

**Participatory approaches for *Volkameria inermis* conservation through herbal bioproducts at the Sirinart Rajini Mangrove Ecosystem Learning Center, Prachuap Khiri Khan Province**

**Nudchanard Rukklin\*, Jedsada Kongkasurichay, Panisa Rodpai, Nidanuch Sungpia,  
and Komson Hongpadharakiree**

Sirinart Rajini Mangrove Ecosystem Learning Center, Pranburi District, Prachuab Khiri Khan, Thailand

\*Corresponding author e-mail: nud-nard@hotmail.com

**Abstract:** The study aimed to examine participatory approach using commercial values of herbal bioproducts and local attitudes to expand the plant habitats inside the Sirinart Rajini Mangrove Ecosystem Learning Center at Pak Nam Pran Sub-district. *Volkameria inermis* was chosen among other mangrove plants for its values. Forty respondents, twenty of them whose incomes were promoted from *Volkameria inermis* herbal products, while another twenty respondents lived adjacent the center. Their attitudes were collected by questionnaire surveys and analyzed by descriptive statistical analysis including percentage, mean, and One-way ANOVA with a significance level ( $\alpha$ ) of 0.05. Incomes increased by added values of mangrove herbal products made from the plant were analyzed. The study showed that respondents whose incomes were promoted through the herbal products had high level of awareness at 61.77% on the plant value and the mangrove forest conservation while another group of respondents showed their moderate awareness with 44.28%. The results showed significant influence ( $p$ -value = 0.024) of knowledge on the plant benefits and the higher incomes earned from the herbal products on the attitude towards a plant and mangrove natural resource conservation. A total income obtained from selling the plant products of center during January 2016 to September 2018 was totally 226,990 baht. Among the products, the incomes from selling the soap and hot balm made from the plant were 222,535 baht and 4,455 baht respectively, made by total fresh leaves of plant 109.34 kilograms or 2,076 baht per kilogram wet weights. It can be concluded that a community income promotion using local mangrove forest resources was an approach to the community's values and awareness on the mangrove forest conservation, leading to community participation in tree planting, caring, and restoring of targeted plant species as well as using the natural resources in sustainable ways.

**Keywords:** Participatory approach, conservation, *Volkameria inermis*, herbal bioproducts

### Introduction

Mangrove forest conservation with participatory policy under the Sirinart Rajini Mangrove Ecosystem Learning Center, at the Klong Kao – Klong Koy National Reserved Forest, Pak Nam Pran Sub-district, Pran Buri District in Prachuap Khiri Khan Province has been ecological restored since 1981 with the area of 786 rai (126 hectares) (Paphavasit et al., 2014). The policy on community participation on the mangrove forest was applied to the mangrove management following His Majesty King Rama IX's speeches "The locals benefit from the mangrove forest, so they must help to conserve it" on 16 November 2002 by His Majesty King Rama IX delivered during the Public Company Limited's 1 Million-Rai Reforestation Project in Commemoration of His Majesty the King Rama IX's 50th Anniversary of His Accession to the Throne. Following the Speech, becoming a policy and actions, the restored mangrove forest tracts of Forest plantation target 29 and forest plantation target 29/3 provided the forest ecosystem benefits with the building the participation of the community in the conservation of mangrove planting to sustainability among communities at Pak Nam Pran Sub-district of Pran Buri District. To achieve the target on community participation on the mangrove forest management, there were four strategic issues were included to the forest operations which were knowledge, community and society, environment, and ecotourism. Social entrepreneurship is an effective tool for promoting participatory resource-based management. Network of villagers who earned benefits from herbal plants of mangrove forest was established under the Center as a group of mangrove forest herbal bioproducts. The social entrepreneurship is known as a process of creating value by combining resources in new concepts of social networking to seek for opportunities regarding social values and needs. Management of herbal bioproduct values to promote more socio-incomes among the members and strengthen the mangrove forest was anchored as foundation of capacity building conservation expanding around the Center. The process of creating value of mangrove plant bioproducts regarding local needs such as hot balm oils for the development of product values of mangrove plants and encourage the sustainable mangrove forest management under the Center. Promotion of mangrove forest services for local communities in particular, various mangrove plant species growing in the center's area is for occupation promotion and socio-incomes of group members. There are more than 20 plant species that could be utilized as herbal bioproducts with simple production process and meet to the market needs of local consumption. Their medicinal characteristics were reported and utilized by local wisdoms and scientific research studies. For example, boiled water from bark of *Rhizophora*

*apiculata* can heal diarrhea, nausea, vomiting, fever, or chronic wounds clean (Faculty of Science Chulalongkorn University as cited in Paphavasit et al., 2014) as well as the boil water or blended bark of *Xylocarpus granatum* can cure wounds and bruise. The boiled water of green leaves of Samma Nga or *Volkameria inermis* is used to clean wounds, treat skin diseases, and bathing to reduce rash (Kung Krabaen Bay Royal Development Study Center. 2006). Among those plant species such as *Rhizophora apiculata*, *Rhizophora mucronata*, *Xylocarpus moluccensis*, *Xylocarpus granatum*, *Thespesia populnea*, *Avicennia alba*, *Avicennia marina*, *Bruguiera cylindrical*, *Acanthus ilicifolius*, *Volkameria inermis*, and etc, the local plant named Samma Nga (*Volkameria inermis*) was selected for participatory management model using commercial values to expand the area of plantation in the Center area.

The plant contains flavone derivatives including hispidulin, acacetin, and diosmetin. The hispidulin is found in *Volkameria inermis* reported as a potential medicinal plant species by Faculty of Pharmacy, Mahidol University. Potential therapeutic role of hispidulin extracted from the plant leaves is volatile substance that decongestive bronchial congestion. More substances of acacetin and diosmetin were found in the plant leaves and exhibits several pharmacological and medicinal properties especially their roles in anti-inflammation of the skin, rash, bruise and sprain.

From highly potential therapeutic roles of chemical substances found in *Volkameria inermis*, but in very small quantity of leaves available at the Center, the plant will be promoted through commercial values and local attitudes to expand the plant habitats inside the Center. Social mechanisms especially social entrepreneurship using the potential of herbal bioproducts to generate the diversified socio-incomes and community participation in the programs of *Volkameria inermis* planting is assessed. Assessment of effectiveness of conservation practices that related to Sirinart Rajini Center programs including knowledge transfer and occupation promotion using benefits from herbal bioproducts of *Volkameria inermis*. The results of assessment would be the management model for sustainable forest management using participatory approach together with commercial values development of herbal bioproducts (Figure. 1).

### Materials and Methods

In order to find the participatory approaches using the social entrepreneurship operating the herbal bioproduct values from *Volkameria inermis* available at the Sirinart Rajini Mangrove Ecosystem Learning Center, Pak Nam Pran Sub-district, field survey was conducted using semi-structure questionnaires. The contents of questionnaires are divided into three data sets.

- A. Demographic information the 40 respondents.
- B. Benefits of *Volkameria inermis* to promote the mangrove forest conservation.
- C. Participatory approaches for *Volkameria inermis* planting in the Center area to promote the mangrove forest conservation.

Attitudes survey, totally forty respondents was conducted by selecting the twenty respondents from communities in the center and another twenty respondents from adjacent communities. The collected data sets were analyzed using the Statistical Package for Social Sciences program for averages percentage and mean values. One-way ANOVA at a significance level ( $\alpha$ ) of 0.05 was chosen to reveal the significant differences of two groups of respondents on the studied data sets. Moreover, using the literature reviews and experts opinions for qualitative data analysis, the records of socio-incomes obtained from the benefits of herbal bioproducts made from *Volkameria inermis* in 2016 to 2018 was analyzed.

### Result & Discussion

The forty respondents were in the middle ages older than 51 years old. The twenty respondents from the observed group who earned benefits from the *Volkameria inermis* herbal bioproducts were mainly female at 65% at 51-60 years old. Their education information showed that 30% of this group graduated in an elementary school or lower and 50% of the respondents were graduated in high school. For the source of main incomes, there were 30% of respondents earning their incomes from fishery, and 30% of those had their total incomes around 5,000-8,000 baht per month.

The other twenty respondents who lived adjacent mangrove forest of Sirinart Rajini Mangrove Ecosystem Learning Center were found females 60% and age of 60 years old of respondents were found around 30%. There were about 30% of respondents graduated in high school, and among the respondents they were found being a merchant. There were 40% of them earned incomes 5,000-8,000 baht per month and another 60% of them earned incomes more than 15,000 baht.

The results of interviews of all respondents showed that their attitudes on the benefits of herbal plant and importance of mangrove forest, the respondents whose incomes were earned from the herbal bioproducts were found at 61.77% while another group of respondents showed their moderate awareness with 44.28%.

The results showed significant attitudes ( $p$ -value = 0.024) on the plant benefits and the higher incomes earned from the herbal bioproducts on the attitude towards a plant and mangrove natural resource conservation. The demographic factors including gender, age, education, occupation and incomes per month did not significantly affect ( $p$ -value = 0.534, 0.824, 0.636, 0.752, and 0.983, respectively) to the attitudes a plant and mangrove natural resource conservation.

In addition, the results showed the respondents whose their incomes were from herbal bioproducts needed training programs for the knowledge related to the benefits of *Volkameria inermis* and should developed other herbal bioproducts to provide alternative choices for consumers. The *Volkameria inermis* may be reduced if harvested continuously, so more areas inside the Center should be for *Volkameria inermis* plantation as well as the determination of timing of restoring the *Volkameria inermis* back to the area.

Socio-incomes obtained from the benefits of herbal bioproducts made from *Volkameria inermis* January 2016 to September 2018 revealed that the plant provided the respondents more incomes. The center with the group of mangrove forest herbal bioproducts produced the herbal bioproducts earned more incomes from selling the herbal bioproducts totally 226,990 baht. Among the different types of bioproducts, the incomes from selling the soap made from the plant were 31,975, 87,600 and 107,145 baht in 2016, 2017 and 2018 respectively. The soap made from total fresh leaves of *Volkameria inermis* 109.34 kilograms or 2,076 baht per kilogram wet weights.

### Conclusion

The results showed the significant attitudes on the benefits of herbal plant, *Volkameria inermis* conservation through incomes promotion of selected stakeholders from the community at Pak Nam Pran Sub-district, Pran Buri District in Prachuap Khiri Khan Province and from the Center adjacent communities. The respondents whose incomes were promoted through the herbal bioproducts had high level of awareness at 61.77% on the plant value and the mangrove forest conservation while another group of respondents showed their moderate awareness with 44.28%. The results showed significant attitudes ( $p$ -value = 0.024) on the plant benefits and the higher incomes earned from the herbal bioproducts on the attitude towards a plant and mangrove natural resource conservation. Moreover, they needed knowledge related to the benefits of *Volkameria inermis* and other herbal bioproducts to provide alternative choices for consumers. To increase the numbers of this herbal plant, more areas inside the Center should be provided for plantation as well as the determination of timing of restoring the *Volkameria inermis* back to the area.

The occupation promotion to community was an approach to the community's values and awareness on the mangrove forest conservation, leading to community participation in planting, caring, and restoring of targeted plant species as well as generating the incomes and using the natural resources in sustainable ways.

### Acknowledgement

The authors gratefully thank the respondents and officers of the Sirinart Rajini Mangrove Ecosystem Learning Center for their information. Also, thank you very much to the PTT Public Company Limited for supporting the research budget. Finally, we would like to thank Dr. Kallaya Suntornvongsagul, Environmental Research Institute of Chulalongkorn University for useful comments and suggestions on the English language and structure of our manuscript.

### References

- Faculty of Pharmacy Mahidol University. 2017. Herbal Plants: *Volkameria inermis*. Retrieved from [https://pharmacy.mahidol.ac.th/siri/index.php?page=search\\_detail&medicinal\\_id=38](https://pharmacy.mahidol.ac.th/siri/index.php?page=search_detail&medicinal_id=38).
- Forestry Kung Krabaen Bay Royal Development Study Center. 2006. Medicinal plants of beach forests and mangrove forests in the Kung Krabaen Bay Royal Development Study Center area. Chanthaburi.
- Paphavasit, N., Siriboon, S., Jaiperm, J. and Mookui, P. 2014. Sirinath Rajini Mangrove Ecosystem Learning Center. From mangrove plantation to mangrove forest enhancing human development (1ed.). Bangkok: PTT co., Ltd and Department of Science, Chulalongkorn University. Bangkok.
- Paphavasit, N., Chawasiri, W., and Theerathanathor, V. 2012. Herbal plants in the mangrove forest Thung Tase in Trang Province. Yves Rocher (France) and Yves Rocher (Thailand) Ltd. And Department of Science, Chulalongkorn University. Pra Suk Chai Printing Part., Ltd. Bangkok.

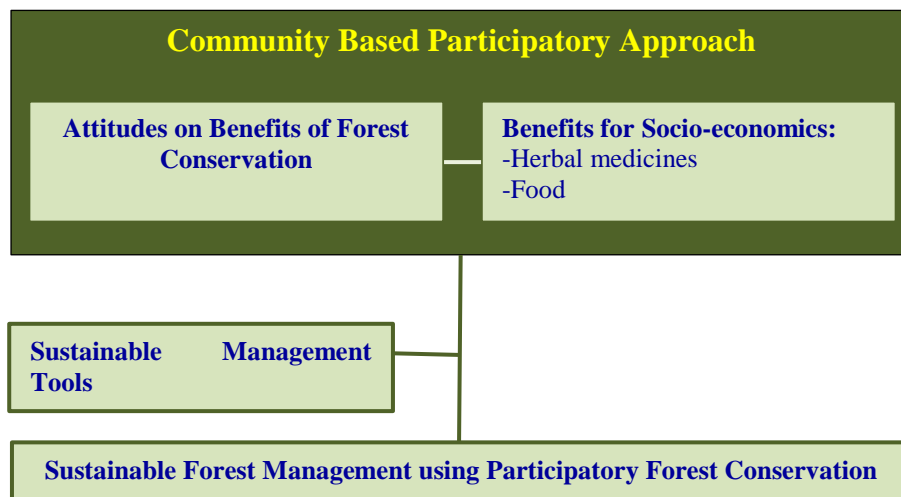


Figure 1. Research framework diagram.