ISA
innovation for sustainable agriculture

A Case Study:

COMMERCIALIZING REGENERATIVE AGRICULTURE IMPLEMENTS THROUGH THE LOCAL WORKSHOPS IN CAMBODIA

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

HAPPEL FOUNDATION

swisscontact

CONTENTS

PREFACE

Executive Summary

This case study on Commercializing Regenerative Agriculture Implements through the Local Workshops in Cambodia, was developed to highlight the vision, activities, and finally, the results of the Innovation for Sustainable Agriculture (ISA) project's work with Noeurn Workshop. The activities with Noeurn started with the Mekong Inclusive Growth and Innovation Programme (MIGIP), the predecessor to the current ISA project.

The vision to commercialize regenerative agriculture implements was developed as a part of the ISA project. As a part of that vision, the partnership with Noeurn evolved over the course, and the idea to test the commercialization of regenerative agriculture implements through local workshops was born. Therefore, the ISA project supported Noeurn's brand development to enable the local workshop to commercialize its products and expand to other provinces.

ISA's collaboration with Noeurn presented a valuable learning experience. Although the initial vision of expanding Noeurn to other provinces was not realized, the intervention proved successful in enhancing Noeurn Workshop's brand recognition within their local region. Furthermore, the workshop effectively expanded its business operations within the province, resulting in increased staff recruitment and the provision of customized regenerative agriculture implements for smallholder farmers in the area.

Nevertheless, the project encountered both external and internal limitations and challenges, leading to the realization that local workshops tend to remain local, with only a select few capable of breaking through to larger markets. The widespread dissemination of products developed by local workshops is hindered due to their localized nature. Despite this, local workshops serve a crucial role that larger corporate machinery providers cannot fulfill, offering context-specific and affordable solutions to smallholder farmers and service providers.

The intervention with the Noeurn workshop concluded in 2022.

THE CONTEXT

Cambodia's agriculture sector is one of the key engines of economic growth and poverty reduction in the country. In recent decades, however, agricultural intensification has destroyed of its natural assets, resulting in soil degradation. Farmers increasingly face low and declining productivity and income. The Cambodian agriculture sector needs to shift from vast production through land expansion and excessive use of inputs towards Conservation Agriculture, Sustainable Intensification and Regenerative Agricultural practices.

The development of regenerative agriculture in Cambodia has benefited from the technical and financial support from various development projects and programs with institutional support and commitment from the RGC through the MAFF (Ministry of Agriculture, Forestry and Fisheries) since the commencement of the design and testing of CA-based cropping in different agroecological systems in Cambodia in 2004. Over the years, regenerative agriculture has moved from the domain of research to commercialization. The provision of CA/SI implements, and technologies started in 2013. However, for a sustainable change to occur in farming systems, private sector engagement was crucial. Therefore, from 2018 to 2020, the Mekong Inclusive Growth and Innovation Programme (MIGIP) the Phase 1 of the current Innovation for Sustainable Agriculture project and Conservation Agriculture Service with a Fee (CASF) project supported in private sector engagement. Finally in 2021, regenerative agriculture was also included in the domain of policy dialogue and extension services through initiatives such as Conservation Agriculture and Sustainable Intensification Consortium (CASIC) and MetKasekor. All these efforts have proved effective as Cambodia saw exponential growth in the uptake of CA/SI over the past decade.

CASIC aims at coordinating and streamlining the efforts of different stakeholders involved in agroecology dynamics. Within the framework of CASIC, MAFF is leading a systems[1] approach with the implementation of different systems to answer to the needs of different stakeholders and at different scales with: (i) the research for development and vocational training, (ii) the higher education, (iii) an extension-led model, MetKasekor, based on a public–private partnership to engage the private sectors and agricultural cooperatives into a transition to agroecology, (iv) the engagement of the private sector on machinery and plant biodiversity, and (v) DeiMeas, the financial mechanism to incentivize farmers for a change towards agroecological farming systems. CASIC is the umbrella that coordinates these different initiatives led by MAFF and its departments.

This systems approach will connect some missing links such as i) lack of technical skills in agroecology, ii) lack of a coordination mechanism and extension system for farmers to implement the change of practice, iii) little to no

1. The system is dubbed as the Light Bulb approach and was co-developed by Swisscontact and CIRAD in Cambodia

investment from the private sector and, lastly, iv) lack of incentive mechanism for farmers to change practice to facilitate smoother uptake and adoption of agroecology and regenerative agriculture. The dynamic endorsed by MAFF is supported by CIRAD (AFD (Agence Française De), FFEM (Fonds Français pour l Environnement Mondial) (European Union), Swisscontact (SDC (Swiss Development Cooperation) and other Swiss foundations) and CE SAIN/RUA/KSU (SIIL, USAID (United States Agency for International Development)) along with support from the Cambodia Climate Change Alliance through its research and innovation grant facility.

The various projects that support the dynamics are a) Innovation for Sustainable Agriculture (ISA, Swisscontact, SDC/Happel foundation, LIEN foundation); b) Agroecology and Safe Food Systems Transition in South-East Asia (ASSET, AFD, EU, FFEM); c) Water Resource Management and Agroecological Transition for Cambodia (WAT4CAM, AFD, EU); d) CE SAIN/RUA within the Sustainable Intensification Innovation Lab (SIIL)KSU/USAID); Investing into Soil Organic Carbon management for resilient and low emissions upland farming (ISOC, CCCA), and a range of initiatives from different platforms with an Agroecology Learning Alliance (ALiSEA) and Agroecology in South-East Asia (ASEA) bringing together public agencies, universities, research for development agencies, and NGOs (non-governmental organizations).

Within these systems, Swisscontact through its Mekong Inclusive Growth, and Innovation Programme (MIGIP) and Innovation for Sustainable Agriculture (ISA) project along with Appropriate Scale Mechanization Consortium (ASMC), led by the University of Illinois at Urbana-Champaign contributed to strengthen ing the commercialization of technologies and practices related to Regenerative Agriculture through local workshops.

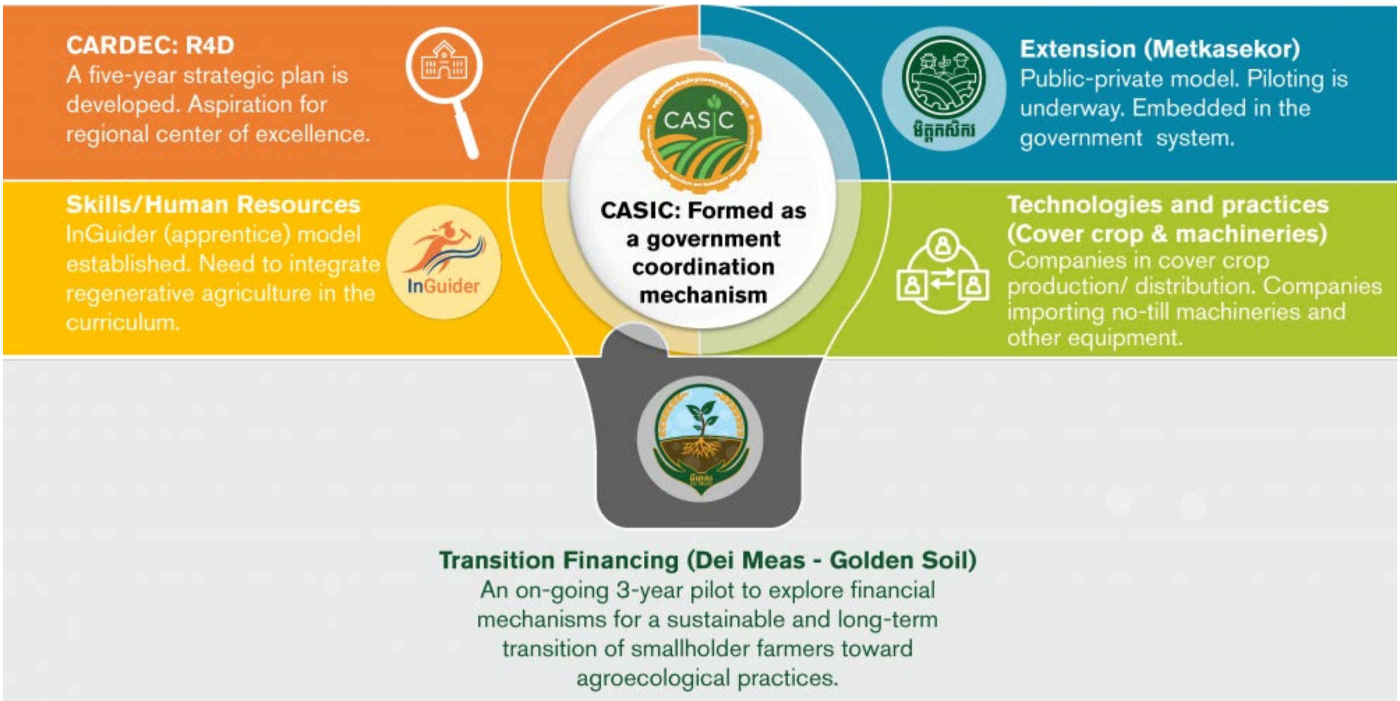


Figure 1: Light Bulb model of the systemic approach to regenerative agriculture

Mekong Inclusive Growth and Innovation Programme (MIGIP)

Mekong Inclusive Growth and Innovation Programme (MIGIP) was a four-year programme (2017-2020) funded partly by the Swiss Agency for Development and Cooperation (SDC). The programme aimed to develop inclusive growth contributing to job creation and income generation. To achieve this, the programme used Swisscontact's Inclusive Markets Approach and delivered its activities through its partners and supports them by strengthening their business model to be more inclusive and perform market functions effectively. MIGIP worked closely with Government agencies, private sector enterprises (both at the national and the local level), research companies, and universities.

The project reached a total of around 21,000 farmers (19% women) of which 6,500 (19% women) increased their income by benefitting from newly introduced services and products.

Innovation for Sustainable Agriculture (ISA)

The Innovation for Sustainable Agriculture (ISA) project, the Phase II of the MIGIP project aims to facilitate access to machinery, inputs, and extension services allowing for sustainable intensification of agricultural production for at least 9 000 smallholder farmers (30% women). This will be achieved by supporting established public and private actors to raise awareness of sustainable intensification practices and provide appropriate technologies and services.

The project provides capacity building and technical support to the government at the national and local levels to establish a public-private agricultural extension model. Furthermore, to promote sustainable agricultural technologies, the project continues its partnerships with small agribusiness companies from Phase I (2017-2020). It helps them to develop and expand their business activities through business development and marketing support.

One challenge hindering the wide adoption of sustainable agricultural practices is the lack of technical human resources. The project has supported the Royal University of Agriculture to establish an internship program. It allows agricultural engineering students to increase their employability, and the private sector benefits from a skilled labor force. It is planned that in total 62 students (30% women) complete the internship program.

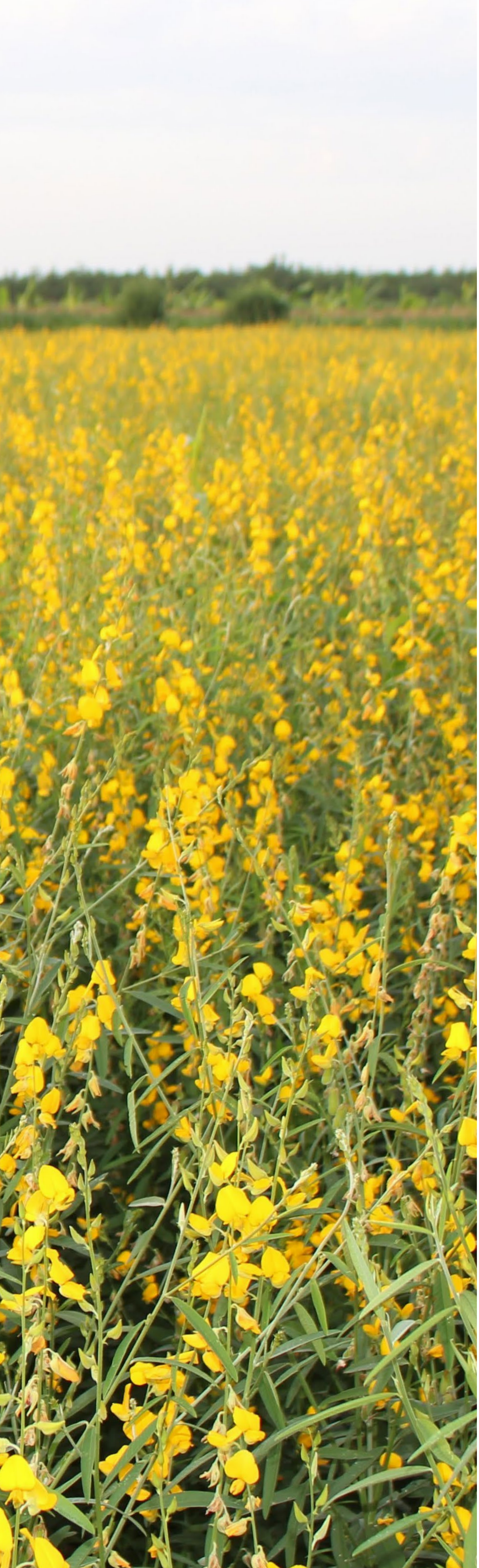
The Innovation for Sustainable Agriculture project is financed by the Happel Foundation, the Symphasis Foundation, and the Leopold Bachmann Foundation among other donors. As part of the Swisscontact Development Programme, it is co-financed by SDC (Swiss Agency for Development and Cooperation, Federal Department of Foreign Affairs FDFA).

Appropriate Scale Mechanization Consortium

The Appropriate Scale Mechanization Consortium (ASMC), led by the University of Illinois at Urbana-Champaign, is a sub-award under the Feed the Future Innovation Lab for Collaborative Research on Sustainable Intensification at Kansas State University, funded by USAID. The Sustainable Intensification Innovation Lab (SIIL) supports collaborative research and development efforts to produce measurable impacts on reducing global hunger and poverty and improving the nutrition of smallholder farmers. The SIIL currently supports research and development in four focus countries: Bangladesh, Burkina Faso, Cambodia, and Senegal. The project targets a regional approach with the overall goal of facilitating the evaluation and scaling up of selected transformational technologies for smallholder farmers. The emphasis is on the sustainable intensification of selected agricultural value chains in Asian and West African regions with the support of innovation hubs and field hubs. In Cambodia, the ASMC project focused on scaling up conservation agricultural (CA) machineries via appropriate technologies and cropping systems that were actively pursued during Phase I.

The Appropriate Scale Mechanization Consortium (ASMC) in Cambodia aims to assess the performances of appropriate-scale machinery (ASM) for rice farming and diversification with fodder species (i.e., affordability, practicability, efficiency, labor saving). The project focuses on training smallholders, service providers, and students on the use of ASM as well as supporting multi-stakeholder initiatives initiating a negotiation process between farmers for the individuals or collective management of fodder sources or crops diversification after wet season rice, and scaling up these ASM to reach out more smallholder farmers in Cambodia.

The goal is to facilitate the deployment of transformational technologies from conventional technology (CT) to conservation agriculture (CA) through four main technologies including 1. no-till planter, 2. land leveler, 3. seed broadcaster, and 4. cover crop, which improves food production and household income. In the meantime, this project aims to intensify smallholder farmers' cropping systems and on-farm operations through mechanization in a sustainable manner. Sustainable intensification integrates social, economic, and environmental impacts with a specific focus on easing the burden on women. ASMC work is integrated into Intervention Area 3 of the ISA project.



SUMMARY

This Case Study sets out the experience of the MIGIP and ISA project in its initiative to commercialize Conservation Agriculture and Sustainable Agriculture implements through local workshops in Cambodia. The Case Study is structured as follows:

Chapter 1 serves to introduce and establishes the wider context of the overall agriculture sector in Cambodia and the need to transition towards Regenerative Agriculture, Conservation Agriculture, and Sustainable Intensification. This Chapter also explores the importance and the role of the private sector in transitioning from research to commercialization and introduces the various Pathways to Technology Commercialization that can be utilized to boost the uptake of Regenerative Agriculture practices and accelerate the transition from conventional tillage to regenerative agriculture.

Chapter 2 introduces Noeurn Workshop as one of the case studies of a local workshop scaling up and commercializing regenerative agriculture implements, and successfully implementing the methodology as outlined in the pathway to technology commercialization and adoption practices. This chapter provides a detailed overview of MIGIP and ISA's intervention with Noeurn Workshop, how the local workshop has not only grown over the years, but also the impact it has had in the sector over these years.

Chapter 3 provides a comprehensive conclusion, key lessons learned, and insights gained from executing the scale-up technology promotion and commercialization through local workshops.

INTRODUCTION

1.1 Agriculture in Cambodia's Context

Cambodia's agriculture sector is still a major employer and livelihood option for the majority of the poor and is one of the key engines for economic growth and poverty reduction in the country. According to the World Bank (2019), 31% of the total population is working in agriculture[2]. About 70% of Cambodian households derive all or an important part of their income from agriculture. The major crops in Cambodia are rice, maize, cassava, and sugarcane[3]. Most farmers are small holders who engage in traditional farming and have less than two hectares per household.

The majority of agricultural production in Cambodia is dependent on the monsoon rain and natural floods/recession of the Tonle Sap River and Lake and are restricted to growing single crop during the wet season. This leaves small holder farmers particularly vulnerable to climate change given their high dependence on rainfall and minimal crop diversification[4]. This, coupled with the threat of land degradation and soil fertility depletion, further exacerbated by unplanned watershed management in the uplands and the lowlands followed by mono-cropping farming systems driven by regional and international market demands, agricultural intensification has entailed the destruction of Cambodia's natural assets.

Therefore, there is a need for the Cambodian agriculture sector to reinvent itself by shifting from increased production through land expansion towards sustainable intensification and regenerative agriculture[5]. As Cambodia *"finds new pathways to drive future growth"*, technology will play a critical role in transforming the sector. The Royal Government of Cambodia's (RGC) vision to modernize the country's agriculture recognizes that sustainable intensification *"primarily depends on the application of techniques, new technologies, R&D, mechanization, and increased capacity of irrigation to improve productivity."* This is reflected in several key documents that have been developed by the RGC.

The future transformation of agriculture in Cambodia through sustainable intensification would improve agricultural production methods as well as profitability with new adaptable techniques and knowledge transfer via agricultural extension services. Hence, in Cambodia, shifting from conventional practices towards sustainable intensification requires tthe effective commercialization of appropriate techniques and technologies.

2. https://tradingeconomics.com/cambodia/employment-in-agriculture-percent-of-total-employment-wb-data.html
3. http://documents.worldbank.org/curated/en/805091467993504209/pdf/96308-ESW-KH-White-cover-P145838-PUBLIC-Cambodian-Agriculture-in-Transition.pdf
4. https://www.kh.undp.org/content/cambodia/en/home/operations/projects/build-resilience/SRL.html
5. *Agroecology, Conservation Agriculture and Sustainable Intensification terms are primarily used in the domain of research, the business world has adopted the term Regenerative Agriculture to describe the same practices.*

1.2 Regenerative Agriculture, Sustainable Intensification and Conservation Agriculture (CA/SI)

Regenerative agriculture describes farming and grazing practices that, among other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity – resulting in both, carbon drawdown and improving the water cycle. These benefits result from the practice of minimum mechanical soil disturbance. (i.e., no-tillage) through direct seed and/or fertilizer placement, implementing permanent soil organic cover with crop residues and/or cover crops and species diversification. This practice optimizes both resource utilization and management whereby farmers produce greater yields with fewer inputs without increasing land area.

The key components of regenerative agriculture (Conservation Agriculture and Sustainable Intensification) are:

- **Efficiency:** better use of on-farm and imported resources.
- **Substitution:** focuses on the replacement of technologies and practices.
- **Redesign:** (transformative) to harness ecological processes and connect scales (field to markets)
- **Conservation Agriculture:** healthy soil, increased resilience of the production system.
- **Three Pillars of Conservation Agriculture:** no or minimum tillage, permanent soil cover, species diversity and spatial arrangement.

Regenerative agriculture has an essential role to play because it ensures the rejuvenation of soil fertility, improves plant health, reduces the outbreak of pests and diseases, increases crop yield, sequesters soil carbon, conserves water, arrests soil erosion, increases water infiltration, reduces labor and energy, and provides tools for farmers to adapt their systems and mitigate climate change risks.

1.3 Role of the Private Sector in Regenerative Agriculture and the Technology Market Segmentation

While there are multiple angles to address sustainable intensification, research has shown that technologies play a key role in the promotion of the three principles of regenerative agriculture. However, the commercialization of sustainable practices along with the technologies is still in its nascent stage in Cambodia.

To transition from research to commercialization, the private sector needs to be involved. Private companies play a crucial role in selling appropriate-scale machinery, and services for land preparation and harvesting, buying farmers' commodities, and adding value to their products. Private companies are also essential players in providing technologies, knowledge, and information needed for different value chains. Furthermore, financial projections have shown that the regenerative agriculture technology market is a sizable business in Cambodia; however, awareness and adoption of regenerative agriculture practices and implements is a critical problem primarily because it is a new concept for the general agricultural sector.

In Cambodia, the commercial activities for no-till services and cover crop sales started around 2018, during which the market for no-till machinery and cover crops was projected to have a potential market value of USD$ 345 million and USD$ 328 million, respectively.[6] The realization of these potentials would not only benefit the private sector and farmers and service providers but to contribute to the growth of the overall economy of Cambodia.

6. *Calculations were conducted as a part of an assessment during the implementation of the MIGIP project.*

1.4 Pathways to technology commercialization

During Swisscontact's five years of work in developing market systems in Cambodia, through the Mekong Inclusive Growth and Innovation Programme (MIGIP) and Innovation for Sustainable Agriculture (ISA) project, different pathways to technology commercialization were encountered and explored. The commercialization pathways include:

i) Passporting Technologies,
ii) Working with Local Workshops,
iii) Research to Commercialization,
iv) Working with technology importers.

Among the four pathways, Pathway 2, Working with local workshops has proven to be an effective strategy for technology commercialization. Local workshops are closer to the farmers, so they can invent and produce technologies suitable and appropriate for the local context.

Figure 2 Pathways to Commercialization

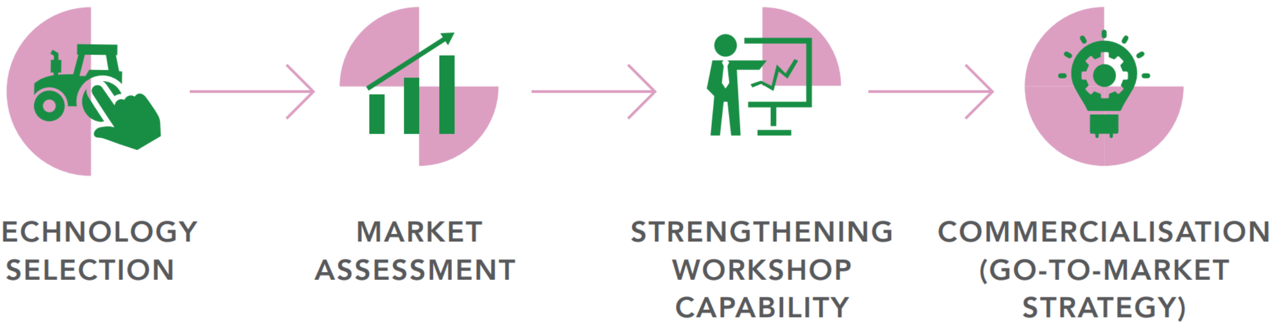


Figure 3: Steps for technology commercialization through local workshops

Through the experience of the project, concrete steps for technology commercialization were designed. These steps include,

Step 1, Technology selection, aims to search and identify the technology from the local workshops. Under this step, the following activities are conducted.
a) Identify workshop and technology, and verify technology using the selection criteria: Level of innovation and improvement of the technology Potential for market gap fulfilment Workshop capability and willingness.
b) Pitch ideas to the identified workshop.
c) Enter into a partnership agreement with the workshop.

Step 2, Market Assessment, aims to conduct a market study to understand the current fit of technology with the demand of the consumers. Under this step, the following activities are conducted.
a) Identify important stakeholders in the location.
b) Develop questionnaires to assess the situation/market.
c) Talk to relevant shop owners, farmers, other service providers, etc.
d) Consolidate the report to analyze the assessment and identify the market opportunity.

Step 3, Strengthening workshop capability, aims to assist the workshop in managing the operations and production while adapting to the innovative marketing strategy. Under this step, the following activities are conducted.
a) Capability assessment in the workshop.
b) Develop and discuss the strengthening plan with the workshop.
c) Execute the plan and make necessary modifications.

Step 4, Commercialization (Go to Market strategy), aims to promote the technology that the local workshop has produced. Under this step, the following activities are conducted.
a) Search for an appropriate Go-to-Market Strategy.
b) Select the strategy and arrange the team & workplan.
c) Execute the workplan and monitor the results of the marketing strategy.

SUCCESS STORY: NOEURN WORKSHOP

2.1 Background

One of the success stories of the commercialization of technology through local workshops is the Noeurn Workshop located in the Stoung district, Kampong Thom province. Noeurn started production of agricultural equipment in 1996 and continues to produce and sell various kinds of customized agricultural implements including seed broadcasters, sprayers, axial plows, mount plows, border discs, fertilizer applications, small-scale rice seeders, grass slashers, etc.

Currently, the local workshop employs twenty-five staff and is well connected with important market actors such as the Department of Agriculture Engineering of the General Department of Agriculture, Royal University of Agriculture, and Appropriate Scale Machinery Association, and is also widely recognized by big landholder farmers.

2.2 Challenges in the agriculture sector

One of the biggest challenges for farmers in Cambodia is the low and declining productivity and yield due to climate change and degrading soil quality, leading to low profits. The underlying causes of this issue can be attributed to the lack of awareness and knowledge amongst smallholder farmers of the range of appropriate technology options and sustainable agriculture practices that are available. Some of these technologies have been proven to drastically improve soil fertility, yield, productivity, and profitability. Moreover, the limited availability of appropriate existing technologies and service provisions for smallholder farmers, further fuels the low and declining productivity and yield.

Therefore, to address these challenges, there was a need for services that not only provide relevant information and promotion of appropriate technologies, but also provide access to the actual machinery and equipment. Nevertheless, to provide these services, certain pain points of the limited market information on the location and identity of the potential buyers, the lack of technical capacity for effective promotion and marketing of technologies, and the limited capacity/skills to establish machinery service provision/rental model and service providers needed to be addressed.

2.3 Partnership to address the challenges in the agriculture sector.

support to set up a distribution network, and an operational and financial system to prepare the workshop to expand their operations. Through this support, the workshop successfully started using the branding concept on all their equipment.

After the end of the MIGIP project in 2020, The Innovation for Sustainable Agriculture (ISA) project in 2021 continued the partnership with Noeurn to work alongside tractor owners and VIP farmers to provide smallholder farmers, an opportunity to access modern technologies.

2018	2019	2020	2021	2022
• Swisscontact Introduced to Noeurn through ASMC • Partnered with MIGIP Project , to commercialize the fertilizer spreader through 4S technology Market Segmentation	• MIGIP supported Noeurn to set up their operational and financial systems in order to prepare the workshop to expand operations	• Workshop successfully started using the branding concept on all equipment	• Partnered with ISA project to promote the Seed Broadcaster Machine to improve farmers productivity and open access to new agricultural technology	• Tested the use of Seed Broadcasters in conjunction with cover crops. • The test yielded positive results. • Decision made on Intervention Closure

Noeurn workshop was first introduced to Swisscontact through the Appropriate Scale Machinery Consortium (ASMC). The workshop along with Swisscontact was invited to engage in the ASMC Hub Advisory Committee in 2018. Soon after Swisscontact's Mekong Inclusive Growth and Innovation Programme (MIGIP) and ASMC partnered with Noeurn, in 2018, to commercialize Noeurn's fertilizer spreader.

MIGIP, ASMC (integrated under Intervention Area 2: Agricultural Mechanization under MIGIP), and Noeurn, aimed to first address the issue of labor shortage and provide farmers with locally made fertilizer spreaders through 4S Technology Market Segmentation (4S Model)[7]. However, a survey analysis conducted in February 2019 showed that there were no rental services or distributors for the machinery and the smallholder farmers did not know about the product. Therefore, the support under the partnership included capacity building of the Noeurn workshop including the development of branding and marketing materials, along with

Through the learnings from the MIGIP project, the ISA project's focus shifted towards Agroecology and Regenerative Agriculture (Conservation Agriculture/Sustainable Intensification). Therefore, while selling tractors had not been an issue in Cambodia, the widespread use of implements, especially those that comply with the principles of regenerative agriculture had not been observed. Therefore, the ISA project after discussion with Noeurn aimed to promote their seed broadcaster machine which had the potential to be used in conjunction with cover crops to improve farmers' productivity and open access to new agricultural technology.

The Broadcasting Method accounts for 80% of used methods in the planting stage and traditional broadcasting methods require an intensive labor force and are time-consuming. Seed broadcaster machines are, therefore, much more efficient. This arrangement aimed to collaborate on improving the use of Seed Broadcaster developed by Noeurn, to farmers in targeted locations in Kampong Thom province,

7. The 4S Technology Market Segmentation or, for short, the 4S Model is a go-to-market strategy developed by Swisscontact Cambodia specifically for private sector players to bring new agricultural technology/machinery to farmers. There are 4 stages in the 4S Model which are: Search, set up, Service Workshop, and Showcase enabling them to improve their productivity and open access to new agricultural technology, at the same time introducing the potential to use the machinery to broadcast cover crop seeds and lay the foundation towards regenerative agriculture transition in the province. The seed broadcaster's commercialization was done through the four steps for technology commercialization as highlighted in the previous chapter.

2.4 Addressing the challenges of promotion and commercialization

To address the challenges around the promotion and commercialization of appropriate technologies, there was a need to strengthen the capacity of the Noeurn workshop. Noeurn's business model in 2018 was not optimal as the workshop primarily sold equipment directly to farmers through networks and walk-ins. Noeurn lacked a sales strategy as the seed broadcasters were sold in limited locations and sale to farmers was conducted without the promotion of the full potential of the technology.

The absence of knowledge on customer segmentation, the capacity to engage other market actors to sell the technology in various locations, and the lack of promotional activities of the equipment for farmers/cooperatives/service providers to see the potential, affected the ability of Noeurn to scale up.

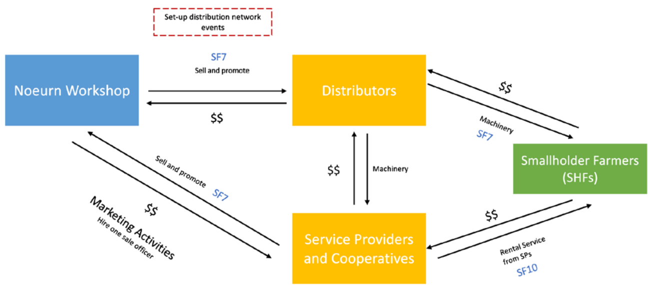


Figure 4: Noeurn's business model

To address these constraints, and to help Noeurn understand the market landscape, the ISA project supported Neourn in hiring finance and sales officers, conducting distributors assessment, and organizing distribution network events to engage potential distributors in various locations. The project also trained Noeurn to conduct market activities and strategies to search and identify potential customers and create demand for farmers and service providers to promote the potential of Seed Broadcasters.

2.5 Market potential

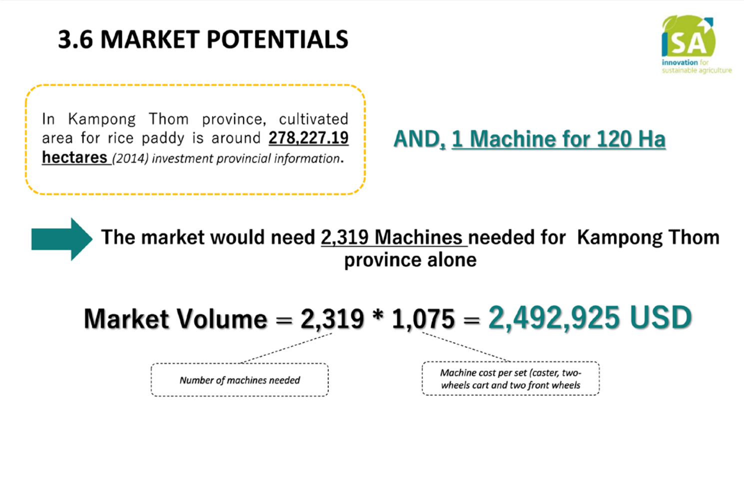
One of the major findings while designing the intervention with Noeurn during the implementation of the MIGIP project was the market potential of regenerative agriculture machineries and implements in Cambodia. Based on the assessment conducted by MIGIP and ISA project, the market potential for No-Till machinery and Cover crops was estimated to be USD (United States Dollars) $ 345 million and USD$ 328 million, respectively.

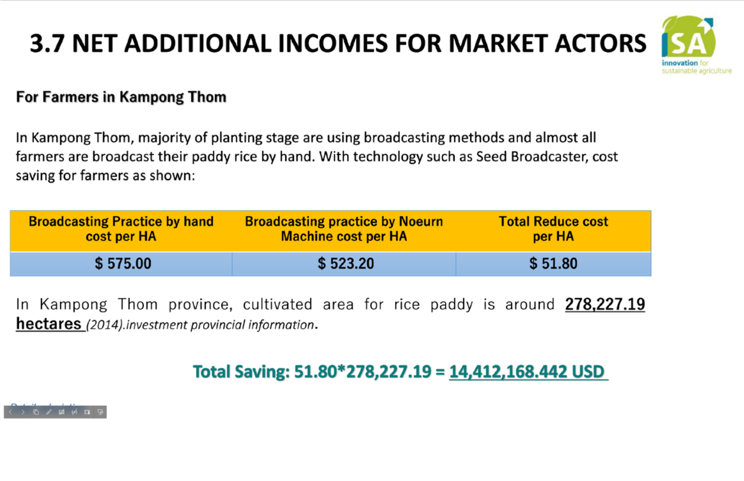
In Kampong Thom province alone, with a total cultivated area of around 278,227 hectares, it would require 2,319 seed broadcasters to cover the land area, resulting in a potential market of approximately $2.4 million.

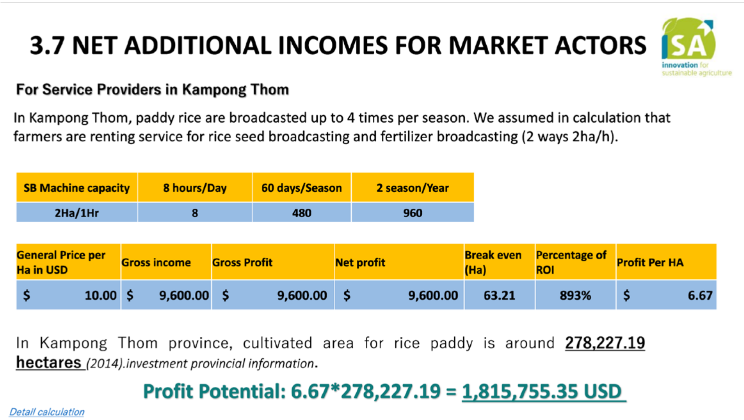
Furthermore, the additional saving of farmers in Kampong Thom by using Noeurn's machine was calculated to be around $51.80 per hectare. It was estimated that the cost per hectare to broadcast seeds by hand was $575, compared to $523.20 with the seed broadcaster. With a total cultivated area of 278,227 hectares, the potential for additional savings would be approximately $14.4 million.

Lastly, for service providers, the potential profit from renting seed broadcasters in Kampong Thom alone was estimated at around $1.8 million.

These estimations provide attractive economic incentives for smallholder farmers and service providers to venture into regenerative agriculture to not only support the vision of RGC, but to also addresses grassroot social, economic, and environmental issues as mentioned above.







2.6 Evidence of Impact

The ISA project conducted an impact assessment of the Noeurn Workshop in August 2022 before the closing of the intervention and interviewed farmers who bought seed broadcasters from Noeurn from January 2020 until December 2021, to get a more in-depth understanding of the practical experience of using the seed broadcasters.

The assessment plan for the intervention with Noeurn Workshop consisted of key research questions around the interest and usage of the seed broadcasters and analyzed the data to see if their usage contributed to increased income and productivity of smallholder farmers. The assessment results showed that 1,067 Smallholder farmers were made aware of the seed broadcasters through Noeurn. Neourn's sales list showed that there were 259 seed broadcaster buyers, however, for the assessment only 237 buyers were selected because of the assessment's limited time. Out of the 237 buyers, 65 buyers located in the four districts including Stoung, Kampong Svay, Tang Kok, and Santuk of Kampong Thom province were sampled for the direct interviews through in-person visits and phone calls.

With regards to the interviewee's profiles, 88% were male, and 76% of the interviewees owned more than 10 hectares of farmland. 98% cultivated rice, along with other crops such as mango and cashews.

With regards to the interviewee's awareness of seed broadcasters, 93% informed that they were made aware of the seed broadcasters through other farmers while another 2% mentioned that they found out about it through demonstration events. 82% of the interviewees mentioned that they recommended the Seed Broadcaster to at least four other farmers.

With regards to the benefits of the seed broadcaster, 92% of interviewees stated that they used labor to broadcast seed before owning seed broadcasters. Compared to using labor for broadcasting, all the interviewees said that the seed broadcaster machine saves time, 38% said it reduced labor costs, and 75% said it spreads seed more evenly onto the field. However, the farmers also mentioned the seed broadcaster was used only for rice, not for cover crops as envisioned.

With regards to the challenges and difficulties, 7% of farmers reported that the seed broadcasters were difficult to operate as the machine broadcasts seed unevenly, along with issues regarding clogged vent hold damaging the seeds, and other machine malfunctions while only 3% reported difficulty in machinery maintenance.

However, overall, the impact assessment yielded positive results as it showed that 75% of SHFs (smallholder farmers) increased their net income through seed broadcaster usage. The income increase per hectare was averaged at around $843, while the median increase was $444. Furthermore, 850 indirect smallholder farmers also were aware of the seed broadcasters primarily through word of mouth and the market segmentation strategy.

One of the major findings was also that the envisaged full potential of the seed broadcaster to be used in conjunction with cover crops was not realized. This issue is further elaborated in Chapter 3.

CHALLENGES IN IMPLEMENTING THE INTERVENTION

The work of ASMC, MIGIP, and ISA projects to support the commercialization of regenerative agriculture implements through local workshops like the Noeurn workshop in Cambodia is an important step towards laying the foundation for regenerative agriculture at the grassroots level. The intervention with Noeurn Workshop aimed to improve farmers' productivity and open access to new agricultural technology, that has the potential to comply with the principles of regenerative agriculture and, commercialize regenerative agriculture technologies and implements which is important not only for the partners and farmers, but also for the overall health of the soil systems and the agriculture sector in Cambodia and contributing to the national commitments of the government.

However, the implementation of any plan is bound to have challenges. The intervention with Noeurn was no different as it faced both external and internal challenges. These challenges were:

A. CHALLENGES DUE TO EXTERNAL FACTORS:

i) Change in weather patterns

The agriculture sector is extremely vulnerable to the increase in temperatures, changes in rainfall patterns, extreme weather events such as cyclones, drought and flooding as well as sea-level rise in coastal areas. Cambodia is considered one of the most vulnerable countries to climate change impacts such as floods and droughts.

Cambodia received an unusually high volume of rain since December 2021, which is generally the start of the dry season[8]. The farmers also mentioned that this change in weather pattern resulted in difficulties in planning the sowing and harvesting seasons, which also impacted the intervention with Noeurn, as it decreased the demand for the seed broadcasters.

ii) The shift in agricultre practices

In recent years, the Cambodian agricultural landscape has also seen farmers shift from rice farming to cassava. Farmers see more profit in cultivating cassava than rice. According to a ministry report on agriculture exports in the first five months of the year, fresh cassava exports reached 609,250 tonnes, up 79.72%, of which 420,550 tonnes were exported to Vietnam and 188,700 tonnes to Thailand. Exports of dried cassava chips amounted to 1,466,840 tonnes, up 21%, of which 1,089,300 tonnes went to Thailand and 377,450 tonnes to Vietnam[9]. This shift also contributed to the decreased demand for seed broadcasters.

iii) Land disputes

One of the challenges faced by Noeurn was concerning the land acquisition authorized by the government to preserve the land surrounding Tonle Sap Lake. Farmers in the provinces around Tonle Sap Lake, including Kampong Thom used to plant rice on public lands. However, in recent years, the government revoked land use for agricultural practices for the protection of the local biodiversity and did not allow local farmers to use the lands without permission. The loss of arable land for the farmers also caused the drop in demand for seed broadcasters, as these farmers did not have other lands to practice agriculture.

B. CHALLENGES DUE TO INTERNAL FACTORS:

i) Operation Modality of Noeurn

One of the biggest challenges for Noeurn Workhop to scale up further was his modus operandi. The small family-owned business is unable to expand there is no plan for a handover of the business as Noeurn's children are not interested to take over, and Noeurn is wary of handing over the business to anyone outside of the family.

ii) Priority of the target location

At the project level, the idea behind commercializing the seed broadcasters was that it would also be used with cover crop seeds and would help facilitate the transition towards regenerative agriculture. However, this did not go as planned because, in Kampong Thom province, small holder farmers plant rice up to three times a year. Therefore, the plan to plant cover crop cannot be integrated with their farming cycle.

8. *Rains quell fire risk around Cambodia's Tonle Sap, but the future looks fiery, Danielle Keeton-Olsen. 2022*
9. *Cassava Farmers Enjoy Boom Times.*

KEY LESSONS LEARNED

Some of the key lessons learned through the work with Noeurn Workshop are:

• With the support of Swisscontact and the ASMC project, Nourn expanded his business and was established as a well-known brand in Kampong Thom province. However, the scale-up momentum hit a glass ceiling, and the only way to overcome that was changing his modus operandi, which Noeurn was not able/unwilling to do because of the challenges highlighted above.
• Noeurn's confidence in his equipment and the workshop's capabilities has increased. This is further reiterated through the backing and support from the Department of Agriculture Engineering.
• An innate feature of local workshops could be, to be well established at the local level only, as the expansion of the business outside, and in multiple locations would take away the localized essence of the workshop.
• Working with local workshops requires simplicity and flexibility.

CONCLUSION

The primary objective of Swisscontact projects, such as MIGIP and ISA, is to achieve systemic change. Despite facing challenges, the intervention with Noeurn workshop, which concluded in 2022, proved to be successful. Valuable insights were gained regarding the expectations of collaborating with local workshops for commercializing innovative technologies.

Through lessons learned, the project aims to capitalize on this experience, replicate success factors, and develop mitigation strategies for the challenges encountered. This approach will streamline future interventions, ensuring behavioral changes in the market system.

To promote sustainability, the Noeurn experience will be leveraged, emphasizing the impact evidence to encourage other local workshops to follow suit. A significant takeaway from this experience was the technological capacity of Noeurn's Seed Broadcaster, which is planned for introduction in Battambang province, distributed by Swisscontact partner Larano. The province has recently seen an uptake in regenerative agriculture, primarily due to the work of MetKasekor and the Conservation Agriculture and Sustainable Intensification Consortium (CASIC). Introducing seed broadcasters for cover crops aims to further support this transition.

Expanding the regenerative agriculture market at the grassroots level will create a positive ripple effect, accelerating Cambodia's agricultural system transition from conventional farming to regenerative agriculture. Although working with local workshops like Noeurn may seem like a small component within larger schemes, grassroots implementation and action, regardless of scale, contribute to these commitments and have a compounding effect over time.

Strategic design for systemic change further adds to the equation by inspiring other market actors to take charge and become more action-oriented. Consequently, this work is not isolated but is part of the synergies working together to bring about systemic change, supporting the transition towards regenerative agriculture.

Authors: Pritesh Chalise, Wensydy Yort,
Soveth Ream, Rathanakvichea Phann
Advisor: Rajiv Pradhan
Designer: Sorphorn Souk