Climate Smart Agriculture Initiative New Zealand

GLOBAL RESEARCH ALLIANCE ON AGRICULTURAL GREENHOUSE GASES

SEAMEO SEARCA

TRAINING ON QUALITY ASSURANCE FOR RESPIRATORY HEADBOX USERS IN THE SOUTHEAST ASIAN REGION

6-8 May 2025 | Royal University of Agriculture, Cambodia

COMPLETION REPORT

Training on Quality Assurance for Respiratory Headbox Users in the Southeast Asian Region

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This is the completion report of the training workshop held from 6-8 May 2025, at the Royal University of Agriculture in Phnom Penh, Cambodia.

This project was funded through the New Zealand Government's Climate Smart Agriculture Initiative as part of its contribution to the Global Research Alliance on Agricultural Greenhouse Gases (GRA).

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ACRONYMS

ASEAN – Association of Southeast Asian Nations

BRIN – National Research and Innovation Agency

CH_4 – Methane

CO_2 – Carbon Dioxide

DA-PCC at CSU – Department of Agriculture Philippine Carabao Center at Cagayan State University

GHG – Greenhouse Gas

GRA – Global Research Alliance

HB – Headbox

NZAGRC – New Zealand Agricultural Greenhouse Gas Research Centre

QA – Quality Assurance

RUA – Royal University of Agriculture

SEARCA – Southeast Asian Regional Center for Graduate Study and Research in Agriculture

SOP – Standard Operating Procedure

UPLB – University of the Philippines Los Baños

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EXECUTIVE SUMMARY

From 6-8 May 2025, the Royal University of Agriculture (RUA) in Phnom Penh, Cambodia, hosted a pivotal workshop titled **'Training in Quality Assurance for Respiratory Headbox Users in the Southeast Asian Region'**. The event was organized by the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), under the New Zealand–ASEAN Climate Smart Agriculture Initiative, in collaboration with the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC).

This workshop convened livestock greenhouse gas (GHG) researchers from across Southeast Asia —Cambodia, Indonesia, Lao PDR, the Philippines, Thailand, and Vietnam—with additional representation from Uganda. The key objective of the workshop was to co-develop a regionally adapted and scientifically robust Standard Operating Procedure (SOP) for headbox respiration systems, which are used to measure GHG emissions in ruminant livestock.

The workshop featured a combination of technical presentations, practical demonstrations, walkthroughs, expert interviews, and group discussions. These activities were designed not only to share expertise but also to document, refine, and

standardize best practices in headbox use. A notable aspect of the workshop was the real-time filming and commentary for the RUA headbox facility, providing visual and technical reference materials for future use.

Throughout the two and a half days training, both experienced researchers and beginners contributed to developing SOPs for four essential headbox topics: (1) design and construction, (2) airflow and safety, (3) animal training and handling, and (4) testing for gas recovery. The workshop concluded with a preliminary SOP draft, supporting instructional videos, and a plan for continuous improvement and dissemination across the region.

INTRODUCTION

Rationale

The accurate measurement of greenhouse gas (GHG) emissions from ruminant livestock has become an increasingly important area of research, particularly in Southeast Asia, where agriculture plays a vital role in economic and environmental sustainability. As discussions on climate-smart agricultural practices continue to grow, the need for standardized and regionally adapted methodologies to accurately quantify methane emissions has become more evident.

Respiratory headbox systems, valued for their cost efficiency and minimal specialized components beyond gas analyzers, have proven to be an effective tool in livestock GHG research. These systems are increasingly used to assess methane output from various regional diets and evaluate the effectiveness of mitigation strategies. However, while headbox technology itself is relatively simple, obtaining accurate and reliable emission measurements requires well-established quality assurance protocols and standardized operational procedures.

With more researchers having focused on livestock GHG measurement, it was crucial to capture the collective expertise of experienced professionals who had extensively used headboxes. The **Training on Quality Assurance for Respiratory Headbox Users in the Southeast Asian Region** workshop served as a platform for researchers to refine methodologies, consolidate best practices, and address operational challenges through collaborative discussions. More than just a training session, the workshop provided an opportunity to document expert knowledge, ensuring that future users have access to clear and well-informed guidance.

Additionally, newer researchers who participated in the workshop were encouraged to actively engage, ask relevant questions, and contribute insights that would help bridge knowledge gaps. By fostering an open exchange of experiences, the workshop aimed to enhance the effectiveness of headbox use in the Southeast Asian region and strengthen regional capacity for livestock emission measurement, ultimately supporting long-term sustainability in agricultural research.

Workshop Objectives and Expected Outcomes

This workshop supports the ASEAN Climate Smart Agriculture Initiative's mission of strengthening regional capacity and fostering collaboration in livestock greenhouse gas (GHG) research. The primary objective was **to collate and make available, current understanding of best methods for the use of headboxes in measurement of livestock measurement emissions.**

By the end of the workshop, the following outcomes were expected:

- Experts have contributed to the best possible advisory material on headbox use for ruminants;
- Beginners have contributed to materials development to make sure that the final outputs are clearly understandable to novice users; and
- Best practice guides were developed for four key headbox aspects.

Participants and Participating Countries

Twelve key researchers and early-career practitioners from Cambodia, Lao PDR, Thailand, Vietnam, Indonesia, the Philippines, and Uganda participated, along with trainers from the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC). Representatives from the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) and the Royal University of Agriculture (RUA) also attended.

WORKSHOP HIGHLIGHTS

Opening Program

Welcome Remarks

Assistant Professor Dr. Huon Thavrak, Vice Rector at Royal University of Agriculture (RUA), opened the training workshop and warmly welcomed all participants. He expressed his hope that the training on respiratory headboxes runs smoothly throughout its duration. He emphasized the importance of sharing knowledge and best practices to drive agricultural growth and sustainability while extending his gratitude to SEARCA and NZAGRC for organizing the event at RUA.

Dr. Roger Hegarty, GHG Measurement Leader of NZAGRC, acknowledged the value of dedicating time to contribute despite busy schedules. He thanked RUA for hosting and SEARCA for facilitating the training on short notice.

"There is less time in life to get things done than we used to have, so taking a few days to contribute is invaluable."

He acknowledged the diversity of experience in the room, ranging from seasoned experts to beginners in livestock greenhouse gas (GHG) research. The session is designed not as a traditional training but as an opportunity to harness collective expertise, ensuring that knowledge is properly documented for future reference. He emphasized the goal of enriching and refining the current draft on essential headbox procedures through meaningful discussions.

Dr. Nova Ramos, Head of SEARCA's Training for Development Unit of the Education, and Collective Learning Department, reminded participants to actively engage in discussions, share experiences, and collaborate so that the headbox system can be widely utilized across Southeast Asia and beyond.

"The keyword is to ENGAGE—"

Participant Introductions & Expertise

To foster engagement and collaboration, a round of introductions was conducted to allow participants who had not previously met to get acquainted before the workshop discussions.

Ms. Wanna Angthong, Ms. Thanamon Buranapawang, and Mr. Slamet Widodo were eager to contribute insights from Thailand and Indonesia, emphasizing application of headboxes in their own research and mitigation strategies. Mr.

Widodo mentioned that Indonesia has headboxes and GreenFeed systems for a long time (Indonesia), but they are still keen to learn more from other participants.

Dr. Viengsakoun Napasirth expressed enthusiasm about their newly built headbox under the NZ project and their scheduled GHG research initiatives. Coming from a circular economy background, he is honored to being able to conduct GHG research and looks forward to gaining insights applicable to their work in Lao PDR.

Dr. Prof. Nguyen Van Thu reflected on his long-term engagement in GHG research and the transition of headbox system management to his students, ensuring continuity in the field.

"We've had the headboxes for years. As I near retirement, my focus is on ensuring students take over the system and build upon our progress."

Dr. Prak Krea and **Dr. Samkol Pok** expressed appreciation for the opportunity to optimize headbox use in RUA though this collaborative effort.

Dr. Phoebe Lyndia Llantada shared working on research focused on large ruminant nutrition and gut microbiome, emphasizing her goal in this workshop, that is comparing the polytunnel system that they have in PCC versus headboxes.

Mr. Gerard Guadayo highlighted his past work in optimizing feeding systems for Filipino farmers and how it connects to his current involvement in international climate-smart agriculture research. Reflecting on the impact of this work with NZ, he shared,

"The past two years of GHG research have given new meaning to our careers. We're honored to contribute and eager to learn how we can improve our systems."

Speaking on behalf of his colleagues, he emphasized the growing relevance of GHG research and its role in shaping more sustainable agricultural practices for the region.

Dr. Tran Thi Bich Ngoc discussed her involvement in the livestock GHG inventory project in her country and her eagerness to engage more deeply with headbox systems.

"I've studied headboxes before but haven't used them yet. This workshop is an excellent opportunity to start engaging with the system."

Ms. Thalia Bacorro, who works alongside Mr. Guadayo on GHG inventory and mitigation research on cattle in the Philippines, expressed enthusiasm about learning and participating in discussions, while also taking pride in her role in documenting the discussions for SEARCA.

Dr. Sath Keo hopes to further advance GHG research in Cambodia after contributing to the design and construction of headboxes at RUA with NZAGRC. He mentioned not being an expert, but he hopes to help improve the systems collectively.

Dr. Constantine Katongole from Uganda has no prior experience in headbox measurements but plans to set up a system with the help of NZ, expressing high expectations from the knowledge gained in this workshop.

Mr. Stoix Pascua, Program Specialist at SEARCA's Training for Development Unit and one of the organizers of the workshop, also served as the emcee. He introduced himself alongside **Mr. Rithyphal Buntong,** who manages technical aspects, as well as **Ms. Kimkhech Heng** and **Mr. Buntoek Vong**, the communication officers responsible for photo and video documentation of the workshop.

SEARCA's Role & Future Collaborations

Dr. Ramos outlined SEARCA's Training for Development Unit (T4DU) programs, which focus on leadership development, education, collective learning, and emerging innovations for growth. While SEARCA does not directly work on headboxes, it plays an active role in supporting agricultural development and collaboration. Interested individuals were encouraged to visit SEARCA's website for updates and potential partnerships.

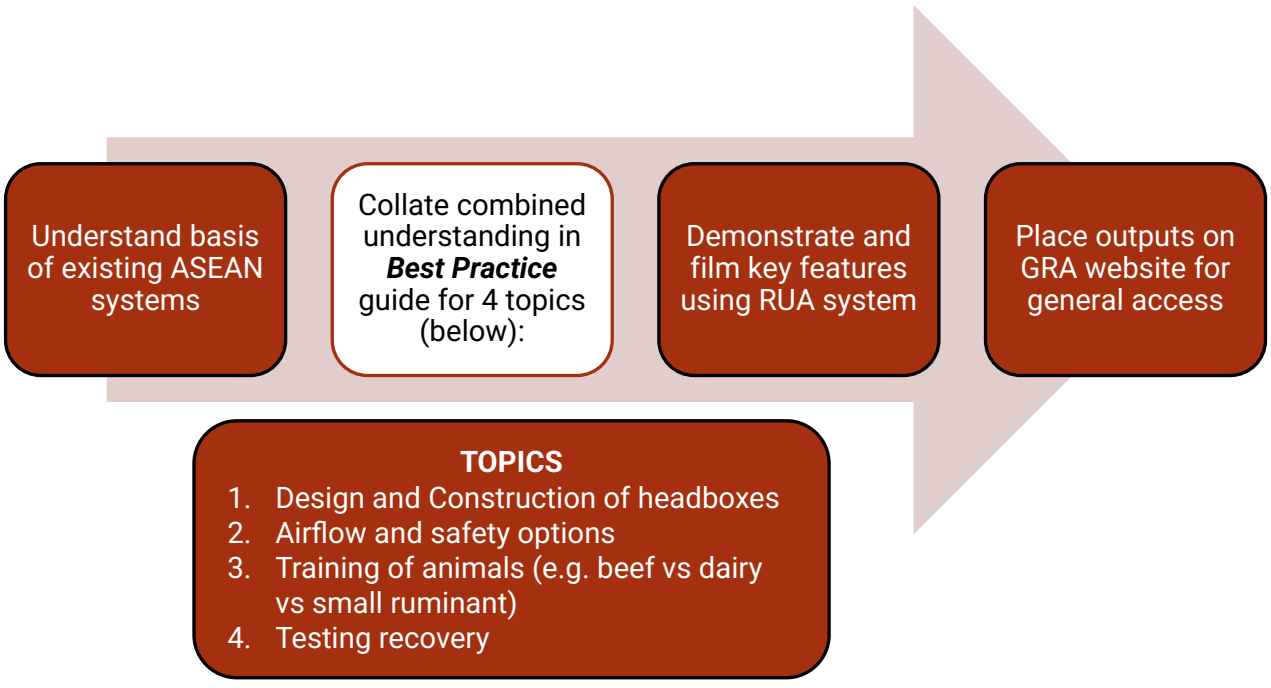
Training Sessions and Activities

Dr. Roger Hegarty reaffirmed the session's purpose: **capturing best practices, refining headbox SOPs, and fostering meaningful exchanges between experienced researchers and newcomers.** With contributions from experts and beginners alike, the goal is to ensure a well-rounded understanding of headbox systems and create valuable reference materials.

Pre-training Task

Each participant who has prior experience and responsibility for a headbox system were expected to bring a pre-prepared dossier on their own system to be presented and to be added as part of the package on a website afterwards.

Overview of the Activities



Day 1

Laying the Foundation for Headbox SOPs

Identifying the Key Standard Operating Procedures (SOP)

- Overview of Regional Headbox Systems
- Visit to the Headboxes at the Royal University of Agriculture

Group discussions of the four key topics

- Design and Construction of the Headboxes
- Airflow and Safety Options
- Training of Animals (e.g., beef vs dairy vs small ruminant)
- Testing recovery (gravimetric CO_2, mass flow meter x pure CH_4)

The goal of creating a helpful guide on how to build a headbox, control airflow, train animals to use the system, and most importantly, test gas recovery can be achieved by observing how each participating country implements these processes. The broader plan after this workshop was to establish a community of headbox users across Asia who can support one another, and hopefully expand to other regions, such as Africa.

Headbox systems can operate in two ways—multiple subsample analysis, where analyzers provide multiple measurements that are averaged to determine total methane production (as seen in Khon Kaen, Can Tho, Bogor, and the Philippines), and single sample analysis, which uses Tedlar bags (a method commonly applied in Phnom Penh and Lao PDR). After hundreds of trials, the difference between results obtained through the two measurement pathways was found to be consistently within 2 percent.

Discussions on the regional headbox systems began with experts presenting slides that explained how their respiratory headbox systems function. They briefly described the structure of their headboxes and shared useful tips on how they set up and operate them effectively.

Ms. Thanamon Buranapawang (left) and Ms. Wanna Angthong (right) co-presented on the headbox system used in Thailand, which features an open-circuit, ventilated hood-type design. One notable adaptation in the Thailand system is their three-phase filter, which includes the use of stockings as a dust filter.

Mr. Slamet Widodo (left) presented information on Indonesia's headboxes, which operates using the Sable System to analyze methane, carbon dioxide, oxygen, and

water vapor. Their system consists of four controlled sealed chambers for large, and four chambers for small ruminants. Data processing is streamlined using ExpeData Software for calculations.

Mr. Gerard Guadayo (right) shared insights on the headbox facility design at UPLB, which was patterned to the one in Can Tho University. Several modifications have been made, including insulation and the addition of individual fans and dehumidifier in each chamber to combat high humidity in the Philippines.

It is also worth mentioning that both Indonesia and the Philippines utilize methane in gas recovery tests with a mass flow controller, as opposed to the manual carbon dioxide recovery test used in RUA.

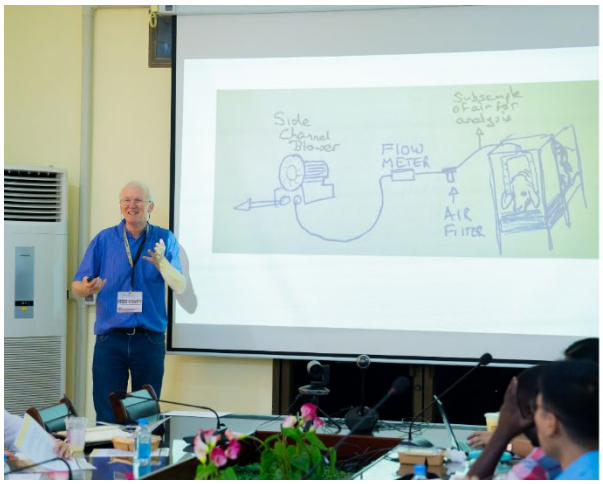
Aligned with most expectations, most researchers already had their own set of guides for operating their systems, and it is this workshop's goal to bring everyone's knowledge together.

To introduce the headbox facility at the Royal University of Agriculture, participants briefly visited the site and received an overview of how RUA's portable analyzer functions within their headbox system. Tedlar bags are used to collect gas samples from each animal over a 23-hour period, with the single bulked sample then analyzed.

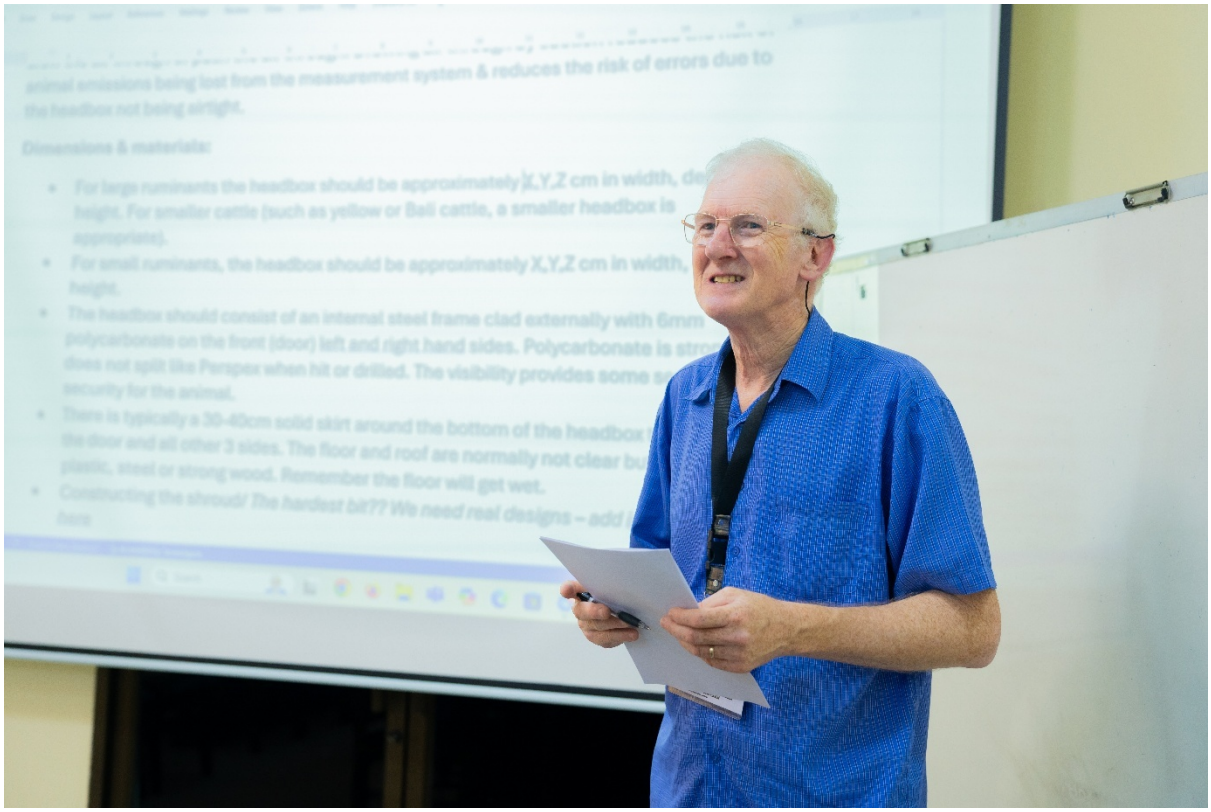
Participants were also shown the safety doors installed in RUA headboxes, which open automatically in the event of power failure or high levels of CO_2 accumulation. This feature addresses a principal animal welfare concern related to confining animals in headboxes.

The most important part of the workshop was drafting a clear and detailed set of standard operating procedures (SOP) spanning at least 20 pages, ensuring consensus among all participants. Another key focus was organizing these data and information in a way that facilitates easy replication by future headbox users.

It was also mentioned that New Zealand researchers developed Excel sheets to assist with calculations, which could be beneficial for others in the group.



With everyone's help and valuable suggestions for improvement, the presenters and trainers collectively summarized the main ideas, shared a vision for how the system could be enhanced, and highlighted key best practices. The rough draft was distributed to all participants for review, ensuring that the revision discussions scheduled for the following days would proceed smoothly.



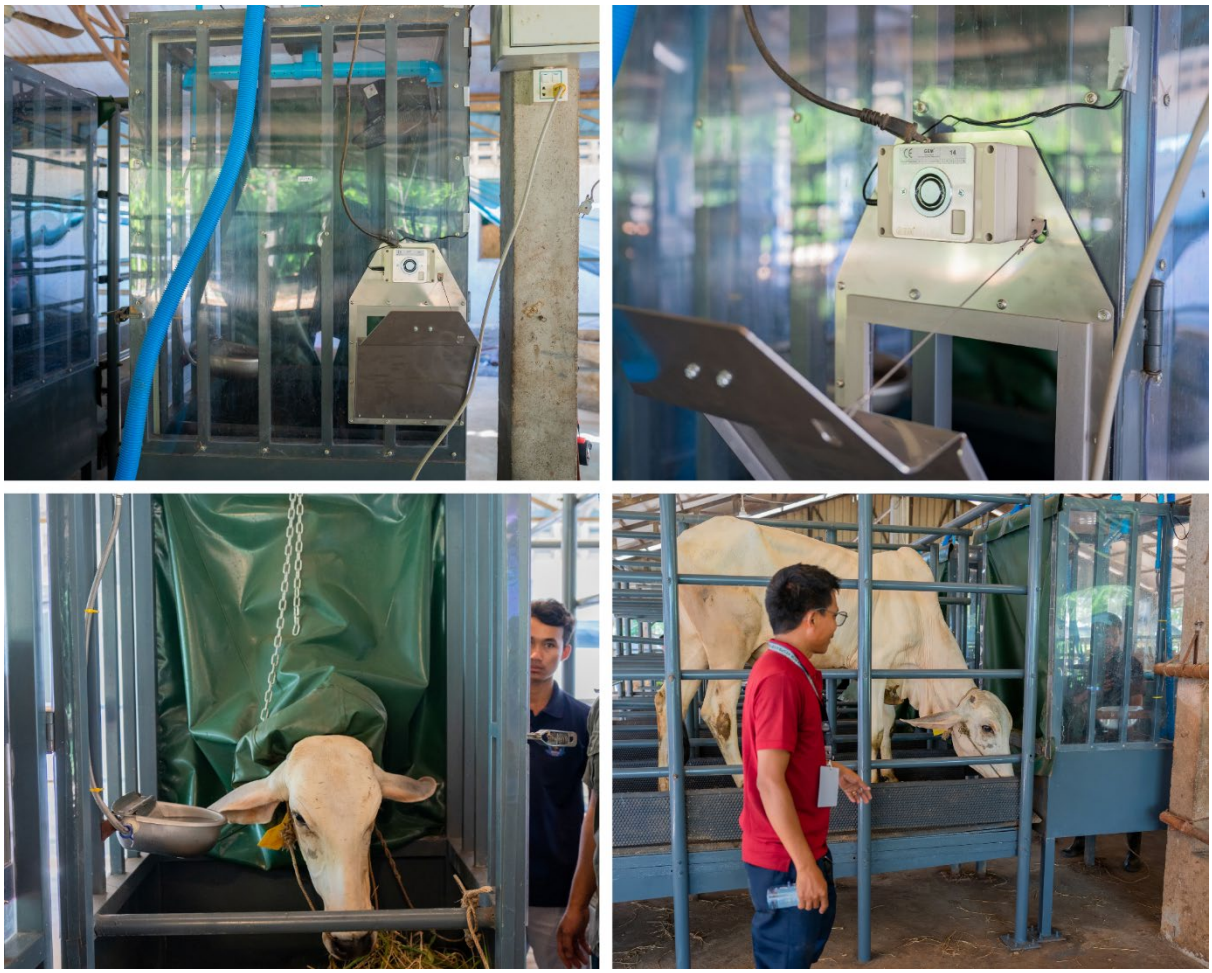
Day 2

Refining and Documenting Best Practices

Completing Outstanding SOP Development; Revisions

Visit to the RUA Animal Facility

- Filming Key Operations to Support each SOP
- Refining SOP on-site to record the processes



In photos: The RUA Headbox Facility, Phnom Penh, Cambodia

It is also the workshop's objective to document the standard operating procedures (SOPs) for the use and operation of headboxes at the Royal University of Agriculture (RUA). Dr. Roger Hegarty and Dr. Sath Keo led the discussions, beginning with a guided walkthrough of the headbox facility.

Key points in filming the RUA Headbox Facility included the development of detailed guidelines for the construction and operation of headbox equipment. During this session, experts provided on-site commentary while being filmed. Dr. Hegarty and Dr. Keo explained how the headboxes operate, while other experts offered input as the process was recorded. The aim was to capture visual documentation of the equipment in use, along with expert perspectives that would later be referenced during the development of formal procedures.

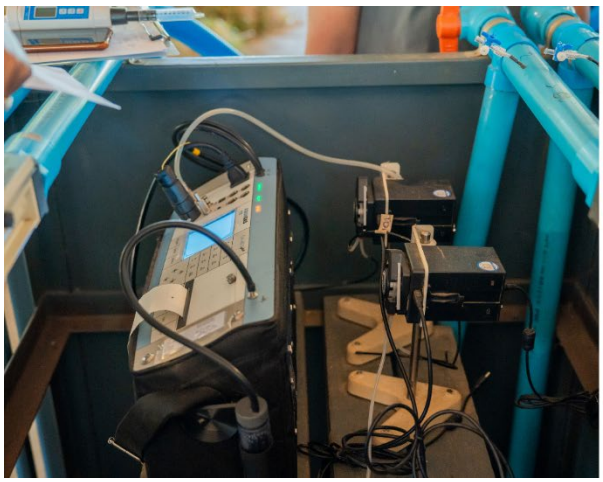

Particular emphasis was placed on the importance of clean air output through effective filtration systems and the inclusion of animal welfare considerations throughout the design.



The filming went by, focusing on the facility's infrastructure, airflow systems, and component functionality—such as the feed area, water dish, safety doors, and airtight design features.

Experts discussed the relationship between airflow and equipment performance, animal handling protocols, and the importance of recovery testing to ensure accuracy and consistency.

The workshop also addressed operational aspects of the measurement system. The headboxes are equipped with electromagnetic safety doors, exhaust fans, and an airflow meter to monitor and regulate flow. A valve is used to control the gas flow rate, and samples are collected via a peristaltic pump and stored in Tedlar bags for analysis after a set duration, typically 23 hours. To ensure accurate measurements, temperature and pressure are monitored multiple times and corrected for during sample evaluation. Background air samples are also collected for comparison, and experts discussed the merits of single bulk sample collection versus multiple sampling outputs—finding less than a 2 percent variation between methods.



Animal welfare remained a central focus. Strategies to minimize animal stress during procedures included leaving the headbox doors open during acclimation, allowing longer adaptation periods, and maintaining a calm environment. Experts recommended environmental enhancements such as proper ventilation, humidifiers, and enclosures sized appropriately for animal comfort. Ethical approval procedures and adherence to established handling protocols were emphasized as essential foundations for credible research and future publication.

Experts from Vietnam, Thailand, Indonesia, and the Philippines contributed their observations and suggestions guided by their own experiences conducting GHG research. Their input addressed issues such as airflow regulation, humidity control, animal positioning (e.g., the ability to lie down), and design safety mechanisms. Concerns were raised about risks from sharp edges, overheating, and high humidity levels within the headboxes. In response, proposed solutions included using rounded corners, padding sharp surfaces, and improving air circulation using fans, pumps, and potentially misting or sprinkler systems.

One particular part of the filming session focused on documenting the gas recovery procedures used in RUA. Various methods exist for gas recovery, including using a propane torch to measure CO_2 production and oxygen consumption, or using a mass flow controller for precise gas release in cases involving methane gas.






The research team at RUA, led by Dr. Keo, carefully demonstrated their approach to gas recovery during experiments. This process involves weighing the carbon dioxide tank and its displacement and measuring the recovered gas.

With videos recorded to support the discussions, bringing people together and helping everyone improve their systems is within reach.

Following the site filming and expert commentary, participants regrouped in the conference room to discuss and refine the SOPs. The session included the final individual presentations by Dr. Viengsakoun Napasirth (left) on headboxes in Lao PDR and Dr. Nguyen Van Thu (right) on those in Vietnam, followed by group discussions aimed at identifying challenges, clarifying procedures, and incorporating feedback into the final documentation.

The participants were grouped into three, ensuring that each group included at least one beginner alongside experts who have conducted research on GHG measurements.


In photos: Dr. Constantine Katongole (right) with (L-R) Mr. Guadayo, Ms. Bacorro and Dr. Napasirth


In photos: Dr. Phoebe Lyndia Llantada (left) with (L-R) Dr. Thu, Ms. Buranapawang and Ms. Angthong


In photos: Dr. Tran Thi Bich Ngoc (right) with (L-R) Mr. Widodo, Dr. Kea and Dr. Keo

After the three beginners to the headbox systems shared their learnings from each group on the four topics, covering key information on headbox designs including flexibility, sustainability, and animal welfare; minor troubleshooting; their group discussions for improvement; and some helpful tips, the group proceeded with roundtable discussions on everything that had transpired.

Overall, the workshop successfully met its objectives by combining direct observations at the facility with collaborative discussions to produce a more robust, ethical, and practical set of SOPs. The input of multiple experts and the visual documentation of real-time equipment usage provide a strong foundation for ongoing improvements and future training related to headbox operations.

Day 3

Strengthening Knowledge & SOP Integration

Consolidate understandings as captured in SOPs

On the last day of the workshop, participants focused entirely on reviewing and refining the draft Standard Operating Procedures (SOP) for headbox use in the region. With active engagement, they worked collaboratively to consolidate key understandings and ensure the SOP reflected best practices in headbox use across the Southeast Asian region.



In addition to finalizing the SOP, participants were asked to complete a form providing a national livestock overview. This included details on key legislative and regulatory policies affecting the scaling of livestock production in their countries and its impact on greenhouse gas (GHG) emissions.

The form also gathered insights on existing investments in climate-smart livestock production, whether funded by national governments or supported by International Development and Cooperation partners.

With everyone's input on each of the four topics: (1) Design and construction of headboxes; (2) Airflow and safety options (3) Training of animals (e.g., beef vs dairy vs small ruminant); and (4) Testing recovery, the workshop reached its near completion. Participants were asked to submit a follow through on the detailed designs by each country, including headbox and shroud patterns, to be incorporated into the final SOP document.

To conclude the discussions, Mr. Widodo and Ms. Ngoc reflected on their experiences over the past few days of the workshop and outlined their actions moving forward.

During the closing ceremony, Assistant Professor Dr. Huon Thavrak, Dr. Roger Hegarty, and Dr. Nova Ramos each expressed their gratitude for everyone's participation and engagement throughout the workshop.

The day ended with participants receiving certificates of completion in recognition of their active participation in the training program.

In photos: Participants received their completion certificates during the last day of the training program.

KEY LEARNINGS AND CONTRIBUTIONS

Participants acquired and contributed to a substantial body of knowledge, including:

- **Technical proficiency** in headbox construction, gas recovery methods, airflow regulation, and safety features.
- **Enhanced awareness** of region-specific challenges such as high humidity, heat stress, and diverse livestock species behavior.
- **Practical innovations** from field experience, including environmental modifications (e.g., misting systems, dehumidifiers) and design improvements (e.g., safety doors, rounded edges).
- **Peer learning** through inter-country exchange of ideas, with beginners learning directly from veteran researchers.
- **Capacity building** for future headbox operators through collaborative SOP development and visual documentation.
- **Commitment to ethical practices**, particularly in animal handling, welfare, and the importance of ethical approvals in experimental protocols.

OUTPUTS AND NEXT STEPS

The workshop produced key deliverables that will serve as foundational resources for current and future users of headbox systems in Southeast Asia, in support of the ASEAN Climate Smart Agriculture for livestock. These include:

- Reference descriptions of the headbox systems in Thailand, Vietnam, Lao PDR, Cambodia, and the Philippines;
- Best practice guides (SOPs) for the four key headbox topics:
    - Design and construction of headboxes
    - Airflow and safety options
    - Training of animals (e.g. beef, dairy and small ruminant)
    - Testing gas recovery
- Instructional videos covering each of the four topics; and
- Excel calculations sheet for pooled sample systems

Each of these documents will be refined and finalized and then uploaded to the Global Research Alliance (GRA) and SEARCA websites. Peer feedback, regional pilot testing and potential SOP adoption by national research institutions are anticipated. This initiative also encourages the formation of a Southeast Asian headbox user community for long-term support, troubleshooting, and innovation.

CONCLUSION

This workshop significantly advanced the Southeast Asian community's capacity to conduct standardized and scientifically accurate livestock GHG measurements.

By combining regional knowledge, on-site demonstrations, and collaborative drafting, the event fostered a sense of a shared vision among participants for improving headbox methodologies.

The outputs from this training, spanning from SOP documents to video demonstrations, are poised to serve as living references that will evolve with ongoing feedback and innovation. More than a technical exercise, the workshop has laid the groundwork for a collaborative network of researchers dedicated to climate-smart livestock agriculture. In doing so, it supports both regional sustainability goals and global climate change mitigation efforts.

SUMMATIVE EVALUATION

Participants were invited to share their feedback for a summative evaluation of the training-workshop program. The following summary presents insights from the 11 participants who completed the evaluation form.

Program Evaluation

A. Time allotment

The majority of the respondents expressed **strong agreement** with the five statements related to time allotment. Seventy-three percent strongly felt that the training workshop provided enough flexibility for participants to effectively achieve the learning objectives. Additionally, 82 percent strongly agreed that there was sufficient time and opportunity for networking, discussions, lectures, and hands-on sessions. More than half (64%) strongly believed that the overall duration of the training program was sufficient.

While most participants found the schedule well-structured, some suggested additional time for finalizing and refining the SOPs, emphasizing the value of a thorough review to ensure all critical details are covered. Others mentioned the need to compare the different methods of measuring gas recoveries and working on excel sheet calculations. A respondent pointed out that the section review on HB construction could benefit from further emphasis, particularly in addressing differences between animals and objectives.

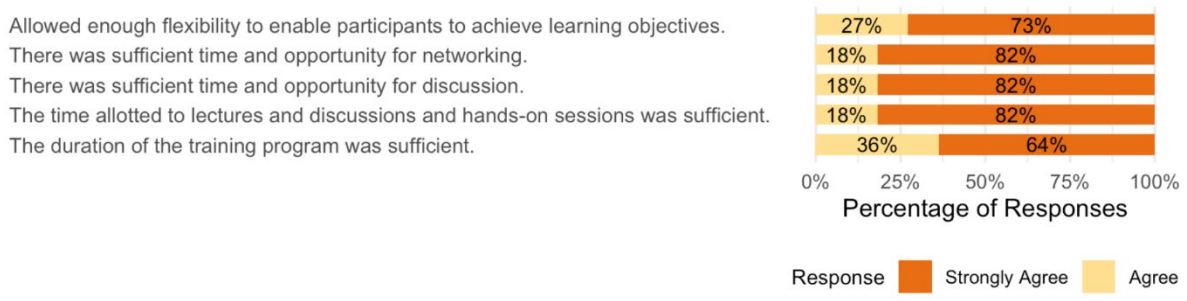


Figure 1. Responses to time allotment section

When asked about the duration of the training program, around 91 percent of respondents felt it was just right, while 9 percent believed it was too short. This indicates that the majority were satisfied with the allotted time.

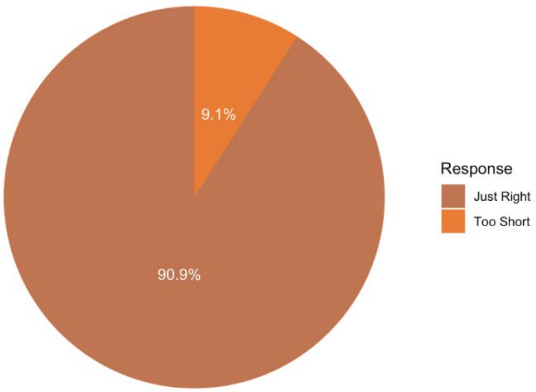


Figure 2. Responses to the duration of the training program

When asked if any sessions should receive less time or emphasis, respondents noted that all sessions are essential and should retain their current level of focus.

B. Contents/Topics

Similar to the time allotment section, the four statements regarding the training content received **strong agreement** from the respondents, with ratings ranging from 45 to 82 percent. However, unlike the previous responses, one participant noted that the information presented was not new to them, while another expressed uncertainty about its relevance to their current work situation.

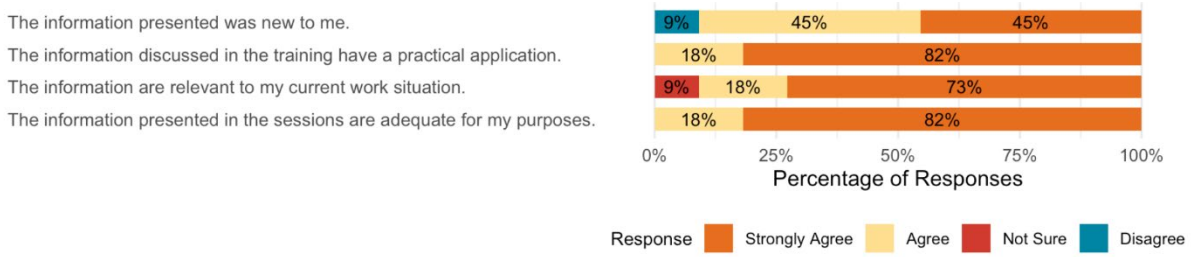


Figure 3. Responses to the contents/topics section

Meanwhile, the effectiveness of the lecture sessions was rated highly, with 91 percent of respondents giving it a 5, the highest rating. Hands-on sessions also received strong feedback, with 73 percent of participants rating it 5 and the remaining 27 percent rating it 4.

The responses on the overall quality of the training program showed similar results, with 82 percent of respondents rating it 5 and 18 percent giving it 4.

Participants also suggested incorporating additional topics into the training program, such as troubleshooting headboxes, experimental concepts and experimental designs. Respondents expressed interest in MS Excel calculation forms and the interpretation of gas analyzer readings.

Other recommended topics included more details on headbox filters, metabolism cage constructions, and detailed design lay-outs from the various attending institutions. While few had no additional suggestions, the overall feedback highlights a desire for more technical and practical applications.

C. Course Materials and Exercises

Seventy-three percent of respondents found the resource materials to be sufficient and relevant to the discussions and considered them useful for their work. The same percentage strongly agreed that the training exercises included were appropriate for the practical application of the skills and knowledge being taught. One respondent even mentioned the lasting value of the workshop, stating that its output will remain useful for years to come, particularly for researchers working with headbox chambers.

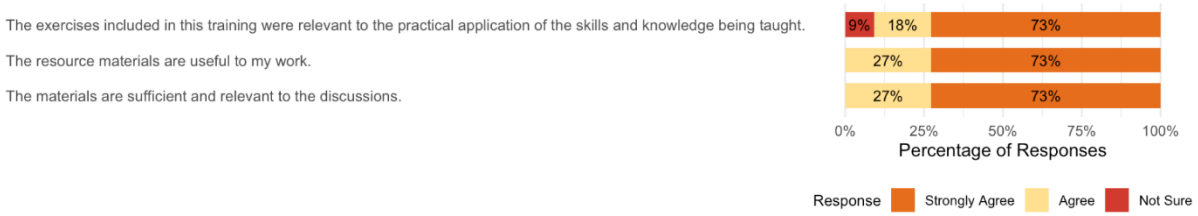


Figure 4. Responses to the course materials and exercises section

D. Administrative Arrangements

The administrative arrangements of the training program were rated high, with most respondents strongly agreeing that the technical setup, time management, and facilitation were efficient and well-handled. The venue, facilities, and overall organization also received positive feedback, though a few participants expressed uncertainty regarding some aspects. Overall, responses indicate that the logistics and management of the program were effectively executed.

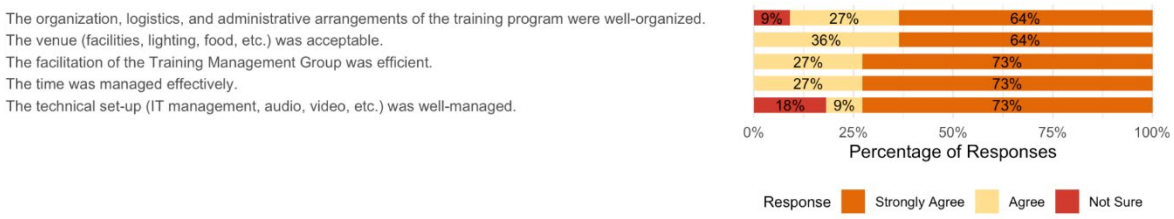


Figure 5. Responses to administrative arrangement

Trainer Evaluation

Participants gave the trainers high ratings across all evaluated areas, including knowledge and mastery of the subject matter, organization and planning, motivation and learning, and resource person-participant interaction. The feedback reflects strong appreciation for the trainers' expertise and effectiveness, with respondents expressing gratitude for their role in successfully facilitating the workshop.

A. Knowledge and Mastery of the Subject Matter

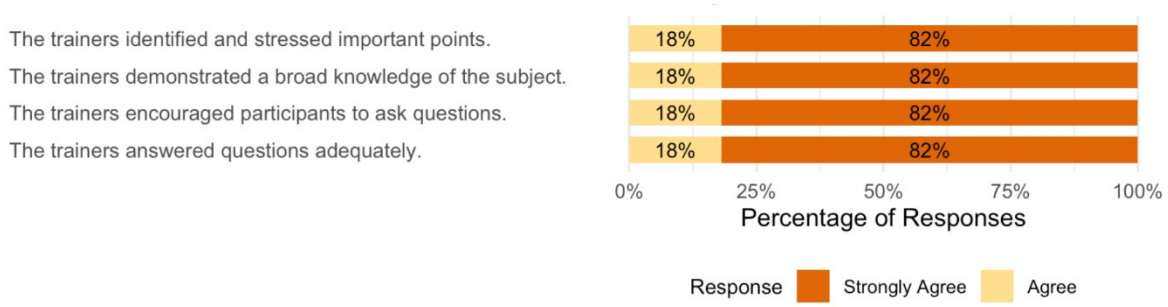


Figure 6. Responses on the knowledge and mastery of the subject matter of the trainers

B. Organization and Planning

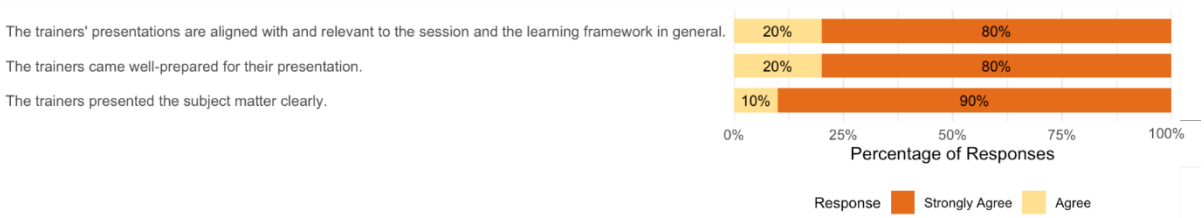


Figure 7. Responses on the organization and planning

C. Motivation and Learning

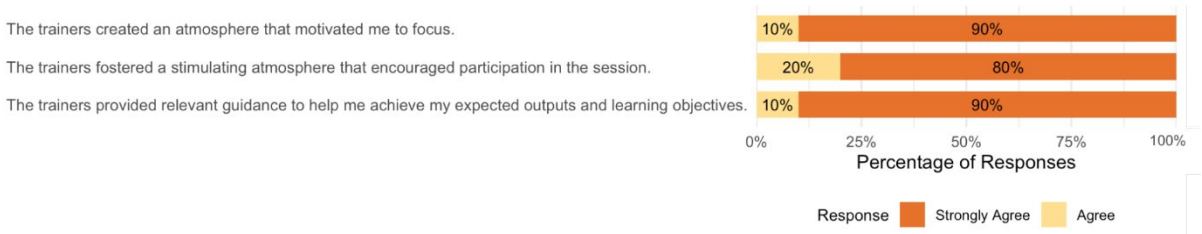


Figure 8. Responses on motivation and learning

D. Resource Person-Participant Interaction

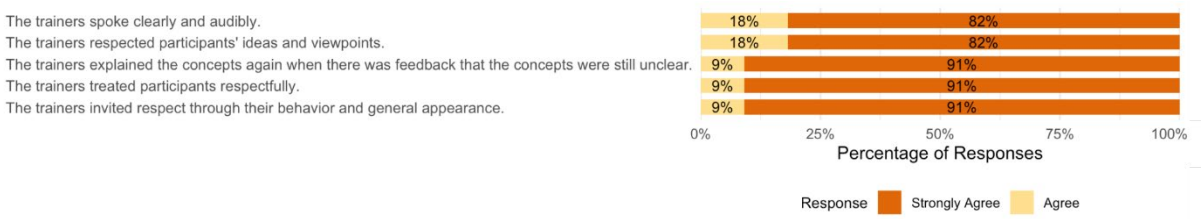


Figure 9. Responses to resource person-participant interaction

Learning and Takeaways

Participants highlighted key takeaways from the workshop, emphasizing the importance of headbox modification for both animal and researcher convenience, as well as the value of collaboration and knowledge exchange. Many expressed that their capacity to design, use, and optimize headboxes had significantly improved, enhancing their ability to measure greenhouse gas emissions effectively.

The workshop was widely described as excellent, collaborative, and highly informative, with participants appreciating the expertise shared and the real-world applications of the sessions. Some respondents suggested follow-up training on topics such as troubleshooting headboxes, interpreting emissions data, and refining calculations.

Nearly all participants would recommend the workshop to colleagues, researchers engaged in GHG projects, institutes, and new-generation staff, recognizing its long-term benefits. The overall rating was overwhelmingly positive, with the majority scoring it a 5, citing the workshop's well-structured, productive, and valuable content.

APPENDIX A

Trainer

Prof. Roger Hegarty
New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC)

A leading researcher in animal science and methane emissions, Prof. Hegarty's expertise spans ruminant nutrition, feed conversion efficiency, and methane production mitigation. His interdisciplinary work integrates themes like grazing, residual feed intake, methanogenesis, and fatty acid metabolism. With over 300 citations on his methane-related studies, his recent work includes a universal equation to predict methane production in forage-fed cattle and innovative methodologies to estimate daily methane emissions using short-term breath measures.

APPENDIX B

SEARCA Training Management Group

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Videographer/Photographer
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APPENDIX C

List of Participants

Dr. Sath Keo

Vice Dean
Royal University of Agriculture
Cambodia



Dr. Samkol Pok

NZAGRC Consultant in Phnom Penh
Royal University of Agriculture (RUA)
Cambodia



Dr. Prak Kea

Lecturer and Researcher
Faculty of Animal Science
Royal University of Agriculture (RUA)
Cambodia



Dr. Viengsakoun Napasirth

Associate Professor
Deputy Head, Livestock and Fisheries
National University of Laos
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Ms. Wanna Angthong

Scientist, Researcher
Bureau of Animal Nutrition Development
Department of Livestock Development
Thailand



Ms. Thanamon Buranapawang

Animal Husbandry Technical Officer
Bureau of Animal Nutrition Development
Department of Livestock Development
Thailand



Dr. Tran Thi Bich Ngoc

Senior Researcher and Associate Professor
Department of Animal Nutrition and Feed
National Institute of Animal Science
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Dr. Nguyen Van Thu

Head
Department of Research and International Affairs Relation,
Tay Do University
Vietnam



Dr. Constantine Katongole

Senior Lecturer
Department of Animal and Range Sciences
Makerere University
Uganda



Mr. Slamet Widodo

Junior Researcher
National Research and Innovation Agency (BRIN)
Indonesia



Dr. Phoebe Lyndia Llantada

Supervising Research Specialist
Department of Agriculture (DA) - Philippine Carabao Center (PCC) at Cagayan State University (CSU)
Philippines



Mr. Gerard Guadayo

University Researcher II
Dairy Training and Research Institute (DTRI),
College of Agriculture and Food Science (CAFS)
University of the Philippines Los Baños (UPLB)
Philippines



APPENDIX D

Program of Activities

Program of Activities

Date	Time	Activity
5 May 2025	Arrival at Phnom Penh International Airport Transport from the airport to Sun & Moon Riverside Hotel	
6 May 2025 (Day 1)	9:00 – 9:30 AM	Opening Program - Welcome Remarks - Workshop Overview - Introduction of the Participants and the Training Management Group
	9:30 – 12:00 NN	Identifying the Key Standard Operating Procedures (SOP)
		Overview of the Regional Headbox Systems *(Note: PowerPoint by national groups)*
		Visit to the Headboxes at the Royal University of Agriculture (RUA)
	12:00 – 1:00 PM	Lunch Break
	1:00 – 5:00 PM	Group Discussion of the Four Key Topics: - Design/Construction of the Headboxes - Airflow and Safety Options - Training of Animals (beef v dairy v small ruminant?) - Testing Recovery (gravimetric CO_2, mass flow meter x pure CH_4)
7 May 2025 (Day 2)	9:00 – 12:00 NN	Complete any Outstanding SOP Development
		Visit to RUA Animal Facility - Film Key Operations to Support each SOP - Refine SOP 'on-site' to Record the Processes
	12:00 – 1:00 PM	Lunch Break
	1:00 – 5:00 PM	Work through draft SOPs / Continue to Revise SOPs *(Note: On-screen and as a group)*
8 May 2025 (Day 3)	9:00 – 11:45 NN	Consolidate understandings as captured in SOPs *(Note: This is our last opportunity to make sure we have the best descriptions we can manage.)*
	11:45 – 12:00 NN	Closing Program
9 May 2025	Transport from Sun & Moon Riverside Hotel to the airport Departure at Phnom Penh International Airport	

APPENDIX E

PowerPoint Presentation

Headbox Heroes

Defining best practice for headbox use

Around the room:

- Name and institution
- Your main research focus
- GHG measurement capabilities
- Do you have headboxes or not?
- What would you like from this few days?

Program ~ learn from each other, not Roger

Understand basis of existing ASEAN systems → Collate our combined understanding in a "Best Practice" guide for 4 topics (below): → Demonstrate and film key features using RUA system → Place outputs on GRA website for general access

TOPICS

1. Design/Construction of headboxes
2. Airflow and safety options
3. Training of animals (beef v dairy v small ruminant?)
4. Testing gas recovery

Day 1:
AM-Introductions and introduction to their systems (Powerpoint from each organisation please)
- Identify the key SOPs we need to draft
- Visit RUA headboxes

PM-Participants will rotate through 4 sessions where all shall input into collating the content in each SOP for main procedures
- Design /construction of the headboxes
- Airflow and safety options
- Training of animals (beef v dairy v small ruminant?)
- Testing recovery (gravimetric CO2, mass flow meter x Pure CH4)

DAY 2
AM –
- Complete any outstanding SOP developments
- Go to RUA animal facility and film key operations to support each SOP & refine SOP 'on-site' to record the processes

PM - Work through draft SOPs on-screen, as a group & continue to revise

DAY 3
AM – Consolidate understandings as captured in SOPs
PM: – Workshop Close 1200 Midday

Expected Outputs

These will be the legacy documents from the workshop and from recent efforts in headbox development to support ASEAN Climate Smart Agriculture for livestock:

- Reference descriptions of headbox systems in Thailand, Vietnam, Laos, Cambodia, and the Philippines; and Indonesia
- Best practice guides (SOPs) for the four topics:
  - Design/Construction of headboxes
  - Airflow and safety options
  - Training of animals (beef, dairy, small ruminant)
  - Testing gas recovery
- Videos of each of the four topics; and
- Excel calculation sheets from 'pooled sample' systems.

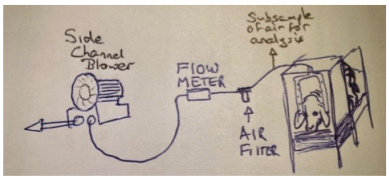
ASEAN Headbox Systems

Multiple subsamples analysed	Single bulked subsample analysed
• Khon Kaen (? analyser) • Can Tho (Horiba analyser) • Bogor/BRIN (Sable analyser) • Philippines (UPLB, Madur)	• Phnom Penh (RUA, Madur GA40) • Laos (NUoL) • S. Africa!

ASEAN Headbox Systems

Multiple subsamples analysed	Single sample analysed
• Khon Kaen (? analyses) • Can Tho (Horib • Bogor/BRIN (Sa • Philippines (UPLB,	(RUA, Madur GA40) (NUoL) • S. Africa!

Dr Constantine Katongole (Uganda)
Dr Phoebe Llantada (Philippines)
Dr Ngoc, (NIAS Vietnam)
'your very interested' students'



Best Practice Guides / SOPs

- Design /construction of the headboxes
- Airflow and sampling options
- Training of animals (beef v dairy v small ruminant?)
- Testing recovery (gravimetric CO_2, mass flow meter x Pure CH_4)

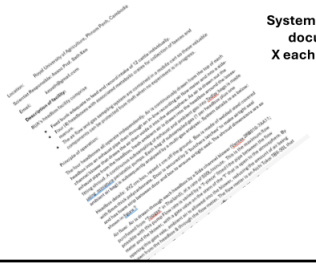
• ~ all too easy?

ISSUES:

- Optimum air flow rate?
- Humidity- How to manage?
- Do I need to allow for moisture content in the air..if so how?
- How to avoid animals going off feed in headbox?
- Is my design statistically strong enough?
- Do I need to allow for flatus in daily emission?
- Confidence in gas recovery checks?
- Managing feed intake and recording
- Temperature and pressure.

The RUA headbox system

- Dr Sath Keo, RUA
- 4 headboxes + metabolism cages
- Single bulked gas sample/headbox/d + bulked ambient gas sample
- Gas recovery test using sort-term, direct, gravimetric CO2 infusion



System overview document
X each location

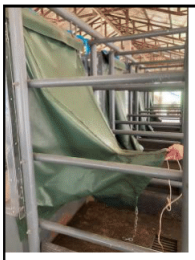
Individual Feed Intake
We **ABSOLUTELY** need to know the daily DM intake of cattle on the day of and on the days leading up to CH4 measurement

- 4 headbox shells with all delicate components removable
- Polycarbonate top and 3 sides

"Portable" analysis trolley, contains:

- 4 ring blowers
- 4 turbine air flow meters
- 4 gas sampling pumps (& one outside of trolley)
- Lockable doors and lid to secure all equipment
- Flexible 'swimming pool' hoses to connect to headboxes

- 4 Metabolism crates
- Heavy duty rubber flooring with drain holes for urine
- Sloping floor under crate to drain urine into collection bucket



- Four heavy plastic shrouds with rope tightener

Madur GA40T+ stack gas analyser

Volunteers to talk about their system?

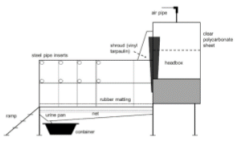
Enhancement of Greenhouse Gas Inventory and Mitigation for Large Ruminants in the Philippines

Project Duration: March 15, 2023 to May 31, 2025

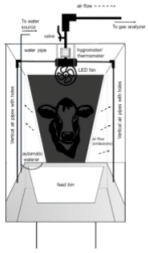
Funding Agency: Ministry of Foreign Affairs and Trade (MFAT) and Ministry of Primary Industry (MPI) through NZAGRC of AgResearch

UPLB-CAFS Headbox Respiration Facility

Design of the Facility



(1) Metabolism stalls with headbox, sideview



Reference designs:

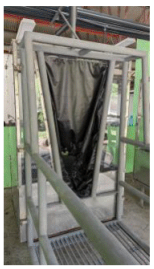
Can Tho University

Ortega et al., 2020

Design of the Facility

Design of the Facility

Design of the Facility



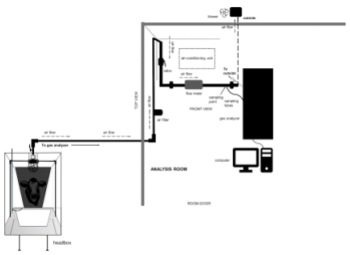
Design of the Facility


Design of the Facility


Design of the Facility


Design of the Facility









CH_4 and CO_2 detectors

- Uses NDIR (Non- dispersive Infra-red)
  - CH_4 – 1ppm resolution
  - CO_2 – 0.01% resolution


Troubleshooting/testing the accuracy of measurements

RECOVERY TEST

- Verifying the accuracy and efficiency of the gas collection and measurement system
- Involves injecting a known amount of methane into the headbox

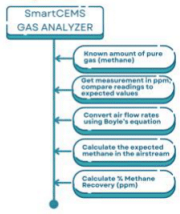
Recovery test

CH_4 is infused at a rate of 30 Ncc/min, and then the concentration is measured using the analyzer to compare against the expected value.


Recovery test



Recovery Test



Boyle's Equation

$$P_1V_1 = P_2V_2$$

where:

V_1 = flow rate set at the mass flow controller, $_{mL/min}$
P_1 = Normalized pressure value
T_1 = Normalized temperature value

V_2 = flow rate set at STP
P_2 = Standard pressure value
T_2 = Standard temperature value

$$\text{flow rate at STP} = V_{2,\,mL/min} = \frac{P_1V_1T_2}{T_1P_2}$$

$$\text{Expected } CH_4 \text{ airstream} = \frac{\text{rate of release of the gas}}{\text{airflow rate at STP}}$$

$$\%\ CH_4 \text{ Recovery} = \frac{\text{methane (ppm) recorded}}{\text{expected } CH_4 \text{ (ppm) in the airstream}}$$

Expected CH4 in air stream @ STP, ppm	CH4 reading at analyzer, ppm	Ambient CH4 reading at analyzer, ppm	Net CH4 increase over ambient, ppm	**Recovery rate, %**
69.45	80.81	2.43	78.38	**112.87**
68.95	81.34	2.26	79.08	**114.69**
69.28	83.55	4.59	78.96	**113.97**
65.76	78.84	6.13	72.71	**110.56**

Adaptation phase (14 days)

- **Dietary Adjustment:** Cattle gradually transition to the experimental diet until they are fully consuming it:

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15	Day 16	Day 17	Day 18	Day 19	Day 20
25%	25%	50%	50%	75%	75%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

- **Adaptation:** Allows enough time for cattle to adjust to the diet, stabilizing their digestion and methane production.
- **Consistency:** Ensures that the methane emissions measured reflect the stable feeding regimen

Treatments for Experiment 1:

The top 4 diets being used by dairy farmers in the Philippines. Based on a study conducted by Loresco *et al.* (not yet published) in 2022 – 2023.

INGREDIENT	TRT 1	TRT 2	TRT 3	TRT 4
Napier grass	70	40	15	35
Corn silage	0	30	15	25
Commercial concentrates	30	30	30	30
Rice straw	0	0	30	0
Soya pulp	0	0	10	0
Spent grains	0	0	0	10
Total	100	100	100	100

Measurement Phase (7 days)

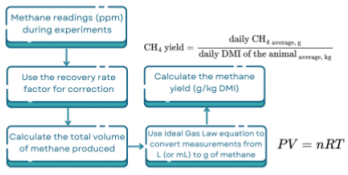
Days 1-7:

- Collect feed, fecal, and urine samples for calorimetry and digestibility measurements
- Record daily dry matter intake

Days 5-7:

- Measure methane emissions with headbox closed and side-channel blowers running

Methane measurements conversion



$$CH_4 \text{ yield} = \frac{\text{daily } CH_{4\ \text{average, g}}}{\text{daily DMI of the animal}_{\text{average, kg}}}$$

$$PV = nRT$$

$$CH_{4\ \text{Total Volume}} = CH_{4\ \text{average, ppm}} \times \text{airflow rate}_{\text{average, mL/min}} \times \text{total duration}_{\text{min}}$$

Important reminders

- Make sure the cow's daily dry matter feed intake is consistent
- Monitor humidity and temperature inside the box
- Monitor if air-flow is consistent

Climate Smart Agriculture Initiative New Zealand

NEW ZEALAND AGRICULTURAL GREENHOUSE GAS Research Centre

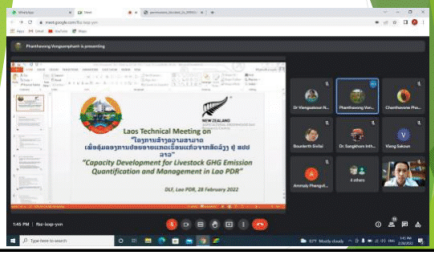
Respiratory Headbox Chamber and Metabolic Crates System for Cattle in Laos

by:

Assoc.Prof.Dr. Viengsakoun Napasirth

Livestock and Fisheries Department,
Faculty of Agriculture, National University of Laos

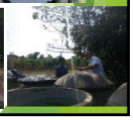
Laos Technical Meeting on 28 February 2022



Project activities

On 23/1/2023

Project team surveyed and evaluation probability for GHG Cattle experiment in at FAG, NUOL.



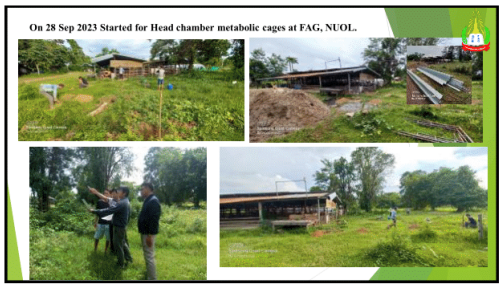
On 14/6/2023 Project team selected place for experiment Cattle ages at FAG, NUOL

7 Month later, On 31/8/2023 Project Selected and designed construction head box chamber - metabolic crates for Cattle

On 5-8 Sep 2023 Cattle GHG training at Can Tho University, Vietnam. (Cambodia, Philippines and Laos)

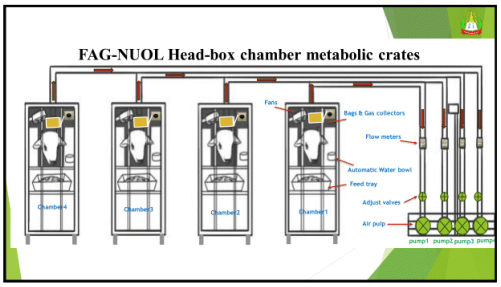
On 26-28 Sep 2023, Inception workshop on Livestock GHG Inventory Project

On 28 Sep 2023 Started for Head chamber metabolic cages at FAG, NUOL.



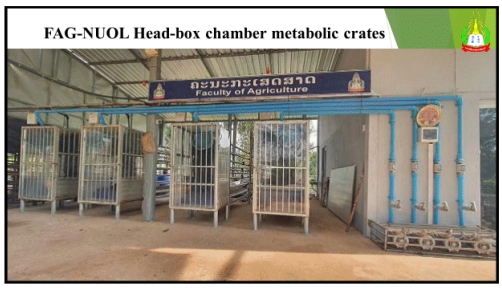
On 3 /11/ 2023 Follow and Discussing for Headbox Chamber design

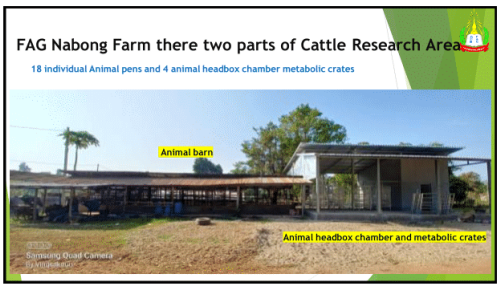
FAG-NUOL Head-box chamber metabolic crates




Samsung Quad Camera


On 30/11/2023 Prof. Roger and team Following and final checked and tested for exp

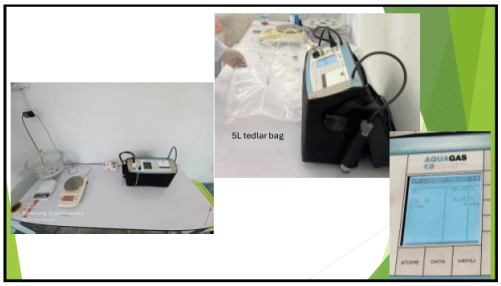

FAG-NUOL Head-box chamber metabolic crates
Faculty of Agriculture


FAG Nabong Farm there two parts of Cattle Research Area
18 individual Animal pens and 4 animal headbox chamber metabolic crates
Animal barn
Animal headbox chamber and metabolic crates
Samsung Quad Camera

18 individual Animal pens (1.5x3.5 m)

4 animal headbox chamber (0.8x0.9x110) and metabolic crates (0.8x2.5 m)


5L tedlar bag


5L tedlar bag
AQUAGAS


Research Out come


- Six gradated undergrad livestock students, FAG-NUOL in 2023-2024

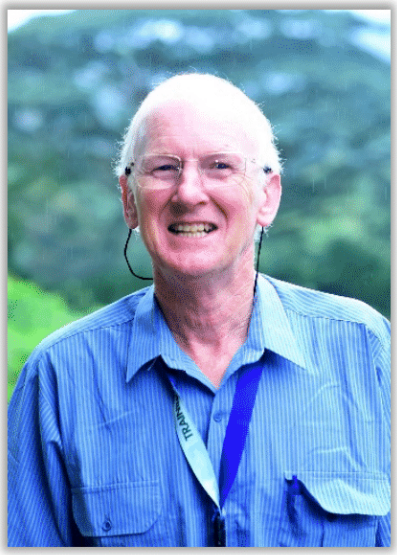

More than 500 Visiting quests, GHG-Cattle metabolic crates Farm, FAG-NUOL
- From High school, University, Farmers, Governments- Private sector and expert foreigners


Samsung Quad Camera
By Vingsakoun
ຂໍຂອບໃຈ
Thank you for your kind attention

APPENDIX F

Information Note

A Message from the Trainer



Dr. Roger Hegarty
New Zealand Agricultural Greenhouse Gas Research Centre
roger.hegarty@nzagrc.org.nz

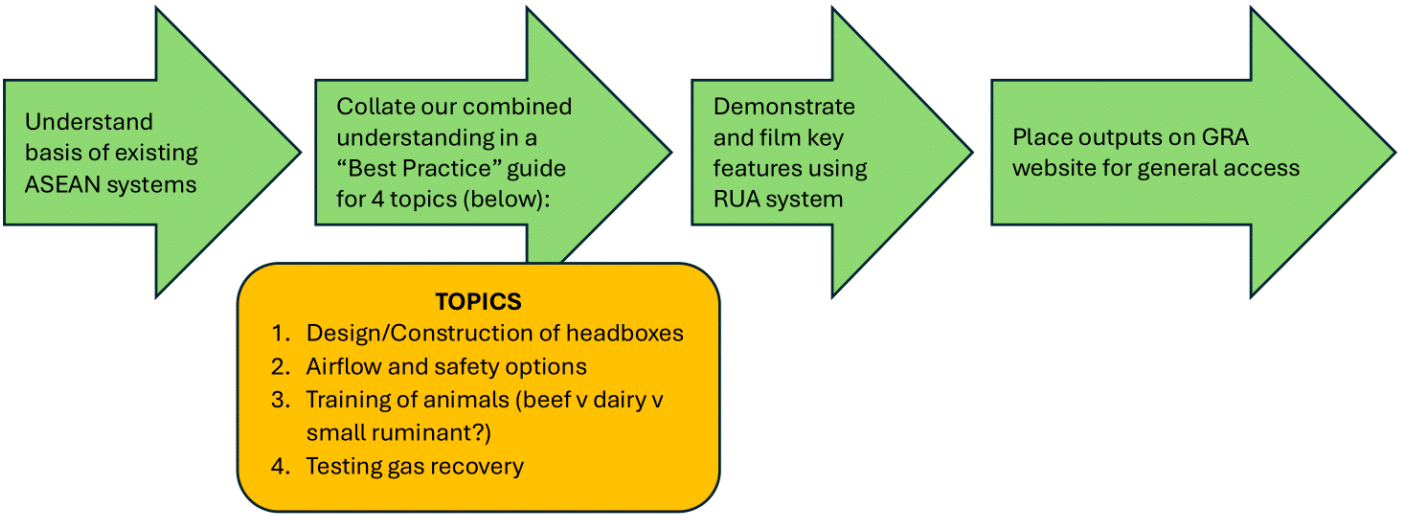
Dear Colleagues,

As you make final preparations for attendance, let me refresh our picture of the upcoming meeting.

The objective stays the same: *"To collate and make available, current understanding of best methods for the use of headboxes in measurement of livestock methane emissions."*

So, how are we to achieve this objective?

I anticipate it as a four-step process as shown below. The key to this is YOU. I will lead our discussions and program, but please remember that many of you are the experts and the aim is to capture. If you are one of the teams who has not used headboxes before, then your role is to make sure that the 'experts' explain everything clearly enough that you feel you fully understand. If something is unclear, then your job is to ASK.



Workshop Overview

A growing awareness of the contribution of Greenhouse Gas (GHG) emissions from ruminant livestock and the opportunity to link GHG management with improved animal productivity is increasing interest in livestock emission measurement in the ASEAN region. Headbox respiration systems are already widely used and are low cost, with minimum specialist components beyond a gas analyzer, with minimum maintenance costs.

Increasingly, they are being used to quantify the methane yield from regionally significant diets and to assess the efficacy of dietary mitigation strategies such as Leucaena, seaweeds, dietary oils, and concentrates.

While the headbox technology is not complex, the use of headboxes to get accurate and meaningful emissions estimates require appropriate quality assurance and operational procedures. As a new generation of livestock GHG researchers emerges, the Climate Smart Agriculture Initiative supported by the New Zealand Government would like to ensure these new users have access to the wisdom and experience of current researchers. For this reason, current regional headbox users were drawn together to discuss methods and develop Standard Operating Procedures (SOPs) for key aspects of headbox use, from training of animals to quantifying gas recoveries. It is not a training-workshop to teach new users, rather a workshop to collate the cumulative knowledge of experienced users. However, several new (potential) users are invited to gain understanding and to raise the queries that new users will have, and which experienced users should answer.

Objective

To collate and make available, current understanding of best methods for the use of headboxes in measurement of livestock methane emissions.

Pre-training Task

Each participant who has prior experience and responsibility for a headbox system will be expected to bring a pre-prepared dossier on their own system (photos and measurement in a template). These will be added as part of the package on a website afterwards. Each participant/group will present an overview of their system.

Expected Outcomes

- Experts have contributed to the best possible advisory material on headbox use for ruminants;
- Beginners have contributed to materials development to make sure that the final outputs are clearly understandable to novice users; and
- Best practice guides are developed for four key headbox aspects.

Expected Outputs

These will be the legacy documents from the workshop and from recent efforts in headbox development to support ASEAN Climate Smart Agriculture for livestock:

- Reference descriptions of headbox systems in Thailand, Vietnam, Laos, Cambodia, and the Philippines;
- Best practice guides (SOPs) for the four topics:
    - Design/Construction of headboxes
    - Airflow and safety options
    - Training of animals (beef, dairy, small ruminant)
    - Testing gas recovery
- Videos of each of the four topics; and
- Excel calculation sheets from 'pooled sample' systems.

Program of Activities

Date	Time	Activity
5 May 2025	Arrival at Phnom Penh International Airport Transport from the airport to Sun & Moon Riverside Hotel	
6 May 2025 (Day 1)	9:00 – 9:30 AM	Opening Program - Welcome Remarks - Workshop Overview - Introduction of the Participants and the Training Management Group
	9:30 – 12:00 NN	Identifying the Key Standard Operating Procedures (SOP)
		Overview of the Regional Headbox Systems *(Note: PowerPoint by national groups)*
		Visit to the Headboxes at the Royal University of Agriculture (RUA)
	12:00 – 1:00 PM	Lunch Break
	1:00 – 5:00 PM	Group Discussion of the Four Key Topics: - Design/Construction of the Headboxes - Airflow and Safety Options - Training of Animals (beef v dairy v small ruminant?) - Testing Recovery (gravimetric CO_2, mass flow meter x pure CH_4)
7 May 2025 (Day 2)	9:00 – 12:00 NN	Complete any Outstanding SOP Development
		Visit to RUA Animal Facility - Film Key Operations to Support each SOP - Refine SOP 'on-site' to Record the Processes
	12:00 – 1:00 PM	Lunch Break
	1:00 – 5:00 PM	Work through draft SOPs / Continue to Revise SOPs *(Note: On-screen and as a group)*
8 May 2025 (Day 3)	9:00 – 11:45 NN	Consolidate understandings as captured in SOPs *(Note: This is our last opportunity to make sure we have the best descriptions we can manage.)*
	11:45 – 12:00 NN	Closing Program
9 May 2025	Transport from Sun & Moon Riverside Hotel to the airport Departure at Phnom Penh International Airport	

Logistical Arrangements

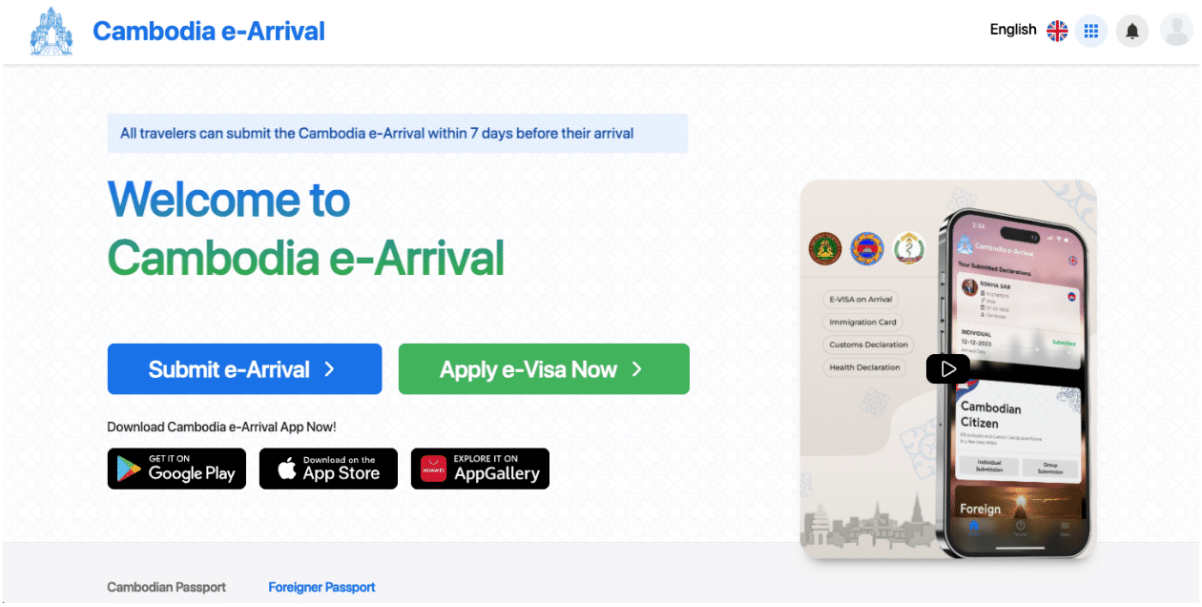
A. Before and Upon Arrival in Cambodia

1. e-Arrival System

Travelers heading to Cambodia are now required to complete an electronic arrival (e-Arrival) card before entering the country. This can be completed online 7 days before arriving in Cambodia.

The e-Arrival card and other forms can be accessed and submitted online through the official website (https://arrival.gov.kh/) or by downloading the Cambodia e-Arrival app, available on both the Apple App Store and Google Play Store.

Once you receive an email with the confirmation of your e-Arrival card, save it on your smartphone or make a printed copy. You may be asked to present it upon arrival in Cambodia.



2. Airport Transfer

Upon your arrival at the airport, please proceed to the arrival area just outside the exit doors. A driver from the Sun & Moon Riverside Hotel will be waiting for you in the arrival area, holding a signboard for easy identification.

After meeting you, the driver will take you to the Sun & Moon Riverside Hotel in Phnom Penh, where your accommodation have been arranged for the duration of the training. Please be advised that the travel time from the airport to your hotel is approximately 1 hour, depending on traffic conditions. If you require a restroom break during the journey, please feel free to inform the driver.

Name	ETA* in Phnom Penh (5 May 2025)	Driver	Vehicle
Dr. Viengsakoun Napasirth	1:00 PM	Mr. Sophat 086991686	Lexus 570 with Plate Number: SMR 003
Mr. Slamet Widodo	2:40 PM	Mr. Theareth 098336080	Toyota Granvia with Plate Number: SMR 001
Ms. Wanna Angthong	4:20 PM	Mr. Sophat 086991686	Lexus 570 with Plate Number: SMR 003
Dr. Tran Thi Bich Ngoc	4:45 PM		
Prof. Nguyen Van Thu	4:55 PM		
Ms. Thanamon Buranapawang	7:55 PM	Mr. David 011829246	Toyota Granvia with Plate Number: SMR 001
Dr. Constantine Katongole			
Dr. Phoebe Llantada			
Mr. Gerard Guadayo			
Ms. Thalia Bacorro	7:55 PM	Mr. Sat Davorn 0763097777	Alphard with Plate Number: AW 1223
Mr. Stoix Nebin Pascua			
Dr. Nova Ramos			

**Expected time of arrival*

B. During your Stay in Phnom Penh

1. Accommodation

We have arranged your accommodation at the Sun & Moon Riverside Hotel, from your arrival on 5 May up to your scheduled departure on 9 May. A single occupancy room is reserved for each participant. Upon arrival, please proceed to the reception desk in the lobby to receive your room assignment. The event organizers have covered your accommodation.

The Sun & Moon Riverside Hotel can be contacted through the following:

Telephone: +855 23 866 668
Email: smr-askme@sunandmoonhotelgroup.com
Address: Waterfront, Corner of Preah Monivong Bridge (93) & Preah Norodom Blvd. (41), Village 10, Sangkat Tonle Bassac, Khan Chamkarmon, Phnom Penh, Cambodia

2. Venue of the Training Program

The venue of the training program will be at the Royal University of Agriculture (RUA) in Phnom Penh. The Conference Room 1 beside the Rectorate Office will be used for presentations and discussions. Participants will also visit the RUA Animal Facility and the respiratory headbox project for the first and second day of the training (6-7 May).

3. Meals

Breakfast is included with your accommodation at the hotel on 6-9 May. Lunch will be provided at the training venue at RUA on 6-8 May. For your dinners on 6-8 May, we encourage you to explore and enjoy the diverse cuisine available near the hotel.

4. Daily Attire

For your convenience and comfort during the training program, please consider the following attire recommendations:

Indoor Sessions
Smart casual attire is recommended for the presentations and discussions, which will primarily be held in an air-conditioned training venue. Since the temperature may feel uncomfortably cold for some, you are encouraged to bring a light jacket, cardigan, or shawl.

Outdoor Activities
You may use comfortable clothes and rubber shoes during the visit to the RUA Animal Facility.

5. Getting Around

A shuttle service will be provided for participants each morning, departing from the Sun & Moon Riverside Hotel to RUA training venue at 8:00 AM. Please be at the hotel lobby during this time. In the afternoon, a shuttle will be available to return participants from the training venue to the hotel.

For personal travel during free time, participants may use public transportation. Please note that the shuttle service is exclusively for training-related travels.

C. Before Departure in Cambodia

1. Accommodation

Upon checkout on 9 May, please return your key cards to the hotel reception desk and settle any outstanding bills, if any.

2. Airport Transfer

A vehicle for airport transfers will be provided by the hotel based on your flight details. If you have alternative arrangements for your airport transfer, please inform us promptly so we can assist you accordingly.

Name	Pick-up Time at the Hotel (9 May 2025)	Driver	Vehicle
Ms. Thalia Bacorro Mr. Stoix Nebin Pascua Dr. Nova Ramos	5:00 AM	Mr. Sophat 086991686	Lexus 570 with Plate Number: SMR 003
Ms. Thanamon Buranapawang Dr. Constantine Katongole Dr. Phoebe Llantada Mr. Gerard Guadayo	5:00 AM	Mr. Theareth 098336080	Toyota Granvia with Plate Number: SMR 001
Dr. Tran Thi Bich Ngoc	7:30 AM	Mr. Theareth 098336080	Toyota Granvia with Plate Number: SMR 001
Prof. Nguyen Van Thu Mr. Slamet Widodo	9:00 AM	Mr. Sophat 086991686	Lexus 570 with Plate Number: SMR 003
Dr. Viengsakoun Napasirth	1:00 PM	Mr. Sophat 086991686	Toyota Granvia with Plate Number: SMR 001
Dr. Constantine Katongole	4:00 PM	Mr. Theareth 098336080	Toyota Granvia with Plate Number: SMR 001

Contact Us

The SEARCA Training Management Group may be contacted via email:

Dr. Nova Ramos – nea@searca.org
Mr. Stoix Nebin Pascua – snsp@searca.org
Ms. Rachelle Anne Mangaya – raem@searca.org

For urgent concerns, you may use the WhatsApp group specifically set up for this training. You may join the group by clicking this LINK or by scanning the QR code below: