Sustainable Food Systems that Protect Biodiversity and Ensure Nutrition Security

Associate Professor Dr. Kitti Sranacharoenpong
Mahidol University
Kitti.sra@mahidol.ac.th

Overview / Agenda

1. Nutritional problems in Thailand
2. What is a sustainable food system?
3. Link between biodiversity, food, nutrition, and health
4. Showcase ezamples of multi-sectorl collaboration

1. Nutritional problems in Thailand

Thailand continues to experience Triple Burden of Malnutrition

S·E·A·N·U·T·S II
SOUTH EAST ASIAN NUTRITION SURVEYS II

©SEANUTS II Thailand, 2023

Nationally representative population: 3,478 Thai children aged 6 months to 12 years
Assessments: body weight, height, 24-hour dietary recall, and blood biochemistry

Nutritional Status

Stunting

0.5 - 0.9 y	9.6%
1.0 - 3.9 y	6.2%
4.0 - 6.9 y	4.1%
7.0 - 12.9 y	3.9%

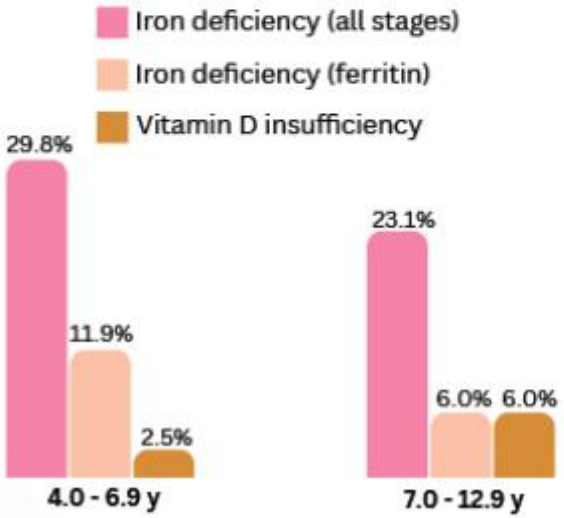
Overweight

0.5 - 0.9 y	2.7%
1.0 - 3.9 y	6.8%
4.0 - 6.9 y	7.9%
7.0 - 12.9 y	14.2%

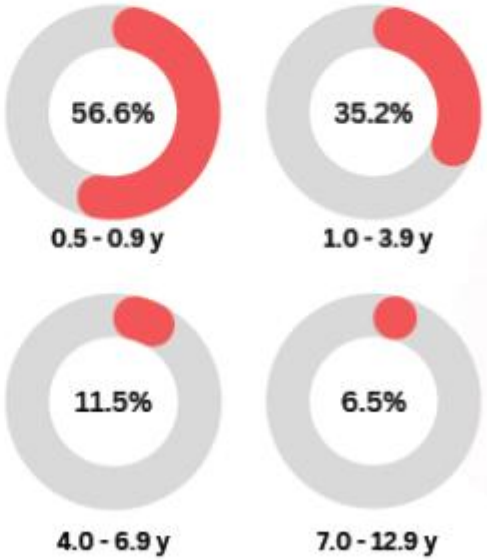
Obesity

0.5 - 0.9 y	0.9%
1.0 - 3.9 y	3.7%
4.0 - 6.9 y	8.8%
7.0 - 12.9 y	16.0%

Micronutrient Deficiencies



Anaemia



Inadequate Micronutrient Intake

Calcium

1.0 - 3.9 y	22.4%
4.0 - 6.9 y	74.1%
7.0 - 12.9 y	89.7%

Iron

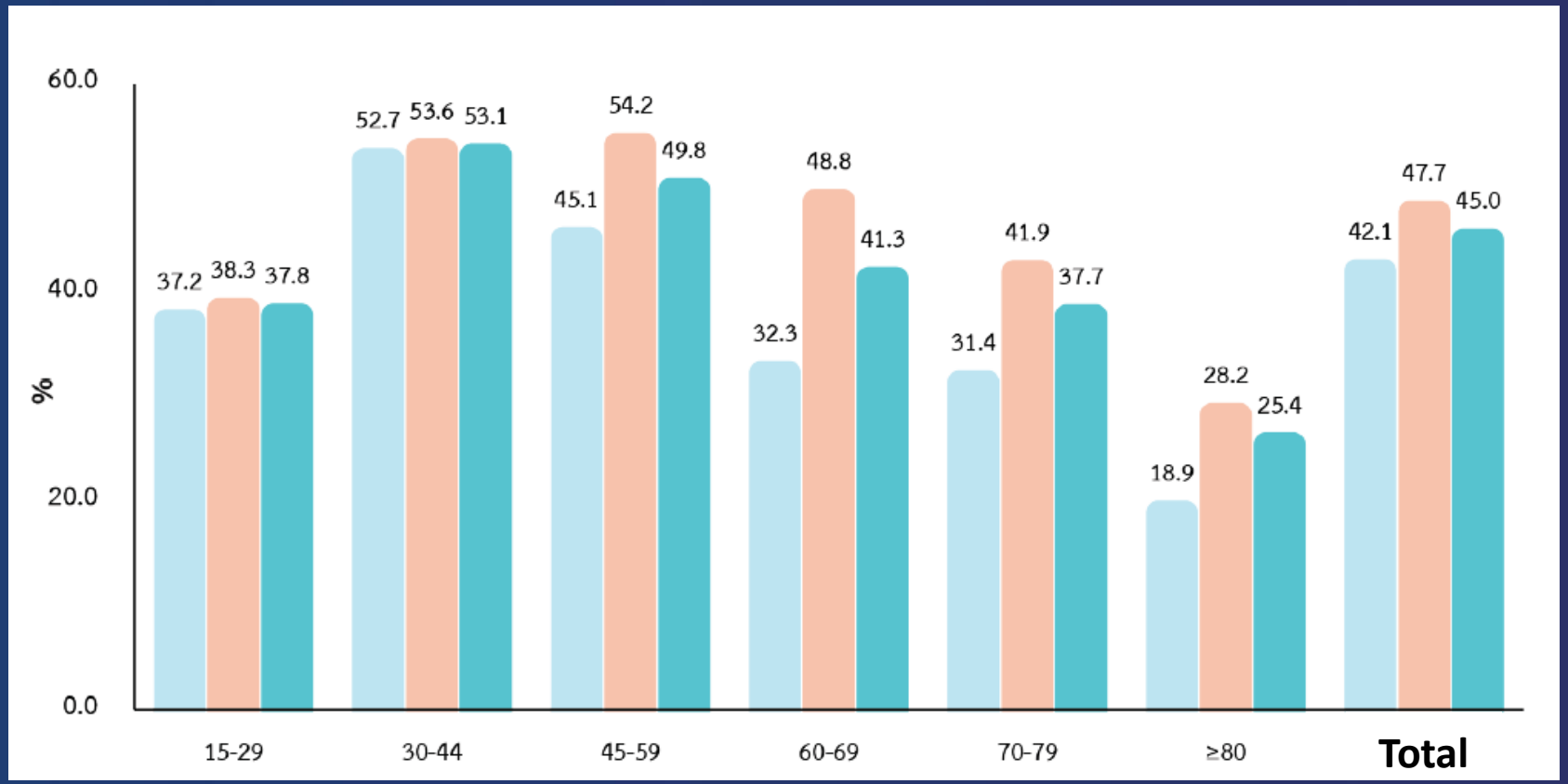
1.0 - 3.9 y	35.9%
4.0 - 6.9 y	34.4%
7.0 - 12.9 y	63.5%

Vitamin D

1.0 - 3.9 y	86.0%
4.0 - 6.9 y	92.8%
7.0 - 12.9 y	95.8%

Pongcharoen T., et al. South East Asian Nutrition Surveys II (SEANUTS II) Thailand: triple burden of malnutrition among Thai children aged 6 months to 12 years. Public Health Nutrition, 2024.

Prevalence of obesity (BMI ≥ 25 kg/m^2) among Thai population aged 15 years and older, classified by gender and age group



Prevalence of obesity:

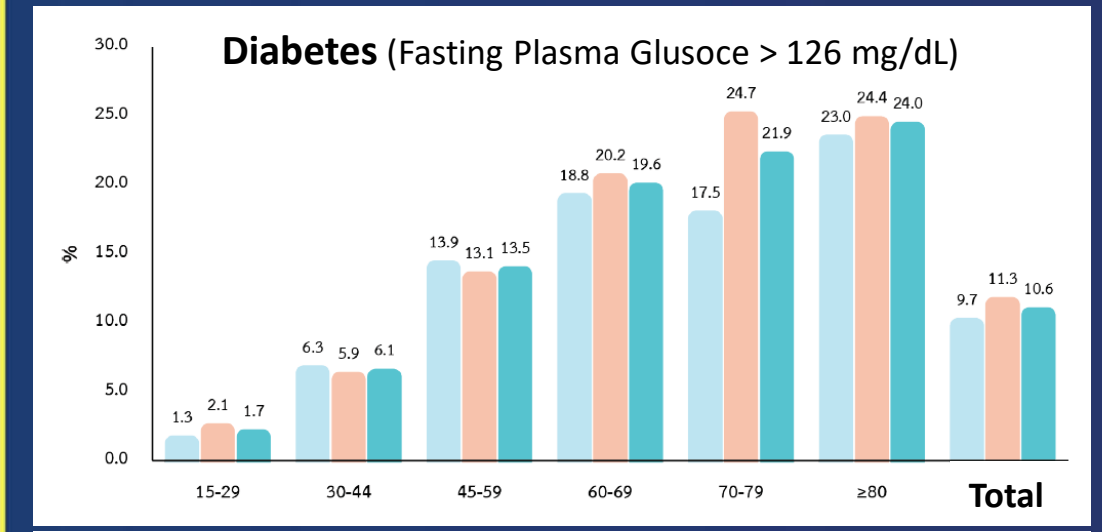
- Male 42 %
- Female 48 %

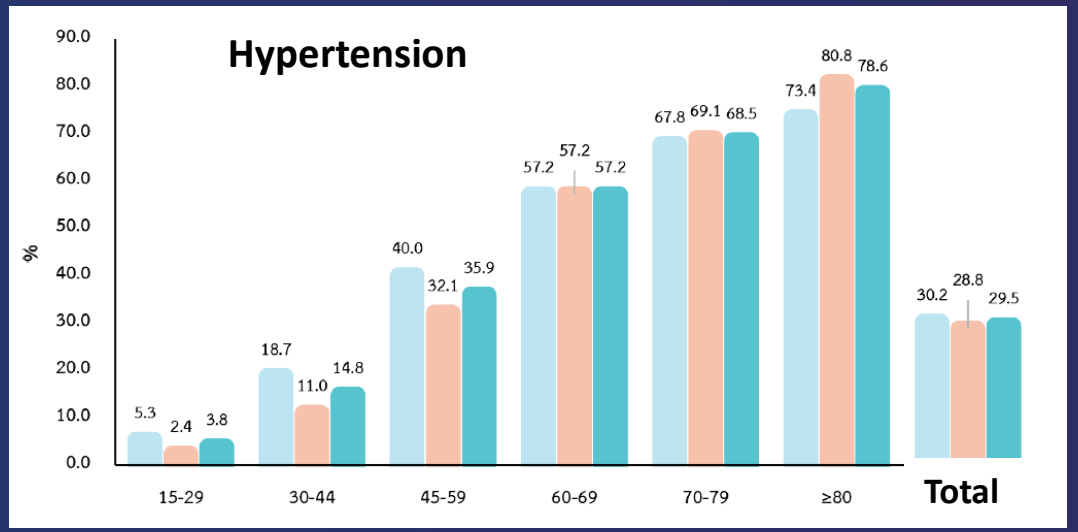
Age group:

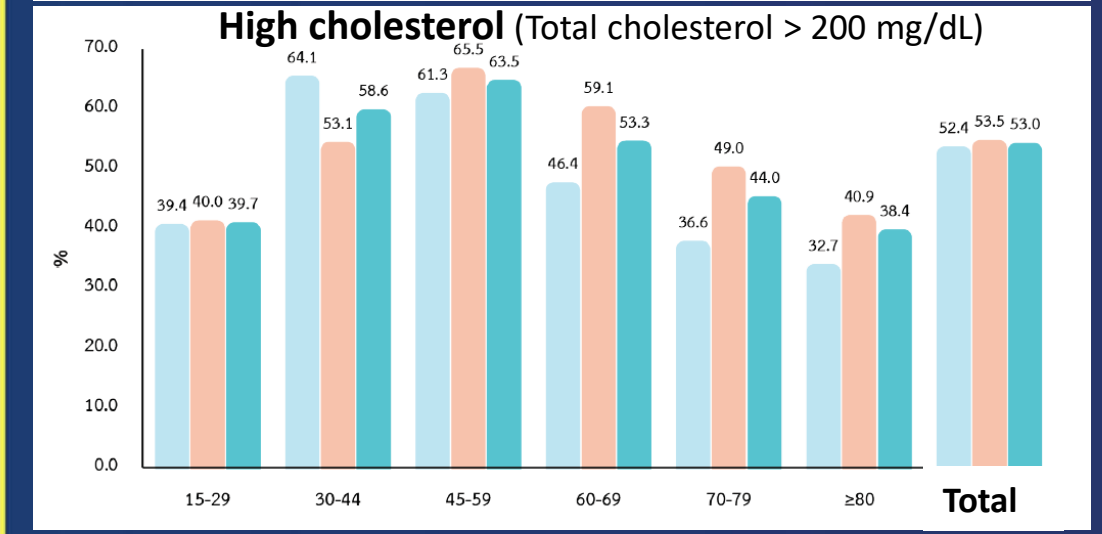
- 30-44 years ↑
- ≥ 80 years ↓

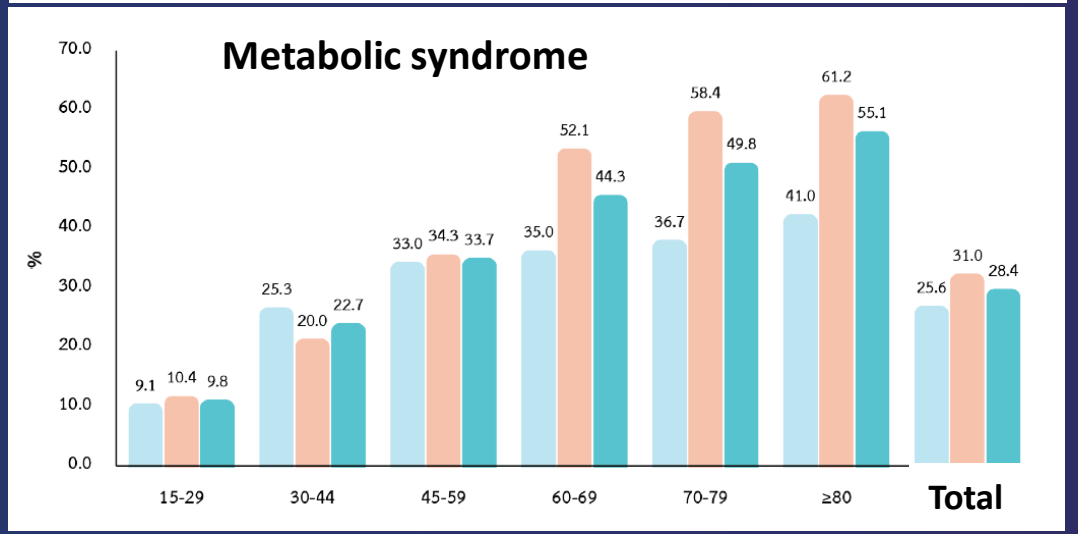
The 7th NHES (2024-2025), the Faculty of Medicine, Ramathibodi Hospital, Mahidol University,

Prevalence of diseases among Thai population aged 15 years and older, classified by gender and age group





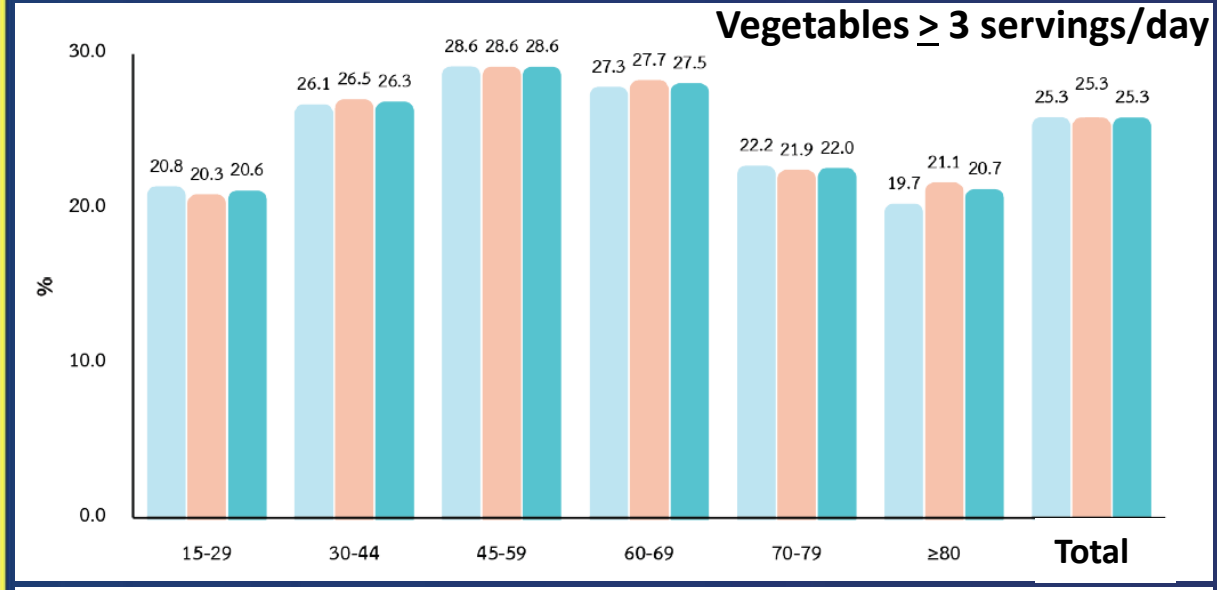


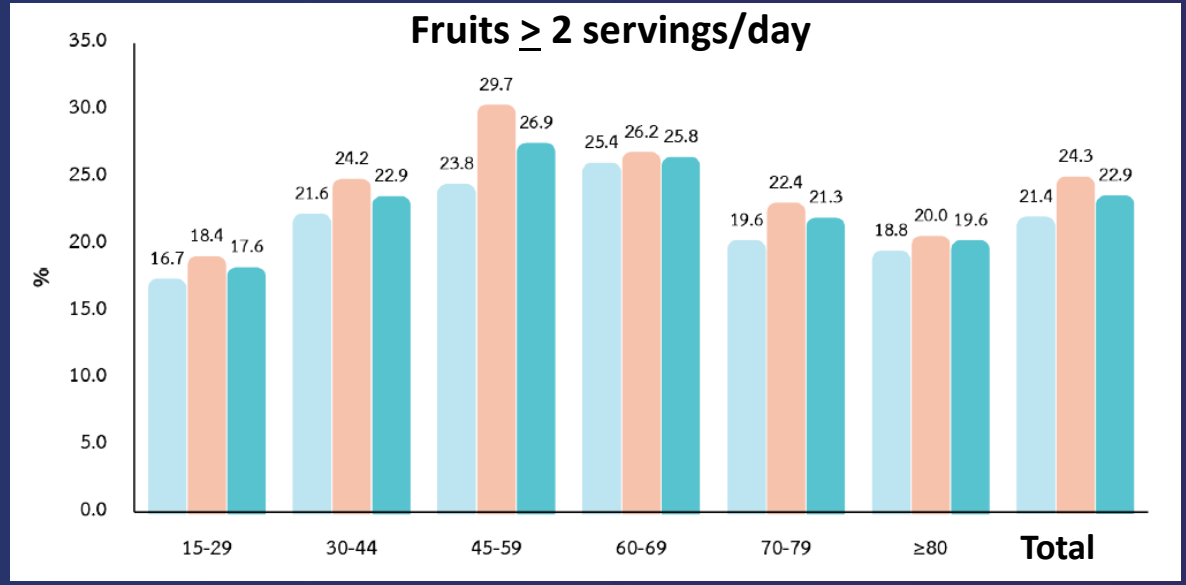


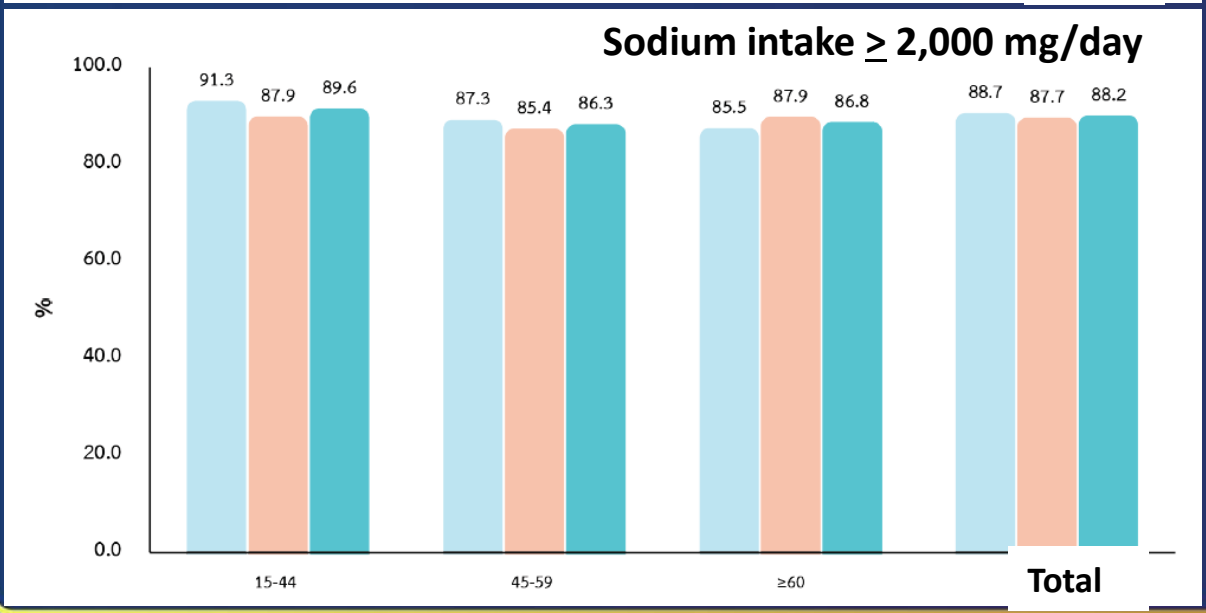
Male
Female
Total

The 7th NHES (2024-2025), the Faculty of Medicine, Ramathibodi Hospital, Mahidol University,

Consumption of foods/nutrient, classified by gender and age group







Recommendation for:

- Vegetables 4-6 servings/day
- Fruits 3-5 servings/day
- Sodium intake less than 2,000 mg/day

Male
Female
Total

The 7th NHES (2024-2025)

2. What is a sustainable food system?

The conceptual model of food system and nutrition security in the context of sustainability

Sranacharoenpong K., et al. 2011

Natural World

Human Societies

Resources

- Sun
- Water
- Energy
- Land
- Chemicals

Food System

Production

- Agriculture
- Livestock
- Fisheries

Life Cycle

- Processing
- Retail
- Transportation
- Storage
- Disposal

- Technology
- Social transformation
- Availability
- Policy

Waste

- Solid waste
- Greenhouse gas emissions

Food

Climate Change

Consumption Patterns of Diverse Populations

Low Regional Food Yields

Food Insecurity

Under-nourished

- Malnutrition
- Deficiency diseases

Over-fed

- Obesity
- Chronic diseases

What is a sustainable food system?

- Definition: A food system that delivers food security and nutrition for all, without undermining the natural environment (including biodiversity), climate, and ecosystems.
- Key features: diversity of production, minimal waste, equitable access, healthy diets, environmental regeneration
- Emphasis on shifting away from unsustainable patterns of production and consumption

3. Link between biodiversity, food, nutrition, and health

Biodiversity, Food, Nutrition and Health — The Link

- Agriculture/
- Food supply/
- Service

- Promotion
- Protection
- Treatment

Nutrition is a link between food and health, regarding the fulfillment of energy, protein and micronutrient requirements and non-nutrients from food in human life course

Ultimate Goals

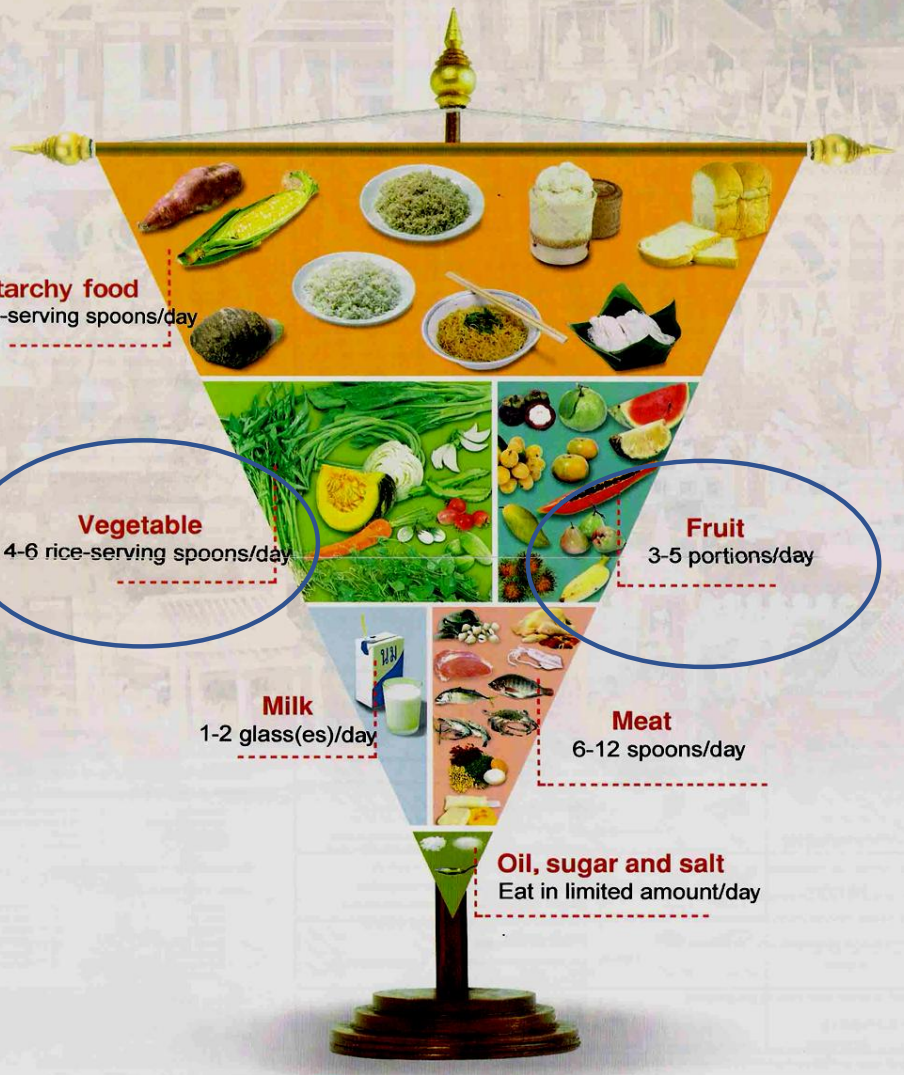
Good Nutrition & Well-being for All

Food and nutrition security

"**Food and nutrition security** exist when all people at all times have **physical, social and economic access to food**, which is safe and consumed in sufficient quantity and quality to meet their **dietary needs and food preferences**, and is supported by an **environment of adequate sanitation, health services and care**, allowing for a healthy and active life."

* From FAO 2012

NUTRITION FLAG



For good health

"Eat a variety of foods in appropriate amounts"

Prepared by: Working Group on Food Based Dietary Guidelines for Thai People
Distributed by: Nutrition Div., Dept. of Health, Ministry of Public Health, 2001

Mahidol University
Wisdom of the Land

How much is enough?

Food group	Suggested energy 1,600 Kcal/day • Children, 6-13 yrs • Working women, 25-60 yrs • Elderly, over 60 years	Suggested energy 2,000 Kcal/day • Teenagers and young adults, 14-25 yrs • Working men, 25-60 yrs	Suggested energy 2,400 Kcal/day • Female/male who needs more energy such as farmers, laborers, athletes
Rice-starchy food	8 rice-serving spoons	10 rice-serving spoons 1 rice-serving spoon of sticky rice = 2 rice- serving spoons of rice	12 rice-serving spoons
Vegetable	4 (6) rice-serving spoons	5 rice-serving spoons	6 rice-serving spoons
Fruit	3 (4) portions	4 portions 1 portion, 1 portion, 1 portion, 1 portion (6 pieces)	5 portions
Meat	6 spoons	9 spoons	12 spoons
Milk	2 (1) glasses	1 glass If one does not drink milk, eat 1 piece of sardine (4 spoons) or 2 spoons of small bony fish	1 glass

Note: oil, sugar and salt are recommended to have in limited amounts. ( ) Recommendation for adults

Thai MoPH, 1998

Journal of Public Health: From Theory to Practice
https://doi.org/10.1007/s10389-019-01189-8

ORIGINAL ARTICLE

Environmental consequences related to nutritional status of Thai populations

Piyanit Churak[1] · Kitti Sranacharoenpong[1] · Thumrongrut Mungcharoen[2]

Received: 26 August 2019 / Accepted: 22 December 2019

Abstract

Aim To quantify the cumulative environmental impact related to dietary preference of Thai adults classified by nutritional status.

Subject and methods The study used the data from the Thailand National Food Consumption Survey in 2006. A sample of 4056 participants aged between 19 and 60 years were categorized (normal, overweight, and obesity) by body mass index (BMI) classification for Asians. Food consumption patterns were analyzed and amounts of popular food consumed were calculated. Each commodity's input was converted into output during the life-cycle to CO_2 equivalent (CO_2-eq) using a Thai database. The most popular plant- and animal-based foods were selected to quantify their emission of GHGs (greenhouse gases) during transportation.

Results Among the ten popular commodities, seven were plant-based foods. Annual GHG emissions by overweight and obesity were higher than that of the normal groups (367, 319, and 301 kgCO_2-eq respectively). The highest GHG contributor was rice. Beef emitted more than other animal-based foods.

Conclusions Food choices ultimately result in impacts on the environment. They also have consequences on public health related to health outcomes. It is therefore recommended that environmentally friendly consumption practices should be encouraged for climate change and food security.

Keywords Greenhouse gas · Climate change · Thai food consumption · Dietary preference · Food security

Mahidol University
Wisdom of the Land

Churak, P., **Sranacharoenpong, K***. & Mungcharoen, T. Environmental consequences related to nutritional status of Thai populations. *Journal of Public Health*. 2021, 29: 879-884

*Corresponding author

Objectives

- To quantify the cumulative environmental impact related to dietary preference of Thai adults classified by Body Mass Index (BMI).

Data setting

- Secondary data from National Thai Food Consumption Survey (2006)
- 19,049 respondents randomly selected from representative provinces of each region
- 24 hour recall

Results: Daily food intake (g/day)

Commodity	Median amount consumption[1]			P-value[2]
	Normal (n=2,119)	Overweight (n=808)	Obesity (n=1,129)	
Rice	360 (269.64)	360 (240.00)	360 (240.00)	0.52
Yard Long Bean	25 (28.56)	27 (23.30)	26 (28.40)	< 0.01
Chinese Kale	22 (21.53)	28 (21.59)	22 (21.53)	< 0.001
Water Morning Glory	16 (43.69)	17 (14.79)	18 (12.47)	<0.001
Round Eggplant	38 (31.50)	40 (31.50)	32 (34.00)	<0.01
Tomato	15 (30.00)	20 (28.34)	20 (22.50)	<0.001
Onion	11 (22.80)	12 (27.24)	21 (15.54)	< 0.05
Pork	84 (67.99)	87 (75.64)	83 (69.19)	0.20
Beef	78 (58.15)	79 (60.00)	67 (61.38)	0.32
Chicken	75 (52.16)	80 (60.44)	77 (48.88)	0.38

[1] Median and interquartile range (in parentheses) [2] Kruskal-Wallis test

Results: Annual CO_2-eq emissions of food intake classified by BMI

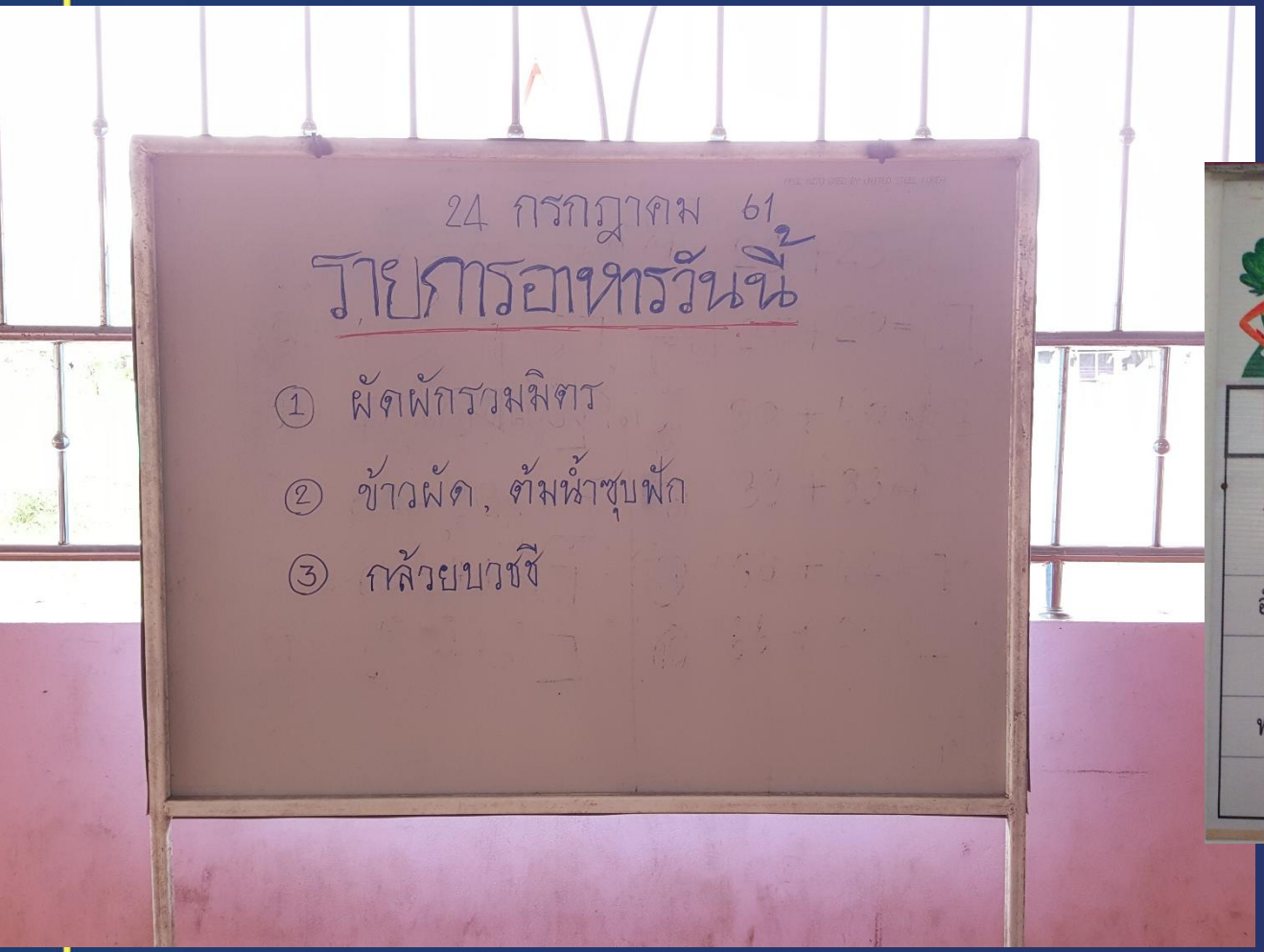
Commodity	Annual Emissions (kg CO_2-eq)			P-value
	Normal	Overweight	Obesity	
Rice	**163.81 (110.43)**	**162.99 (98.29)**	**161.76 (98.29)**	**0.52**
Yard Long Bean	1.57 (1.41)	1.66 (1.21)	1.26 (1.43)	< 0.01
Chinese Kale	0.07 (0.05)	0.07 (0.05)	0.05 (0.04)	< 0.001
Water Morning Glory	0.07 (0.11)	0.04 (0.04)	0.04 (0.03)	< 0.001
Round Eggplant	0.35 (0.25)	0.35 (0.25)	0.25 (0.27)	< 0.01
Tomato	0.28 (0.24)	0.17 (0.22)	0.16 (0.18)	< 0.001
Onion	0.21 (0.22)	0.21 (0.26)	0.20 (0.15)	< 0.05
Pork	62.54 (64.76)	81.99 (71.50)	78.23 (65.40)	0.21
Beef	**132.88 (152.02)**	**157.63 (156.88)**	**132.64 (160.47)**	**0.32**
Chicken	105.99 (86.37)	127.44 (100.09)	107.68 (80.95)	0.38
All foods	467.77	**532.55**	482.27	
Plant-based foods	166.36	165.49	163.72	
Animal-based foods	**301.41**	**367.06**	**318.55**	

4. Showcase ezamples of multi-sectorl collaboration

Mahidol University
Wisdom of the Land

Monitoring and Evaluation

The Intervention Program for School Lunch Program and Healthy Thai Students



รายการอาหารในแต่ละวัน

สัปดาห์ที่ 1

วัน	รายการอาหาร
จันทร์	อนุบาล : ต้มจืด
	ประถม : แกงอ่อมไก่
อังคาร	ผัดกระเพราหมู
พุธ	ต้มแซบ
พฤหัส	ไข่เจียวหมูสับ
ศุกร์	ต้มเส้น และผลไม้

สัปดาห์ที่ 2

วัน	รายการอาหาร
จันทร์	ต้มข่าไก่
อังคาร	อนุบาล : ข้าวต้ม
	ประถม : ผัดผักรวมมิตร
พุธ	ไข่พะโล้
พฤหัสบดี	ลาบหมู
ศุกร์	ข้าวมันไก่ และผลไม้

สัปดาห์ที่ 3

วัน	รายการอาหาร
จันทร์	ไข่ต้ม ตำแตงกวา
อังคาร	ข้าวผัดหมูไข่ใส่คะน้า
พุธ	สุกี้หมู
พฤหัสบดี	แกงเขียวหวานไก่
ศุกร์	ทอดไก่ ส้มตำ และผลไม้


อาหารหลัก 5 หมู่
Cafeteria / Canteen
Keep Clean
รายการอาหาร สัปดาห์นี้

Kindergarten students

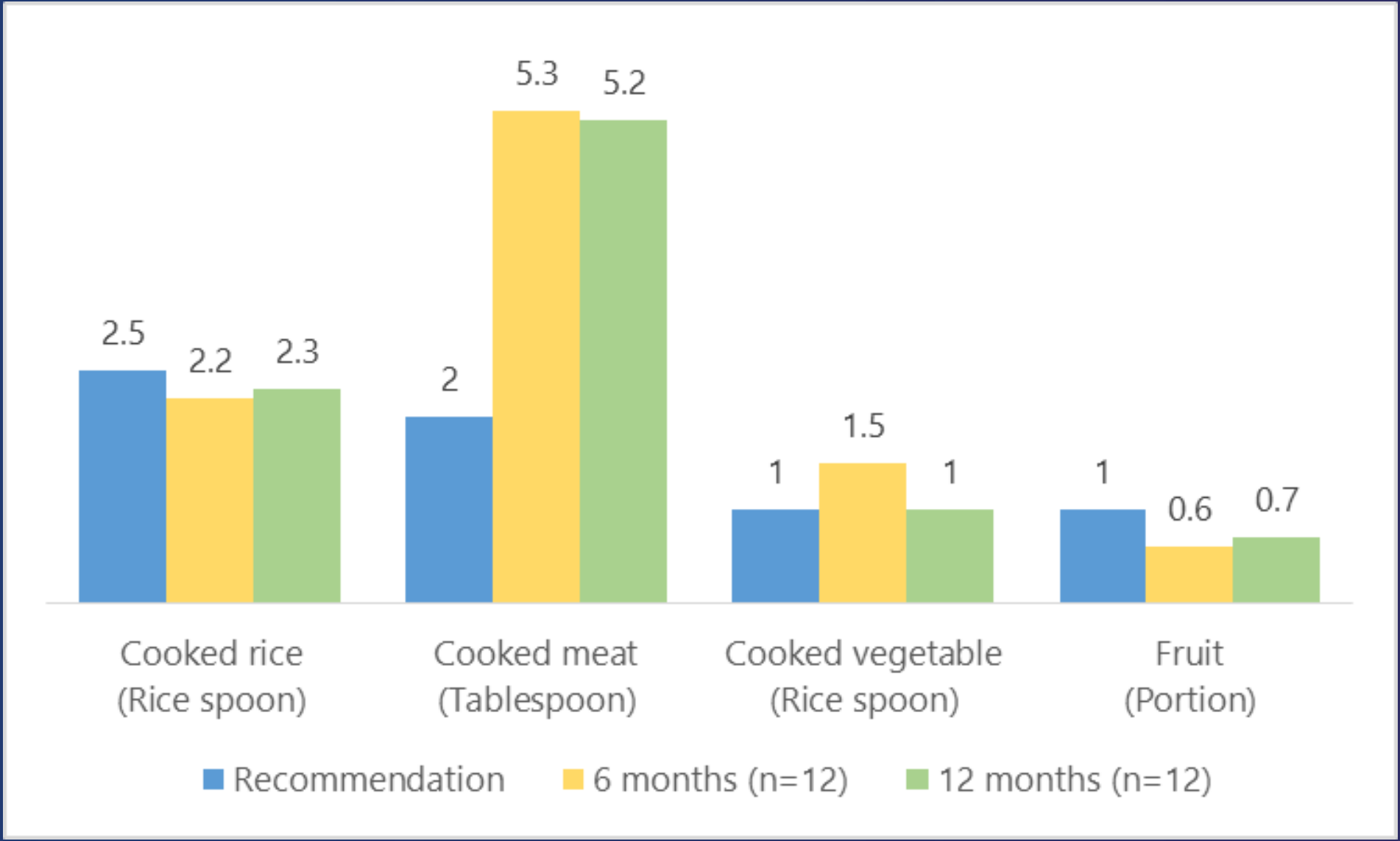
Primary school students grade 1-3

Primary school students grade 4-6

Sranacharoenpong K, et al., 2020


IN mu, Thailand
formas
รหัสโรงเรียน 152034 จังหวัด นครพนม
ชื่ออาหาร น้ำเงี๊ยว, น้ำซุป, กล้วยน้ำว้า
ระดับชั้น ประถมศึกษา (1-6)
วัน/เดือน/ปี ที่เก็บข้อมูล 24 / ก.ค. / 2561

The average portions of food items in lunch trays of primary school



Sranacharoenpong K, et al., 2024

ORIGINAL STUDY

Development and Implementation of a Unique, Tailored School Lunch Training Program for Teachers and their Stakeholders at Public Primary Schools in Thailand

Kantanit Chammari, Arisa Keeratichamroen*, Kitti Sranacharoenpong, Punnee Ponprachanuvut, Nuttarat Srisangwan, Piyanit Churak, Panrawee Praditsorn

Institute of Nutrition, Mahidol University, 999 Phuttamonthon 4 Road, Salaya, Phuttamonthon, Nakhon Pathom, 73170, Thailand

Abstract

Background: **Although teachers responsible for the school lunch program were trained by the Ministry of Education (MOE) staff, they were not equipped with the basic knowledge of nutrition for children. This study aimed to develop and implement a unique, tailored school lunch training program for teachers and their stakeholders.**

Methods: **The training program was developed using the "Design for Learning (D4L) model." Public primary schools run by the government from all regions of Thailand were selected. Target persons included principals, health teachers, nutrition teachers, cooks, and local staff from the MOE. All participants participated in a 5-day training course. They were tested on their knowledge before and after the training.**

Results: **The training course consisted of six modules. A total of 510 participants were selected from 109 schools. The average overall score increased from 54% at baseline to 70% after the training, with significant improvements in knowledge for all topics. Post-training scores of cooks were significantly different from others.**

Conclusions: **The improvement of participants' knowledge from baseline to the end of the training met our a priori criteria for success. The benefits of this training program included short-term satisfaction and knowledge gain among participants.**

Keywords: Thai school lunch training program, Professional training, Design for learning, Learning environment

1. Introduction

Historically, Thailand has faced undernutrition in children; yet, paradoxically, the prevalence of diseases of over-nutrition has escalated in recent years [1–3]. The Thai school lunch program, launched by the Ministry of Education (MOE) in 1992, is one of the solutions to those issues. Healthy meals are provided for government-run, public primary schools across the country. Currently, the MOE supports a school lunch budget of 21 THB (approximately 0.63 USD) per student for 200 days each year.

The school lunch meal was expected to fulfill 30% of the daily Thai Recommended Dietary Allowance (RDA) for nutrients and 10% of the RDA for nutrients is daily milk intake for children. Each primary school must manage healthy lunches through menu planning, food purchasing, food preparation, and cooking based on the teachers' guidelines [3,4]. Unfortunately, many teachers lacked nutritional knowledge, even though they had good cooking skills. In addition, some teachers could not manage the program due to their teaching workload. Others did not understand the program's purpose or why specific nutrients are necessary to children [5–7].

Received 21 February 2023; revised 24 April 2023; accepted 22 May 2023.
Available online ■■■

* Corresponding author at:
E-mail address: arisa.kee@mahidol.ac.th (A. Keeratichamroen).

https://doi.org/10.56808/2586-940X.1065

ORIGINAL STUDY

Using SWOT Analysis to Create Strategies for Solving Problems in Implementing School Lunch Programs in Thailand

Nuttarat Srisangwan, Piyanit Churak, Panrawee Praditsorn, Punnee Ponprachanuvut, Arisa Keeratichamroen, Kantanit Chammari, Kitti Sranacharoenpong*

Institute of Nutrition, Mahidol University, 999 Phuttamonthon 4 Road, Salaya, Phuttamonthon, Nakhon Pathom, 73170, Thailand

Abstract

Background: **Thai school lunch program (Thai SLP) is crucial for Thai children's health, there should be another way to improve the quality of school lunches. This study aimed to address problems arising from the Thai SLP operation, prioritize problems, and devise strategies to help resolve those issues under the SLP.**

Method: **School principals and educational service area staff are key persons in school lunch management. Sixty participants from 30 schools across Thailand were invited and divided into 6 groups. They were asked to discuss problems and obstacles in the program implementation. Strengths, weaknesses, opportunities, and threats (SWOT) analysis was used to analyze data from brainstorming activities.**

Results: **SWOT analysis showed six strengths, seven opportunities, eight weaknesses, and six threats. Eleven strategies were formulated and presented in the TOWS matrix. One proactive strategy was to maintain good network partners between schools and communities. A corrective strategy also showed creating a network between schools, communities, and temples to ask for food donations to alleviate the problem of delayed and insufficient budgets. A school or district level nutritionist to reduce teachers' workload was proposed.**

Conclusion: **The study created a variety of strategies that are required to solve operating problems and improve the quality of the SLP. Priority solutions should start with strategies that the schools can implement by themselves. Forming networks between schools and communities for sustainable management could also help in the quality improvement of the SLP.**

Keywords: School health, School lunch quality, Strategy, SWOT Analysis, Thai school lunch program

1. Introduction

Thai school lunch program (Thai SLP) is a government awareness program that recognizes the importance of tackling malnutrition in children and encourages all children to have a nutritious diet. Thai SLP is the basis for physical and intellectual development, especially for children in primary schools. The Fund for the Lunch Program in the Primary Schools Act was established in 1992 to allocate primary school budgets to administer lunches for all children and integrate with the agricultural products from the Agriculture for Lunch Program [1]. Initially, schools received subsidies of five baht per student per day for 200 days per academic year. Since 2021, the subsidy has been increased to 21 baht per student per day, allocated for schools to carry out the SLP for kindergarten pupils to 6th graders.

To implement a sustainable Thai SLP, it is imperative that stakeholders should have a mutual understanding of operational guidelines and also knowledge of the SLP practice [2] since there is neither a nutritionist nor a dietitian assigned to take care of SLP in schools. Therefore, existing school staff, including the school principal (SP) and teachers, are responsible for managing lunches and monitoring nutrition-related health outcomes

Received 31 August 2022; revised 13 November 2022; accepted 14 November 2022.
Available online 6 June 2023

* Corresponding author.
E-mail address: kitti.sra@mahidol.ac.th (K. Sranacharoenpong).

https://doi.org/10.56808/2586-940X.1039

The SLP project: Impacts at Ministry Levels

เลขาธิการ กพฐ.เป็นประธานประชุมวิเคราะห์ค่าใช้จ่ายอาหารกลางวันของนักเรียนในโรงเรียนประถมศึกษาตามขนาดจำนวนนักเรียนครั้งที่ 1/2562 ณ ห้องประชุม กศน.อาคาร 5 ชั้น 6 กระทรวงศึกษาธิการ

14 สิงหาคม 2562 ข่าวส่วนกลาง

เดลินิวส์

MENU

อ่านความจริง อ่านเดลินิวส์

อังคารที่ 29 กันยายน 2563

เมื่อวันที่ 29 ก.ย. นายณัฏฐพล ทีปสุวรรณ รมว.ศึกษาธิการ เปิดเผยภายหลังการประชุมคณะรัฐมนตรี (ครม.) ว่า กระทรวงศึกษาธิการ (ศธ.) ได้เสนอผลวิเคราะห์การบริหารจัดการโครงการอาหารกลางวันของนักเรียนโรงเรียนประถมศึกษาทั่วประเทศให้ที่ประชุม ครม.พิจารณา เนื่องจากการบริหารจัดการโครงการอาหารกลางวันมีปัญหาหลายส่วน โดยเฉพาะการจัดสรรงบประมาณอาหารกลางวันที่ได้รับในอัตราหัวละ 20 บาทต่อวัน จำนวน 200 วันที่ถือว่ายังไม่ได้มีการพิจารณาปรับปรุงมาเป็นเวลา 5 ปี แล้ว ซึ่งที่ประชุมได้อนุมัติในหลักการแต่ให้

Impacts

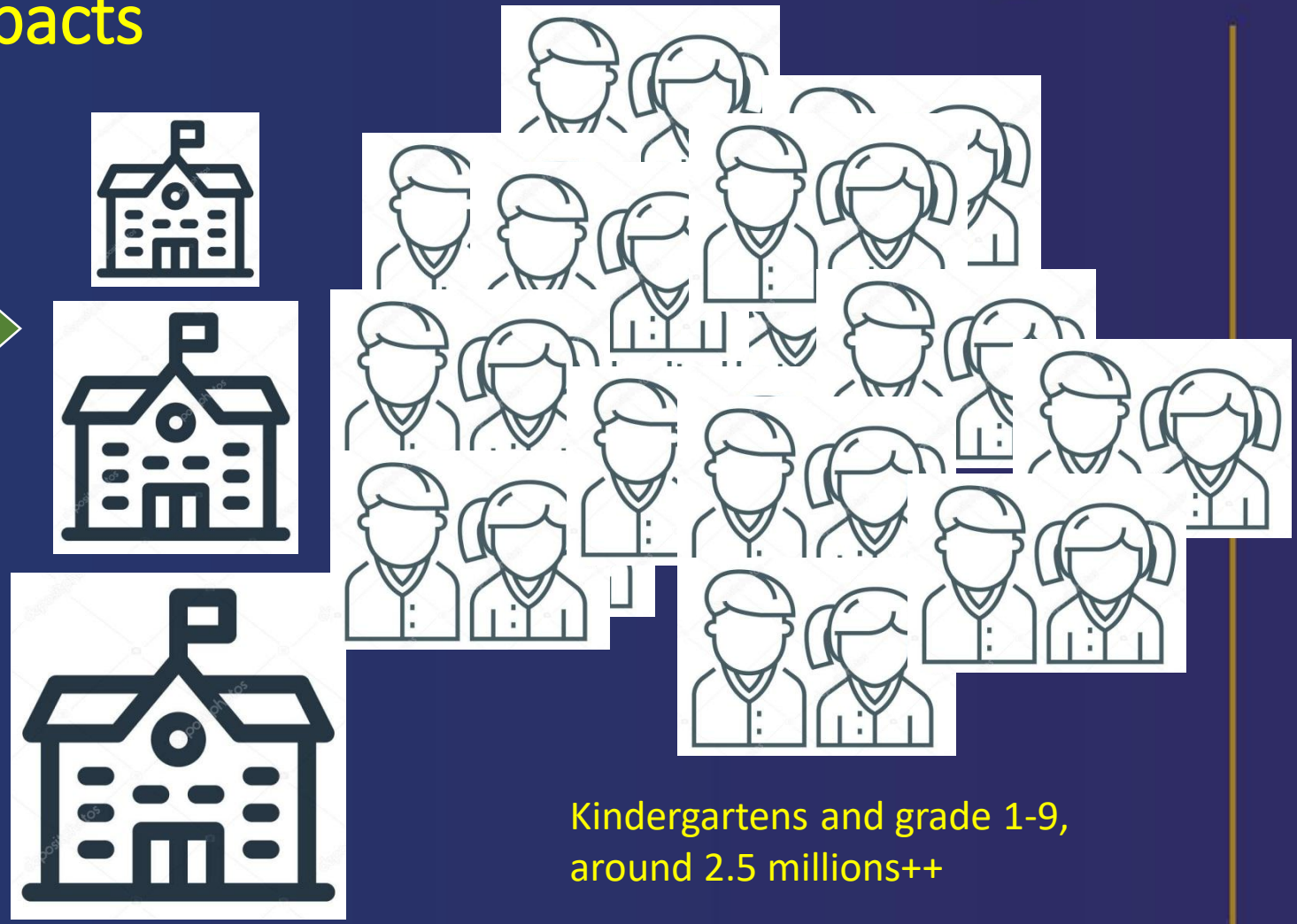
- **Increase school lunch budget from 20 Baht/person (US$0.63) to 22-36 Baht/person (US$0.69-1.13) for 200 days per year + milk program;**
- **Covered more than 2.5 millions students at primary schools (more than 20,000 schools in rural, semi-urban and urban areas) across; Thailand.**
- **Next step – having nutritionist at sub-district and/or at schools;**

The PPPs and SLP project: Impacts

New budget: 2023

START 2023

Total students	Budget per head*	
	Thai Baht**	USD***
1-40	36	1.13
41-100	27	0.84
101-120	24	0.75
121+	22	0.69



Kindergartens and grade 1-9,
around 2.5 millions++

*SLP for 200 days/year

**New budgets will be covered;
raw ingredients, food service management (wage, gas, 5% of inflation, etc)

***USD 1= 32 Thai Baht

Sranacharoenpong K, et al., 2020

Local Food-Mile Pathways Supplying School, Chiang Mai

1. Food Miles:

- Physical distances that vegetables travel from their sources to the school;
- Quantity of the school's food supply chain;

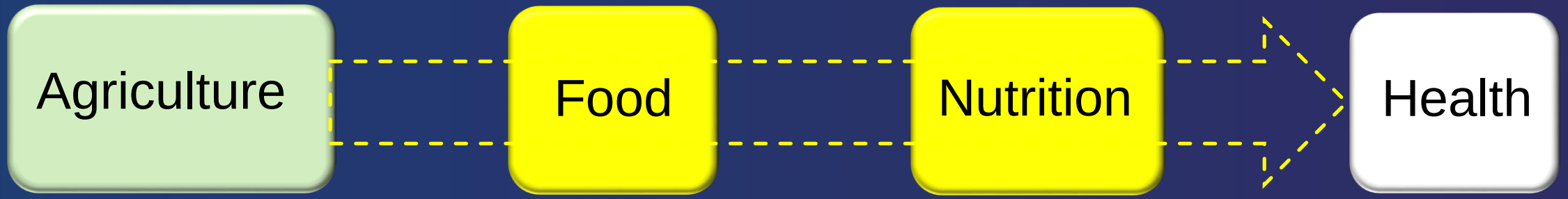
2. Safe and Healthy Food Supply:

- Farms and market are emphasized as sources of chemical-safe, fresh vegetables, aligning with the objective of improving student health.
- Local farms as reliable providers of safe produce at prices suited to the school's budget.

3. Community-Based Food System:

- How connecting schools with nearby farmers and markets;
- Support local agricultural livelihoods while ensuring consistent access to nutritious food for students.

Continuum from Agriculture, Food & Nutrition to Health



- Food production, processing & supply
- Nutrition orientation for healthy diet
- Food, feed and fuel and bio-products
- Climate changes

- Food quality
- Food safety
- Food service

(For consumer and trade)

- Nutrient needs
- Dietary intakes
- Nutritional wellbeing
- Nutrition literacy

- Promotion
- Protection
- Treatment
- Safe from Hazards

Good health

Food and Nutrition Security

Food, Nutrition & Dietetic Education

Food Culture

Associate Professor Dr. Kitti Sranacharoenpong
Mahidol University
Kitti.sra@mahidol.ac.th

Thank you.

Mahidol University
Wisdom of the Land

Mahidol University
Wisdom of the Land

999 มหาวิทยาลัยมหิดล ถนน พุทธมณฑลสาย 4
ตำบล ศาลายา อำเภอพุทธมณฑล นครปฐม 73170
โทร : 02 849 6000