

Research Article

Assessing the outcomes of farmers on promoting herbal medicine use

Pakakrong Kwankhao¹,
Kaemthong Indaratna²,
Luerat Anuratpanich³,
Arthorn Riewpaiboon^{3*}

¹ Pharmacy Department, Chao Phya
Abhaibhubejhr Hospital, Prachinburi,
Thailand

² Faculty of Economics, Chulalongkorn
University, Bangkok, Thailand

³ Social and Administrative Pharmacy Excellence
Research (SAPER) Unit, Department of
Pharmacy, Faculty of Pharmacy, Mahidol
University, Bangkok, Thailand

*Corresponding author:
arthorn.rie@mahidol.ac.th

KEYWORDS:

Farmers; Herbal medicine; Logical
Framework; Outcome assessment

ABSTRACT

The objective of this study is to assess outcomes of farmers who are in herbal medicine (HM) production phase by using Logical Framework (LF) as a new approach. One hundred ninety-seven farmers participating in contract farming scheme of one social enterprise (SE) in Thailand were the subjects of the study. The mixed method (a combination of qualitative and quantitative approaches) study was conducted between December 2015 to June 2016. There were 3 steps of outcome assessment; outcome identification, questionnaire development and outcome confirmation. The results showed that all farmers experienced four outcomes within eight years of participation in contract farming scheme which were increase of income, more stable and regular income, decrease of health expense and improvement of environment condition. The indicators for four outcomes were presented; 69,287 baht of increased income, 95% of times receiving paid on time, 604.23 baht of reduced health expense and achievement to the standard of pollution control department for heavy metal level. In conclusion, promotion of HM use could create significant outcomes to farmers as mentioned earlier. Though, the results of this study may not be generalized to other farmers as the activities provided by this SE are unique but it is an example to build partnerships with farmers in order to ensure quality of herbal raw materials. Additionally, LF may be applied to measure outcomes from other stakeholders in HM value chain as it is the stakeholder engagement tool that may contribute to sustainable development of organization.

1. INTRODUCTION

In Thailand, herbal medicine (HM) is available at health facilities as it has been recognized that modern medicine alone does not have all the answers to the nation's health problems¹. However, there is a big debate whether it is worth to promote HM use in mainstream healthcare because of different perspective between HM and western medicine such as patients' preference on HM use, availability of evidence on the effectiveness of HM and appropriate and well-defined comparators that leads to methodological limitation on economic evaluation (EE) of HM². Nevertheless, there is increasing on the consideration of non-

health outcomes in EE but there is not yet consensus in methodology to assess the outcomes³.

Regarding development of HM in the past decades, a number of HMs have been proved on effectiveness and safety, then, they have been included in the national list of essential medicines. Currently, they have been available in hospital formulary. However, study on evidence of their value is still limited. Hence, assessment of value of HM is stated in the Master Plan on Thai Herbal Development (2017-2021). The Master plan mentioned that promotion of HM would not be beneficial to only patients but it also affects to everyone in value chain particularly underprivileged farmers⁴. In HM production, quality of herbal raw material is fundamental to the efficacy and safety of HMs⁵, therefore contract farming can be a means to promote sustainability of HM development.

Chao Phya Abhaibhubejhr hospital foundation (CAF); a health SE focusing on revitalizing traditional and indigenous knowledge to improve the country's self-sufficiency in healthcare. It has collected the knowledge based on the practices of local healers and applied it to the development of HM for Thai consumers. CAF has been recognized as a model for development of HM particularly farm management which is the starting point of the farm-to-shelf supply chain for high quality product. CAF has promoted the production and handling of good raw materials by encouraging and supporting farmer groups to convert from conventional to organic farming as they begin growing medicinal plants^{6,7}.

All farms under CAF project are received certified organic under Organic Agriculture Certification Thailand (ACT) basic standard in line with the International Federation of Organic Agriculture Movements (IFOAM) principle^{7,8}. Farmers are permitted to use only natural materials in organic production such as fertilizers and soil conditioners, products and measures for pest and disease control, plant regulators, cleansing agents, disinfectants, additives used in products for pest control, and inputs for livestock production⁸. Apart from natural processes to ensure health and ecology commitment, organic practice also promotes fairness and care to society as basic requirement to fulfill organic farming certification. Therefore, CAF purchases herbal raw materials from the farmers at guaranteed quantity and prices to provide them with higher

and more regular income and has also educated and encouraged them to use herbs for self-care in order to improve self-sufficiency of the community^{6,7}.

The Logical Framework (LF) is a rational linkage between a program's inputs (resources needed for project management e.g. time, money, staff and other assets), activities (processes that organizations do to create outputs, outcomes and impacts), outputs (direct results from activities), outcomes (longer term changes in outputs) and impacts (long term changes due to organization)^{9,10}.

LF helps identifying and planning beforehand or adapting resources and activities in response to expectation of partners and stakeholders⁹. It is a means to foster collaboration among stakeholders in order to achieve organization goals, strengthens program management and facilitate internal and external communication¹⁰. It can also be applied as a self-assessment tool to evaluate organization performance and can be further used in conjunction with a wide range of other economic methodology such as Social Return on Investment (SROI)¹¹.

In this study, LF was applied to assess outcomes of farmers under contract farming scheme of CAF. The results of the study may provide a clearer picture of the potential contribution of HM promotion to the other groups of stakeholders beyond consumers and may lead to develop appropriate interventions responded to national policy. In addition, the new approach may be applied to measure outcomes from other stakeholders by getting their involvement that may lead to sustainability of development.

2. MATERIALS AND METHODS

2.1. Study design

Mixed method integrating quantitative and qualitative approaches was employed to conduct the study.

2.2. Study population

The 197 farmers who had entered into contract agreements of Chao Phya Abhaibhubejhr hospital foundation (CAF) were the subjects of this study. At the study time, there were five groups of farmers; Kanchanaburi-Tak (78 farmers), Prachinburi (21 farmers), Mahasarakham (51 farmers), Chiang Mai-Chiang Rai (35 farmers), and the three southernmost provinces (12 farmers).

2.3. Study period

The data collection was done during December 2015 to June 2016.

2.4. Study processes

2.4.1. Outcome identification

Two representatives from each group of farmers were invited to participate in the process of identifying outcomes, however, there were only ten representatives from three groups, i.e. from Kanchanaburi-Tak (3), Prachinburi (4), and Mahasarakham (3) took part in the focus group. Representatives from the other two groups could not attend due to long distances and political sensitivity, as was the case for of the residents of the three southernmost provinces. The objective and processes were explained to farmers. Case studies and picture were also used to improve understanding about basic concept of LF. Focus group was performed to examine changes or outcomes experienced by the farmers as well as the period that outcomes would happen. In-depth interviews were also used where the focus group did not produce adequate response. All farmers participating in the focus group meeting were encouraged to freely discuss the outcomes generated by their partnership with CAF. They were asked about their early expectations of benefits, the later actual outcomes, and the reasons behind them. The participants were encouraged to express their feelings and views on both benefits and negative consequences. Voice recording was used with permission from the informants to reexamine and verifying what was said. Content analysis was employed to identify outcomes occurred to farmers.

To ensure causal relationship between resources and results, the farmers were asked to put each outcome that they all agreed in LF and trace back to inputs, processes and outputs. The indicators which actually linked to each outcome were also enquired from focus group in order to evaluate if farmers received these outcomes.

2.4.2. Questionnaire development

To confirm outcomes specified by representatives truly happened to all farmers. A questionnaire consisting of four parts – personal information, income information, history of illness

and health expense, and environmental fertility — was developed, based on the results from the focus group meeting. Five farmers from each group were invited as experts to verify if the questionnaire could assess the outcomes as mentioned by farmers and being understood by farmers. The questionnaire was revised regarding comments of experts.

2.4.3. Outcome confirmation

The questionnaire was delivered to the coordinators of each group before distributing to farmers. The farmers were requested to finish the questionnaire by two months after receiving the questionnaire. In case, farmers could not read or write Thai, the coordinators brought questionnaire to farmers' homes and read the questionnaire for them. The result was analyzed by using descriptive statistics.

3. RESULTS

3.1. Outcomes identification

All farmers agreed to use eight years of participation in contract farming program as a period to make changes to them. They explained that transition period from conventional to organic agriculture normally took 3 years and then had another 5 years to get changes. Before participation, they only expected to have higher income with stable manner which was the big problem for them, however, they got more outcomes so far. They all agreed that being partners with CAF has produced changes in the following four changes:

- *Increased income*: CAF bought certified organic herbal raw materials at higher prices, so they could be certain to receive higher income. Moreover, CAF and the representatives of all farmer groups would get together to plan the quantities of raw materials and set the prices at which CAF would buy from them every year thus that they did not incur loss.
- *More stable and regular income*: They would know before when and how much money they would earn from supply raw materials due to effective cultivation plan done between CAF and farmers. Most of the farmers emphasized the importance of getting regular income over earning more because it allows them to plan and manage their finances wisely.

- *Reduced health expenses:* CAF has not only supported them to be its suppliers but also empowered them to revive the use of traditional remedies in their own communities. Despite having access to health insurance, these farmers, like almost all Thais, often buy medicines from pharmacies and visit private clinics for their health problems even though they have to pay out of pocket. But as they have increasingly turned to herbal remedies for self-care, using herbs harvested from their own gardens, their expenditures on medicines were reduced.
- *Improved environmental conditions:* Converting to organic agriculture, the farmers have ceased harmful practices of conventional farming, including heavy application of chemical fertilizers and pesticides, which would cause a buildup of poisonous residue in soil, water and air. The improvement of environment conditions lead to better health of farmers. Some of them reported allergic condition got better after changing to organic agricultural practice.

Apart from the above benefits, some farmers mentioned that they now grew some vegetables for themselves instead of buying them from the market, and these were safe and free. They were also proud of being a model for other groups and communities. A number of visitors came to learn their experiences and bought their seedlings and herbal remedies, providing them with extra income.

Karen farmers from the Kanchanaburi group related their experiences of how their conversion to growing herbs and organic farming helped reduce the loss of forests due to shifting cultivation and restore soil fertility and the environment. Moreover, the new practices have helped to strengthen the role of Karen communities living in their ancestral lands in Huay Kha Khaeng Wildlife Sanctuary as buffer zones to protect it from encroachers.

Although the participants said up to now, they had not experienced any negative impacts, they expressed concern about a reduction in CAF's demand for herbal raw materials that occurred a few years ago and still had no idea how they would cope with such problem if it recurred.

As all the participants agreed on four outcomes; i.e. increased income, more stable and regular income, reduced health expenses, and improved environmental conditions; these were

used as the basis for developing a LF framework. The participants suggested that indicators of these outcomes should not be too complicated and be simple enough for the farmers to understand. Therefore, indicators for increase of income and reduction of health expense on simple ailments (fever, common cold, cough, headache, diarrhea, constipation muscle pain), before and after working in connection with CAF, could be asked directly from the farmers as they have done monthly household spreadsheet whereas certainty and regularity of income should be asked through various questions such as stress relief from certainty and regularity of income, saving plan, debt reduction and saving increase whereas performance indicators should be number of times being paid on time by CAF. Improved environmental conditions was checked by investigate the crop yield of raw material and vegetable grown on the land including the quantity of heavy metals found in lands that should meet the standard of Pollution Control Department that was the basic requirement for starting organic farming because they thought that it was the minimal standard to have a safe environment for living organisms.

The inputs for organic farming activities include time spent by farmers, CAF extension workers, organic farming auditors, land, seedlings, fertilizers and soil conditioners, products for pest and disease control, plant regulators, cleansing agents, disinfectants and inputs for livestock production, organic farming manual and meals and transportation during farm visits.

The production and pre-processing of organic herbal raw materials by the farmers involve the following steps: improving soil and water quality, plant breeding, cultivation and farm management, harvesting and preprocessing and delivering raw materials to CAF. Farm certification was conducted every year by external auditors and monitoring and mentoring were done to every network. The inspection was also done by certifying body very two years. Training on organic farming and self-healthcare was also delivered to farmers occasionally. As CAF's aim in promoting organic farming is to help farmers generate more income as well as to improve their health and the environment, the number of participating farmers and their farming areas were used as outputs.

All four outcomes were mapped according

to the outputs as presented in Table 1. Increased income, more stable and regular income, and reduced health expenses were the outcomes for

the farmers whereas improved environment was the outcome for the environment that may later affects to farmers' health.

Table 1. Logical Framework diagram for assessing outcomes of farmers

Input	Process	Output	Outcome
- Farmers	- Improvement of soil and	- Number of	- Increased income
- CAF staffs	water quality to meet organic	farmers participating	- Stable and regular
- Auditors	farming standards	in the project	income
- Land	- Plant breeding	- Organic farming land	- Reduced health
- Seedlings	- Cultivation and farm management		expenses
- Fertilizers and soil	- Harvesting and pre-processing		- Improved
conditioners, products for pest	- Training and study visits for		environment
and disease control,	farmers		
plant regulators, cleansing	- Transportation of raw materials		
agents, disinfectants and inputs	- Education program for		
for livestock production	self-health care		
- Organic farming manual	- Monitoring, mentoring and		
- Meals and transportation during	inspection		
farm visits			

3.2. Questionnaire development

The questionnaire was designed to measure four outcomes; increase of income, more stable and regular income, reduced health expenses, and improved environmental conditions from all farmers in 8 years of contract farming scheme. The idea of farmers given in 3.1 together with literature review was brought to develop questionnaire.

The experts commented that it may have recall bias on history of illness. It would be better to check only health expense. For environment condition, it should not be asked about the crop yield as they usually grew various kinds of herbs in the same land according to organic farming principle. One more thing, it was not clear that organic farm could help to improve yield of raw material from their own experiences. The final version of questionnaire was revised according comments of five experts.

3.3. Outcome confirmation

All 197 questionnaires were received back within two months. One hundred and twenty-two

farmers could not read so the coordinators in each area read and filled the questionnaire for them. The average age of farmers was 50.7 years old (maximum age: 70 and minimum age: 28 years old). Female farmers were 59.90%. The average family size was 4.53 members whereas average participation time was 8.7 years.

The outcome indicators represented changes within 8 years of project participation were shown in Table 2. All farmers received higher incomes and spent less on health. The average annual income after deduction of production cost was 84,100 baht and 153,387 baht before and after working with CAF, respectively. The average annual health expenses were reduced by 604.23 baht. They got payment on time from CAF for 95% of times. One kilogram of soils was taken from each group of farmers for analysis of 8 types of heavy metals; arsenic, cadmium, chromium, lead, manganese, mercury, nickel and selenium regarding soil fertility standard for living and agriculture of pollution control department¹². Analysis showed that heavy metal levels in the soil samples satisfied the standard.

Table 2. Outcomes assessing from farmers during eight years of participation in contract farming scheme

Outcomes	Outcome indicator	Result
Increased net income project participation	Difference of net income before and after	69,287 baht*
More stable and regular income	Number of times being paid on time by CAF	95%
Reduced health expenses	Reduction of health expense	604.23 baht**
Improved environment conditions	Levels of 8 types of heavy metals in soil.	Meets the standards of pollution control department ¹²

Remarks:

*Net income before and after project participation were 84,100 and 153,387 baht, respectively.

**Net reduction of health expense before and after project participation were 800 and 196.39 baht, respectively.

4. DISCUSSION

In this study, it was found that promotion of HM use could generate positive changes to farmers who grow organic herbal raw materials. The results of this study are similar to the previous ones. There is evidence showing that conversion to organic farming could increase income for farmer. For example, small scale farmers in Northeastern of Thailand, supported by Grassroot Innovation Network (GIN), a Thai SE, had their incomes increase by 32%¹³. Another study found that organic cotton growers in Kyrgyzstan earned more income than those practicing conventional farming¹⁴. The main reason for increases in income is that organic products generally command higher prices than their non-organic counterparts. Moreover, national farmers' average annual income before deduction of production cost was 160,932 baht (US\$ 4915.76) in 2017 whereas organic herb farmers' average annual income after deduction of production cost was 153,387 baht (US\$ 4685.30)¹⁵.

Moreover, both the GIN-supported and Kyrgyz farmers similarly observed that their cleaner environment had made them healthier but it did not find that improvement of environment led to healthier state of the farmers in this study^{13,14}. In our study, some farmers stated that they had better health in focus group but all of them did not agree on this issue. Moreover, experts in questionnaire development phase, they did not agree to measure health changes because of a reason mentioned above. In the future, health status of farmers should be assessed because it is one goal of organic farming practice⁸.

In this study, health outcomes were not noticed among farmers but it seems that four outcomes of farmers; increase of income, more stable and certain outcome, decrease of health expense and improvement of environment condition (reduction of pesticide in environment) would lead to better health in medium and long term¹⁶⁻¹⁹. Moreover, the relationship between chemical pesticides and human health is inclusive as there are various confounding factors affecting to the outcomes but epidemiological studies have reported adverse effects of certain pesticides on children's cognitive development at current levels of exposure²⁰. On the other hand, likely human health benefits associated with organic food production such as a modestly higher content of phenolic compounds in organic fruit and vegetables may have protective effects to human health²¹. So, assessing health outcomes in farmers should be regularly performed.

Due to contract farming scheme of CAF provided to farmers, it made farmers had more stable and regular income which leads to well plan and reduce household debt. This finding did not find in other studies. Moreover, farmers reported that they received pay on time only 95% of times, though it should be 100% of times as is the policy of CAF. So, CAF should use this data to correct the activities in order to improve the satisfaction of farmers.

The LF helped CAF to listen from their stakeholders and may reallocate resources to serve need of stakeholders in order to improve efficiency of organization. In the first engagement with farmers, they expressed that each group experienced different

outcomes for instance one group of farmers stated that they earned more income from visitors who came to observe their activities therefore CAF may advise them to set up the efficient system that can attract more visitors. Besides, contract farming may create dependency of farmers to CAF in long-term, farmers should be encouraged to have additional dependent jobs to address farmers' concern about a reduction in demand for herbal raw materials.

Finally, LF is a broad concept that currently adopt as a management tool in real practice but implementation may be different depending on understanding and interpretation of users. To improve validity and reliability of this concept, the guideline for LF implementation should be developed to make the results from different organizations/projects comparable.

The major limitation of this study is the possibility of recall bias. The time gap between the start of CAF contract farming project in 2001 and the study period could possibly cause inaccurate reporting by the farmers of their incomes even though they were encouraged to keep books for their farms and households when joining the program. The data collection was done by field coordinators who were CAF staff which may influence the results of the study where they were trained to collect data ethically.

5. CONCLUSIONS

Farmers who grow organic herbal raw material under contract farming scheme experienced 4 outcomes which were increased income, stable and regular income, reduced health expense and improved environment.

Though, this study may not be generalized to other farmers as the activities provided by CAF is unique, but policy makers can encourage the other enterprises to build partnerships with farmers in order to create economic and social sustainably as well as ensure quality of herbal raw materials. The same approach could be employed to measure outcomes of other stakeholders in HM value chain such as patients, health product entrepreneurs.

6. ACKNOWLEDGEMENTS

We would like to thank Chao Phya Abhaibhujhr Hospital Foundation (CAF) for

financial support and Dr. Yongsak Tantipidok, Mr. Theeradej Uthaiwittayarat and Mr. Disathat Rojanalak for kindly providing valuable comments and suggestions about this manuscript.

Conflict of interest

CAF is owned by Chao Phya Abhaibhujhr Hospital (CAH) which is the first author's workplace. However, first author did not involve during data collection as it may influence to the assessment of outcomes from farmers.

Funding

None to declare

Ethical approval

None to declare

Article info:

Received June 20, 2018

Received in revised form January 1, 2019

Accepted January 21, 2019

REFERENCES

1. Department of Thai Traditional and Alternative Medicine, Ministry of Public Health. Thai traditional and alternative health profile: Thai traditional medicine, indigenous medicine and alternative medicine 2014-2016. Nonthaburi: Department of Thai Traditional and Alternative Medicine; 2017.
2. Herman PM. Evaluating the economics of complementary and integrative medicine. *Glob Adv Health Med.* 2013;2(2):56-63.
3. Benning TM, Alayli-Goebbels AFG, Aarts MJ, Stolk E, de Wit GA, Prenger R, et al. Exploring outcomes to consider in economic evaluations of health promotion programs: what broader non-health outcomes matter most?. *BMC Health Serv Res.* 2015;15:266.
4. Department of Thai Traditional and Alternative Medicine, Ministry of Public Health. Master plan on Thai herbal development 2017-2021. Nonthaburi: BS Interprint; 2017.
5. Calixto JB. Efficacy, safety, quality control, marketing and regulatory guidelines for herbal medicines (phytotherapeutic agents). *Braz J Med Biol Res.* 2000;33(2):179-89.
6. Research Team of Best 50 Social Enterprises.

- The best 50 social enterprises. Bangkok: Bizzbook; 2010.
7. Chao Phya Abhaibhubejhr Hospital. The coming of age of herbal medicine sharing the herbal heritage. Bangkok: Poramat; 2014.
 8. Organic Agriculture Certification Thailand (ACT). ACT Organic Standard [document on the Internet]. Bangkok: The Foundation; 2016 [cited 2017 Jun 3]. Available from: <http://actorganic-cert.or.th/download/act-organic-standards/>.
 9. W.K. Kellogg Foundation. Using logic models to bring together planning, evaluation and action: logic model development guide. Michigan: W.K. Kellogg Foundation; 2004.
 10. Kaplan SA, Garrett KE. The use of logic models by community-based initiatives. *Eval Program Plann.* 2005;28(2):167-72.
 11. Cabinet Office, Office of the Third Sector. A guide to Social Return on Investment [document on the Internet]. London: Office; 2014 [cited 2017 Jul 2]. Available from: http://www.bond.org.uk/uk/data/files/Cabinet_office_A_guide_to_Social_Return_on_Investment.
 12. Notification of The National Environmental Board No.25, B.E.2547, Issued Under Standard of Soil Quality [document on the Internet]. Bangkok: Ministry; 2004 [cited 2017 Jun 3]. Available from: http://infofile.pcd.go.th/law/9_1_soil.pdf.
 13. School of Change Makers. Grassroot Innovation Network [document on the Internet]. Bangkok: Social business; 2017 [cited 2018 Mar 9]. Available from: <https://www.schoolofchangemakers.com/knowledge/11496>.
 14. Bachmann F, Amanbaev A. Impact assessment - organic cotton in Jalalabad Oblast, Kyrgyzstan. Centre for development and environment; 2010.
 15. Office of Agricultural Economics, Ministry of Agriculture and Cooperatives. Economic data for the agricultural household: The proportion of poor people decreased [document on the Internet]. Bangkok: Ministry; 2014 [cited 2018 Mar 9]. Available from: http://www.oae.go.th/ewt_news.php?nid=26318&filename=new.
 16. Ettner SL. New evidence on the relationship between income and health. *J Health Econ.* 1996;15(1):67-85.
 17. Fritzell J, Neremo M, Lundberg O. The impact of income: assessing the relationship between income and health in Sweden. *Scand J Public Health.* 2004;32(1):6-16.
 18. Imlach GF, Carter KN, Liu I, Richardson K, Blakely T. The relationship between income and health using longitudinal data from New Zealand. *J Epidemiol Community Health.* 2012;66(6):e12.
 19. Benzeval M, Judge K, Shouls S. Understanding the relationship between income and health: How much can be gleaned from cross-sectional data?. *Soc Policy Adm.* 2002;35(4):376-96.
 20. Durham WF. Significance of Pesticide Residues to Human Health. *J Dairy Sci.* 1971;54(5):701-6.
 21. Mie A, Andersen HR, Gunnarsson S, Kahl J, Kesse-Guyot E, Rembialkowska E, et al. Human health implications of organic food and organic agriculture: a comprehensive review. *Environ Health.* 2017;16(1):111.