is used as preservative to prevent spoilage and to stabilize fermentation. The smell of *Prahoc* also differs according to the amount of salt used. Watanabe (1982) showed that the characteristic smell of fermented fish is the result of enzymatic and microbiological activity in the fish muscle. Rahayu (1992) recorded that the first salting step takes several weeks to develop its characteristic flavor and texture, and this is followed by a maturation phase. Only one producer in Kampong Chhnang province said that they used chemical substance like insecticides to preserve fish. Unfortunately, these chemicals are taken without any strict control over the safe dosage level. Hence the product, though protected from insects, could be harmful to consumers. In this stage, it is in line with Azeza (1986) and Kofi (1992).

***Prahoc* processing chain for micro scale in the province and capital**



Fig. 1 *Prahoc* Cha-eang processing



Fig. 2 *Prahoc* Sach processing

Prahoc processing chain for small, medium, and large-scale

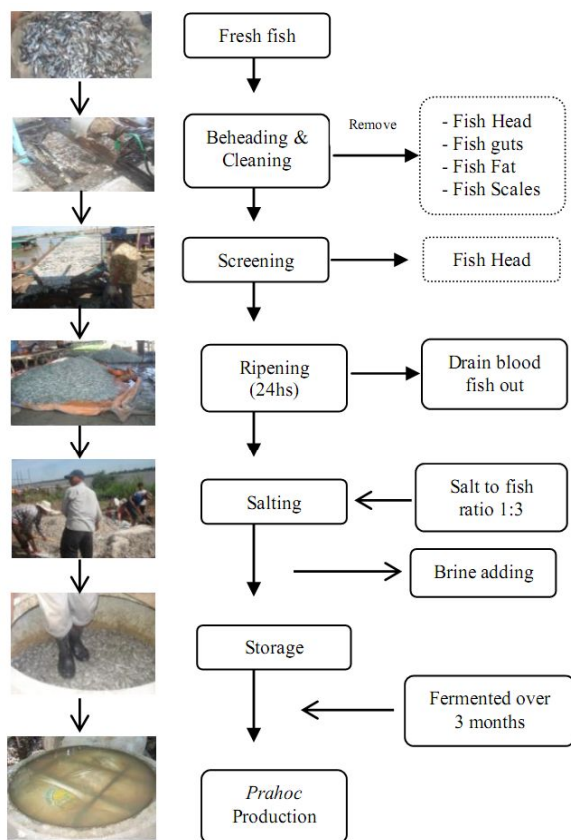


Fig. 3 Processing chain in Phnom Penh and Kandal

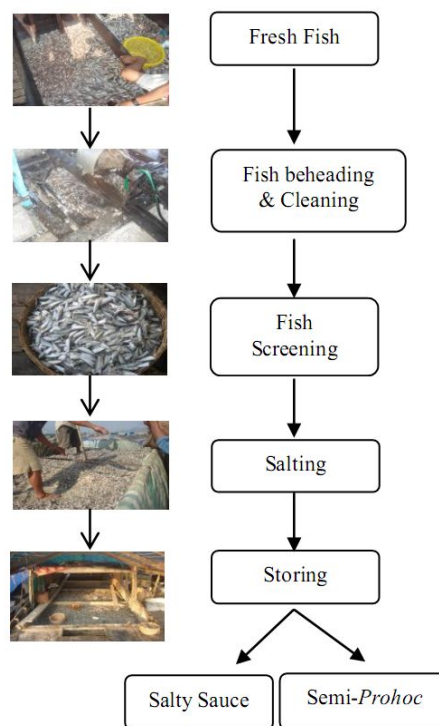


Fig. 4 Processing chain in KG Chhnang

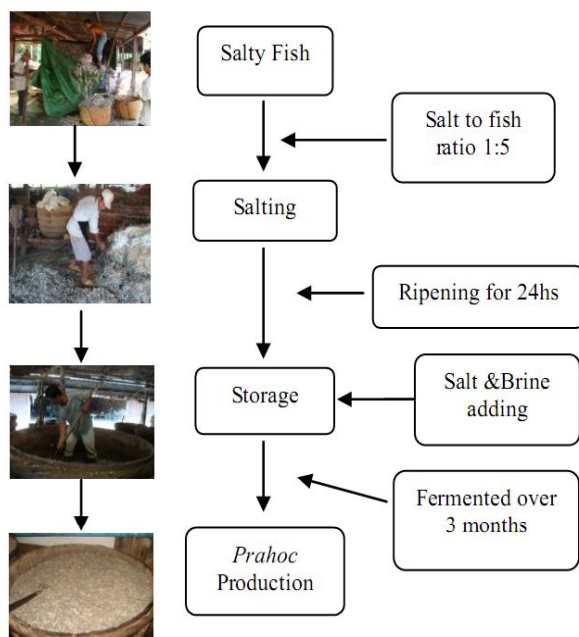


Fig. 5 Processing chain in Battambang

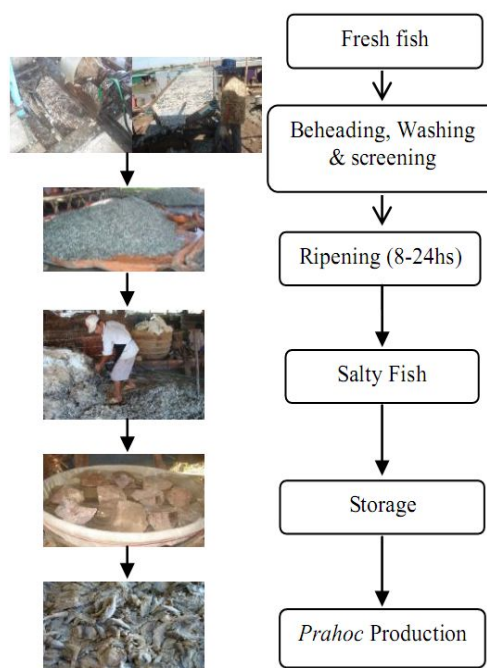


Fig. 6 Processing chain in Siem Reap

The main problems faced by producers were; 1) poor quality and hygienic conditions of inland small-sized fish paste due to the lack of quality control system in Cambodia, leading to fluctuation of demands for export markets and change in price 2) increasing price of raw materials such as fresh small-sized fish and salt indicating an increase of 50% and 75% respectively 3) lack of good information on domestic and foreign sources of technology and equipments/materials, for example: non-existing reasonable grading and packaging materials, leading to underdeveloped export market 4) shortage and lack of working capital to start or expand the business due to a very high interest rate from most local micro credit intuitions or banks 5) low technical skills that are shown by 25% to 40% 6) poor research; and 7) lack of trained human resources in fish processing.

Table 3 Major problems and constrains in *Prahoc* production

Constrains in <i>Prahoc</i> production	Name of province and capital					Total (%)
	PP	KD	KG Chh	BB	SR	
Expending on fee and non-fee for authority	0	1	0	19	12	32
Difficulty in determining the market price of final production	3	6	5	0	10	24
Low price of (<i>Prahoc</i>)	18	15	3	1	1	38
Affordable competition for fresh fish	5	12	0	20	13	50
High price of salt	12	3	20	20	20	75
Addible water before weight	5	0	0	19	0	24
Unclean processed fish	17	3	2	19	0	41
Rancidness	7	12	7	12	1	39
Salting is not good in the first stage	5	6	5	11	0	27
Lack of workable capital	2	0	9	20	0	31
The company blends the price of fresh fish	0	0	0	16	8	24

Micro scale *Prahoc* production in Phnom Penh, four provinces of Kandal, Kampong Chhnang, and Battambang was minus while the medium-scale *Prahoc* producers have the highest economic efficiency. Meanwhile, producers in Siem Reap were getting suitable profit because of the price, kinds of boneless *Prahoc*, and quality. Producers have kept *Prahoc* for their own consumption due to the intuitions that *Prahoc* in the market are being used with chemical preservative and poor sanitation of *Prahoc* production.

Table 4 Economic analysis of *Prahoc* scales in the provinces and capital

Scales	Economic efficiency				
	PP	KD	KG Chh	BB	SR
Micro	0.67	0.59	0.83	0.72	1.87
Small	1.10	1.06	1.19	1.37	1.81
Medium	1.67	1.62	1.12	1.39	2.34
Large				1.39	

CONCLUSION

According to the production scale of *Prahoc*, there are two kinds of small-sized fish paste processing in Cambodia. First, micro-scale is divided into two types which are bony and boneless (Cha-eang and Sach in Khmer) *Prahoc* processing technique. Second, small, medium, and large-scale are processed as bony *Prahoc*. Bony *Prahoc* processing technique is documented in all five surveyed provinces. It is mostly consumed by the poor who have limited income.

Boneless *Prahoc* processing technique is documented in the surveyed provinces by using 2 species of small-sized fish; the moonlight gourami *trichogaster microlepis* and the three-spot gourami *trichogaster trichopterus*. It is being sold at a higher prices compared to that of bony small-sized fish paste. Moreover, the two main problems encountered in *Prahoc* processing are the

fluctuation of prices of raw materials and lacking of technical skills such as hygienic and food safety practice. Micro-scale *Prahoc* producers gained negative incentive except in Siem Reap province because that they are producing boneless *Prahoc* which could be more profitable in the market. Based on the results on this research, it was concluded that improving the quality, hygiene and safety of *Prahoc* is necessary to be improved in order to increase the demand of *Prahoc* products.

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