

Impact of Application of Sufficiency Economy Philosophy on the Well-Being of Thai Population: A Systematic Review and Meta-Analysis of Relevant Studies

Proloy Barua^{1*} and Phudit Tejativaddhana²

Abstract

This paper summarizes the impact of Sufficient Economy Philosophy (SEP) on the well-being of Thais by selecting and reviewing relevant studies published in English. Twenty electronic studies were accessed based on inclusion criteria after the primary and secondary screening processes. The review applied narrative synthesis and meta-analysis for qualitative and quantitative data analyses respectively. Findings pointed to a positive correlation between SEP interventions and well-being across six emerging themes: education, social, economics, agriculture, environment, and health. Meta-analysis of two studies confirmed this relationship ($n=5,579$, pooled standardized mean difference of well-being score, 0.545 [95% CI, 0.178 to 0.912]).

Keywords

Sufficiency economy philosophy (SEP); impact evaluation; systematic review; meta-analysis; Thailand

Background

His Majesty King Bhumibol Adulyadej of the Kingdom of Thailand first proposed the concept of Sufficiency Economy Philosophy (SEP) in 1974 and since 1997, it has become a popular sustainable development philosophy (Bergsteiner & Dharmapiya, 2016). His Majesty defined sufficiency as “a state of being that enables individuals, families, organizations and nations to enjoy, at a minimum, a comfortable existence and, if conditions permit, a reasonable degree of luxury that balances economic, social, environmental, and cultural conditions” (Bergsteiner & Dharmapiya, 2016, p.1101).

The SEP is a sustainable development tool consisting of three principles: *moderation* (avoiding extreme and overindulgence), *reasonableness* (causal connection between actions and consequences), and *prudence* (sufficient protection to cope with the likely impact arising from internal and external changes) (Bergsteiner & Dharmapiya, 2016; Krongkaew, 2003). There are two preconditions attached to these principles: *virtues* (positive values of a person or positive norms of a group) and *knowledge* (simply what is known or empirical evidence).

Moderation: A moderate mind-set to avoid extremes and try to balance between punitive austerity and unaffordable extravagance, between self-deprivation and over-indulgence, between tradition and modernization, and between full-sufficiency and dependency (Bergsteiner & Dharmapiya, 2016, p.1108). It is a balance between a person's physical (i.e. need) and psychological (i.e. want) characteristics that factors potential social (i.e. people around us) and environmental (i.e. health hazard) impacts.

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Reasonableness: It means causality or causal connections between actions and consequences. The decision or action concerning the level of sufficiency must be made rationally with critical examination of the factors involved and careful anticipation of the outcomes that may be expected from such action not only on oneself but also on society and the environment in the short term and the long term. The reason to make that decision or take that action must be beneficial, justifiable and fair. For example, drunk-driving is dangerous and therefore, prudence must be exercised in order to arrive at the right decision or to take the right action.

Prudence: It is having sufficient protection to cope with likely impacts arising from internal and external changes in various aspects by considering the probability of future situations. In order to attain self-immunity, one needs to apply prudence combined with available knowledge and virtues.

Virtues: These are the positive values of a person. The SEP emphasizes enduring virtues that may be inherited, learned or take place through discernment. For instance, being altruistic, assertive, challenge-accepting, compassionate, creative, diligent, fair, honest, inquisitive, intelligent, loyal, open-minded, patient, persevering, tolerant, trustworthy, displaying integrity, and many other desirable qualities (Bergsteiner & Dharmapiya, 2016). A few individuals hold all of these virtues in this mundane world. Shared virtues held by a group is called norms or ethics. It should be noted that having virtues are insufficient to maximize sustainable outcomes unless knowledge is present.

Knowledge: It is simply what is known. Virtues without knowledge do not work in practice. Hence, different forms of knowledge, such as explicit, tacit or non-expressed and skills & life experience are essential to make informed and wise decisions. Individuals can obtain explicit knowledge through academic training, coaching, mentoring, or other learning processes. Similarly, a group of people can gain explicit knowledge from evidence-based research findings published in journals, newspapers, on the internet and television. Tacit group knowledge is a shared experience in the form of organizational and national culture, norms as well as indigenous knowledge.

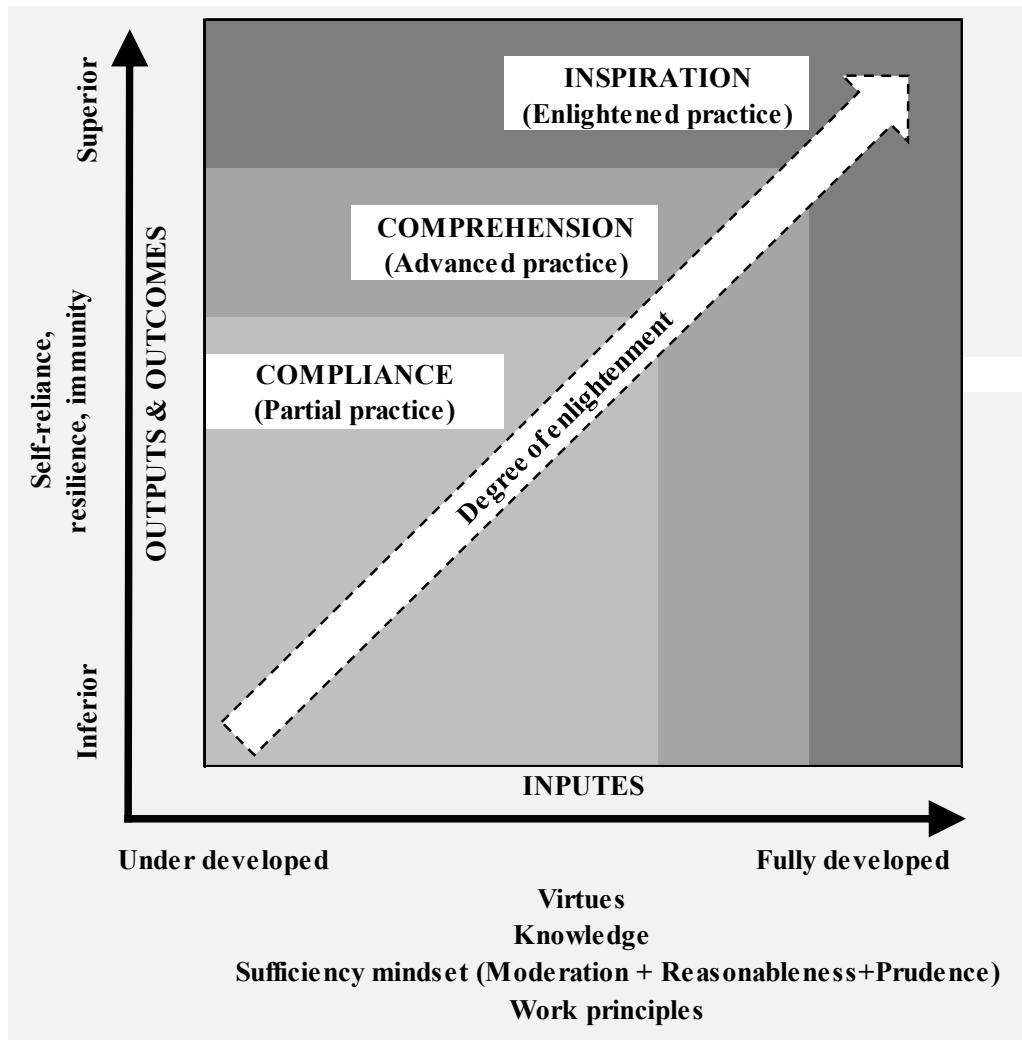
Thus, virtues coupled with knowledge shape moderation, reasonableness, and prudence to maximize sustainable outcomes. Proper implementation of these principles leads to the achievement of sustainable outcomes: *self-reliance, resilience, immunity* through balancing life in four dimensions: economic, social, environmental, and cultural (Ministry of Foreign Affairs Thailand, 2016). These outcomes are interlinked and inseparable like Boromean rings; this means removing any one of the rings will unglue the other two.

The SEP concept originates from the Buddhist philosophy that teaches its adherents to follow the “*middle path*” by avoiding greed and overindulgence, especially in pursuing economic development in the era of globalization (Avery & Bergsteiner, 2016; Kittiprapas, 2016; Krongkaew, 2003). Mainstream economics have failed to address global economic crises and fluctuations, natural resource depletion, environmental degradation, poverty, and income inequality. Therefore, the SEP is seen as an approach to solve all these problems (Mongsawad & Thongpakde, 2016).

Kittiprapas (2012) emphasized human-centered sustainable development by applying the concepts of Buddhist-inspired inner happiness rather than Western style unsustainable happiness concept based on self-centeredness, competition, material consumption and accumulation, and natural resource depletion. Wisdom is essential to develop a high level of happiness. A high level of consumption and resource use on the other hand may not lead to an increase in happiness.

Puntasen (2004) suggested sufficiency thinking can be adopted at three stages of cognitive aspects: compliance, comprehension, inspiration, with three behavioral counterparts: partial practice, advanced practice, enlightened practice. This transformational process is shown in Figure 1 where inputs (virtues, knowledge, sufficiency mind-set, working principles) are on the horizontal-axis and outputs and outcomes (self-reliance, resilience, immunity) are on the vertical-axis.

Figure 1: The progressive embracing and realization of the SEP



Source: Adapted from (Sathirathai & Towprayoon, 2016)

Krongkaew (2003) recommended the spiritual foundation of the people is developed at all levels so the latter are conscious of moral integrity and honesty and strive to live a life shaped by wisdom, forbearance, diligence, self-awareness, intelligence, and attentiveness. Thus, people can maintain balance and are fully equipped to cope with rapid physical, social, environmental, and cultural changes in the world.

Wibulswasdi, Piboolsravut, and Pootrakool (2012) explained two major types of applications of the SEP concept: (a) way of life, where SEP can be employed as a guiding principle to answer real life questions, such as how we should act, which items we should buy, and how we should live our lives to achieve a self-sufficient lifestyle; (b) large scale agricultural and community development, business practices, and government policies. Recent studies

acknowledged the relevance and applicability of the SEP concept in Thailand to achieve sustainable development of the business sector (Suttipun, 2018).

Kittiprapas (2016) emphasized the core concept of true sustainable development which is understanding the interdependence of all beings and nature for the overall well-being of humanity. The SEP concept could reverse conventional sustainable development frameworks by addressing the root causes of sustainable development problems and changing human behavior.

The SEP concept is closely related to sustainable development. The most frequently quoted definition of sustainable development is from *Our Common Future*, also known as Brundtland Report:

"Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: (a) the concept of needs, in particular, the essential needs of the world's poor, to which overriding priority should be given; and (b) the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs." (International Institute for Sustainable Development, 2017, p. 1).

The United Nations declared 17 Sustainable Development Goals (SDGs) to be achieved by 2030 (Willis, 2016). These goals are set to address issues related to agriculture, economics, social, environment, education, and health. There are many development alternatives to address the SDGs while SEP is one of them (Shone, 2014).

The SEP has been adopted in Thailand as a core principle of the National Economic and Social Development Plan since 2002 (Charungkaitkul & Henschke, 2014). In addition, the current constitution of Thailand has integrated SEP and sustainable development as its integral goals. The development approach based on SEP is in conformity with the core principle of the 2030 Agenda and can serve as an approach to support the realization of the SDGs. The SEP promotes a sustainability mind-set and provides guidelines for inclusive, balanced and sustainable development. The Thai cabinet decided on the 25th October 2016 to promote the application of SEP for SDGs in all areas and at all levels. Thailand has also been actively sharing SEP as a development philosophy with the international community, especially since her G-77 chairmanship in 2016 (The United Nations, 2018).

The three SEP principles discussed earlier may be applied to achieve SDGs. For instance, SDG-1 (end of poverty) may be addressed by applying principles of reasonableness and moderation that lead to self-reliance by achieving a balance of economic, social, cultural and environmental aspects and ensuring their stability (Shone, 2014, p. 10). Panyarachun (2017) argued SEP has the foundational principles of SDGs while Pitsuwan (2017) acknowledged the contribution of SEP to address the issue of global poverty. While SEP has been promoted to achieve sustainable development goals (SDGs) by 2030 (Ministry of Foreign Affairs Thailand, 2016) as one of the development alternatives, a cumulative evidence of impact of SEP interventions on well-being is essential to reinforce such initiatives and to enrich the body of literature on this topic. In addition, the body of evidence is useful not only for making evidence-based policy decisions but also in understanding the applications of SEP principles at individual, community, and institutional levels to change their well-being by promoting people-centered development (Wedchayanon & Chorkaew, 2014).

However, there has been no systematic review of empirical studies on the application of SEP projects to understand the overall impact of the application of SEP in different sectors, such as agriculture, education, economic, environment, health, and society. Hence, this paper is

aimed at generating the cumulative impact of sufficiency economy philosophy (SEP) on the well-being of the population in Thailand. This evidence might help to better understand the impact of SEP to undertake relevant projects for the target population in the similar context.

Methods

Data sources

This review paper accessed electronic databases, grey literature, e-books, Google Scholar, personal contact through email, and snowballing methods to compile and review studies on SEP published between January 1, 2000 and August 6, 2018. The electronic databases included Science Direct, Academic OneFile, Academic Search Complete, Informit Business Collection, Publisher Provided Full-Text Searching File, OmniFile Full Text Mega, Emerald Insight, Directory of Open Access Journals, and Business Insights: Essential. In addition to these electronic databases, reports published in the websites of Thailand International Cooperation Agency (TICA), and National Economic and Social Development Board (NESDB) were also examined.

Selection criteria

The authors reviewed abstracts of each study following these inclusion criteria: (i) full-text, peer-reviewed empirical studies related to SEP regardless of study designs published in English and available in electronic databases. (ii) publications containing the themes of SEP application initiated by the government or local community, and implementation strategies. (iii) SEP studies conducted in Thailand. The news articles and publications in Thai and studies that were not in full-text were excluded. A PRISMA flow-chart of the screening processes of studies is shown in Figure 2. A total of 455 records were accessed from electronic databases and other sources after discarding duplicates. Sixty-one percent of the records were excluded based on the aforementioned selection criteria. Finally, 20 records were selected for systematic review while only two studies were selected for meta-analysis (Figure 2).

Data collection

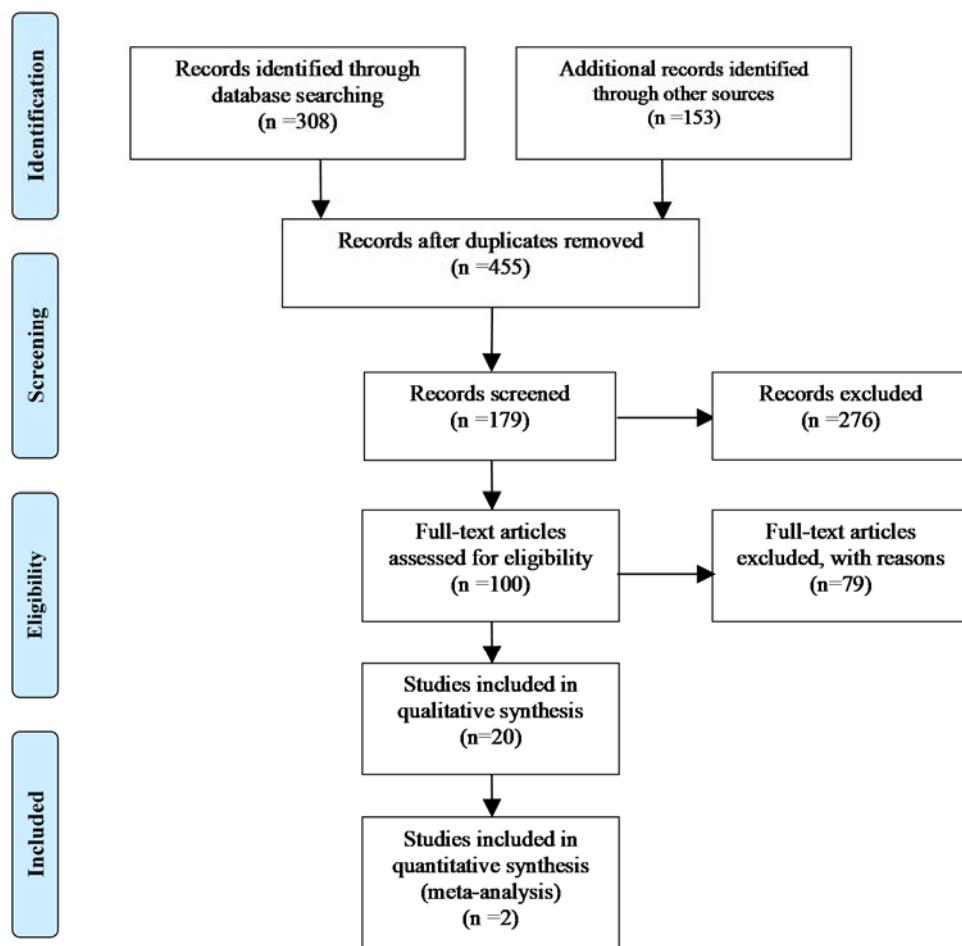
The researchers collected data from studies that published between 2000 and August 6, 2018, principally those that examined the incorporation of SEP in Thailand's economic development since the early 2000s. Study design, geographical locations, thematic area, sample size, outcome variables, results, and limitations were determined based on these literatures.

Data items

Participant, intervention, comparison, outcome, time, and setting (PICOTS) formula was used to study impact of SEP on the Thai economy (Riva, Malik, Burnie, Endicott, & Busse, 2012). Participants included individuals, community people, and villagers irrespective of their age, gender, and ethnicity. The intervention or exposure includes any social project that applied SEP at any level. The comparison or control group indicates groups who did not receive exposure. It also included before and after estimates of the same group. However, having a comparison group was not used restrictively in this study. The outcome variables of the

individual study were regarded as well-being in this study. Well-being is a broad term used in the literature (Dodge, Daly, Huyton, & Sanders, 2012; McGregor, Camfield, Masae, & Promphaking, 2008; Michaelson, Mahony, & Schifferes, 2012). In this study, the term is used to define any socioeconomic benefit or positive changes gained by participants due to the SEP project. Timing or duration of exposure was used to measure outcomes in this study. The setting was another key component of each study, which was the project location in Thailand. The authors considered Thai provinces as the location for this study.

Figure 2: Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) Flow Diagram



Source: Adapted from Moher, Liberati, Tetzlaff, Altman, and Group (2009)

Data analysis

The authors followed both qualitative and quantitative syntheses of selected empirical studies. For qualitative synthesis, the authors grouped the studies according to five thematic areas: economic, environmental, educational, social, and health based on the nature of SEP interventions on the specific population. They later looked at the sample size and measured scales of different outcome variables under each thematic area. The authors considered the types of research designs applied in the selected studies such as cross-sectional, observational studies. They also focused on the geographical locations of selected studies such as the

provinces of Thailand to see the spatial concentration of SEP studies. For quantitative synthesis, the authors selected two studies for meta-analysis as they met the all required information, such as mean, standard deviation, treatment and comparison groups or before-after estimates. The authors considered all well-being outcomes in a single study for the meta-analysis. Thus, there were 10 different well-being outcomes in two different studies. Medcalc software was used for meta-analysis (Schoonjans, 2017). Both fixed effect and random effect models were applied for meta-analysis. Heterogeneity between the studies and publication bias were also tested for reliability and internal validity of estimates.

Results

The authors organized the results based on overall narrative synthesis of the reviewed studies followed by thematic analyses in subsequent sections. While SEP has diverse applications from individual to national and global levels, six themes emerged. The results from the meta-analysis are presented to support narrative syntheses.

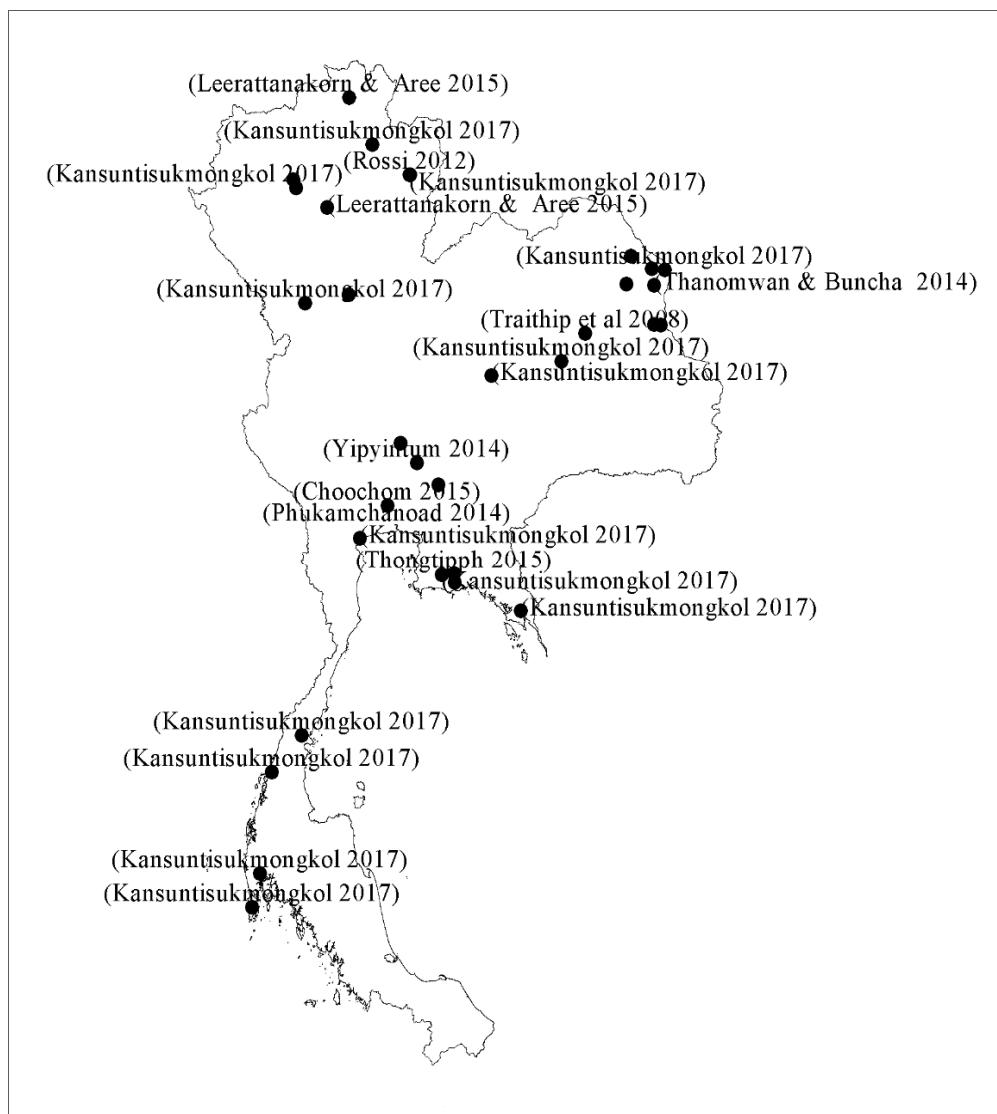
Narrative synthesis

The authors screened 455 abstracts, reviewed 100 full-text articles, and analyzed 20 studies (The summary of the findings of each of 20 studies can be found in the Annex. It also shows study location, study type, the unit of analysis, sample size, outcome variables, and measuring scales of the outcome variables). These studies were categorized into six broad themes based on the nature of interventions: education, social, economics, agriculture, environment, and health. The studies which examined education had the largest weight based on the pooled sample size (n=88,717) followed by social (n=1,379), economics (n=885), agriculture (n=687), environment (n=613), and health (n=208) studies. In terms of number of studies reviewed, the social category had the highest frequency (five studies) followed by education (four studies), economics (four studies), environment (four studies), agriculture (two studies), and health category (one study). In terms of study design, 13 adopted the quantitative method while the rest used qualitative. Sixteen studies used cross-sectional data meaning data were collected from study subjects at the same time. Only four studies that applied panel data meaning data were collected from the same subjects before and after an intervention. The well-being outcomes were measured mostly using a Likert scale while the associations between outcomes and SEP exposures or interventions were estimated applying regression and correlation analyses. All the studies were synthesized and grouped based on six thematic areas. This will be discussed in detail in the following sections.

Spatial distribution of studies

The author mapped the geographical location of the reviewed studies referencing corresponding authors and published year of their studies within parentheses to have an overview of SEP studies in Thailand. The names of the provinces are not shown to avoid crowding the map. Nineteen studies were carried out in 26 Thai provinces (Figure 3). It is interesting to note most of the studies were carried out in Rayong Province (East region) and greater Bangkok Metropolitan (Central region). It should be mentioned here that one single qualitative study conducted by Kansuntisukmongkol (2017) covered 16 provinces in Thailand. The authors only found one SEP study conducted in the southern provinces of Thailand (Kansuntisukmongkol, 2017).

Figure 3: Mapping of selected SEP studies shown on the map of Thailand



Source: Developed for this paper

Thematic Synthesis

Education

The authors reviewed four studies under this category. The samples of these studies were students from secondary schools (Thanomwan & Buncha, 2014); staff, teachers, students and parents of students from the school (Tungkasamit, Silanoi, Nethanomsak, & Pimthong, 2014); and university students (Choochom, 2015; Yiengprugsawan, Seubsman, Khamman, Lim, & Sleigh, 2010). The SEP principles were applied at schools to change their organizational culture, improve management (Thanomwan & Buncha, 2014) and better learning outcomes (Tungkasamit et al., 2014), to improve the living behavior of students (Choochom, 2015) and long-term life satisfaction (Yiengprugsawan et al., 2010). All studies in this group applied Likert type scales (5-10 points) to measure the well-being of the study population and

followed cross-sectional design (Choochom, 2015; Thanomwan & Buncha, 2014; Tungkasamit et al., 2014; Yiengprugsawan et al., 2010). Thanomwan and Buncha (2014) found a positive and significant relationship between organizational culture and the level of sufficiency school management. In addition, quality of work, decision making, and empowerment policies of the respective organizations were found to be significant predictors of sufficiency school management. The results of Tungkasamit et al. (2014) suggested the participants perceived all aspects of well-being at a high level. Regarding the product aspect, the academic, physical, and social environment of the school were found highly satisfactory. Choochom (2015) found that living behavior was directly associated with psychological immunity and attitude towards SEP while it was indirectly associated with family and friend factors mediated by SEP. Yiengprugsawan et al. (2010) concluded that overall life satisfaction were associated with standard of living, future security, achievement in life, sense of community, and personal safety.

Social

The authors found four records under this category but dropped one from the analysis which was conducted in Lao-PDR and Timor Leste (Shone, 2014). The following studies were reviewed (Phukamchanoad, 2014; Piyapong & Chaweewan, 2016; Yipyintum, 2014). The participants of these three selected studies were adults from Bangkok Metropolitan area (Phukamchanoad, 2014), Rayong Province (Piyapong & Chaweewan, 2016), and Saraburi Province (Yipyintum, 2014). The application of SEP principles among rural community members was observed to see if they have led to improvement of quality of life of the people (Piyapong & Chaweewan, 2016); the practice of sufficiency thinking for socioeconomic development (Phukamchanoad, 2014) and the adoption of SEP guidelines among employees to improve the quality of their working lives (Yipyintum, 2014). Two studies applied cross-sectional design (Phukamchanoad, 2014; Piyapong & Chaweewan, 2016) while one study used before-after design (Yipyintum, 2014). All studies in this group applied Likert type scales (4-5 points) to measure the well-being of the study population. Piyapong and Chaweewan (2016) found the practice of SEP principles improved the quality of life, the social and environmental conditions of rural people as measured by a trust score. Similarly, Phukamchanoad (2014) found the sufficiency mind-set improved the economic (income, expenses, savings) and social (community living, conservation, altruism) activities of the urban people. Yipyintum (2014) pointed out quality of work life (QWL) significantly improved among employees who applied sufficiency guidelines in their work.

Economics

The authors identified four publications under this theme. The participants or units of analyses were households (Thongtippha, 2015; Wanakiti & Nantarat, 2015) and individuals (Kantabutra, 2014; Thongpoon, Ahmad, & Yahya, 2012). Thongtippha (2015) implemented SEP principles to measure sustainable income pre and post intervention. Wanakiti and Nantarat (2015) explored the association between the level of SEP knowledge and household income using a cross-sectional design. Kantabutra (2014) applied SEP in the context of corporate sustainability to measure the economic crisis endurance score based on cross-sectional data obtained from CEOs. Thongpoon et al. (2012) applied SEP in small to medium sized enterprises (SMEs) to measure their sustainable competency score. Two studies used five to six-point Likert type scales to measure well-being outcomes. These studies found improved quality of life and self-reliance (Thongtippha, 2015). The knowledge of SEP was found to be associated with increased household income (Wanakiti & Nantarat, 2015). A high economic crises endurance score was associated with SEP principles (Kantabutra, 2014). High

sustainable performance/organizing competency scores was also associated with SEP practices (Thongpoon et al., 2012).

Agriculture

There were two studies under this category. The units of analysis consisted of farming communities (Amornsiriphong & Piemyat, 2012) and individuals, such as farmers (Leerattanakorn & Aree, 2015). The authors of these studies examined if SEP principles helped to strengthen community-based organizations (CBOs) to improve social capital among members of the community (Amornsiriphong & Piemyat, 2012) and the extent of application of SEP to improve the well-being of farmers (Leerattanakorn & Aree, 2015). Using qualitative design, Amornsiriphong and Piemyat (2012) found CBOs with SEP mind-set were associated with greater social capital and community welfare. Improved cooperation was observed among the savings fund group, agricultural group, and rice cooperation group. It led to improved rice value chain leading to greater quality of life. Leerattanakorn and Aree (2015) measured the well-being of farmers using a Likert type scale and individual income respectively. They found the happiness of farmers was associated with the intensity of practicing sufficiency economics rather than simply looking at income.

Environment

There were four studies under the environment theme. The target population or participants of these studies were households (Ubonsri & Pannun, 2013), adults (Arundee & Thipoom, 2015), community leaders (Traithip, Kohtbantau, & Baojai, 2008), and members of minority ethnic groups (Rossi, 2012). SEP principles were applied for improving the communal environment (Ubonsri & Pannun, 2013), solid waste management (Arundee & Thipoom, 2015), land resource conservation (Rossi, 2012), and forest resource conservation (Traithip et al., 2008). Two studies applied cross-sectional design (Arundee & Thipoom, 2015; Ubonsri & Pannun, 2013) while the rest used before-after study design meaning they interviewed the respondents twice, before and after intervention (Rossi, 2012; Traithip et al., 2008). Ubonsri and Pannun (2013) found an association between the application of seven sufficiency principles and the communal and housing environment. Arundee and Thipoom (2015) also found an association between the application of SEP principles and an improved solid waste management knowledge. The SEP project improved political harmony and the agro-ecological environment among the minority ethnic groups (Rossi, 2012). Traithip et al. (2008) concluded the level of knowledge on forest resource conservation improved among community environment leaders by practicing SEP.

Health

Under the theme of Health, the authors found only one study that applied SEP principles. Wichaiangoen, Rerkrai, and Thongchai (2011) applied SEP for hospital budgeting. The unit of analysis was hospitals and they measured the income and expenditure of hospitals before and after implementing the SEP budget planning model. The study used a six-point Likert type scale to measure the knowledge of administrative personnel. A ratio scale was used to measure the income and expenditure of hospitals and the results showed the knowledge score on budget planning was associated with the application of SEP principles. In addition, the income of hospitals increased significantly while their total expenditure decreased dramatically after they adopted SEP principles.

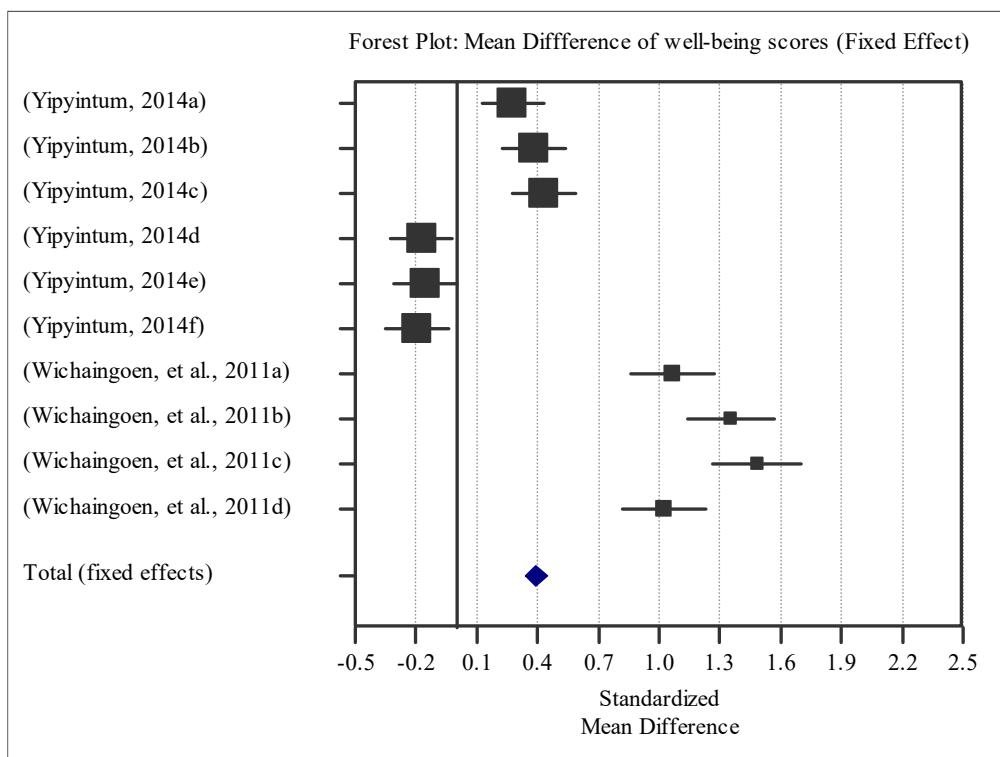
Meta-Analysis

Two studies were considered for a meta-analysis as they fulfilled the criteria for it, such as sample size by treatment and comparison groups, mean, and standard deviation of the outcome of treatment and comparison groups. There were ten outcomes in those two studies. For continuous outcome variables, the study applied mean difference, hypothesizing the mean difference to be zero for null effect (Lipsey & Wilson, 2001). Both random effect and fixed effect models for meta-analysis were also applied.

Fixed effect model

The study used a fixed effect model with an assumption that two selected studies for meta-analysis were homogenous. Figure 4 shows the results of a fixed effect model in the forest plot; a thick vertical line shows the null effect meaning the mean difference of the continuous variable is zero. Left and right side of the thicker vertical line show the control and treatment groups respectively that favored the results. The diamond shows the pooled effect size. The size of squares with a horizontal line shows the weight of the study with confidence interval (CI). Larger samples get a larger weight in the fixed effect model. The fixed effect model found the significant effect of SEP exposure on well-being which was 0.39 with a sample size of 5,579, and 95% CI from 0.33 to 0.44 (Figure 4).

Figure 4: Standardized mean difference of well-being scores using fixed effect model



The authors also checked the heterogeneity in selected studies. Table 1 shows that the selected studies were inconsistent as inconsistency (I^2) statistic is slightly higher (97.82% at 95% confidence interval) than recommended which is 97% (Hak, Van Rhee, & Suurmond, 2016, p. 9). It implies a high variation between the two selected studies. Therefore, the random effect model was introduced to address the inconsistency problem.

Random effect model

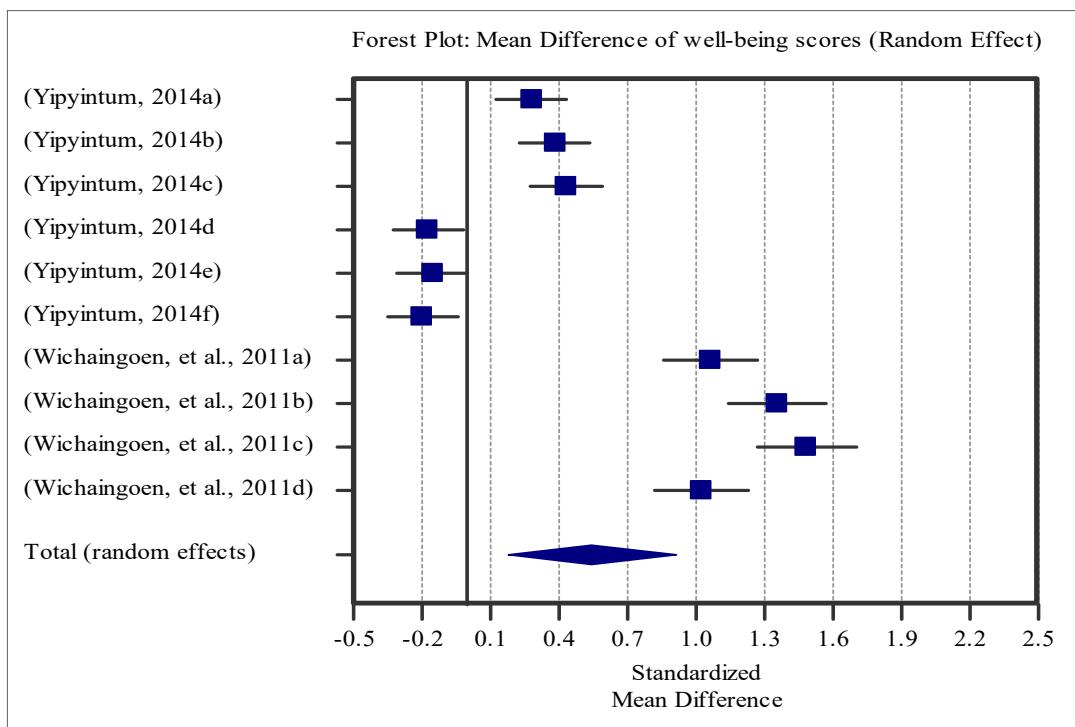
The random effect model found a significant effect of SEP exposure on well-being which was 0.55 with a sample size of 5,579 and 95% confidence interval (CI) from 0.18 to 0.91 (Figure 5). Table 1 shows CI is wider (0.178 to 0.912) in random effect model than fixed-effect model (0.339 to 0.447). It further proves the selected studies for meta-analysis were heterogeneous, compared among 10 outcomes of two studies. The detailed results of both the fixed effect model and the random effect model are shown in Table 1.

Table 1: Detailed meta-analysis results

Source	Treat (n1)	Control (n2)	Total	SMD	SE	95% CI	t-stats	P-value	Weight (%)	
									Fixed	Random
(Yipyintum, 2014a)	325	331	656	0.278	0.0784	0.124 to 0.432			12.32	10.06
(Yipyintum, 2014b)	325	331	656	0.381	0.0787	0.227 to 0.536			12.22	10.06
(Yipyintum, 2014c)	325	331	656	0.432	0.0789	0.277 to 0.586			12.16	10.06
(Yipyintum, 2014d)	325	324	649	-0.173	0.0786	-0.327 to -0.0187			12.26	10.06
(Yipyintum, 2014e)	325	324	649	-0.154	0.0785	-0.308 to 0.000			12.27	10.06
(Yipyintum, 2014f)	325	324	649	-0.197	0.0786	-0.351 to -0.0424			12.25	10.06
(Wichaingoen, et al., 2011a)	208	208	416	1.062	0.105	0.857 to 1.268			6.92	9.92
(Wichaingoen, et al., 2011b)	208	208	416	1.356	0.109	1.143 to 1.570			6.42	9.90
(Wichaingoen, et al., 2011c)	208	208	416	1.485	0.111	1.267 to 1.702			6.19	9.89
(Wichaingoen, et al., 2011d)	208	208	416	1.023	0.104	0.819 to 1.228			6.98	9.93
Total (fixed effects)	2,782	2,797	5,579	0.393	0.0275	0.339 to 0.447	14.288	<0.001	100.00	100.00
Total (random effects)	2,782	2,797	5,579	0.545	0.1870	0.178 to 0.912	2.911	0.004	100.00	100.00
Q	412.824									
DF	9									
Significance level	P < 0.000									
I ² (inconsistency)	97.82%									
95% CI for I ²	97.04 to 98.39									

Note: SMD: Standard mean difference

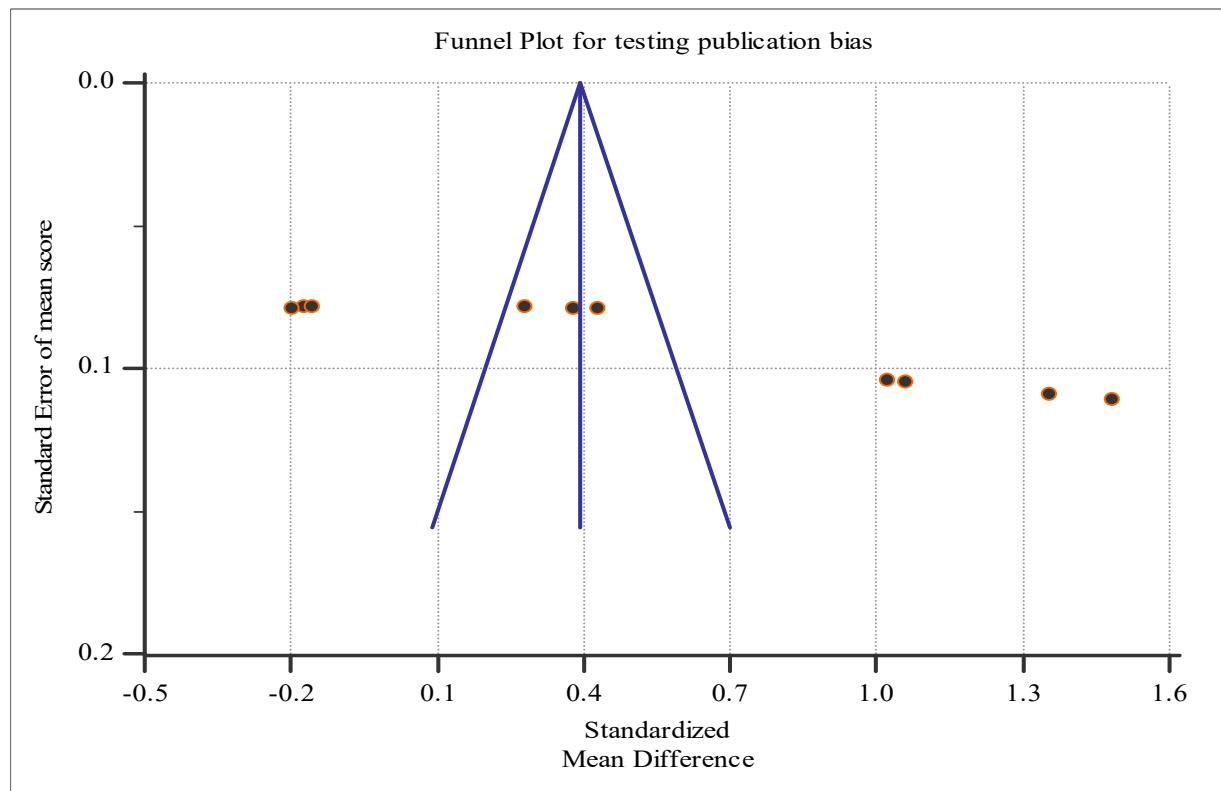
Figure 5: Standardized mean difference of well-being scores using random effect model



Checking publication bias

The publication bias of the selected studies was also checked using funnel plot. There was no publication bias. Figure 6 shows the outcome estimates are both inside and outside of the funnel. This means selected studies reported both favored and unfavored estimates. Hence, the selected studies did not suffer from publication bias which represents transparency and the strength of the included studies.

Figure 6: Standardized mean difference and standard error of well-being scores



Discussion and Conclusion

The objective of this review paper was to examine the cumulative impact of the sufficiency economy philosophy (SEP) on the well-being of the Thai population whereby state has been promoting SEP for addressing its sustainable development goals (SDGs). However, no systematic review had been conducted on observational studies to understand the impact of SEP projects in the country.

This review examined 20 studies, including 17 quantitative and three qualitative, to understand the impact of SEP interventions on the well-being of the population of Thailand. Findings of these qualitative and quantitative studies suggest that the SEP projects have a significant impact on the well-being of the Thais at the individual, household, community, and institutional levels. The findings are based on six themes: education, social, economics, agriculture, environment, and health. Findings of this review paper suggest SEP projects were beneficial and effective in improving the well-being of the Thais. This was supported by meta-analysis.

A large number of studies used Likert type scales to measure well-being outcomes. This review found consistent empirical evidence of the significant association between SEP and the well-being of the study population across six thematic areas. The pooled random effect of SEP on well-being was found to be greater (0.55) than the pooled fixed effect (0.39) at 95% confidence level. This means the SEP interventions improved the well-being of the study participants by 55% compared with non-participants. This review relied on the results from the random effect model due to the heterogeneity found between the studies confirmed through a consistency check.

This review paper applied rigorous processes for systematic review and meta-analysis following Cochrane review guidelines (Higgins, Green, & Cochrane, 2011), which is the main strength of this paper. Additionally, the findings are supported by meta-analysis that improves the reliability of impact estimates. Furthermore, the study results, to some extent, are consistent with those of a prior study in Thailand (Kantabutra, 2007; McGregor et al., 2008). The current findings are useful for policymakers and researchers to make an informed decision and in initiating new research projects on SEP.

However, this review has several limitations. First, only publications in English were considered. Second, there was incomplete information in the selected articles. Most of the studies did not present full statistical results of outcomes such as mean, standard deviation, regression results. Therefore, the authors could not extract all the data required for a meta-analysis. Only two studies met the criteria for meta-analysis. Although from a formal point of view, even just two empirical studies suffice for a meta-analysis, the greater number of included studies would make the meta-analysis even more interesting and generalizable with a rigorous aggregate effect (Valentine, Pigott, & Rothstein, 2010). Finally, there is a lack of a rigorous impact evaluation of the observational studies on SEPs. Most of the studies followed a cross-sectional study design without considering the counterfactual effect of SEP intervention. It was therefore hard to draw conclusions about causality between exposure or intervention and outcome in cross-sectional studies, where exposure did not precede the outcome. Additionally, within the quasi-experimental design, most of the studies applied weak evaluation methods without comparison groups or counterfactuals. Therefore, the conclusion of this paper suffers from methodological weakness of the studies reviewed. The findings of this review should be used with caution.

This paper recommends methodological improvement in future research. The quality of the evidence of reviewed studies is not standard. None of the studies applied the gold standard of impact evaluation, namely randomized control trial (RCT). There is therefore, a scope for undertaking rigorous impact studies on SEP project evaluation to generate more reliable evidence by using rigorous evaluation designs, such as difference-in-difference, propensity score matching (PSM), instrumental variable (IV) methods where RCT is not possible (Khandker, Koolwal, & Samad, 2010). The effect size of SEP interventions found in this study (0.55) could be used for calculating study power and sample size in future research. Most of the studies reviewed used a Likert scales to measure well-being which is consistent with recommended method (Angner, 2010; McGregor et al., 2008; Stoklasa, TalÁŠEk, KubÁŤovÁ, & SeitlovÁ, 2017). Cronbach's alpha should be used to check the validity and reliability of Likert type scales (Morera & Stokes, 2016), which was not used by the studies.

To reiterate, the SEP is a culmination of the development thinking of Thailand's long-reigning monarch, His Majesty Late King Bhumibol Adulyadej. Although the SEP concept was introduced over 45 years ago, it has been adopted as the core principle of National Economic and Social Development Plan of Thai Kingdom since 2002 as the basis of its national government policy (UNDP, 2007). Findings suggest a positive impact of application of SEP principles on the well-being of the Thais. However, as a development alternative, SEP has

more to offer for a wider global community. It has global relevance in the 21st century especially during economic uncertainties, climate change, and unsustainable usage of natural resources. This is because it offers a more balanced and sustainable path of development by immunizing society against the negative side effects of globalization and focusing on well-being rather than wealth building.

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Annex

Annex Table: Data collection of selected studies for review

#	Source	Study location	Type of study	Broad theme	Unit of analysis/ participants	Intervention/ Exposure	Outcome(s): measures	Impact/ Results	Limitation (s)/ Remarks
1	(Thanomwan & Buncha, 2014)	Thailand: Sakonnakhon, Nakhonphano, and Mukdahan upper northeastern provinces	Cross-sectional study/ex post survey	Education	200 informants in 100 secondary schools following stratified random sampling	The schools followed Sufficiency Economy Philosophy (SEP) model	Level of implementation in sufficiency school management: Five Likert-scale (1-5)	There is a positive and significant relationship between organizational culture and the level of sufficiency school management. In addition, quality of work, decision making, and empowerment policy of organization were found to be significant predictors of sufficiency school management culture and the level of sufficiency school management.	Measurement of variables was ambiguous. Even regression output table is not present let alone survey instrument. Mean, SD, SE of outcome were not reported.
2	(Piyapong & Chaweewan, 2016)	Thailand: Rayong province-Ban Jamrung community	Cross-sectional study	Social	124 community members	Practice of SEP in rural area	Trust or level of individual expectations, such as quality of life, environmental quality, social condition in SEP: Four-point Likert scale (0-3)	Trust score (Mean=3.69, SD=0.49). The residents who applied the sufficiency economy philosophy in their daily lives experienced a relatively better quality of life. The rational factors, such as households' financial security, capacity to adopt local wisdom for SEP activity, and problems during practicing SEP are	Cross-sectional study did not identify causal relationship as exposure and outcome measured at the same time. Subjective measure of outcome might be different from objective measures that are unknown.

#	Source	Study location	Type of study	Broad theme	Unit of analysis/participants	Intervention/Exposure	Outcome(s): measures	Impact/Results	Limitation(s)/Remarks
								better predictor of trust in the philosophy than emotional factors, such as relationship with community leaders and neighbors.	
3	(Thongtipph, 2015)	Thailand: Rayong province-Ban Jamrung community	Before-after design 2010-13	Economics	100 households in 2010 and 60 households in 2013	CSR-sufficiency model	Sustainable development by self-reliant (income)	Household income increased by 42.5%, occupational expenditure reduced by 12%, personal expenses on alcohol and smoking, and fortune seeking expenses reduced by 53% and 54% respectively while savings increased by 184%. These indicate improved quality of life and self-reliant	Non-probability sampling and 60 households as final sample size. No comparison group. SD of income was not presented. Weak method of impact evaluation.
4	(Ubonsri & Pannu, 2013)	Thailand: Bangkok Metropolitan: Pandintong Koi Rut Tak Wa, Samakk, Ruam Jai, and Soi Sansuk communities	Cross-sectional study	Environment	365 households interviewed, three case studies	Three standard principles of HM King Bhumibol Adulyadej, National Economic and Social Development Board (NESDB), and Bangkok Metropolitan	Physical outcomes; dwelling, communal environment social and economic outcomes: population health, family relationship, income, borrowing, savings;	The study found association between application of seven sufficiency principles and outcomes.	All are subjective outcomes and statistical results were not presented in the article. Precise outcomes are not discussed in the article.
5	(Arundee & Thipoom, 2015)	Thailand: Nakhon Phaom Province: Phra-Yot-Mueang Kwang fort	Cross-sectional	Environment	Random sample of 217 individuals	SEP for solid waste management	Knowledge of waste management, level of waste management following SEP principles (Used Likert scale)	44%, 43%, and 13% of sample had high, moderate, and low level of knowledge on solid waste management. Following SEP, the level of waste management was found to be at intermediate level (mean score =3.40, SD=0.449).	Small sample, not generalizable, detailed analysis in tabular form are absent to grasp consistency of results, Cronbach's alpha was not tested for internal consistency of question items by category.

#	Source	Study location	Type of study	Broad theme	Unit of analysis/ participants	Intervention/ Exposure	Outcome(s): measures	Impact/ Results	Limitation (s)/ Remarks
6	(Kansuntisukmongkol, 2017)	Thailand: 4 provinces in North, 5 provinces in Central; 5 provinces in Northeast; 4 provinces in South	Qualitative study design	Environment	16 agricultural communities	SEP for adopting climate change	Coping and adaptation to climate change; success factors of adaptation to climate change	Five adaptive strategies were found: self-evaluation, diversity dependency, storage and reserve, cooperation, and mobility over space and time. SEP components (moderation, reasonableness, prudence, knowledge, virtues) were found to be the success factors of adaptation.	This study covered four corners of Thailand. However, as a qualitative study, it has little scope for generalization.
7	(Rossi, 2012)	Thailand (Northern): Nan province	Ethnographic study design between 2008 and 2009	Environment	ethnic minority groups	SEP for resource conservation	Depoliticization, sufficiency farming	Improved political harmony through influence of royal project in Nan. Agro-ecological environment was improved to be sustainable	Cannot be generalized, true for local context only
8	(Amornsiriphong & Piemyat, 2012)	Thailand: Nakhon Pathom province	Cross-sectional study	Agriculture	18 Community Based Organizations	SEP for strengthening community-based organizations (CBOs)	Social capital (7 components-group type, general regulations, collaboration, communication, caring, volunteerism, social trust)	The CBOs with SEP mindset as well as naturally formed were associated with greater social capital and community welfare. A good collaboration was found among the savings fund group, agricultural group, and rice cooperation group that improved the rice value chain which resulted in improvement of quality of life.	Statistical difference was not mentioned neither between natural and government group nor between Bann Rang E-Meay and Bann Saradin
9	(Tungkasamit et al., 2014).	Thailand (Upper northeastern region):	Cross-sectional study	Education	Three administrators, 40 teachers, 260	SEP using a model of Context-Input-Process-Product (CIPP)	Learning activity plan, stakeholders' readiness for implementation,	Results indicated the participants perceived all aspects of outcomes at a	The measuring scale of outcome was unclear as the researchers found

#	Source	Study location	Type of study	Broad theme	Unit of analysis/ participants	Intervention/ Exposure	Outcome(s): measures	Impact/ Results	Limitation (s)/ Remarks
					parents, 260 students		management and evaluation of learning activity, changed school environment and lifestyle (used Likert scale)	high level. Regarding the product aspect, the academic, physical, and social environment of the school were found highly satisfactory.	high level of perception, but numeric scale of high/low was not mentioned. In addition, confounding factors were not controlled using rigorous regression model. Not a single statistical result was presented though sample was 260 students
10	(Choochom, 2015)	Thailand: Four universities in Bangkok	Cross sectional design	Education	800 Undergraduate students	Psychological-immunity, family and friend mediated by attitudes toward SEP	Living behavior based on sufficiency principles (Five-point Likert scale)	Living behavior is directly associated with psychological immunity ($\beta=0.30$) and attitude towards SEP (0.52) while indirectly associated with family ($\beta=0.23$) and friend ($\beta=0.45$) factors mediated by SEP.	Causality cannot be inferred by cross-sectional design. However, SEM modeling for testing causality was insightful. Outcome statistics (mean, SD) score was presented. SEM model was used but SE of Beta was not presented to calculate CI.
11	(Wanasilp & Tangvitoontham, 2015)	Thailand (rural northern part)	Cross-sectional design	Economics	372 households	Level of knowledge on SEP	Monthly household income as a proxy of quality of life or well-being of households (dichotomous dependent var)	The knowledge on SEP was found to be associated with household income. If the test score of PSE (randomly picked) increases by one point, then the probability that the family's incomes is equal or greater than 10,000 baht per month increased by 1.41 percent	Multicollinearity was not tested. How rural people filled in the self-administered questionnaire was unclear. The response rate was also not mentioned.
12	(Wichaingoen, et al., 2011)	Thailand: Lop Buri Province (Tha-Wung Hospital)	Pre-posttest design	Health	208 individuals (hospital personnel)	Budgeting following SEP principles	Budgeting knowledge following SEP (Six-point Likert scale),	Knowledge score (Mean=3.31, SD=0.896), Income increases in accordance with	There were no estimates for natural control group. Hence, causal inference was not

#	Source	Study location	Type of study	Broad theme	Unit of analysis/ participants	Intervention/ Exposure	Outcome(s): measures	Impact/ Results	Limitation (s)/ Remarks
							hospital income, hospital expenses	philosophy of sufficiency economy, total income increased with 12,489,814.21 Baht or 22.62 percent (total income of budget of B.E. 2553 was 55,207,965.21 Baht and total income of budget of B.E. 2554 was 67,697,779.42 Baht). Total expense decreased with 10,628,149.17 Baht or 15.18 percent (total expense of budget of B.E. 2553 was 70,021,134.06	rigorous. Cronbach's alpha was not shown for internal consistency reliability of 6-scale knowledge items.
13	(Yiengprugsawan et al., 2010)	Thailand: Sukhothai province	Cross-sectional (Educational)	Education	87,134 university students	8 personal wellbeing index (PWI) domain	Life satisfaction by PWI domain (10-point Likert type scale)	Overall life satisfaction (mean=7.57, SD=1.73). Using multiple regression and rating scale 0 to 10, the study found that 'overall life satisfaction' was associated with 'standard of living' (b = 0.196) 'future security' (b = 0.171), 'achievement in life' (b = 0.152). 'sense of community' (b = 0.015) and 'personal safety' (b = 0.058)	Cronbach's alpha was not checked for internal consistency of scale items.
14	(Kantabutra,2014)	Thailand	Cross-sectional study	Economics	294 CEOs in Thailand	SEP for corporate sustainability	Strong performance, social and economic crises endurance, public benefit happiness (6-point Likert type scale)	Economic crises endurance score (mean=5.394, SD=1.10) Out of six independent variables, perseverance and resilience were found to be the direct predictor of	Questionnaire method was followed for data collection. However, data collection period was not indicated. Sampling was not clear as population pool was not mentioned from

#	Source	Study location	Type of study	Broad theme	Unit of analysis/participants	Intervention/Exposure	Outcome(s): measures	Impact/Results	Limitation(s)/Remarks
								corporate sustainability in terms of strong performance, crises endurance and delivering public benefit	where random sample was drawn. Regression model could guide the proposed study
15	(Traithip, et al., 2008)	Thailand: Kalasin province	Before-after design with same subject	Environment	30 community environmental leaders (CELs)	Forest resource conservation (FRC) following SEP training	Knowledge retention, Practice of training for forest resource conservation	The study found that level of knowledge on FRC was higher than before among CELs that helped them to better manage forest resources. However, precise estimates were not presented	The measurement scale was not clear and statistical table was not shown and precise estimates were not given let alone internal consistency check. using Cronbach's alpha. Mean and SD of outcome were not presented
16	(Leerattanakorn & Aree, 2015)	Thailand (upper north): Chiang Mai, Chiang Rai, Lampang	Cross-sectional design	Agriculture	671 farmers	Intensity of sufficiency economy (SEI) (0-10 scale)	Happiness (1-7 points scale) as a proxy of well-being and objective well-being (1-10 points scale)	Happiness score (mean=5.3487, SD=0.8107), Objective well-being score (mean=6.1812, SD=0.8569). Happiness of farmers were associated with intensity of sufficiency economy principles rather than income. Happiness level increases by 11% if SEP increases by one unit.	The model (ordered logit regression) was useful to follow and replicate with little value addition. However, Cronbach's alpha was not tested for internal consistency of variables/terms
17	(Phukamchanoad, 2014)	Thailand: Bangkok Metropolitan	Cross-sectional design	Social	392 adults	Sufficiency mindset	Economic and social activities-based SEP (measured in five-point scale)	Economic (income, expenses, savings) and social (community living, conservation, altruism) activities of individuals were found to be high (mean=3.72, SD=0.70) on	Cronbach's alpha was not checked for internal consistency of items. Regression model could be applied with precise dependent and independent variables.

#	Source	Study location	Type of study	Broad theme	Unit of analysis/ participants	Intervention/ Exposure	Outcome(s): measures	Impact/ Results	Limitation (s)/ Remarks
								average in 1-5 scale ratings	
18	(Shone, 2014)	Lao PDR and Timor-Leste	Cross-sectional design - qualitative	Social	73 individuals	Application of SEP in village and training center.	Uptake of SEP model in village and training centers	Uptake was found to be high in villages and training centers.	The paper was informative and closely related to the review. However, the study was qualitative and limited to generalization.
19	(Yipyintum, 2014)	Thailand: Saraburi province	Action research design-before-after	Social	2012: control-390, Treatment-360. 2013: control-412, Treatment-353	Adoption of SEP guidelines at work	Quality of work-life (QWL) as proxy of employee's well-being and business sustainability employee engagement, and SEP (1-5 points scale)	QWL score (mean=3.0669, SD=0.39849) for treatment and (mean=2.9684, SD=0.44401) for control group. The sufficiency score increased by 0.22 points while this figure was 0.23 points for quality of work-life and 0.29 points for employee engagement compared with control group.	Participants who joined the program later might have received less exposure of SEP that undermine effect of the intervention. Additionally, it was cross-sectional panel survey but difference in difference (Diff-in-diff) was not performed to measure rigorous effect of SEP.
20	(Thongpoo et al, 2012)	Thailand: Southern	Cross-sectional design	Economics	119 SME entrepreneurs	Sufficiency economy philosophy in SME sector	Economic (financial, competitors, growth) and social performance (Five-point Likert scale)	Sustainable performance/organizing competency score (mean=3.80, SD=0.64).	Multicollinearity might be present in the multiple regression model due to variance inflation factor (VIF). The study used high tolerance level of VIF (0.25-4.07) to claim no multipolarity. But in ideal situation, VIF should be one for claiming no multicollinearity.