Research article

Possibility of Value Addition on Traditional Rice Liquor in Cambodia

MITSURU HAMANO
Faculty of Agriculture, Shinshuu University, Nagano, Japan

TAKASHI KURODA
Graduate School of Bioagricultural Sciences (graduated), Nagoya University, Aichi, Japan

CHIM CHAY
Faculty of Agro-Industry, Royal University of Agriculture, Phnom Penh, Cambodia

BORATANA UNG
Cambodia and Japan High-quality Agricultural Products, Phnom Penh, Cambodia

KASUMI ITO*
International Center for Research and Education in Agriculture, Nagoya University, Japan
Email: kasumito@agr.nagoya-u.ac.jp

Received 30 December 2020 Accepted 21 September 2021 (*Corresponding Author)

Abstract Rice liquor is one of the traditional alcoholic beverages produced by small-scale farmers in rural areas. However, rice liquor production faced deficits and low profitability due to low sales price and productivity, frequent production failure, and low quality. It was hypothesized that improving the quality could increase the product value and the profitability of rice liquor production. The key modifications of production techniques to improve rice liquor quality include sanitary control of the working place, equipment, and raw material, and production process and quality management. However, it remains unclear if improving the product quality may result in value addition on traditional rice liquor in Cambodian markets. This study aimed to assess the possibility of value addition on the traditional rice liquor in Cambodian markets. First, consumers had structured interviews with questionnaires to identify consumption trends and preferences on rice liquor and other alcoholic beverages. Second, liquor produced with the modified techniques underwent consumer tests on its quality and sales price in 2009. Finally, quality liquor with the required registration for commercialization was trialed to identify the possibility of adding value to the products in Phnom Penh markets from 2010 to 2011. The survey results found that traditional rice liquor was consumed more in rural areas than the urban areas. More males consumed rice liquor than females, who mostly consumed medicinal and fruit liquor. A consumer test was conducted with tasting, observing bottled products, and labeling after a quality check. Both Cambodians and foreigners' evaluated liquor produced with modified techniques and indicated the possibility of putting a higher price as commercialized products. After registering for commercialization, the quality rice liquor was trialed for marketing and sales. These activities attracted several supermarkets, restaurants, and souvenir shops, and a sales contract was agreed for more than ten times higher than the sales price at the local markets. These results showed that the traditional rice liquor with value addition might gain market shares by ensuring product quality and safety.

Keywords value addition, agro processing, rural development, marketing, rice liquor

INTRODUCTION

Value addition to agricultural products is expected to increase farmers' incomes and reduce poverty in rural areas (Royal Government of Cambodia 2006; Royal Government of Cambodia, 2013). Rice liquor is one of the traditional alcoholic beverages produced by small-scale farmers in rural areas. It

contributed to income generation combined with pig farming, which became profitable by using rice liquor residue that reduces feeding costs. However, rice liquor production faced deficits and low profitability (Yagura et al., 2010). Main factors of low profitability include low sales price and productivity and frequent production failures, and many producers recognized the issues of low quality (Hamano et al., 2020). It was hypothesized that improving quality could increase the profitability of rice liquor production (Hamano et al., 2020).

The general production methods of traditional alcoholic beverages from rice in Vietnam and Laos have been clarified (Kozaki et al., 2002; Kozaki et al., 2005). Kozaki (2007) also revealed the production methods of traditional brewed and distilled liquor from rice in Cambodia. Yamamoto and Matsumoto (2011) identified the production methods of starter culture and its raw material for rice liquor and wine in Cambodia. Hamano et al. (2014) identified the key modifications of production techniques to improve rice liquor quality, such as sanitary control of working place, equipment, and raw material, and production process and quality management.

However, it remains unclear if improving product quality may result in value addition on traditional rice liquor in Cambodian markets.

OBJECTIVE

This study aimed to assess the possibility of value addition on the traditional rice liquor in Cambodian markets.

METHODOLOGY

This study employed a series of action research (Greenwood and Levin, 1998; Popplewell and Hayman, 2012) to examine the possibility of value addition on the traditional rice liquor through interview surveys on consumption behavior, consumer tests on quality, and marketing and sales trials in domestic markets of Cambodia.

First, structured interviews were conducted with questionnaires to the consumers to identify the consumption trends and preferences on the rice liquor and other alcoholic beverages during the Water Festival and One Province One Product Exhibition (OPOP) in 2008 at the capital city, Phnom Penh (Fig. 1). Second, rice liquor produced with the modified techniques by rice liquor farmers in Takeo Province was provided for consumer tests on its quality and sales price during the OPOP in 2009 at Phnom Penh. In order to set up the trial sales prices, the sales conditions of the local rice liquor and other commercialized alcoholic beverages were clarified by conducting market surveys in Takeo province and Phnom Penh in advance. Third, the trial marketing and sales of the quality liquor with the required registration for commercialization were conducted to identify the possibility of adding value on the products at Phnom Penh markets from mainly 2010 to 2011. Finally, the possibility of the value addition on rice liquor was discussed with the necessary conditions.

Fig. 1 Target area

RESULTS AND DISCUSSION

Trends and preference of consumers: The interview survey was performed with questionnaire on alcoholic beverage consumption to the Water Festival visitors in Phnom Penh, the capital city of Cambodia. The interviews were conducted to 111 males and 121 females, and 230 valid answers were obtained. Most interviewees at 94% came from provinces outside Phnom Penh.

Table 1 shows the alcoholic beverage consumption behavior of the interviewees. The results indicated that beer is consumed by 73.5% of the interviewees, with rice liquor at 59.6% and herb liquor at 54.8%. More people drink beer than rice liquor and herb rice liquor processed from the rice liquor, followed by palm wine at 46.1%, and fruit rice liquor at 33.1%, which are both traditionally produced and consumed in Cambodia. On the other hand, the traditional rice liquor, herb rice liquor, and palm wine were more frequently drunk on a daily (5-7 times/week) or weekly (1-4 times/week) basis than beer. Rice liquor, herb liquor, and palm wine were consumed by 27.4%, 21.4%, and 14.8%, respectively, more than once per week (both 5-7 times/day and 1-4 times/week), while beer was consumed by 11.3%. On the other hand, whiskey and wine were consumed a few occasions per year (1-11 times/year).

Table 1 Consumption of alcoholic beverage by the interviewees

	Beer		Rice liquor		Herb rice liquor		Fruit rice liquor		Whisky		Wine		Palm wine*		Rice wine*	
	Answer	%	Answer	%	Answer	%	Answer	%	Answer	%	Answer	%	Answer	%	Answer	%
No drink	61	26.5	93	40.4	103	44.8	153	66.5	178	77.4	162	70.4	123	53.5	220	95.7
Drink	169	73.5	137	59.6	126	54.8	76	33.1	52	22.6	68	29.6	106	46.1	10	4.3
1-11 times/year	99	43.1	50	21.8	57	24.8	43	18.8	49	21.4	64	27.8	64	27.8	10	4.3
1-3 times/month	44	19.1	24	10.4	22	9.6	7	3.0	1	0.4	2	0.9	8	3.5	0	0.0
1-4 times/week	21	9.1	33	14.4	26	11.3	10	4.3	1	0.4	2	0.9	23	10.0	0	0.0
5-7 times/week	5	2.2	30	13.0	21	9.1	16	7.0	1	0.4	0	0.0	11	4.8	0	0.0
No answers	0	0.0	0	0.0	1	0.4	1	0.4	0	0.0	0	0.0	1	0.4	0	0.0
Total	230	100.0	230	100.0	230	100.0	230	100.0	230	100.0	230	100.0	230	100.0	230	100.0

Note: Most interviewee (94%) were from provinces out of Phnom Penh.
**Palm wine and rice wine were brewed alcoholic beverages without distillation like rice liquor.*

Table 2 shows the interview results during the One Province and One Product Exhibition in 2008 about the rice liquor consumption comparing urban and rural residences. Interviews were conducted with 393 visitors and obtained 337 valid answers (by 303 male and 34 female) consisted of 202 from Phnom Penh and 135 from other provinces out of Phnom Penh.

The results indicated that both urban and rural people consumed rice liquor since more than 59.9% by Phnom Penh visitors and 66.7% by consumers from other provinces. The weekly (1-2 times/week) or daily drinkers (Everyday) shared 13.9% at Phnom Penh and 17.0% at other provinces. Although rural people tended to consume rice liquor more frequently, people in Phnom Penh also consume traditional products.

Table 2 Consumption behavior of rice liquor in urban and rural areas

	Phnom Penh		Other provinces		Total	
	Answer	%	Answer	%	Answer	%
No drink	81	40.1	45	33.3	126	37.4
Drink	121	59.9	90	66.7	211	62.6
1-5times/year	68	33.6	48	35.6	116	34.4
1-3times/month	25	12.4	19	14.1	44	13.1
1-2times/week	20	9.9	13	9.6	33	9.8
Everyday	8	4.0	10	7.4	18	5.3
Total	202	100.0	135	100.0	337	100.0

The interviewees were asked about their impression of the rice liquor quality (Table 3). Among the answers, 116 (34.4%) recognized rice liquor as low quality at a nearly same ratio in Phnom Penh

and from provinces, while 76 (22.6%) evaluated it as high quality. Among the 116 interviewees who answered "low quality", the reasons were described and appearances of keywords were counted. As a result, "added industrial alcohol" or "other kinds of harmful chemical" was 47 (41.6%), followed by "bad for health" at 23 (20.4%), "unstable quality" at 14 (12.4%), and "no quality control" at 13 (11.5%).

Table 3 Impression on traditional rice liquor quality in urban and rural areas

	Phnom Penh		Other Provinces	
	Number	%	Number	%
High quality	41	20.3	35	25.9
Low quality	70	34.7	46	34.1
No idea	79	39.1	43	31.9
No-answer	12	5.9	11	8.1
Total	202	100.0	135	100.0

Table 4 Factors of low quality

	Frequency	%
Add industrial alcohol/chemical	47	41.6
Bad for health	23	20.4
No standard/ Various quality	14	12.4
No quality control	13	11.5
Add water	3	2.7
Others	11	9.7
No idea	2	1.8
Total	113	100.0

**Frequency of key words in the answers to the open-ended question. 108 out of 116 respondents answered and 113 key words were counted. No answer by 8 respondents.*

Current sales price and its quality: Hamano et al. (2013) identified the modified production techniques for quality improvements by improving sanitary conditions and quality control through trial productions with a selected farmer in a rural area of Takeo province. Consumers recognized the improved quality and high possibility of commercialization in the trial rice liquor during consumers' tasting tests, comparing with the farmer's liquor in the One Province and One Product Exhibition in 2008. However, people were suspicious about the quality and safety control of the local rice liquor as shown in Table 3. It indicated that the consumers refused pay high value without the guarantee of the products quality and safety under a strict production control.

During the OPOP exhibition in 2009, the quality liquor was provided to the second consumer test with tasting and observation of the rice liquor products, which have been developed to ensure the necessary conditions for the commercialization. The rice liquor was produced under strict quality management, such as ensuring the sanitary condition of raw material, equipment, and production place, checking and recording the production process, measuring the alcohol degree, and conducting the sensory tests for checking taste, fragrance, color, and smell. The rice liquor was packaged with sealed glass bottles. Front and back labels were attached to the bottle with the product logo mark and named as "Sraa Takeo," which means rice liquor from Takeo province in Khmer language. The label included the information on producers, and product information such as alcohol percentage, raw material, and production process with strict sanitary and quality control (Fig. 2).


Checking fermentation
Recording production


Sensually test and alcohol degree check


Final sensually test and alcohol degree check


Bottling and labeling

Fig. 2 Quality check during the rice liquor productions

Fig. 3 shows comparison results of retail prices of general rice liquor at local shops between Phnom Penh and Takeo province. The price setting at Phnom Penh has three price ranges of R2,000 – R3,000/L (USD0.5–0.75), while the price at Takeo province has only one price range at R2,000/L. It seemed that the Phnom Penh market could be more sensitive in differentiating the prices and

quality. However, the prices and the alcoholic degree did not have a significant correlation. It means that the traditional rice liquor was not clearly evaluated its quality with price setting.

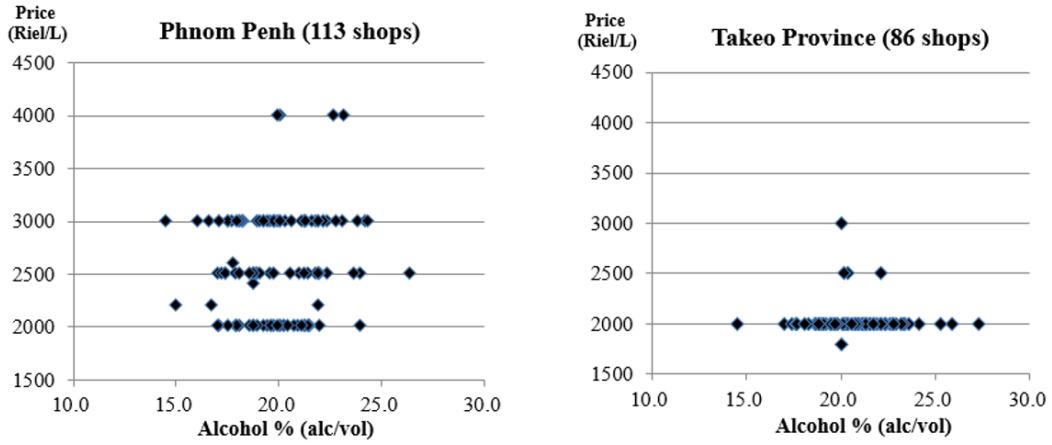


Fig. 3 Rice liquor price (Riel/L) and alcohol contents

The prices of the trial products for commercialization were also based on the production cost and market survey results on alcoholic beverages in Phnom Penh. Table 5 shows the retail prices at 10 shops, including supermarkets and local shops. Local liquor was sold at USD0.5–1.0/L in local shops and supermarkets. On the other hand, imported whiskey, vodka, and wine were sold at USD5/L in the lowest price, and USD10–20/L in general. The alcohol contents varied from 20%–40% in the case of distilled liquor.

Consumer tests on its quality and sales price: For the consumer test, two trial products with different alcohol degree at 25% with a green label and 40% (alc/vol) with a black label, and one local liquor from the market in Phnom Penh were provided to the OPOP exhibition visitors in 2009 at Phnom Penh to compare the liquor quality and examine the marketability of the packaged products (Fig. 4). The total number of interviewees was 349, consisting of 332 Cambodians (314 males and 18 females) and 17 foreigners (14 males and 3 females). Among the Cambodians, 86.5% lived in Phnom Penh, and 13.2% were from other provinces. The eight foreigners included were Japanese, Americans, and Europeans.

Table 5 Sales of alcoholic beverages in different retailers

	Type	Price /Liter	Package	Alcohol contents (%)	Producer info.
Rice liquor (local shops)	Distilled liquor	USD0.5-1	Re-used PET bottles	Provided only oral information Inaccurately at 2 times higher than real alcohol content.	Unwritten and unavailable
Local distilled liquor (Super-markets)	Distilled liquor	USD1-2	Recycled glass bottles	Written on label inaccurately at 2 times higher than real alcohol content.	Unwritten and unavailable
Whisky (Imported)	Distilled liquor	USD5-	Glass bottles	Written on label Accurate alcohol percentage.	Written on label
Vodka (Imported)					
Wine (Imported)	Brewed	USD10-			

Note: Rice liquor (local shops) were distributed with plastic container from local farmers and sold after putting in re-used PET bottle without showing any information such as alcoholic contents and raw material.

The results of interviews after the tasting and observations of the products most interviewee preferred the trial products sharing Sraa Takeo 25% (alc/vol) and 40% (alc/vol) at 50.7% and 40.7% of total answers respectively (Table 6). The fragrances of two Sraa Takeo products were highly evaluated that more than 66% of interviewees recognized them as the more preferred aromas, while only 23.8% preferred the aroma of the local rice liquor (Table 7). The color of Sraa Takeo products, which were mostly transparent, were preferable for the consumers, while nearly 70% of the

interviewees described the cloudy local liquor as unpreferable, as it usually appeared in general local rice liquor in Cambodia (Table 8). The prices set per 500-mL bottle, which were USD5 for Sraa Takeo 25% and USD8 for Sraa Takeo 40%, were recognized as the appropriate price for commercial products by respectively 56.7% and 53.2% of all interviewees, even though the local rice liquor was sold at USD0.75/L (Table 9).

Green label: 25% alc/vol at USD5.00

Black label: 40% alc/vol at USD8.00

Sample of quality rice liquor products

Samples for tasting

Interviews after tasting and observation of the products

Fig. 4 Consumer tests during One Province One Product exhibition in 2009

Table 6 Preference of rice liquor

	Answers (%)
Sraa Takeo 25%	177 (50.7)
Sraa Takeo 40%	142 (40.7)
Local rice liquor	30 (8.6)
Total	349 (100.0)

Table 7 Evaluation on fragrance of rice liquor

	Local rice liquor (%)	Sraa Takeo 25% (%)	Sraa Takeo 40% (%)
Aromatic	83 (23.8)	232 (66.5)	236 (67.6)
Not aromatic	266 (76.2)	116 (33.2)	112 (32.1)
No idea	0 (0.0)	1 (0.3)	1 (0.3)
Total	349 (100.0)	349 (100.0)	349 (100.0)

Table 8 Evaluation on color of rice liquor

	Local rice liquor (%)	Sraa Takeo 25% (%)	Sraa Takeo 40% (%)
Good	106 (30.4)	321 (92.0)	314 (90.0)
Bad	242 (69.3)	27 (7.7)	34 (9.7)
No idea	1 (0.3)	1 (0.3)	1 (0.3)
Total	349 (100.0)	349 (100.0)	349 (100.0)

Table 9 Evaluation on price setting of trial rice liquor

	Sraa Takeo 25% (%)	Sraa Takeo 40% (%)
Reasonable	2 (0.6)	3 (0.9)
Appropriate	198 (56.7)	186 (53.3)
High	149 (42.7)	160 (45.9)
Total	349 (100.0)	349 (100.0)

Questionnaires about the place of drinking rice liquor were answered to be mainly consumed at the house (Fig. 5), while the other alcoholic beverages were consumed at house and restaurant (Fig. 6). On the other hand, rice liquor was purchased directly from producers at 36.0% and local markets at 30% (Fig. 7). Other alcoholic beverages were bought from local markets, street stoles, and at supermarkets (Fig. 8). These results indicated that the traditional rice liquor has not been introduced to the supermarkets and restaurants, where popularly high valued alcoholic beverages were served and sold. In other words, high-quality rice liquor could have room to enter those markets.

Trial marketing and sales of the quality rice liquor: Based on the consumers' concerns for unsafety of the rice liquor especially by the contamination of the industrial alcohol and other chemical material into the products, it was assumed that the safety control has remained as a fundamental issue toward value addition on rice liquor product. Thus, the trial rice liquor was packaged by glass bottle and sealed cap after completing the commercial registration under the Ministry of Commerce and manufacturing registration under the Ministry of Industry, Mine, and Energy with quality test which certify the alcohol degree, appropriate acidity and no contamination of methyl alcohol.

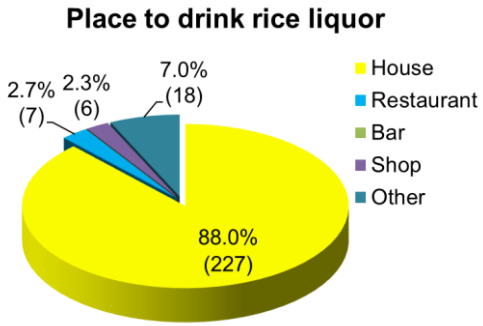


Fig. 5 Drinking place of rice liquor

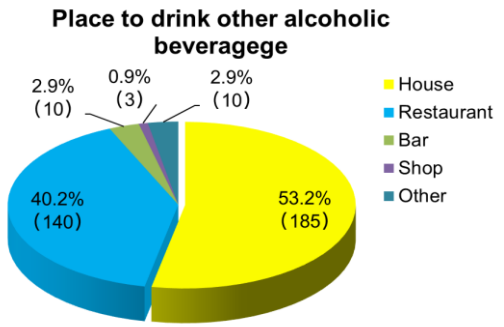


Fig. 6 Drinking place of other alcoholic beverage

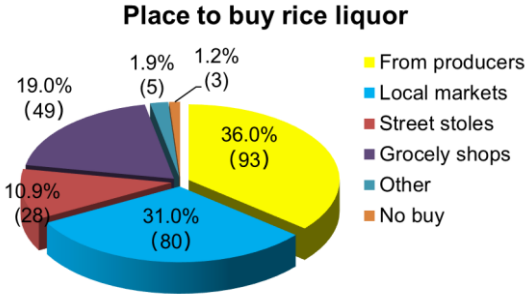


Fig. 7 Buying place of rice liquor

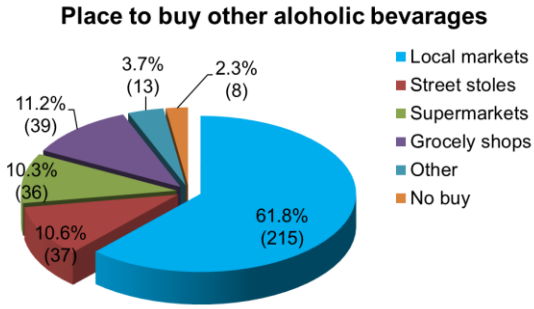
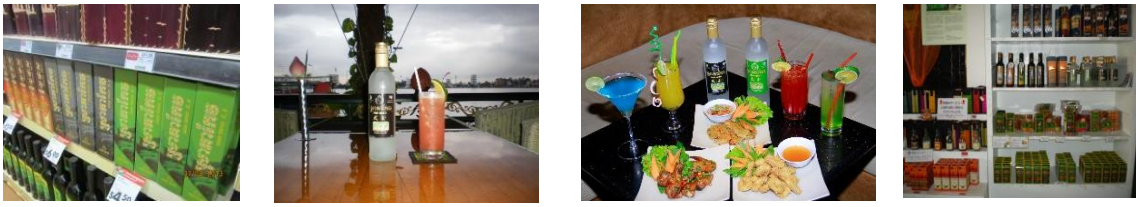


Fig. 8 Buying place of other alcoholic beverage

After the required registrations for commercialization in terms of business (company) registration, tax, small-medium manufacturing and product test, and trademarks, the Sraa Takeo 25% and 40% were trialed for marketing and sales from 2010 September. The marketing and promotion activities targeted around 80 clients including 4 supermarkets and 7 minimarts, 10 souvenir shops, 50 restaurants, 7 hotels in Phnom Penh and Siem Reap (Fig. 9).

These activities resulted to get 35 clients who bought Sraa Takeo 25% and 40% at least one time and sell at the suggested consumer price consumer price at USD5 for Sraa Takeo 25% and USD8 for 40% with 500 ml in minimum which were more than 10–16 times higher price than the local rice liquor price at the local markets during the 1st year. Then two supermarkets, three restaurants/bar, six souvenir shops repeated to purchase the products within the first-year sales.



Supermarkets | Restaurants | Bars | Souvenir shops

Fig. 9 Marketing and sales of Sraa Takeo 25% and 40%

Figure 10 shows the first-year results of the sales every 3 months. The average monthly sales were about 100 bottles in the first 6 months and increased to 200 bottles in the second 6 months. The main clients were several souvenir and food shops and restaurant in the first 6 months and 2 supermarkets in the second 6 months in Phnom Penh, and a part of sales were accepted by souvenir shops in Siem Reap, a famous tourism area.

Hamano et al. (2013) has clarified that the rice liquor production techniques can be modified for quality improvement based on the local famers' processing know-how without introducing high-

cost material and equipment and difficult techniques from other countries. Keeping the sanitary condition and quality control were the fundamental technical improvements.

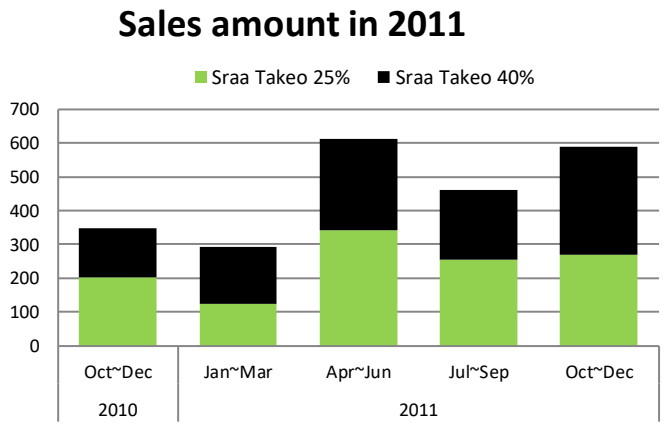


Fig. 10 Sales (bottle numbers) of Sraa Takeo

Local markets in general did not have significant differences in the values on the traditional rice liquor even though the alcoholic percentage was different. Thus, the commercialized markets such as supermarkets, restaurants and bar, or souvenir shop that sold the high value alcoholic beverages in the urban areas could be considered as possible markets for value addition.

In order to enter those markets, the rice liquor with improved quality should be developed as commercialized products with commercial registration including not only business and manufacturing registration but also obtaining the certification on product safety and quality from the authorized laboratories. In addition, the products packaging with bottling, sealing, and labeling with necessary information to indicate the product name, product quality, raw material, and producers.

One year marketing and sales activities to the high value markets in urban areas revealed that supermarkets and souvenir shops, and also restaurants and bars have accepted to sell the high-quality rice liquor at USD5-8 which were 6-10 times higher than the local products. Some of them become frequent buyers and continuously purchased. These indicated that there were needs of the traditional rice liquor by both domestic consumers and international customers. In the following year, the souvenir shops in the international airports at Phnom Penh and Siem Reap accepted the Sraa Takeo. The one of the largest chain supermarkets in Cambodia also continuously purchased the Sraa Takeo and extended the sold stores in their distribution system. In December 2020, at the time of writing this paper, the products have been continuously sold in these retail markets.

These results indicated the high possibility of value addition on the traditional rice liquor in the domestic markets of Cambodia through the quality improvement and the safety control. However, the efforts of the marketing and promotion activities or further product development should be necessary for the further market extension and sustainable commercialization.

CONCLUSION

This study was conducted by using action research method to examine the possibility of value addition through conducting the interview surveys on consumption behavior, market survey on the price setting of local rice liquor, and impression on quality of the trial products for the commercialization with tasting and observation. Finally, the sales of the commercialized products were trialed in the domestic markets. These results indicated the possibility of value addition on the traditional rice liquor under ensuring not only the high and stable quality but also the product safety under the appropriate quality control and testing.

ACKNOWLEDGMENTS

We thank Professor Tetsuo Matsumoto for his supervision and instruction of this study, and Mr. Mitsuhide Fujimoto and Mr. Iwao Fukaya for their technical supports during the quality improvement and commercialization of the rice liquor; This study was supported by Grants-in Aid for Scientific Research (No. 20405045) and Cooperation Bases System (34-G-G0003) from the Ministry of Education, Culture, Sports, Science and Technology of Japan.

REFERENCES

Greenwood, D.J. and Levin, M. 1998. Introduction to action research: Social research for social change. SAGE Publication (California), 274.

Hamano, M., Matsumoto, T. and Ito, K. 2013. Technical modifications for the quality improvement of rice liquor (*Sraa Sar*) in Cambodia. Tropical and Agriculture Development, 57, 126-137.

Hamano, M., Matsumoto, T. and Ito, K. 2020. Factors causing deficits in traditional rice liquor production in rural areas of Cambodia. International Journal of Environmental and Rural Development, 11, 105-113.

Kozaki, M. 2007. Alcohol beverages and fermented foods of Ratanak Kiri, in Northeast Cambodia, J. Brewing Soc. Japan, 102, 31-38. (in Japanese)

Kozaki, M., Iino, H., Thuoc, T.L., Ho, P.T. and Seki, T. 2002. Rice wine of south highland of Annamese Cordillera (Vietnam) -Ruou can and ruou nep-. J. Brewing Soc. Japan, 97, 327-337. (in Japanese)

Kozaki, M., Naitoh, A. and Takayama, T. 2005. Rice wine of northern Laos (1): Fermented mash of rice wine and distilled rice wine of Thai people. J. Brewing Soc. Japan, 100, 796-806. (in Japanese)

Popplewell, R. and Hayman, R. 2012. Where, how and why are action research approaches used by international development non-governmental organizations? International NGO Training and Research Center, Briefing Paper, 32.

Royal Government of Cambodia. 2006. National strategic development plan 2006-2010. Royal Government of Cambodia (Phnom Penh), 211.

Royal Government of Cambodia. 2013. National strategic development plan 2014-2018. Royal Government of Cambodia, Phnom Penh.

Yagura, K., Nishimura, Y., Keo, S. and Matsumoto, T. 2010. Roles and obstacles of agro-processing industries in rural Cambodia. J. Agr. Develop. Studies, 20, 1-8. (in Japanese with English summary)

Yamamoto, S. and Matsumoto, T. 2011. Rice fermentation starters in Cambodia: Cultural importance and traditional methods of production. Southeast Asian Studies, 49, 192-213.