



## Mango Leather Development in Kiensvay District, Kandal Province by Adaptation of Traditional Techniques

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**Abstract** Kiensvay district, Kandal province is a popular place for mango leather processed in Cambodia where plenty of mango trees are grown. However, due to lack of skill and technical knowledge of the people, the product has failed to make economic impact on their livelihoods due to poor product quality that does not meet market standards. Poor sanitation and lack of technical information are mainly responsible for this situation. This study was conducted among producers and farmers in the selected area with the objective to gain an understanding of the technical processing methods and to analyse the economic viability of this product. 55 people in these districts were interviewed with semi-open questionnaire: details of each family's technical method for mango leather processing were collected. The initial results were used to identify various techniques used by farmers in the processing method. Then, yes/no questionnaire was applied to 20 people in order to deeply understand the process. After this, the technical processes used by farmers were categorised. Experiments were carried out on farmers techniques and tested in controlled laboratory conditions of Graduate School of Royal University of Agriculture. The results of this research will provide an insight into the best processing technique that may be used for commercial development with the aim of improving the income and livelihoods of the inhabitants.

**Keywords** mango leather, processing, traditional technique

## INTRODUCTION

Mango has become a naturalized and adapted fruit throughout the tropics and subtropics. Much of the spread and naturalization has occurred in conjunction with the spread of human populations, and as such, mango plays an important part in the diet and cuisine of many diverse cultures. There are over 1,000 named mango varieties throughout the world, which is a testament to their value to humankind. Mango is a common garden tree throughout the tropics. When ripe, this delicious desert fruit is particularly high in vitamin A. The fruit is also an important source of sustenance for birds, bats, insects, and mammals (Bally, 2006). The fruit may be eaten green, processed into pickles, juice, pulps, jams, cream, wine, ice cream, dessert, children's food, and chutneys, and is frozen or dried (Swi-bea wu and Chen, 1993). Mango drying into edible mango slabs has long been a tradition of the people of this region. Mango is an essential commercial crop in the tropical countries (Donald and Robert, 2008).

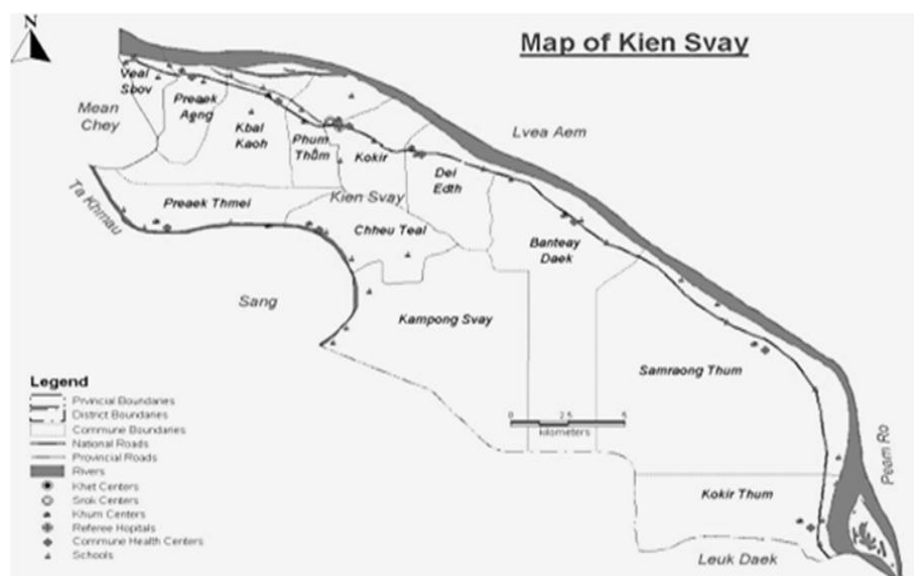
The food industry contributes xx% of the GDP and provides employment for rural population, hence a source of income (Global Agri System, 2005). Most people enjoy eating ripe and green mangoes. However, high perishability of ripe mangoes, inadequate storage conditions and poor infrastructure for transportation to distant markets make profitable production to remain a challenge

to farmers, resulting into income loss. Mango is a seasonal crop; so, the fruits usually ripen at the same time, as a result market prices fall due to oversupply, making it hard to be sold at a good price. Value-addition through food processing would be a good strategy to utilize rejected mango and other unmarketable fruits. It adds value to mango while keeping the cost of production down. It is also important for the products to be competitive in the world market. Fruit preservation will provide availability of mango flavour throughout the year, and is important to avoid wastage and increase income. Some of the simplest ways of preserving fruits include drying (mango leather), juicing, and making jam or chutneys (Agri Business Week, 2009).

The processed mango products would provide additional source of income, especially during peak season when there is a glut in supply and the price of mangoes is much cheaper. Although mango leather process has been an old tradition for Cambodian people, the techniques used for processing as well as the use of mango were limited. There is therefore a need to improve ripe mango processing techniques and improve sanitation during mango leather processing. This study was conducted to review existing methodologies and analyze the economic efficiency of mango leather production.

## METHODOLOGY

This study was conducted in Kien Svay district (Fig. 1), one of the 11 districts of Kandal province. This is especially an agricultural district along the Mekong River and an important dam is located there. The study was done in two stages. The first stage focused on interviewing people in Sdaokan Lang village, Dey Ed commune, and Kompong Svay village, Kompong Svay commune, Kiensvay district, Kandal province. Sdaokan Lang village have 1,377 families and Kompong Svay village have 672 families who made mango leather. The second stage experiments (drying by solar dryer) were conducted at Royal University of Agriculture.



**Fig. 1 Map of the study area in Kien Svay District**

Yamane (1967 and 1973) equation was used for sample selection based on the calculation of the sample during field survey as shown below. Sample selection was chosen by purpose with the producers in the target areas.

$$Yamane(1967)n = \frac{N}{1 + N.e^2} = \frac{2077}{1 + 2077(0.05)^2} = 335 \quad (1)$$

$$Yamane(1973)n_i(Sdaokanlang) = \frac{nxN_i}{N} = \frac{335 \times 190}{2077} = 31 \quad (2)$$

$$Yamane(1973)n_{ii}(KompongSvay) = \frac{nxN_{ii}}{N} = \frac{335 \times 145}{2077} = 24 \quad (3)$$

This study involved interview of the focus group and direct observation. The focus group interviews adopted open-ended questions to obtain general information, as processing chain, hygienic practises during processing, and economic efficiency of producers. Specific questions were given to check for the answers and to observe the contexts related to each question.

The collected data was analysed using SPSS version 17.0 statistical software by using descriptive statistics to interpret the results. For economic efficiency, the data is analyzed by Microsoft Excel and then using the formula of Economic Efficiency = Total Revenue (TR) divided by Total Cost (TC).

## RESULTS AND DISCUSSION

Mango processing technique was divided into three main procedures. The first procedure is pre-heating and stirring (involves selecting deteriorative mangoes, washing and peeling and chopping roughly into chunks/pieces or by the use of blending machine). The second procedure is heating and stirring (during which sugar and spices are added to the liquid solution and mix thoroughly). The third procedure is post heating and stirring. The mango mixture is evenly spread to approximately 1/4 -inch thickness on the trays as a thin sheet, and positioned on fruit roll liners on dryer trays and placed under the sun. Drying is done continuously for about 3-4 days depending on the temperature, and relative humidity. The trays are then removed from the sun when mixture is dry, with no sticky areas. Level of dryness is examined by touching gently in several places near centre of leather; where wetness indentation should be evident.

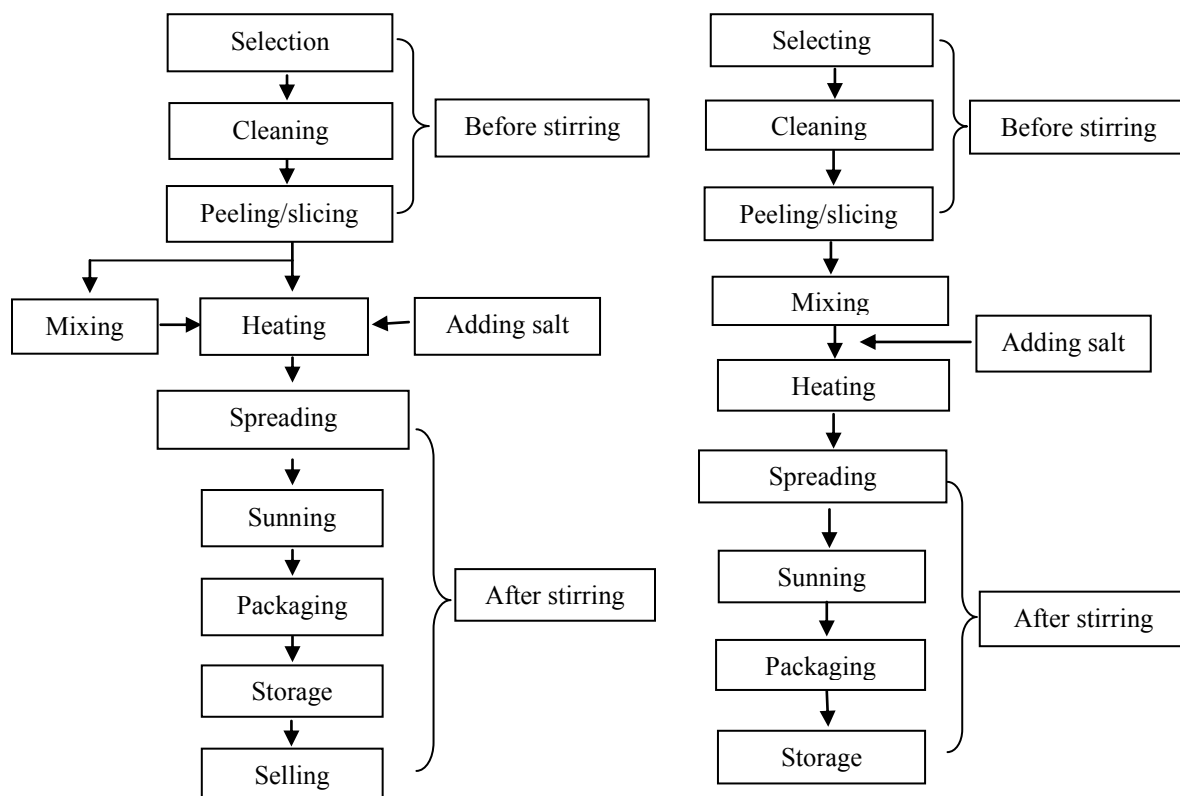
The leather is peeled from trays while still warm and left on the second tray on the dehydrator, while the first leather was peeled, the leather may be re-warmed slightly by exposing to the sun if they cool too much prior to peeling. The sheet is then cut into quarters, laid on a piece of clean plastic food storage wrap about 1 to 2 inches longer at each end of the plastic wrap and tightly closed.

The fruit rolls are stored in room temperature-quality plastic bags or airtight plastic container for short term storage, up to about 6 months. Leathers should be stored in a cool, dark and dry place. For longer storage up to 1 year, it should be placed in tightly wrapped rolls in a refrigerator. Drying time will be longer for the large leather than smaller ones. Drying time may also be longer depending on temperature during drying. For a large leather pieces, it is necessary to check the leather after 2 to 4 days.

The results of analysis also showed that all people washed the processing equipments and 76.4 percent of people washed hands during processing. The water used mostly was from wells (58.2%) which may be a source of contamination of microorganisms. In addition all people did not think about the sanitation while drying. Plastic is the packaging and storage container that people prefer to use than other containers (65.5% of people use plastic as storage container and 87.3% use it as packaging container).

### Analysis on economic efficiency of mango leather processing

Mango leather processing provided an average economic efficiency of 1.29, which is equal to 128,100 Riel of profit on average during ripe mango season. Moreover, it helps to reduce the surplus mango product after selling or provides use for overripe mangoes. Table 2 below shows the 5 case studies on mango leather processing and demonstrates that fresh overripe mangoes could be processed into mango leather during peak season and could generate more income. Economic efficiency for this processing was started from 1.17 to 1.26 consistently. Saka et al., (2004) and Mithofer (2004) showed that harvesting fruit from the forest and the farm could reduce food shortage and improve local development and create more income by value-added products thus more products of greater economic value.



**Fig. 2 Mango leather processing (producers) Fig. 3 Mango leather processing (experiment)**

**Table 1 Economic efficiency for 5 case studies with producers**

Case Study	Total Revenue (Riel)	Total Cost (Riel)	Profit (Riel)	Economic Efficiency
1	209.000	169.342	39.658	1.23
2	264.000	217.400	46.600	1.21
3	216.000	184.267	31.733	1.17
4	336.000	288.100	47.900	1.17
5	352.000	277.417	74.583	1.26
Average			128.100	1.19

### Considerable factors for families that process mango leather

It was observed that factors that should be taken into consideration during processing are: (1) technical skill for producers such as ingredients used during processing, heating identification, stirring method, tasting method, thickness of the products, drying method or condition used, texture of the products, control condition for the products, testing for dryness, storage at room temperature/cool condition, dark, dry place, packaging material plastic, as bags, paper, jar or other suitable containers, uniformity of the product, and sanitation practice. (2) Suitable equipments or materials for drying. (3) Water quality used: well water has micro organisms and unsuitable components. (4) Market chain and management. (5) Share and acceptance of the experience with/from the experts.

Berdegue, J.A. et al., (2008) showed that small-scale farmers need to change their ways of working to be able to access restructured markets and, above all, to sustain participation over time, as these markets continue to evolve in ever more demanding ways. There seems to be three common elements to all successful case studies of smallholder farmer participation;

- Upgrading of technical skills, infrastructure and management capacities
- Specialization within multi-agent organizational arrangements
- Increased working and investment capital, usually requiring subsidized external support for prolonged periods of time

## CONCLUSION AND RECOMMENDATIONS

Svay Koa Lmeat is a popular variety of mangos in Kien Svay district and it was a popular resource for being processed into mango leather. Processing of this product had 3 main stages: preparation, juice extraction and stirring, and straining and drying. During the preparation stage people used different techniques: some people used grinding machine and some people used knives for slicing followed by peeling. Generally, equipments used during processing were the simple ones and always cleaned before processing. Plastic was the preferred packaging and storage material used. 76.4 percent of the producers interviewed ensured that cleaning and sanitization was done before processing. 100 percent of producers did not care about the storage method during drying to protect infestation or contamination.

Processing provided more profit to the farmers, being on average 128.100 riel per ripening season. Although the economic efficiency on average was 1.19, the abundant fresh fruit could be utilized and provide more profit from processing on average 7000 riel per person. With these contexts, some recommendations have been made for improved profitability and quality

- Cleaning before process as a rule for producers-the equipments must be dried
- Increase product quantity by producers
- Filter well water before using for processing mango leather
- Producers must identify alternative suitable package for mango leather
- Survey on the equipments used during drying with respect to the conditions and socio-economics related to local livelihood
- Conduct more studies on the shelf life of the product
- Conduct studies on the preservation methods used to increase shelf life of the products
- Conduct quality assessment studies of the s with a focus on the micro organisms'
- Identify detail on the micro-organisms followed by the 5 parameters:  
(1) Fecal Coliform or Thermptolercent Coliform (2) *Campylobacter* spp (3) *Salmonella* spp (4) *Clostridium perfringer* (5) *Staphylococcus aureas* for mango leather
- Extension services to train the producers on the best practices and hygiene requirements.

## REFERENCES

- Agri Business Week. 2009. Make mango rejects profitable through value-adding. (www.Agribusinessweek.com).
- Bal, J.S. 1997. Mango. fruit growing, first edition. New Delhi, India, 155-182.
- Bally, I.S.E. 2006. Species profiles for Pacific island agroforestry: *Mangifera indica* (mango). (www.traditionaltree.org).
- Berdegue, J.A., Bienabe, E. and Peppelenbos, L. 2008. Keys to inclusion of small-scale producers in dynamic markets - Innovative practice in connecting small-scale producers with dynamic markets, Regoverning Markets Innovative Practice series, IIED, London.
- Christian and Joffin, J.N. 1989. Food microbiology. Center Regional of Documentation of Bordeaux. Pasteur Institute of Cambodia, 40-46.
- Global AgriSystem. 2005. Global AgriSystem Pvt. Ltd.
- Mithofer, D. 2004. Economics of indigenous fruit tree crop in Zimbabwe. Ph.D thesis. Department of Economics and Business Administration, University of Hannover. Hannover, Germany.
- Saka, J.D.K., Swai, R., Mkonda, A., Schombarg, A., Kwesiga, F. and Akinnifesi, F.K. 2004. Processing and utilization of indigenous fruits of the miombo in Southern Africa. World Agro-forestry Centre: Nairobi, Kenya, 343-352.
- Swi-bea Wu, J. and Chen, H. 1993. Fruit juice processing technology: Mango juice. Agscience, Inc. Auburn-dale, Florida, 620.
- Yamane, T. 1967. Statistic an introductory analysis, 2<sup>nd</sup> Edition, New York: Haper and Row, Institute of Food and Agricultural Science, University of Florida, USA.
- Yamane, T. 1973. Statistics an introduction analysis, 3<sup>rd</sup> Edition, New York : Haper and Row, Institute of Food and Agricultural Science, University of Florida, USA.