Higher education institutions, SDG2 and agri-food sustainability: lessons from Chulalongkorn University and Thailand

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Abstract

This paper examines higher education efforts linking United Nations Sustainable Development Goals (UNSDGs) and agri-food system sustainability given reports of stagnant movement for SDG2 in Southeast Asia and lack of data for effective monitoring or evaluation to realize the *2030 Agenda*. It discusses Thai contexts amid a growing global movement in academic theory, policy and practice to mainstream SDG knowledge and implementation across campuses presenting one case to illustrate broader concerns. Chulalongkorn University policies, faculty awareness, curricula, research, sustainability reporting and partnerships about SDGs have contributed to SDG2 objectives from different disciplines and academic units. However, some faculty still lack understanding of SDGs generally while SDG2 has not been an institutional priority. The university has made welcome progress since a 2017 policy promoting SDGs but still needs to strengthen SDG2 data collection, teaching, research and community outreach capacities including links to government and international reporting to address complex agri-food system sustainability challenges. Comparative studies could also help while critically debating SDG deficiencies and promoting socioeconomic, ecological, agri-food system, community and campus sustainability.

Keywords Higher education institutions · SDG2 · Chulalongkorn University · sustainable agri-food system · Sufficiency economy philosophy · Thailand

1 Introduction

In 2015 United Nations (UN) member states agreed to 17 interrelated, cross-cutting Sustainable Development Goals (SDGs) underpinning the *2030 Agenda for Sustainable Development* (UNGA, 21 October 2015). Our paper discusses SDG2 *End hunger, achieve food security and improved nutrition and promote sustainable agriculture* principally amid a growing movement to mainstream SDGs in academia while reforming campus policies, teaching, research priorities, operations and services. It includes a case study of

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Chulalongkorn University (CU) in Thailand to illustrate broader global challenges and practical concerns, particularly what roles academia should play in monitoring, evaluating, critiquing, studying or teaching SDG2 while better addressing agro-environmental problems and achieving agri-food system sustainability.

Our study has three main aims. The first is to discuss CU faculty perceptions, understandings and contributions to SDGs generally. The second is to provide a critical analysis of SDG2 and associated SDGs implicating wider CU policy, research, curricula, outreach and international reporting. Third, we propose new multi-disciplinary theoretical framing and method for assessing SDG2 at CU, potentially adaptable or replicable elsewhere to better address related agri-food system sustainability knowledge, research innovation and academic reform challenges.

2 Agro-environmental and SDG2 policy issues in Thailand

SDG2-related challenges are substantial. Five years into *Agenda 2030*, with just a decade left, a UN Asia–Pacific assessment stressed that “on its current trajectory” the region “will not achieve any of the 17 SDGs by 2030” without “accelerated progress” on all fronts. Moreover, there was “stagnant” movement on SDG2 specifically. For Southeast Asia (SEA) the UN flagged the need for improvement especially on targets: 2.2 Malnutrition; 2.3 Agricultural productivity; 2.5 Genetic diversity; and 2.a Investment in agriculture. Especially worrying was inadequate attention to agro-environmental concerns in Target 2.4 “Sustainable food production,” the UN calling to reverse this trend (UNESCAP, 2019, pp. iv, 2, 15, 34). Moreover, globally, the Food and Agriculture Organization of the United Nations (FAO) presented a “grim picture” of evidence for SDG targets related to sustainable agriculture, food security and nutrition with serious gaps in available country or global data of four SDG2 indicators (FAO, 2019, pp. 3–4). Lack of reliable SDG data is a major challenge (UNESCAP, 2019, p. 29). The COVID-19 pandemic has also created further vulnerabilities and uncertainties for achieving food system related SDGs implicating higher education (Nelles & Ferrand, 2021; noting FAO et al., 2020).

In Thailand with a population of over 69 million agriculture is important to society and the economy contributing around 8.0 percent of GDP with a labor force of 10.63 million (National Statistical Office, 2019; and World Bank¹). Nonetheless, much agriculture work is still not clean, safe, green or adequately paid amid a multitude of interrelated socio-economic, environmental, health and consumer food safety concerns. External assessments have underscored that “the expansion of intensive agriculture in Thailand placed a heavy strain on the environment” (OECD, 2018, p. 133). Contaminated food chains with produce exceeding pesticide maximum residue limits and dangerous agrochemicals poisonings are subjects of long-standing public debate and unresolved policy conflict (Nation, 1 September 2020).

At the same time Thailand’s strategy for “safe and environment-friendly agro-food products” complements SDGs generally and SDG2, SDG13, and SDG17 in particular (ADB, May 2018; Weaver et al. Eds., May 2019). Thailand’s official approach to SDGs is ostensibly guided by the Sufficiency Economy Philosophy (SEP) of the Late King Bhumibol. SEP

¹ World Bank Data (latest 2019) citing “Agriculture, forestry, and fishing, value added (% of GDP),” <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS> (accessed 10 May 2021).

encourages localized food security and economic self-sufficiency for farm families and communities. Advantages include: reducing risks and input costs; curbing rural outmigration; increasing or diversifying incomes, better balance with natural environments and improved quality of life (Government of Thailand, 2016, p.1). The *National Economic and Social Development Plan (NESDP) 2017–2021*, promotes “scaling up... sustainable agricultural production systems... including the “New Theory Agriculture” (aka SEP), integrated farming, agroforestry, organic farming, natural farming, and Good Agricultural Practices...increasing use of organic products to replace agricultural chemicals” (Government of Thailand, 2016, pp. 3, 6, 25, 34, 72, 111).

Thailand’s first *Voluntary National Review* report on SDGs to the UN promoted SEP in its national *Framework on the Promotion of Sustainable Agriculture 2017–2021* as well as through international cooperation initiatives. The *Framework* targeted increase in sustainable agriculture to achieve food security, reduce expenditures, and preserve and fertilize soils while improving incomes and health implicating SDG3, 12 and other goals (MOFA Thailand, 2017, pp. 11, 13, 16). However, one international SDG assessment, *SDR 2019*, expressed concern about SDG2 in Thailand showing “significant challenges remain” particularly for sustainable nitrogen management (Sachs et al., 2019, pp. 26–27, 422–423). Major culprits recognized globally are agrochemicals contributing to pollution, health threats, associated land degradation, biodiversity loss and climate change exacerbated by lack of coherent or adequate policies (Sutton et al. 2013; UNEP, 09 March 2019). Universities can play important roles in better addressing interrelated agro-environmental, policy, curricular, pedagogical and SDG2-specific issues in Thailand, SEA and globally.

3 Materials and methods

This paper contributes to new “mapping” called for to assess “how high-level university strategies, policies, plans and reporting indicators align with the SDGs and identify which organisational units are relevant to which SDGs” while aiming to better understand gaps in academic responses (SDSN Australia/Pacific, 2017, pp. 2, 23, 32, 35). Mapping goals, methods and scope, as well as specific types of data collected or analyses applied can vary among universities or scholarly fields. No one approach or discipline could adequately address the multitude of variables or implications. We focus principally on SDG2 to illustrate broader theoretical, Thai national, SEA regional and global socioeconomic, agro-environmental sustainability, learning and cross-sectoral research challenges.

Our study has three components utilizing social science methods complemented by a sustainability sciences theoretical lens (Sect. 4). First, it provides a recent (post-2015 SDG era) mapping of relevant published and grey literatures in English highlighting SDG2 related activities or studies at CU. Second, at the campus level we conducted a small survey about faculty understandings of SDGs in courses with perceived training needs. A third component involved a participatory assessment through a multidisciplinary focus group faculty workshop about SDG2 including representatives from nine academic units.

4 Theory implicating Praxis: academia, SDG2 and agri-food sustainability

Our study examines agri-food system sustainability implicating higher education institutions (HEIs). It is a preliminary attempt to critically analyze SDG2 issues in the HEI sector. It builds on a growing body of academic literature and practice about universities and SDGs, complemented by social science tools sharpened through a multi-disciplinary sustainability science lens.

Literature in sustainability science tends toward interdisciplinary collaboration with transdisciplinary problem framing to better understand complexity and apply integrative thinking about HEIs. One study, for example, highlighted the need for cooperation across engineering, economics, social sciences, policy and governance studies, physics, environmental sciences, health studies, agriculture sciences, technology studies, computer science, marketing, food studies, energy and more (Yarime et al., 2012, *passim*). Sustainability studies includes understanding food systems (Evans, 2019, p. 21). Educational science, an applied field, addresses how to understand and improve pedagogies to support learning, teaching competencies and curricular content addressing practical social-ecological concerns including agri-food system issues. It can be enhanced by sustainability science (Barth & Michelsen, 2013).

Others have stressed HEIs can be strategic partners for gathering necessary data, providing multi-disciplinary scientific interpretation, and synthesizing different types of specialized knowledge, while bringing technical training and teaching, critical thinking, practical skills, evidence-based policy options of viable transformation pathways and community outreach to achieve SDGs (Franco et al., 2019; Purcell et al., 2019; SDSN Australia/Pacific, 2017; Sonetti et al., 2019; Vaughter, 2018). A growing international movement since 2015 aims to reframe HEI missions, strategies and reporting tools aligned with SDGs. The International Association of Universities (IAU) began in 2016 to address knowledge gaps and begin research partnerships to deliver on SDGs (IAU, 2018; van't Land, September 2017). The UN has facilitated political dialogues, documenting HEI progress on SDGs and encouraging academia's active engagement (Global Alliance., 2019). The Times Higher Education (THE) Impact Rankings in 2019 began comparing universities' SDGs progress (THE, 17 September 2019). Proposed SDG2 indicators assess universities' research on hunger; teaching on food sustainability; commitment to tackle food waste and how they address students' and local communities' hunger (THE, 2021).²

Nonetheless, the tertiary sector, as it is referred to in SDGs and *Agenda 2030*, is still narrowly conceived in SDG4 (Quality Education, Target 4.3) about promoting affordability, access and quality while SDG2 does not mention education. There are implications for agriculture research in Target 2.a yet university roles are missing. HEI contributions are implicated in SDG Target 4.7 on "education for sustainable development" but without reference to agri-food learning potentially linked to other SDGs. Global policy frameworks, academic analysis and technical assessment tools for SDGs have not paid adequate attention to postsecondary agri-food systems learning competencies, research and community impacts. For example, five literature reviews in leading journals discussing academic sustainability reporting or theorizing did not mention agriculture or food issues

² Note *Impact Rankings Methodology 2021, Version 1.3* with update (April 14, 2021) on SDG2 reporting https://www.timeshighereducation.com/sites/default/files/breaking_news_files/the_impactrankings_methodology_2021_v1.3_final.pdf (accessed 11 June 2021).

at all (Ceulemans et al., 2015; Karatzoglou, 2013; Lozano, 2011; Lozano et al., 2017; Wiek et al., 2011). Another review suggested university capacities for SDG2 teaching and research in Asia were weak with significant gaps (Franco et al., 2019, pp. 1633, 1639).

Thai peer-reviewed studies on SDGs generally, or SDG2 implicating agri-food systems learning particularly, also appear lacking.³ CU, as a precursor to UNSDGs, began organizing various regional academic dialogues, policy debates and national studies to strengthen social and sustainability sciences integration in university-based agriculture education. One theoretical and pragmatic concern CU scholars identified was inadequate Thai education and research impacting sustainable agriculture in practice. A comparative study of Thai universities presented new data and analysis (Visetnoi & Nelles, 2017/2014, pp. 185–186).

A CU-coordinated national policy brief on *Transforming Thai higher education for sustainable agriculture* offered theoretical and practical insights on challenges facing Thai universities. Academic partners identified five key constraints or obstacles to reform: (1) resistance from Thai scholars narrowly focused on their own disciplines; (2) low prestige of agriculture education by parents and students; (3) many university administrators not interested in sustainable agriculture (SA); (4) bureaucratic rules and regulations; and (5) lack of solid action plans which include or prioritize SA (Visetnoi et al., 2016, p. 4). Some apply to CU today despite welcome changes underway. Our present study builds on prior CU work with partners to address gaps in the HEI literature, particularly inadequate attention to SDG2 and food or agriculture.

5 Results and discussion

CU since at least 2016 has been engaged in various activities either intentionally contributing to *Agenda 2030*, or indirectly to understanding or implementing specific SDGs and linkages but so far with no attempts to systematically document, analyze or critique developments. Our analysis builds on the following policy commitment:

Sustainability is one of our core missions... in the university's four strategies...2017-2020. Chulalongkorn University disseminates the understanding of sustainability...and tries to create the physical environment in the sustainable way for living and studying. We also integrate the United Nation's SDGs in the courses and researches. In 2017, many programs relating to sustainability were initiated... (Prof Bundhit Eua-arporn, Ph.D., CU President, *Chulalongkorn University Sustainability Report 2016–2017*, p. 3).

Our documentation of published and grey literatures below shows how this commitment implicates SDG2 while CU has been a global actor supporting SDGs policy dialogue, research and implementation collaborating with national, regional and international academic partners as well as government, civil society and international agencies.

³ Around the time of our SDG2 focus group workshop discussed below, a key word search of Scopus database publications referring to “*SDGs and Thailand*,” revealed 16 results with only a few referring directly to either agriculture, fisheries and education. Another search “*SDG 2 and Thailand*” revealed zero results (from www.scopus.com 23 February 2020).

5.1 Sustainability contexts, policies and SDG trends at CU: 2016–2020

CU founded in 1917 is Thailand's oldest public university. CU joined the International Sustainable Campus Network (ISCN) in 2014 and co-founded the Sustainable University Network (SUN) Thailand with 15 others.⁴ CU has been recognized for its campus canteen food waste to biogas initiative (ISCN Secretariat, 2016, pp. 38–39). This implicates SDG2 but with more direct relevance to Target 12.3 on sustainable consumption. In 2016 CU, with three other Thai HEIs, hosted IAU's *15th General Conference* with a sustainability theme (IAU, 2018). In 2017, CU announced its new *Sustainable University Policy* based on SEP (national policy noted above) as well as UNSDGs (Inkarojrit, Nd, 2018, pp. 3, 11).

In 2019 CU began submitting data internationally for THE Impact Rankings which aim to measure global universities' success in delivering UNSDGs. Initially CU focused on SDG3, 15, 12 and 17 selected for perceived strengths in related research, outreach and stewardship. CU's submission on SDG3, Good Health and Well-being, was led by Medical Science Faculties. SDG12 on Responsible Production and Consumption integrated results from different departments or projects, particularly Zero Waste, Green Meetings, and Waste Management. Concerning SDG15, Life on Land, showcased outreach to communities including agricultural knowledge transfer related especially to effects on forests and soils. On THE's compulsory reporting for SDG17 (Partnerships), CU illustrated engagement with international communities, civil society organizations and other activities supporting SDGs.

In 2020 the university collected additional data on SDGs 4, 8, 9 and 14 while increasing cross-campus efforts to document sustainability projects aiming for a more extensive submission to THE impact rankings. This externally driven process has been a significant catalyst encouraging other SDG knowledge, debates and innovation at CU. Noticeably absent so far, however, has been attention to SDG2.

In 2020 CU launched a new website documenting SDG-related activities and outputs of four types: Policy and Operations; Research and Innovation; Teaching and Learning, and Outreach and Engagement.⁵ CU's community engagement includes several activities in Nan Province, where CU has a regional program and small rural campus with demonstration teaching farm. Some CU scholars earlier identified "agrochemical dependency" in Nan and the rest of Thailand as a significant concern with inadequate government support for organic alternatives (Nelles & Visetnoi, 2016). Five projects later tackled related problems including chemical contamination from farming while promoting wider interest in organic approaches: (1) Restoration and Development of Nan Agriculture; (2) Nutritional Systems and Changes in the Way of Life, (3) Health Risk Assessment of Nan Farmers who Use Pesticides; (4) Study and Assessment of Agricultural Chemical Contamination, and (5) Study of Herbicide Residues in Field Crabs and Local Food. Community engagement, research and teaching has been led mainly by five CU Faculties or institutes: Chulalongkorn University School of Agricultural Resources (CUSAR); Social Research Institute (CUSRI); Faculty of Veterinary Science (FVS); Faculty of Allied Health Science; and Faculty of Science. Some CU agriculture and food related projects contribute to various SDGs, but especially SDG1, 2, 9, 12 and 15. They aim to reduce poverty; support food security and safety;

⁴ The Green Chula website (www.green.chula.ac.th/) contains *Chulalongkorn University Sustainability Reports*. ISCN Information is at <https://international-sustainable-campus-network.org/>. SUN Thailand materials (<https://sunthailand.net/>) are hosted by Chiang Mai university (all accessed 19 August 2020).

⁵ <http://www.sustainability.chula.ac.th/> (accessed 10 May 2021).

promote small farmer innovations; encourage more responsible production or consumption of animal products as well as alternatives to harmful pesticides; and discouraging farm-related biodiversity loss while improving land/natural resource management (Chulalongkorn University, 2020, pp. 25–52). Project reports also stress the importance of interdisciplinary cooperation with community service for achieving SDGs.⁶

CUSAR, as an agriculture school, has a natural mandate to address SDG2. Benefitting from close proximity to Bangkok-based international agencies, CUSAR has led or co-facilitated numerous SDG-related activities. Projects have included conferences, technical workshops, policy dialogues and joint research. Donors, partners or co-facilitators have included internal CU research funds or external sources such as: the Agroecology Learning Alliance in Southeast Asia (ALiSEA); Asia-Pacific Association of Agricultural Research Institutions (APAARI); Maejo University, (MJU) Thailand; FAO Regional office for the Asia-Pacific; Office of the Higher Education Commission (OHEC), Thailand; SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA), Philippines; Stockholm Environment Institute (SEI) Swedish International Agriculture Network Initiative (SIANI); United Nations Educational, Scientific and Cultural Organization (UNESCO); and others.

To address SDG2 specifically CUSAR secured two small grants from SEI-SIANI to coordinate a regional Expert Group on Higher Education for Sustainable Agriculture (HESA) and Food Systems in ASEAN. Activities included numerous technical meetings, workshop reports and policy briefs from collaboration in Thailand and across SEA engaging over 500 participants over three years.⁷ A chronology of CU's main outputs implicating SDG-related work especially highlighting agri-food sustainability themes is summarized in Appendix 1 of our paper. Below we discuss faculty perceptions, curricular innovations, research and outreach since CU's co-hosting the IAU conference in 2016 and 2017 commitment to SDG implementation.

5.2 Faculty pilot survey on SDGs (2019)

Collecting SDGs related data across campus has been challenging due to lack of standardized information available from faculties or common, coordinated cross-campus data collection tools and gathering efforts. We began with a pilot survey in 2019 assessing faculty perspectives about SDGs sampling 20 faculty members from two academic units: 8 from CUSAR and 12 from Department of Environmental Science (ENVS). Initial focus was on two programs: Environmental Science (ES) and Agricultural Resource Administration (ARA). Main goals were to analyze courses offered and instructors' awareness of SDGs.

We disseminated a questionnaire to course coordinators. The questionnaire assessed how teaching and SDGs aligned. Results highlighted that both programs' contents addressed all 17 goals but the ES program dedicated more (about 20% content) toward

⁶ See English translation, "Chemical-free farming and preservation of historic old town in the spotlight" available at www.sustainability.chula.ac.th/ (accessed 19 August 2020). For original Thai language story see *CU Around*, Vol. 61, No. 12, Dec 2018 (<https://www.chula.ac.th/magazine/15240/>). See also, more recently, "Reviving Nan watershed areas through Chula's interdisciplinary knowledge" available at <http://www.sustainability.chula.ac.th/report/989/> (accessed 10 May 2021).

⁷ Space does not permit reference to numerous universities and individuals collaborating to host national or regional workshops across SEA since 2015. Documentation is available on the ALiSEA (<https://ali-sea.org/>) and SIANI (<https://www.siani.se/expert-groups/>) websites (accessed 10 May 2021).

SDG6 (Clean Water and Sanitation), whereas ARA program content was geared more toward teaching SDG2 (Zero Hunger) and SDG7 (Affordable/Clean Energy), with 30% and 20% of program contents respectively. In addition, analyzing relationships among “5P” framing of SDGs,⁸ showed the majority of ARA teaching content and courses were not surprisingly most aligned to ‘People’ i.e. Goals 1–5, whereas the ES program reflected ‘Planet’ (Goals 6, 12–15).

We also investigated faculty awareness about SDGs teaching and support from the university. Faculty perceptions scoring from 1 (Lowest) to 4 (Highest) identified that curricula in both CUSAR and ENVS programs apparently had 81.21% and 83.35% content respectively related to SDGs. But among various questions posed to faculty those noted below underscore broader more striking trends and challenges.

Questions	CUSAR (8)	ENVS (12)
1. To what degree do you agree with the institution’s policy to encourage all teaching program and courses be aligned with SDGs	High (3.22)	High (3.60)
2. To what degree have you received training or attended Workshops (provided/supported by University) on SDG topics	Low (1.89)	Moderate (2.10)

Faculty responses clearly suggest most viewed SDGs as important in teaching. However, faculty also believed the university could do more to promote SDGs into course contents while increasing awareness among staff and students.

5.3 Multidisciplinary focus group assessment of SDG2 (2020)

Building on initial 2019 pilot survey results the Center for Social Development Studies (CSDS) and CUSAR partnered in 2020 to better assess agri-food sustainability concerns. In February 2020 we held a small “*Workshop on Evaluating Implementation of SDG2 at Chulalongkorn University*” with a strategic focus group discussion on SDG2. Participants joined from nine academic units representing: CSDS, CUSAR; Social Research Institute CUSRI; Faculty of Allied Health Science (FAHS); Department of Botany (DBot); Department of Food Technology (DFT); Environmental Research Institute (ERI); Department of Environmental Science (ENVS); and Faculty of Veterinary Science (FVS).

Our participatory assessment workshop aimed to assess how some CU activities potentially contribute to attaining SDG2 either intentionally or coincidentally. The process involved self-introductions, a technical orientation, short exercises, and written reflections recorded through a questionnaire. Group discussion focused on how SDG2 related to four elements: 1. Teaching and Curriculum; 2. Research and Publications; 3. Community Outreach and Engagement; and 4. Knowledge or Training. Resource Materials and discussion transcripts were translated from Thai to English as needed.

Participants were invited to define their ideas of SDG2. Responses ranged from a focus on physical science approaches ensuring adequate nutrition or enough protein, to social science concepts about food security, including safe food access or cultural contexts of

⁸ The *Agenda 2030* Preamble introduces five Ps covering all goals. I.e. P1 People: Goal 1,2,3,4,5; P2: Planet: Goal 6,12,13,14,15; P3 Prosperity: Goal 7,8,9,10,11; P4 Peace: Goal 16; and P5 Partnership: Goal 17 (UNGA, 21 October 2015, p. 2).

Table 1 Summary of key SDG2 themes and intended outcomes by 2030 (authors' adaptation, drawing from UNGA, 21 October 2015)

SDG2 target	Main SDG2 cross-cutting themes in key words	Core action or intended outcome
2.1	Food security Hunger Safe food	End Hunger (with Safe and Nutritious Food)
2.2	Malnutrition	End malnutrition
2.3	Agricultural productivity and income Marginalized groups (e.g. especially women; indigenous people; family farmers; pastoralists; fishers)	Improve Agricultural productivity and Income
2.4	Sustainable food (production) systems; Climate/disaster resilience	Promote (ecologically) Sustainable Food Production
2.5	Genetic diversity (seeds, plants, livestock, breeds) Traditional knowledge (preservation, utilization and promotion)	Protect Genetic Resources (Agrobiodiversity)
2.a	Agricultural research Farmer extension	Increase Agricultural Research and Extension Investments
2.b	Agriculture markets and trade	Prevent Agriculture Markets and Trade Distortions
2.c	Food prices and commodity markets	Limit Food Price Volatility (can exacerbate hunger/food insecurity)

food. Both physical and social science participants commented on relevance of their field to equity dimensions, namely ensuring zero hunger for all. To provide a shared baseline a PowerPoint introduction to main SDG2 themes linked to core actions or intended outcomes (Table 1) was given to participants. We asked them to select three key words best matching their work. The two most selected were ‘safe food’ and ‘food security,’ corresponding to SDG Target 2.1.⁹ Third were: Agricultural Research (Target 2a); Agriculture Extension (Target 2a); and Traditional knowledge (Target 2.5).¹⁰ Participants’ research and teaching activities covered all SDG2 Targets, except 2b and 2c. The workshop was small to allow engaged participation and dialogue. But given the limited sample of CU faculties represented (e.g. not economics or business administration) future work is needed to expand data collection scope, numbers of faculty engaged and student involvement.

5.3.1 SDG2 teaching and curricula

Some progress in sustainability teaching appears evident in the past few years. Since 2016, according to the Administration, courses teaching sustainability across the university increased by 129 suggesting by 2020 at least 1331 courses offered an integrated perspective or SDGs as a key component (Chulalongkorn University, 2020, pp. 9, 20).

On SDG2 teaching and curricula specifically all 2020 workshop participants identified a number of related courses. Most participants stated some were designed with SDG2 in mind. Several multidisciplinary courses were on related environmental issues. Those on sustainability, environmental politics and rural development incorporated SDG2 references in classes addressing food systems, agriculture and concepts such as safe food. Others focused on physical science and practical skills necessary to attain SDG2 including soil science, organic gardening, horticulture and plant growing technology, food microbiology and processing/chemistry, and animal breeding. Several programs offered community-based study and research exposing students to agriculture practices and food security challenges. Participant self-assessments of SDG2 relevant curricula and teaching in their respective units are summarized below.

How do your teaching and curriculum align with SDG2?

⁹ Target 2.1: “By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round”.

¹⁰ Target 2a: “Increase investment.... in rural infrastructure, agricultural research and extension services...” Target 2.5 “By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species...and associated traditional knowledge...”.

Academic unit	Course name	How does it contribute towards SDGs generally?	Does the course align with SDG2?
ERI	Environment (Gen Ed)	Multidisciplinary Promoting good environment	Yes. Safe food, land contamination, sustainable management principles
	Multidisciplinary Study for Rural Development	Students learn about rural people, change, society, education, health Research with communities	Yes, Field report—environmental management/ increased incomes
	Environmental Modeling (Graduate Level)	Environment/Biosphere Fundamentals; Integrates ecosystem functions with human activities	–
	Environment Development and Sustainability (EDS) Ph.D	Sustainable development Policy	–
CUSRI	Urban Poor Community Study	Teaches about community life	–
ENVS	Elective: Environment & Sustainable Development	Discusses Circular Economy in Food Industry	Discuss MDGs to SDGs success/failure including SDG2
	Core Course: Environmental Soil Science	Soils fundamental to agriculture/food security. Physical, chemical, biological aspects	Intentionally aligns with SDG2. GIS soil analysis
DBot	Organic Gardening	Organic gardening; Soils/microorganism interaction; Post-harvest certification/marketing; sustainable agriculture	Yes
	Horticulture and Plant Growing Technology	Collect seeds; Factors affecting propagation	Yes
	Post-harvest Technology; Breeding; Soil/Plant Relations	Safely prolong shelf life of vegetables, fruits and flowers	Yes
CUSAR	Principles Plant Production Management	Understanding self-reliance. Agricultural management with farmer communities	Yes. Students grow crops; raise chickens, pigs, fish
	Horticulture Production Management	Learn horticulture management; farm communities work	Students learn food production and healthy eating skills
	Plant protection	Plant health management; reducing pesticides; biocontrol	Students learn crops care

Academic unit	Course name	How does it contribute towards SDGs generally?	Does the course align with SDG2?
DFT	Food Microbiology	Teaching how to control microorganisms to provide safe food for consumers	Yes
	Food processing	Teaching how to process safe and quality food	Yes
	Food chemistry	Chemical reactions in food to control nutritional value	Yes
	Elementary Food technology	General Education class	Yes
FVS	Rural Community Study 2 weeks	Educate farmers; Increase productivity; Public health	–
	Animal breeding; Nutrition Animal husbandry	Increase productivity	–
FAHS	Food safety	Test for contaminants, preservatives, pathogenic bacteria. Cafeteria safety	–
	Community Nutrition Course and Internships	Screen status of populations; Provide nutrition recommendations	–
CSDS	Environmental policy/politics. MA Intl Development Studies	Environmental sustainability political science perspectives	No, except guest lecturer, sustainable agriculture
	Development Theory and Practice	History of farming modernization; ‘New Agricultural Countries’ (NACs)	No
	Innovation for Inclusive Development	Teaches ‘design thinking’ in one organic farm community case	No

5.3.2 SDG2 research

On research programs workshop participants did not identify many projects directly aligned with or referring to SDG2. Correspondingly a Scopus database search (footnote 4) found no peer-reviewed publications in English language journals. However, recently the university has supported developing 15 cross-disciplinary sustainability research clusters. Some align with SDGs including one on “Food and Water” linking SDG2 and 14 (Chulalongkorn University, 2020, p 20). Several studies are underway so relevant publications could appear.

Workshop participants noted topics ranging from social science-oriented research on informal economy, indigenous peoples, and water governance, to multidisciplinary ethnobotany studies with upland ethnic communities, to diverse physical science research including biological control in plant production, application of UV radiation or non-thermal processing for juice production, and addressing salt-stress in organic food production. On safe food and transforming agricultural practices, several research projects emphasized transitions to organic agriculture. They were undertaken collaboratively with government line agencies and administrative departments, civil society, other universities, private sector and communities.

Faculty noted other research activities implicating SDG2 specifically. For example, CSDS research and fellowships on Salween River Water Governance examined wild species and fisheries and riverbank gardening involving NGOs in China, Myanmar and Thailand with Australian university collaboration. One CUSAR research project on *Biological Control in Plant Production* helps farmers reduce agrochemicals on farms, protect health, and increase productivity of plant crops while consumers get safer environment-friendly food. Some DAHS research focuses on developing healthy, nutritious food products for patients and the general population. DBot research examines Symbiosis of Mycorrhizal fungi and root of plant which mitigates forest burning while increasing community food security with local tree species. One ERI study is on contaminated, degraded, toxic land focused on improvement of environmental quality of lands and catchment areas for communities to increase healthy/safe land for food and better income opportunities. An ENVIS Research Project: *Land Degradation Neutrality (LDN)* Assessment for SDG15 examines land use, land productivity and soil carbon changes from (2017–2020) and changes that impact food yield and production.

5.3.3 SDG2 community outreach and engagement

Aside from SDG2-related curricula and research we collected data on CU's service mission and faculty development. On community outreach and engagement, whilst many activities bridge the university and wider society, most workshop participants shared examples not designed to attain SDG2 although some programs have relevant implications. CUSAR, for example, facilitates collaboration between students and communities in Nan Province on farming techniques and local enterprise. Some outreach transferred technical knowledge from university-based research, to improve soil conservation through planting vetiver grass in Saraburi Province with a 'train-the-trainer' project for farmers to scale-up the approach. Other examples were social-science focused involving participatory research enabling communities to influence policy, such as a CUSRI project with Moken indigenous communities in the Andaman Sea on local food, livelihoods, and resource management. Finally, the ERI supported a "Youth for SDGs debate" collaborating with a Bangkok international school.

5.3.4 SDG2 faculty knowledge, training and collaboration

Regarding knowledge and training on SDGs available to university researchers, over half of workshop participants noted they had joined or convened SDG trainings. But several (echoing perceptions from the 2019 SDG survey discussed above) said they wanted more. Given that many SDGs are interrelated we also discussed current or potential collaboration across the university from different specialized fields. Faculty noted cross-cutting linkages of SDG2 with other SDGs while some worked beyond their discipline. Physical sciences mainly collaborated with other physical sciences and interdisciplinary sciences (e.g. agricultural science or environmental studies). Social scientists identified collaborations with both physical and social sciences. Regarding future hopes one physical science scholar expressed interest in deeper social sciences collaboration, while social scientists wanted more collaboration with physical sciences.

6 Lessons learned and conclusions

Our paper is not a comprehensive assessment of CU. That would take time and additional resources for a large complex institution with over 8000 faculty and 37,000 students from all disciplines and professional fields. However, it could provide elements of a proto-conceptual framework or participatory assessment model potentially adaptable or scaled-up to conduct comparative SDG2 specific data collection and analysis within CU or among other universities.

Our analysis addresses a well-known critique that many universities are organized according to siloed disciplines and fragmented knowledge production. We utilized sustainability science theory and a participatory assessment applied to agri-food systems to transcend siloes and encourage cross-campus cooperation. Our results suggest several disciplines or academic units were integrating SDGs and SDG2 in some teaching and research but some CU faculty were not familiar with specific SDG targets and indicators. The university committed to improving SDG awareness and implementation evidenced by new courses and research funding (Chulalongkorn University, 2020). Annual reporting for THE Impact rankings has been a catalyst for positive change and new learning. Nonetheless, CU still must improve capacities to understand, monitor/evaluate and implement all SDGs; identify curricular, research and practice gaps with response strategies; provide better data for academic planning; and facilitate SDG partnerships beyond mapping alone (building on SDSN Australia/Pacific, 2017, p. 3, *passim*).

Prior to CU participation in THE impact rankings the majority of university staff and faculty were not fully aware about SDGs. Some improvements followed THE reporting but sustainability progress at CU has been limited by constraints including limited SDG knowledge awareness, participation levels and cooperation, organizational structure and finance on campus. These appear common elsewhere (Evangelinos et al., 2009, p. 1155). Barriers to change have included some administrators, faculty or students not viewing SDGs as a priority for research or teaching. A few representatives at our SDG2 workshop expressed this. CU is also a large comprehensive mostly urban university, rather than a mandated, specialized rural agriculture university. This means that Administration priorities, disciplinary boundaries and competing interests for attention and funding may institutionally limit SDG2 awareness and study. Resistance is also common requiring long-term perspectives and investments facilitating changes to academic culture, capacities and structures (Lozano, 2006). With respect to CU specifically the university also does not (yet) have a clear common policy or platform on sustainability integration or to systematically collect all SDG-related data.

Principal lesson-learned arising from our study are:

- Administration leadership with a comprehensible SDG implementation plan is required to incorporate sustainability across all university activities (Teaching, Research, Outreach).
- University ranking platforms can be catalysts for campus learning and change toward sustainability. However, data collection and reporting for rankings alone, may not be adequate to address all SDGs or deficiencies in targets and indicators.
- HEI partnerships to share lessons, knowledge and practices as well experiences regarding SDG transformation and practices can be useful.

With respect to future action recommendations at CU we suggest.

- A sustainability task force (currently planned) representing different faculties and disciplines/fields could help drive CU's sustainability strategy better integrating all SDGs into administration, physical infrastructure, campus environment, faculty/staff, research and teaching while supporting innovation and social/community sustainability.
- A distinct SDG data collection tool is still needed engaging diverse faculty and content experts to better document, organize and accelerate sustainability transformations with SDG implementation at CU and beyond. This should be based on additional indicators complementary to external THE Impact Ranking reporting.

With respect to SDG2 specifically (especially given its importance to Thailand's national economy, culture and environment) we suggest that CU.

- Include an integrated approach to SDG2 as priority linked to other SDGs in CU's new task force. Gather data on related projects/impacts while encouraging cross-cutting studies, teaching and community work on agri-food sustainability.
- Develop new projects and data collection tools to improve and expand indicators for SDG2 understandings and impacts beyond the narrow evaluation lens suggested by THE Ranking methodology alone or existing SDGs.

In sum our SDG2 focus at CU reinforces a broader regional effort at policy dialogue, collaborative study and HEI reforms for sustainable agri-food systems related policy, knowledge and practice across SEA (Nelles & Ferrand, 2021, pp. 3–4). Future work could facilitate new activities among other universities engaging larger cohorts of faculty, administrators, students and partners to collect comparable data while more critically assessing and teaching about SDGs especially comparing/contrasting SDG2 related work among multi-purpose and agriculture mandated universities. This could improve the quantity, specificity and quality of relevant data and research for HEIs, governments, the UN and regional agencies including but not limited to THE metrics. It could enhance community impacts and partnerships addressing agri-food system sustainability concerns to achieve SDG2 among others.

CU's latest sustainability report shows progress and promise advancing work on all SDGs (Chulalongkorn University, 2020 *passim*). Related campus dialogue, learning and research processes will continue. But we still need better understanding, critiques or implementation of SDGs not just for external academic reporting or university rankings. More robust indicators and critically reflective processes about SDGs, among HEIs are needed to facilitate long-term agri-food system sustainability transitioning, across Thailand, SEA and beyond building especially on agroecological principles and practices (e.g. note Chulalongkorn University, 2019; Nelles & Ferrand, 2021, pp. 3–4).

Moreover, whether any SDGs can facilitate global agri-food system transformations adequately is still moot. Some studies have rightly questioned conceptual, political and economic assumptions or vested interests in framing and adoption of SDG2 particularly (Sexsmith & McMichael, 2015; Evans and Musvipwa, 2017; Spann, 2017; Spangenberg, 2017, p. 319). Others have discussed the need to better understand, critique or improve targets and indicators (Gennari & Kalamvrezos, 2019; Gil et al., 2019; Sunderland et al., 2020). Meanwhile, serious gaps still exist in accessible country or global data of four critical SDG2 indicators including the very idea and operationalization of "agricultural sustainability" (related to SDG2.4.1) missing in one FAO assessment of SDGs, partly because governments have not collected or provided necessary data (FAO, 2019, pp. 3–4). HEIs must do more to address both SDG aspirational limitations and data gaps.

In conclusion, although our study contributes new data and analysis about SDG2, simply mapping SDG implementation in HEIs is necessary, but not sufficient. Critical multi-disciplinary research, teaching, community outreach, evaluation and evidence-based policy dialogue while prioritizing agroecological approaches in reforms should address contentious *2030 Agenda* issues and technical gaps in official targets and indicators. Many such issues implicating HEIs require follow-up study.

Appendix 1: CU-led activities and outputs contributing to SDG2 (and other SDGs), 2016–2020

Year	CU policy, project or activity	Main donor(s) or sponsor(s)	Main partners	Main outputs (cited references)
2016	IAU, <i>15th Gen Conf: Higher Education: A catalyst for innovative and sustainable societies</i> CU. 13–15 Nov	CU IAU	AIT SU SUT UNESCO	<i>Ann Report & Webpage</i> (IAU,)
2017	CU Announcement on “the Sustainable University” (30 Jan 2017) Project: Higher Education for Sustainable Agriculture and Food Systems in ASEAN ASEAN Extension Research Project (HESA theme) <i>CU Sustainability Report 2016–2017</i> : First Official commitment to SDGs	ALiSEA ASC CGN OHEC; SEARCA SIANI (SEI/Sida) Chula UNISEARCH, “ASEAN Cluster Fund”	CU President ASEAN SEARCA UNESCO CUSAR (with ALiSEA, ASC, UNESCO)	<i>Policy Commitment</i> (Inkarojrit, nd. 2018) <i>Technical Meeting Report</i> (CUSAR & SEARCA., 2018) <i>Report</i> : (CU, 2017) <i>Proceedings</i> : (Nelles, Ed., 2017) <i>Institutional Report</i> : (Inkarojrit, nd., 2018)
2018	Project: <i>ASEAN Way Forward for SDGs and COP21 through Social and Sustainability Sciences</i> Assessing Agrobiodiversity in SEA (highlighting SDGs) <i>CU Sustainability Report 2017–2018</i>	OHEC SIANI (SEI/Sida) ACB SEARCA CU	APAARI SEI SIANI UNESCO CU	<i>Conference Report</i> (CU, 2018) <i>Working Paper</i> (Nelles, 2018) <i>Institutional Report</i> : (Inkarojrit, 2019)

Year	CU policy, project or activity	Main donor(s) or sponsor(s)	Main partners	Main outputs (cited references)
2019	Project <i>ASEAN Way Forward (Phase 2)</i> Seminar: <i>Synergies—FAO Agroecology Initiative & Thai SEP to Achieve SDGs</i> UN Side Event: “ <i>Quality Education for Sustainable Agri-food Systems in SEA Univ</i> ” – <i>SDG4 & SDG2 Synergies</i> (Bangkok) Regional Workshop: “ <i>Scaling-up Agroecology in ASEAN HEIs to meet SDGs</i> ” (MJU Chiang Mai) SDG17 (Partnerships) Report THE SDG Impact Rankings Project: Study on SDG perceptions at CU	OHEC CU ALiSEA CU MJU OHEC CU ORA-CU	FAO UNESCO FAO NIDA UNESCO APAARI RIHED SEARCA UNESCAP UNESCO ALiSEA FAO MJU SEARCA UNESCO CUSAR and ENV5	<i>Three Policy Briefs</i> (discussion drafts) <i>Multimedia</i> . YouTube Video <i>Concept Note</i> –(UNESCAP, 2019) <i>Multimedia</i> YouTube Video <i>Workshop Report</i> (Chulalongkorn University, 2019) SDG17 Data (submitted to THE) <i>Questionnaire, Survey and Data Summary</i>
2020	Focus Group Workshop: <i>Evaluating Implementation of SDG2 at CU</i> Policy Brief Drafting <i>Chulalongkorn University Sustainability Report, 2018–20</i>	CU OHEC (initial funding); FAO editing CU	CUSAR and CSDS with 9 academic units	<i>Focus Group Data with Narrative Report</i> Nelles and Ferrand, (2021). <i>FAO-CU Policy Brief on ASEAN HEIs</i> CU (2020)

Appendix 2: Summary of main acronyms

ACB	ASEAN Centre for Biodiversity
ADB	Asian Development Bank
AIT	Asian Institute of Technology
ALiSEA	Agroecology Learning Alliance in Southeast Asia
APAARI	Asia-Pacific Association of Agricultural Research Institutions
ASC	ASEAN Studies Center
ASEAN	Association of Southeast Asian Nations
CGN	Chula Global Network
CSDS	Center for Social Development Studies (CSDS), Faculty of Political Science
CU	Chulalongkorn University
CUSAR	Chulalongkorn University School of Agricultural Resources
CUSRI	Chulalongkorn University Social Research Institute

DBot	Department of Botany
DFT	Department of Food Technology
ERI	Environmental Research Institute
ENVS	Department of Environmental Science, Faculty of Science
FAHS	Faculty of Allied Health Sciences - Halal Food
FAO	Food and Agriculture Organization of the United Nations
FVS	Faculty of Veterinary Science
HEIs	Higher education institutions
IAU	International Association of Universities
ISCN	International Sustainable Campus Network
MJU	Maejo University, Thailand
NESDP	National Economic and Social Development Plan
NIDA	National Institute of Development Administration, Thailand
ORA	Office of Research Affairs
OHEC	Office of the Higher Education Commission, Thailand
SEAMEO-RIHED	Southeast Asian Ministers of Education Organization-Regional Centre for Higher Education and Development,
SEAMEO-SEARCA	Regional Center for Graduate Study and Research in Agriculture
SEI	Stockholm Environment Institute
SIANI	Swedish International Agriculture Network Initiative
SU	Siam University
SEP	Sufficiency Economy Philosophy
SDGs	Sustainable Development Goals
SUN	Sustainable University Network, Thailand
SUT	Suranaree University of Technology
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization

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