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SCOPE LEARNING STUDY

Scaling Sustainable Production and Consumption in the Tofu & Tempeh Industries

JANUARY 2016



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Executive Summary

This learning study provides a detailed analysis of Mercy Corps' European Commission (EC) funded SCOPE program in Indonesia. SCOPE aimed to use a market development approach to catalyse a shift to energy efficient and hygienic production practices among microenterprises producing tofu and tempeh. The study was conducted alongside a formal program evaluation and was intended to delve deeper into the process of implementation, drawing out key market development lessons.

Of particular interest for Mercy Corps is the fact that the SCOPE program had two distinct goals: (i) to contribute to poverty reduction; and (ii) to promote energy efficiency / reduced environmental impact. These dual goals are characteristic of many other sustainable energy programs implemented by Mercy Corps and other organisations in the global energy community. This study examines the extent to which SCOPE was able to balance the imperative of achieving impact in both goals and the extent to which this was achieved.

The study consists of three parts. Part A summarises the program design and logic, including why tofu and tempeh was chosen as the target market system, the main factors constraining the market prior to SCOPE, and the interventions that SCOPE selected to address these constraints. Part B looks at what happened in practice, assessing first whether SCOPE interventions achieved the desired systemic changes in four targeted supporting markets, secondly whether changes in the supporting markets led to a system change in the core market, and finally the extent to which this led to impact in terms of the two program goals. Finally, Part C draws out the key lessons learned and recommendations.

Main Lessons Include

Non-economic incentives can be a key driver of market system change, but without a clear economic benefit uptake of new practices can be sluggish. Under SCOPE, uptake of new production practices by microenterprises was largely motivated by non-economic factors such as a clean kitchen and less smoke. However, for many businesses that didn't adopt the new practices, concern about the cost of operating the new technology was a major disincentive.

Designing and testing appropriate energy technologies can take a long time and can result in technological 'dead-ends'. The SCOPE team mitigated this problem by facilitating private sector actors to work together to develop the designs themselves, reducing the risk of inappropriate designs and accelerating the design process.

The lack of consumer awareness about new energy technologies makes it difficult to rapidly reach sustainable economies-of-scale. However engaging directly in marketing and awareness-raising is not always effective. SCOPE investment in media messaging to consumers was ineffective, as it failed to build a connection between tofu and tempeh retailers. Support to private sector actors to invest in their own face-to-face marketing with customers would likely have been more effective.

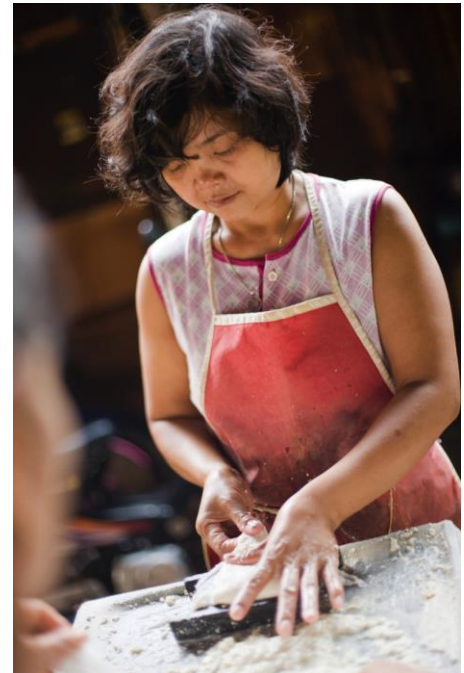


Photo Credit: Thatcher Cook for Mercy Corps

For energy products, ‘up-front’ trust is particularly important to stimulate market demand, as transactions are generally one-off or infrequent and a significant investment. The SCOPE team and the KOPTIs recognised the need to rapidly build ‘up-front’ trust in the clean equipment, and this led to an increased focus on model factories and peer-to-peer visits to demonstrate the new technology in action.

Market development programs in the energy sector are vulnerable to fluctuating energy prices, which creates uncertainty around technological choices. In the SCOPE program, dual-fuel technologies helped to mitigate this uncertainty. Detailed and clear cost benefit analysis (CBA) for the new technology would also have helped to reduce uncertainty by identifying the fuel price at which a new technology is no longer cost beneficial.

Market development programs in the energy sector often have to navigate the prominent involvement of government, which can have a positive or negative impact on the market system. In SCOPE the impact was positive; government distributed sets of equipment for free during SCOPE, but these were in distant provinces so didn’t undermine the nascent market, and the government played an important role in building momentum among key stakeholders.



RTI employee boiling soybeans in upgraded factory. Photo Credit: Thatcher Cook for Mercy Corps

GLOSSARY

| | |
|-------------------------|--|
| SCOPE | The 'Scaling Sustainable Consumption and Production of the Soybean Processing Industry in Indonesia' programme |
| SWITCH-ASIA | The EC funding mechanism under which SCOPE was funded |
| Clean tofu and tempeh | Tofu and tempeh produced using hygienic and environmentally-friendly production practices |
| DNS | The GoI Ministry of Environment's Debt Nature Swap (DNS) program which provides cheap financing for access to clean technology |
| Equipment manufacturers | Businesses manufacturing equipment for tofu and tempeh production |
| Equipment resellers | Businesses retailing tofu and tempeh equipment to MSEs |
| GoI | Government of Indonesia |
| KOPTIs | Primary Cooperative of Tempe Tofu producers in Indonesia |
| LPG | Liquid Petroleum Gas |
| PIRT | Pangan Industri Rumah Tangga (Household Food Industry Certificate) |
| PUPUK | Perkumpulan Untuk Peningkatan Usaha Kecil (PUPUK) - The Association for Advancement of Small Business, Mercy Corps' main partner for the implementation of the SCOPE programme |
| RTI | Rumah Tempe Indonesia (RTI), the model factory in Bogor producing branded clean tempeh and selling it through supermarkets |
| Tempeh | A fermented soybean cake |
| Tofu | A soft, bland, white food, high in protein content, made from curdled soybean milk |
| Tofu and tempeh MSEs | Micro and Small Enterprises producing tofu and tempeh |

PART A: PROGRAM DESIGN

Why was the market system for tofu and tempeh selected?

The European Commission (EC) 'SWITCH-Asia' funding mechanism has two distinct goals: first, to promote economic prosperity and poverty reduction; and second, to promote production and consumption practices that have a low environmental impact. In 2011, Mercy Corps applied for SWITCH-Asia funding, choosing to focus on the market system for tofu and tempeh production in Indonesia.

Mercy Corps identified the tofu and tempeh market system in Indonesia as having good potential to contribute to **poverty reduction** for the following reasons:

- The sector is dominated by small-scale informal sector producers, with tempeh production in particular characterized by family-run cottage industry;
- The sector is huge, with an estimated 85,000 micro or small enterprises (MSEs) producing tofu or tempeh nationally, offering good potential for impact at scale;
- The sector employs large numbers of low-wage workers (approximately 285,000 nationally);
- Existing production practices were resource-intensive and energy inefficient, offering an opportunity for increased production and profitability.

The tofu and tempeh market system was also identified as having excellent scope to promote **production and consumption practices that have low environmental impact**:

- Tofu and tempeh production is energy intensive as it requires extensive boiling of soybeans;
- Almost all tofu and tempeh MSEs in Indonesia rely on firewood for fuel and use energy inefficient technologies such as an open fire or inefficient steam boilers;



TOFU AND TEMPEH

While tofu is widely consumed in Asia and the West, tempeh is a particularly Indonesian product. Both products are produced by soaking and processing soybeans. The final product is consumed by millions of Indonesians every day. In Indonesia, tofu and tempeh are commonly associated with being food for the 'poor' and are thought of as dirty due to the conditions in which they are produced. Nevertheless, they provide an affordable and vital source of protein.

Production of tofu and tempeh is in small cottage industry micro- and small-enterprises (MSEs), scattered throughout urban areas of Indonesia. Factories are often family-run and on average employ less than 5 persons.

Photo Credit: Thatcher Cook for Mercy Corps

- The environmental footprint of the tofu and tempeh sector is huge, with the impact felt at the local level through indoor air pollution in MSE factories and in surrounding homes, at the national level in terms of pressures on forest resources, and at a global level through carbon emissions that contribute to climate change.

In 2012 Mercy Corps was awarded SWITCH-Asia funding and began implementing the €900,000 three-year SCOPE program ('Scaling Sustainable Consumption and Production of the Soybean Processing Industry in Indonesia'), which ended in January 2015.

THE SWITCH

The primary technological switch envisaged by Mercy Corps, intended to address both the poverty and environmental goals, was for MSEs to transition from firewood to LPG and use stainless steel vats and steam boilers for boiling soybeans. In making this transition, Mercy Corps envisaged that many MSEs would also choose to upgrade their facilities more generally, for example using stainless steel equipment for soaking and grinding soybeans and drying the finished tempeh product. They hoped to promote a vision for the future of the sector that was clean in terms of both energy-use and hygienic practices.



Before upgrade



After upgrade

Photo Credit: SCOPE Program team for Mercy Corps

What constraints were identified? The SCOPE program aimed to facilitate the emergence of a functioning and sustainable market system for clean tofu and tempeh¹. To achieve this, the SCOPE team first needed to understand the constraints that were preventing MSEs from producing (supply) and selling (demand) clean tofu and tempeh products.

Through market assessments and analysis conducted at the start of the program, the SCOPE team identified four major constraints:

¹ Tofu and tempeh produced using energy efficient and hygienic technologies and processes.

1. Unavailability of appropriate clean technology
2. Lack of information about clean technology and practices among MSEs
3. Lack of access to capital to purchase clean technology
4. Low consumer awareness and demand for clean tofu and tempeh

These constraints and their underlying causes are outlined below.

Unavailability of appropriate clean technology

Prior to the SCOPE program, appropriate technology for clean tofu and tempeh production was almost completely non-existent, even in Jakarta and other major cities where there are numerous manufacturers producing equipment for other food processing industries.

Root causes

- A lack of information on the part of equipment manufacturers about what technology was needed for the tofu and tempeh sector;
- A lack of demand for improved equipment on the part of tofu and tempeh MSEs, which created a disincentive for technology manufacturers to invest in research and design for the sector;
- A lack of appropriate distribution channels for manufacturers to reach tofu and tempeh MSEs, even if they invested in equipment design and production.

Lack of information about clean technology and practices among MSEs

MSEs producing tofu and tempeh had no information about the availability and benefits of new clean production technologies.

Root causes

- Most tofu and tempeh MSEs operate as self-contained units, individually purchasing soybeans and selling tofu/tempeh output to their own static list of consumers. This limits their access to information from other market actors.
- While in theory KOPTIs could have been a good source of information about alternative production practices for MSEs, in practice, before SCOPE they had no interest in addressing the

› KOPTIS

KOPTIs (cooperatives of tofu and tempeh producers) were once highly influential in Indonesia with good revenue streams as the sole importers and retailers of soybean. In theory KOPTIs could be a good source of information for MSEs. However, after government deregulated soybean imports at the end of the 90s, many KOPTIs collapsed and are now non-functioning, while those that remain have dwindling numbers of active members. At the start of the SCOPE program KOPTIs were resistant to working with Mercy Corps as they were sceptical about the prospects of changing an industry in which technology had been unchanged in decades.

issue and were providing no information to members.

Lack of access to capital to purchase equipment

The cost of purchasing new clean production technology was expected to range from a minimum of \$230 for a small tempeh factory up to \$5,000 for a larger tofu producer. Given these substantial costs, the SCOPE team identified a lack of access to a lack of capital as a third obstacle that would prevent MSEs switching to clean production technologies.

Root causes

- Commercial banks and microfinance institutions (MFIs) required business registration and collateral for loans, both of which most tofu and tempeh MSEs lacked. Banks and MFIs were not able to use tofu/tempeh equipment itself as collateral;
- Lease financing companies provided collateral-free credit, however their product lines were limited to vehicles and electronics and did not cover food processing equipment;
- MSEs lacked information about how to apply for loans or credit from financial institutions.

Low consumer awareness and demand for clean tofu / tempeh

In switching to clean production, one of the intended benefits for MSEs was to improve the per kilogram value of their output, enabling MSEs to either charge a higher price for their product or increase their production and market share. There are three possible ways that switching to clean production might result in a higher value product: first, through physical improvements in the taste and texture of the product; second, an environmental premium, whereby customers prefer the product because it is 'eco-friendly'; and thirdly, a hygiene premium, where customers prefer the product because it meets certain hygiene and food safety standards.

In order for these product improvements to translate into increased income for MSEs, consumers must have a certain level of awareness about clean tofu and tempeh and how it is different to the mainstream product, and furthermore must place a value on that difference. Market research conducted by SCOPE showed that Indonesian consumers of tofu and tempeh have almost no awareness of, or interest in, the conditions in which tofu and tempeh is produced. This lack of awareness, which implies low demand for clean tofu and tempeh, was identified by SCOPE as a fourth constraint preventing the market system for clean tofu and tempeh emerging.

Root causes

- The perception of tofu and tempeh as 'poor man's food', which reinforces the acceptance of the product as dirty;
- The large and fragmented network of tofu and tempeh MSEs, which sell small quantities of unbranded products to an even more fragmented network of small-scale traders. The absence of aggregated transactions and larger-scale players means that there is no actor with the required coordination, and incentive, to educate consumers.

What intervention areas were selected?

In response to the four constraints identified above, the SCOPE team designed and implemented interventions in four areas:

Intervention area 1. Availability of clean technology for tofu and tempeh MSEs

Intervention area 2. Information on clean equipment and practices for MSEs

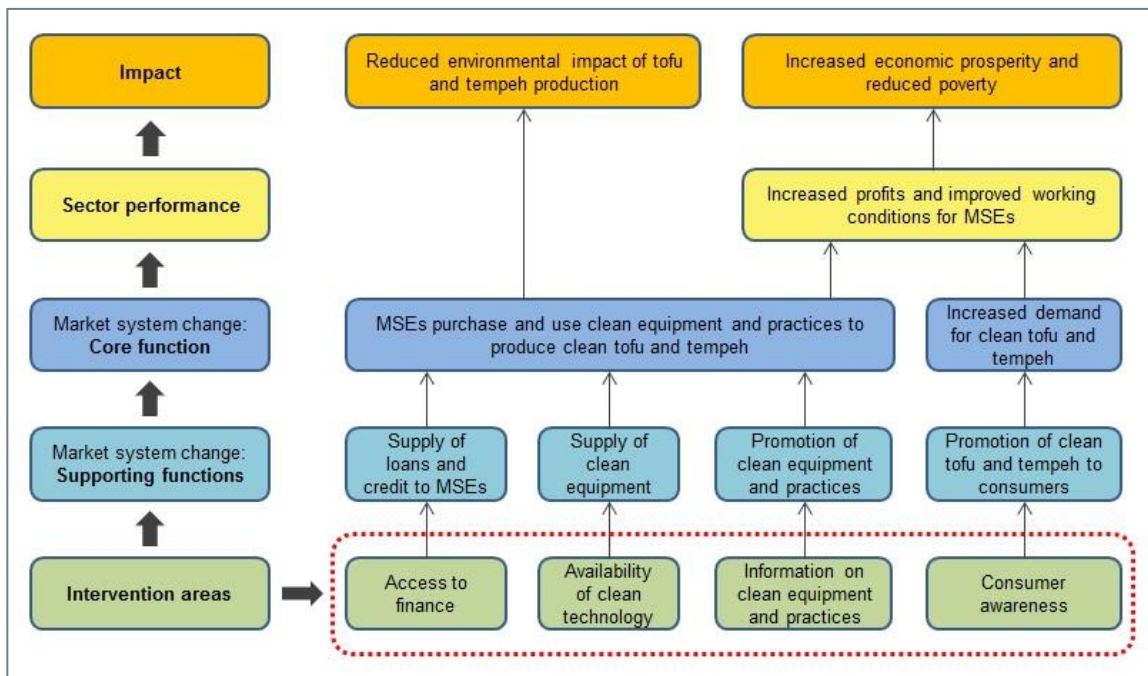
Intervention area 3. Access to finance

Intervention area 4. Consumer awareness about clean tofu and tempeh

The strategic framework below (Figure 1) illustrates the causal logic of the SCOPE program. This was developed retrospectively as part of this learning study, as the SCOPE team had not explicitly developed a theory of change or results chain.

The four intervention areas were each intended to stimulate a system change in one of the secondary markets supporting the production and sale of clean tofu and tempeh (these secondary markets are known as ‘supporting functions’). In order to avoid distortions and to catalyse changes that are sustainable, as much as possible the SCOPE team aimed to work in a facilitation role with existing market actors, rather than delivering services directly. There were some notable exceptions to this, in particular in relation to intervention area 4 addressing consumer awareness.

FIGURE 1: SCOPE STRATEGIC FRAMEWORK



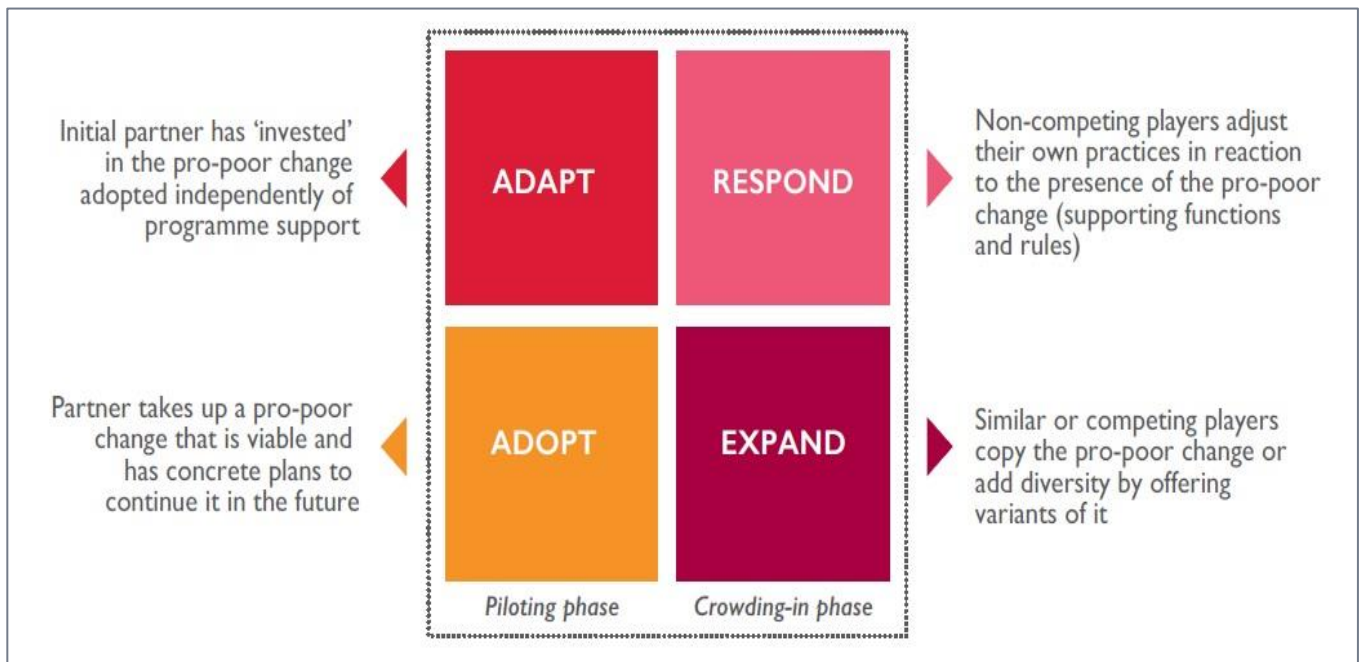
PART B: IMPLEMENTATION AND EVIDENCE OF IMPACT

How did the team apply the market systems approach for each intervention and what evidence is there that the interventions resulted in systemic change?

System change in the four supporting functions was intended to trigger a sustainable, systemic change in the production (supply) and sale (demand) of clean tofu and tempeh (known as the 'core function'). According to the program logic, this switch to clean production would result in improved performance and profits of MSEs (sector performance) and would contribute to the two program goals (impact).

This section will assess the extent to which the implementation approach chosen for the four main intervention areas was successful in stimulating system change in the four target supporting functions. The 'Systemic Change Framework'² will be used to structure the analysis (see Figure 2). This is a tool that helps determine whether market actors have reacted to program interventions, thereby helping to establish whether market changes are truly systemic and sustainable.

FIGURE 2: SYSTEMIC CHANGE FRAMEWORK



² Springfield Centre, M4P Operational Manual

Intervention area 1: Availability of clean technology for tofu and tempeh MSEs



Target Supporting Function: Supply of clean production equipment to MSEs

Intended System Change: Technology manufacturers are producing appropriate equipment for clean tofu/tempeh production

Implementation Step by Step

Identification and partnership: SCOPE identified five manufacturers with potential to start producing clean equipment for tofu and tempeh production, all of which were already producing similar technologies designed for other types of food processing. Information from market assessments was then used to present a compelling business case to manufacturers and convince them to invest in R&D and adapt their manufacturing process to produce new equipment.

Equipment design: The SCOPE team provided basic advice on technology design options to manufacturers, but most important was their role in facilitating business introductions between technology manufacturers, MSEs and KOPTIs to ensure the equipment designed met MSE needs. Through a series of meetings and design workshops, often organised independently of Mercy Corps, they worked together to identify MSE needs and develop optimal designs. For one specific type of technology (a vacuum cooker) the SCOPE team played a far more active role in developing and testing designs over the course of one year of the program, however this ultimately proved unviable.

Evidence of systemic change

ADOPT

Success: Three manufacturing businesses, out of five that Mercy Corps directly worked with initially, have designed and are manufacturing clean production equipment for the tofu and tempeh sector. The three successful 'adopters' have been producing and selling new equipment for at least 24 months, and since Mercy Corps' initial engagement have been operating independently.

ADAPT

Success: Partnering manufacturers have continued to invest in developing new designs, working iteratively with KOPTIs and MSEs to diversify their product range. An estimated 20 new types of equipment for tofu and tempeh production have been introduced independently of the SCOPE programme, such as different shapes, sizes and qualities of stainless steel vats, trays and grinders. In many cases equipment manufacturers are also providing additional services, for example installation and training on new equipment and providing equipment on credit.

EXPAND

Success: At least five other manufacturers in SCOPE target areas have 'crowded in' to the market, and begun manufacturing equipment for the sector. Equipment resellers have been the driver of this expansion, seeking out manufacturers that are able to produce niche products demanded by some of their customers.

EXPAND

Limitation: Crowding-in of manufacturers has so far been limited to SCOPE program areas. In order to reach scale and to support the efforts of KOPTIs and government in other parts of the country which are trying to promote improved production practices, it's likely that new manufacturers will need to

begin production in these other areas (to avoid high transportation costs for the bulky and heavy equipment). Any future phase of the program will need to address this gap.

Conclusions and lessons-learnt

The SCOPE program has been very effective in stimulating systemic change in the supply of clean tofu and tempeh equipment and this has now extended to numerous non-partnering manufacturers.

A key factor in this success appears to have been SCOPE's commitment to a facilitation approach and avoidance of direct support to manufacturers, in terms of either funding or prescriptive technical advice. This served to test the commitment level of manufacturers (two businesses lost interest early on), and avoided the program propping up unmotivated businesses. The facilitation approach also allowed manufacturers to take ownership for developing the original designs, in consultation with market actors that would be their customers, which gave them the market connections to get feedback on technology performance and the confidence to adapt and develop new technology over time.

Intervention area 2: Information on clean production equipment and practices for MSEs



Target Supporting Function: Promotion of clean equipment and practices to MSEs

Intended System Change: KOPTIs and equipment retailers are promoting clean production equipment and practices to tofu and tempeh MSEs

Implementation step by step

Transforming KOPTIs into agents for change: Despite their currently diminished status, KOPTIs (see box 3) are widely recognised by tofu and tempeh MSEs throughout Indonesia and still have large numbers of members, even if most are inactive. The SCOPE team identified KOPTIs as having potential in stimulating a shift to modern clean production practices for MSEs. Initially, KOPTI management had no interest in new technologies and were resistant to the team's attempts to engage them. SCOPE staff invested substantial time in developing personal relationships with management from five KOPTIs, spending time in their offices learning about their operations, getting to know each other socially, and gradually developing the relationship. This development of trust proved to be an important prerequisite for KOPTIs to start listening seriously to the SCOPE program's ideas, and subsequently becoming agents for change in the sector, promoting and training their members on new clean production practices.

Model factories: Once manufacturers had refined their equipment design, SCOPE supported six KOPTIs to establish model factories on their premises, as a means of showcasing the new technology and promoting the vision of clean production practices to MSEs. The model factories were established and managed by KOPTIs, which received a 15% - (averaging 17%) 50% contribution from Mercy Corps and raised the remaining costs from their own funds and from private investors and government. Some KOPTIs selected one MSE to operate the model factory but maintained control of all distribution and sales of the output, while others rented out the factory space and equipment to a number of different MSEs which were each responsible for their own production and sales.

Promotion of equipment by manufacturers and resellers: The first part of this intervention was aimed at building distribution channels for clean equipment. The SCOPE team facilitated linkages between equipment manufacturers and three resellers, one of which was an existing trader specialising in selling inputs to tofu and tempeh MSEs, while the other two were KOPTIs that decided to diversify their revenue streams by reselling equipment to members. The second part of this intervention was aimed at improving the ability of equipment manufacturers and resellers to promote the new technologies to MSEs. This largely took the form of a direct intervention in terms of developing and printing promotional materials which were provided to businesses to help them showcase the equipment, including brochures, catalogues, posters and desk calendars. Mercy Corps also developed websites for the KOPTIs. Thirdly, to stimulate interest and demand in the new equipment, SCOPE provided vouchers to 87 MSEs which gave them between a 5.7% (for tofu steam boilers) and 25% (for tempeh stainless steel vats) discount on the cost of new equipment.

Government promotion: This intervention was originally intended to be focused on facilitating linkages between tofu and tempeh MSEs and the Ministry of Environment's Debt Nature Swap (DNS) program which provides cheap financing for access to clean technology. By the start of SCOPE, however, the DNS program was no longer operational. Instead, in response to the emergence of a new model of modern and clean tofu and tempeh production and partly as a result of advocacy from KOPTIs, the Ministry of Industry (MoI) developed new initiatives aimed at standardising and expanding the approach. This intervention therefore focused instead on facilitating strengthened linkages between KOPTIs and the MoI and supporting them as they pushed forward the new initiatives.

Direct promotion and education for MSEs by Mercy Corps and PUPUK: At times Mercy Corps and the local implementation partner PUPUK directly promoted new technologies to MSEs, through organising market events, cross visits and financial literacy training sessions.

Evidence of systemic change

ADOPT

Success: The transformation of **KOPTIs** from inward-looking and change-averse organisations into proactive champions of change in the tofu and tempeh sector has been one of the most impressive successes of the SCOPE program. Five partnering KOPTIs in four Indonesian cities have bought into a shared vision for the sector and, to varying degrees, are actively promoting new production practices to their members. Perhaps the best indication that this change is sustainable and KOPTIs' commitment will continue are the substantial sums of capital (more than \$200,000) they have invested in model factories (using their own savings or funds sourced from other private investors).

ADOPT

Limitation: To-date only the two **KOPTIs** in Bogor and South Jakarta (which are also selling equipment) have been successful in persuading members to switch. The other three partnering KOPTIs, and also KOPTIs in other parts of the country, have only recently been actively promoting clean equipment and it is far from clear whether they will have similar success.

ADOPT

Limitation: While the **KOPTIs** have been successful in promoting new production practices to their members, they have failed to develop promotional practices to reach the far larger number of non-member MSEs. The example of the KOPTI in South Jakarta illustrates this challenge, as despite several thousand MSEs producing tofu and tempeh in their area the KOPTI has only around 100 active members and of these has succeeded in persuading only 45 to switch.

ADOPT

Success: To some degree, **equipment retailers** (manufacturers and resellers) have adopted new marketing and awareness-raising practices for clean production technologies. The two KOPTIs that are reselling equipment have been very active in promoting equipment to their members. They seem certain to continue this beyond the SCOPE program, motivated by a belief in the importance of modern production for MSEs to maintain competitiveness and by the financial incentive of income from equipment sales. One equipment manufacturer (PT Gastech) invested considerable resources in building last mile distribution channels, employing five agents to do promotions directly to MSEs. Although PT Gastech ceased operations right at the end of the program (in December 2014) when staff left to establish their own business, the new business they formed (CV Dynasty) has adopted many of the same marketing techniques and has ambitious plans to expand the business further. The most successful equipment retailer was also the smallest; the reseller Hari-Hari Jaya has integrated last-mile marketing into its daily business activities, doing door-to-door promotion, facilitating cross-visits to previous customers and sending information via SMS to a client base of around 300 tofu and tempeh MSEs. Table 1 shows the number of MSEs that purchased equipment from each retailer (this includes the 87 MSEs that received a voucher giving them a 25% discount).

TABLE 1: NUMBER OF MSEs PURCHASING CLEAN PRODUCTION TECHNOLOGY, PER RETAILER

| Name of seller | Number of MSEs purchasing |
|-----------------------------------|---------------------------|
| Hari-Hari Jaya (reseller) | 88 |
| Gastech (manufacturer) | 76 |
| KOPTI of Bogor Regency (reseller) | 80 |
| KOPTI of South Jakarta (reseller) | 45 |
| Gatayu (manufacturer) | 26 |
| CV Dynasty ³ | 10 |
| Other | 6 |
| Total | 331 |

ADOPT

Limitation: The reach of **equipment retailers** is still very limited. One reason for this is that there are still only four retailers selling equipment, far too few given the huge size of the overall market. Another reason is that businesses have struggled to develop and expand last-mile distribution channels.

³ CV Dynasty was formed in January 2015 when key technical staff and management left PT Gastech to form their own company, causing the latter to cease operations.

The two KOPTIs have only been successful in selling to their active members, which is a very small proportion of the overall market. Even Hari-Hari Jaya, the most successful retailer, has fairly limited reach, promoting equipment to their existing client base in one fairly small confined of Jakarta, and rarely attempting to promote equipment in other surrounding areas.

ADAPT

Success: There are several instances of partnering actors continuing to adapt their behaviour over time, investing in new ways of promoting equipment and providing technical support. One example is the KOPTI in Bogor, which has been extremely proactive in generating publicity for its model factory and equipment independently of Mercy Corps, using media relationships and other information channels. The KOPTI Bogor is also now in the process of raising private capital to invest in a production facility for other tempeh products such as tempeh chips and tempeh burgers. Another example of new types of market behaviour is how PT Gastech and Hari-Hari Jaya, two equipment retailers, both sold equipment on credit to 65% and 20% of their customers respectively. Hari-Hari Jaya, the small reseller that succeeded in reaching the highest number of MSEs, went one step further and developed a relationship with a local lease financing company that provided financing to 44% of their customers.

EXPAND

Success: The only evidence of crowding-in has been non-partner KOPTIs promoting clean production practices to their members. At least 8 KOPTIs in provinces outside SCOPE target areas have purchased equipment and established a model factory to promote clean production to their members. The extent to which this will be successful and continued beyond the end of the SCOPE program is not clear, as it was not possible to visit KOPTIs in other provinces as part of this study.

EXPAND

Limitation: There has been no crowding-in by private sector businesses promoting and retailing clean production equipment, and this is a significant limiting factor on systemic change at scale in the tofu and tempeh market system. Future programming will need to focus on stimulating such crowding-in.

RESPOND

Success: In response to the newly available technology and the increasing numbers of MSEs switching to clean production, the Ministry of Industry (MoI) has introduced recommended standards for tofu and tempeh equipment. The KOPTIs played a key role in advocating for this, and advising government on the technical specifications. In addition, the national-level MoI has funded training workshops on clean technology and practices in 15 locations around the country, delivered by senior management from the KOPTI in Bogor to MoI staff and MSEs. Subsequently, 26 local branches of the MoI purchased a combined 145 sets of equipment which they distributed free to MSEs in an effort to promote clean practices. The SCOPE team did not have the necessary staffing to follow-up on this initiative, and it is not clear whether government will continue and expand this approach in the coming years.

Conclusions and lessons-learnt

The SCOPE program succeeded in stimulating the emergence of a new and sustainable supply chain for clean tofu and tempeh equipment, an impressive achievement in the timeframe. Nevertheless, the reach of the new supply chain and the ability of market actors to promote the new equipment and practices to MSEs are still very limited, with only four equipment retailers selling equipment in fairly confined geographic areas.

In program target areas, promotion by market actors has been effective in transforming MSEs' awareness of clean production technologies and their benefits. In a survey of MSEs that have *not* yet purchased equipment, 59% say they have 'some information' or 'a lot of information' about clean production equipment, compared to only 10% prior to SCOPE.

Many MSEs are aware of clean production technologies and motivated to switch, but have no clear plan to do so. 77% of MSEs that have *not* switched said they are planning to purchase new equipment, though of these only 12% said they would purchase it in the next year with the others saying they didn't know when they would make the switch.

The SCOPE program illustrates how last-mile distribution can be a formidable challenge even in high-density urban areas. Only two private sector businesses introduced direct marketing to MSEs in communities and it is no coincidence that these achieved the highest sales. Yet even the reach of these businesses was very limited in comparison to the overall market size. A stronger programmatic focus on developing wider distribution channels and a greater number of points-of-sale, and supporting businesses to introduce more effective marketing approaches, could have resulted in even higher numbers of MSEs switching to clean production. Notably, 28% of MSEs that switched said they first heard about clean production from Mercy Corps directly, with only KOPTIs more influential at 34%.

KOPTIs will not be an effective mechanism for driving sales of equipment at scale in the future. The partnerships with KOPTIs were very effective in rapidly raising the profile of clean tofu / tempeh production. KOPTIs' connection to government and their long-term vision for the sector also proved to be important assets for the program. The SCOPE team did an excellent job at developing productive partnerships with these quasi-private sector organisations, developing a relationship of trust slowly over time through repeated business and social engagement. Nevertheless, to-date KOPTIs remain focused on serving the needs of their relatively small number of active members and showed little impetus or ability to promote and market clean equipment to non-member MSEs in their areas.

Model factories were crucial in establishing a 'vision for the future' for the tofu and tempeh sector, giving credibility to the program and generating excitement that brought other actors on board, in particular catalysing KOPTI involvement and buy-in. The effectiveness of model factories was in large part due to the KOPTI ownership model chosen by the SCOPE team, which gave KOPTIs a sense of pride that greatly enhanced their commitment and made them excellent ambassadors for clean production.

Intervention area 3: Access to finance



Target Supporting Function: Supply of loans and credit to MSEs

Intended System Change: Financial service providers introduce and promote financial products appropriate for energy efficient Supply of loans and credit to MSEs

Implementation Step by Step:

This intervention was implemented through a facilitation approach working with existing financial service providers:

Identification and partnership: SCOPE identified and engaged with five commercial banks, MFIs and lease finance companies, which were seen as having the potential to offer loans to tofu and tempeh MSEs. The SCOPE team supported interested financial institutions to identify appropriate loan products and help them develop a strategy for marketing these to MSEs.

Facilitating linkages: SCOPE facilitated linkages between financial institutions and KOPTIs as a means of stimulating outreach to MSEs. In practice, only one financial institution actively engaged MSEs, so at times Mercy Corps and PUPUK directly provided information and guidance about financial institutions to MSEs in an effort to jumpstart applications for loans.

Evidence of Systemic Change:

ADOPT **Limitation:** The SCOPE team developed partnerships with three financial services providers but, as Table 2 shows, only one (Bank Syariah Mandiri) reached double figures of loans issued. Bank Syariah Mandiri provided loans to 21 MSEs, but offers poor prospects for sustainability as these were provided as part of a one-time arrangement with the KOPTI in South Jakarta, and the KOPTI used its own land holdings as collateral against the loan. Further loans by these partnering financial service providers are very unlikely to continue beyond the lifetime of the program.

TABLE 2: NUMBER OF MSEs RECEIVING LOANS FROM PARTNER FINANCIAL INSTITUTION

| Financial institution | Number of MSEs receiving loans |
|--|--------------------------------|
| Bank Syariah Mandiri (commercial bank) | 21 |
| Sinar Bintang Finance (MFI) | 2 |
| Universal Finance (MFI) | 1 |
| Grand Total | 24 |

EXPAND **Success:** Without any prompting or support from SCOPE, two equipment retailers responded to the capital needs of MSEs by selling equipment on credit, a positive indication of the dynamism and sustainability of the emerging market system. Between them, Gastech and Hari-Hari Jaya provided equipment on credit to 74 MSEs, as shown in Table 3 below. However, the prospects of replication and expansion of credit to MSEs from equipment retailers does not look promising, as retailers are constrained by their own limited capital. Moreover, Gastech has ceased operations and CV Dynasty, the business that replaced it, has not yet begun providing credit.

EXPAND

Success: Another positive development was a partnership that emerged between Hari-Hari Jaya and the lease financing company CV Gemilang, also independently of the SCOPE program. CV Gemilang purchases equipment from Hari-Hari Jaya, provides it on credit to MSEs, and collects repayments over a period of three to six months. 39 MSEs received equipment on credit through this partnership and prospects for sustainability and expansion are excellent, with CV Gemilang considering introducing the product line for their other branches. A similar partnership was established between the KOPTI in Bogor and CV Intan Jaya, another lease finance company. This was discontinued as the KOPTI felt the terms offered to their members were not acceptable. Interestingly, the KOPTI admitted that the six MSEs that received equipment through the arrangement were very happy with the outcome.

TABLE 3: NUMBER OF MSEs RECEIVING CREDIT FROM OTHER ACTORS

| Name of company | Number of MSEs receiving loans |
|---------------------------------------|--------------------------------|
| PT Gastech (manufacturer) | 56 |
| CV Gemilang (lease finance company) | 39 |
| Hari-Hari Jaya (reseller) | 18 |
| CV Intan Jaya (lease finance company) | 6 |
| Grand Total | 119 |

Conclusions and lessons-learnt

The SCOPE program was unsuccessful in its efforts to stimulate systemic change in the supply of credit and loans to MSEs through partnerships with financial service providers. This was partly mitigated by other private sector actors who responded to this gap by developing new channels for the provision of credit to MSEs.

Access to finance to purchase clean tofu and tempeh equipment remains a huge unmet need .

According to MSEs, lack of capital and access to financing is the biggest obstacle preventing them from making the switch to clean production; 77% of MSEs that have *not* switched said they are planning to purchase equipment in the future, and lack of capital was most commonly given as the major reason for not yet doing so (47%).

The partnerships with financial service providers were unsuccessful because of a failure to address the underlying constraints preventing MSEs from accessing their credit or loans . These constraints, in particular the collateral requirements, proved to be intractable and were a deal breaker for almost all MSEs. This is unlikely to change in the foreseeable future so any future phase of programming should seek other mechanisms for MSEs to access capital.

The provision of equipment to MSEs on credit provided by equipment retailers does not offer a model for credit at scale, though it is an excellent sign of private sector commitment to the market. In practice, equipment retailers are only willing to provide credit to known and trusted MSEs, which limits their ability to expand beyond established working areas.

The success of the lease finance company CV Gemilang, while still small-scale, provides a model that could be replicated more widely. Lease finance companies are very active in Indonesia and have far less strict terms than commercial banks and MFIs. The model that CV Gemilang developed with the equipment reseller Hari-Hari Jaya could be expanded to other branches fairly easily, though the relationship with a trusted equipment retailer is essential for success.

Intervention area 4: Consumer awareness about clean tofu and tempeh



Target Supporting Function: Promotion of clean tofu and tempeh to consumers

Intended System Change: Market actors are promoting clean tofu and tempeh to consumers

Implementation Step by Step:

This consisted of four main interventions, only one of which was implemented through a facilitation approach:

Mass media campaigns: This intervention involved SCOPE delivering a service directly, rather than adopting a facilitation approach, with the aim of providing an initial boost to the market for clean tofu and tempeh. SCOPE invested a significant amount of time and resources in developing mass media campaigns highlighting the availability and benefits of clean tofu and tempeh. This included television, radio, newspapers and a program website. It also involved social media, including Facebook, twitter and blogs.

Consumer awareness groups: This intervention aimed to generate awareness and interest in clean tofu and tempeh products through existing civil society groups and community-based organisations such as women's groups. SCOPE staff presented information at their events, and invited groups to participate in cross-visits and other marketing events.

PIRT certification: Certification for tofu and tempeh producers that had switched to clean technologies was originally intended to certify 'environmentally friendly' production practices, however this was deemed inappropriate and unsustainable as environmental concerns are not a significant factor in consumer decision-making and demand. Instead, SCOPE identified 'PIRT' certification, an existing Ministry of Health food hygiene certification, as having potential. To test the interest levels and potential of PIRT certification, SCOPE promoted this directly to MSEs, providing guidance and 'hand-holding' as they went through the application and certification process.

Promotion of clean tofu and tempeh by MSEs: This was implemented through a market facilitation approach; however SCOPE did not invest significant time and resources in this. It was largely restricted to working with one KOPTI in the city of the Bogor, supporting them to develop effective distribution channels for the tofu and tempeh from their model factory. In another small initiative, SCOPE tried to support other MSEs to use improved packaging, but this was not successful.

Evidence of Impact:

ADOPT

Limitation: Most of the interventions targeting improved consumer awareness were delivered directly by the SCOPE program, and have had no impact in terms of a system change involving market actors adopting sustainable promotion. The mass media campaigns were developed, implemented and funded by SCOPE and will not continue beyond the lifetime of the program. The work with consumer groups also relied on the SCOPE team to push things forward and there is no realistic prospect that consumer groups will continue to promote clean tofu and tempeh after SCOPE ends. Clean tofu and tempeh is a marginal issue for these groups and they have little motivation to organise activities without SCOPE coordination and funding. Similarly, while 40 MSEs successfully received PIRT food hygiene certification, this was achieved only through intensive efforts and hand-holding by SCOPE staff and it is unlikely that any further MSEs will get certification after the end of the program.

ADOPT

Success: There is one case of an MSE developing an effective promotion and marketing strategy. The model factory in Bogor, known as Rumah Tempe Indonesia (RTI), has developed a sustainable distribution and marketing strategy for their product with advisory support from the SCOPE team, which has generated increasing demand for a higher value tempeh product. The two key factors in their success have been high-quality attractive branding of their products and partnerships with two external food processing companies that are selling the product through their existing distribution channels.

ADOPT

Limitation: With the exception of support for RTI, SCOPE did not invest significant time and resources in supporting MSEs to promote clean tofu and tempeh to consumers, and there is little evidence of systemic change in this regard. The number of MSEs providing information to their customers about their products is low; a survey of MSEs as part of the learning study found that only 33% had 'often' or 'sometimes' told their customers about their new products, compared with 67% which have 'never' or 'rarely' spoken to their customers. Most MSEs felt there was little incentive to promote their products actively, as without branding and a way to clearly distinguish their clean product from tofu and tempeh produced using old technology, it was not possible to persuade customers to pay a higher price.

A NEW MARKET FOR QUALITY TEMPEH

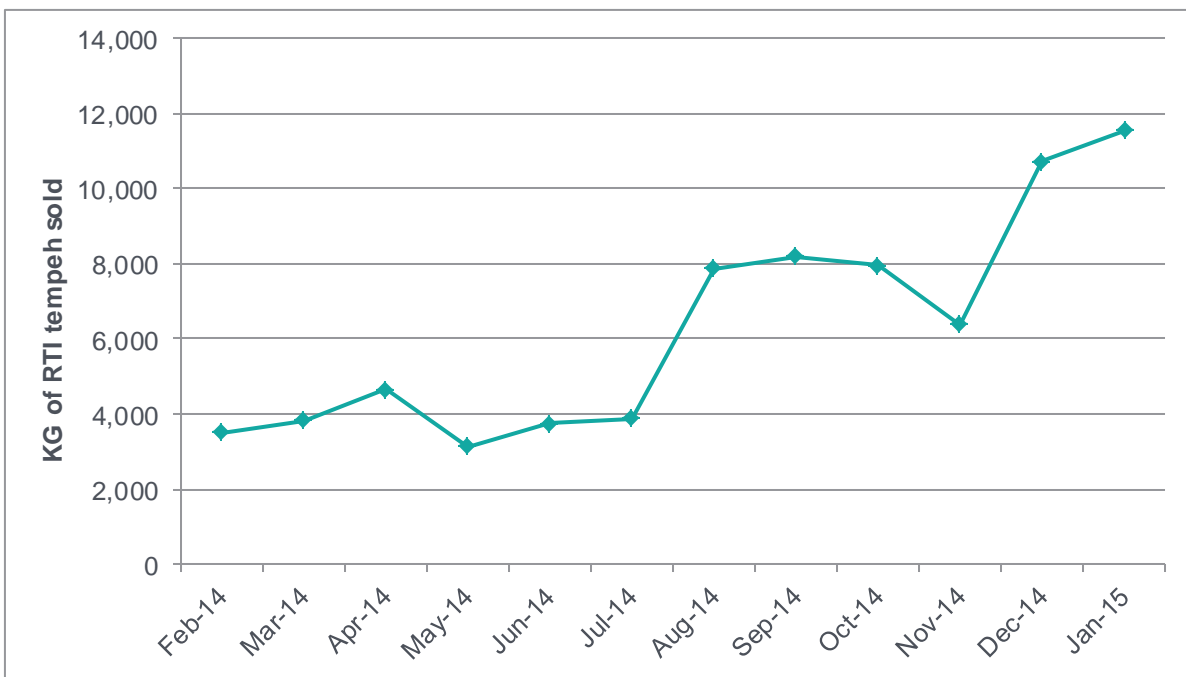
Prior to August 2014, Rumah Tempeh Indonesia (RTI) had been selling tempeh to a handful of independent retailers in the Bogor area, and sales had stagnated. In August 2014, with Mercy Corps support, RTI developed partnerships with two external distribution companies which had large existing networks of businesses selling their products. The number of outlets stocking RTI tempeh promptly skyrocketed. By January 2015 RTI tempeh was being sold in approximately 120 outlets in the Greater Jakarta area. Partnering retailers included 10 multi-chain supermarkets, including Carrefour and Lotte, and chains of high-end vegetable stores. The product is marketed at middle- and upper-income customers and retails from 10,000 IDR to 18,000 IDR per packet (USD 0.77 to 1.38), compared to less than 5,000 IDR (USD 0.38) for 'normal' tempeh sold in street markets.



Photo Credit: Thatcher Cook for Mercy Corps

Since August 2014, monthly sales of RTI tempeh also increased dramatically, rising by 198% in just 6 months, as shown in Figure 3 below. As consumer awareness of the new product increases and the number of outlets continues to grow, sales of RTI tempeh are expected to continue this impressive growth-use and hygienic practices.

FIGURE 3: MONTHLY SALES OF CLEAN TEMPEH BY RTI



Conclusions and lessons-learnt

SCOPE did not catalyse a system change in terms of market actors promoting clean tofu and tempeh to consumers. This remains a major gap in the new market system, limiting the ability of MSEs to get a better price for their clean tofu and tempeh and therefore acting as a disincentive to switch to clean practices.

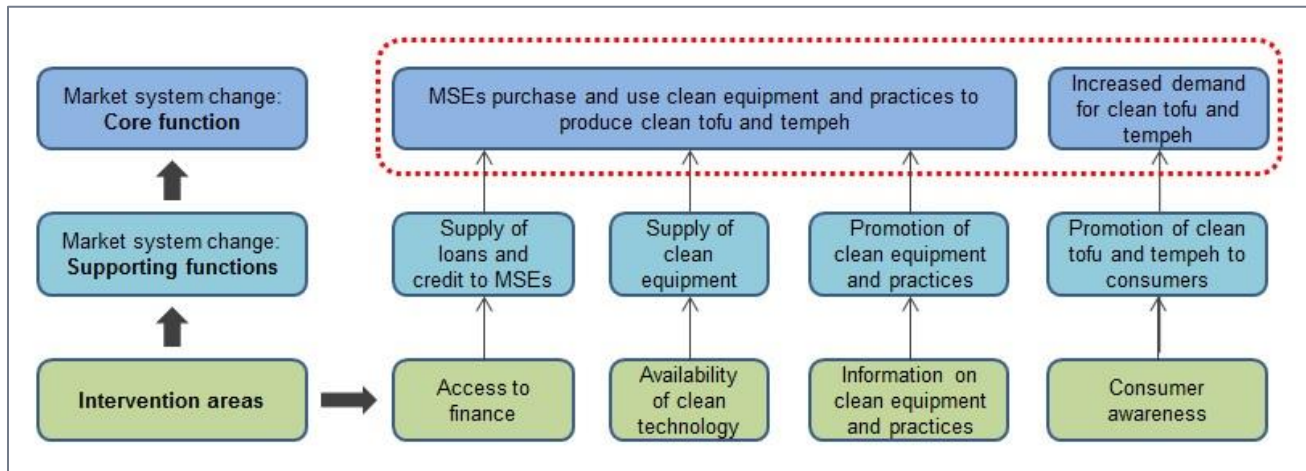
Consumer awareness interventions were not focused on facilitating sustainable and system-level change. The main interventions, including the mass media campaigns and support for consumer groups, used a directly delivery approach with no mechanism for sustainability. These were intended to provide an initial boost to consumer awareness and demand, but in reality were poorly designed and had a negligible impact on consumer demand and sales. The content of media messaging and awareness-raising by civil society groups was very general and did not provide information about where the products could be purchased. This was compounded by an absence of branding for all but one MSE, making it impossible for consumers to distinguish clean tofu and tempeh from the standard product. As a result, these interventions had a negligible impact on consumer demand. The SCOPE team were fully aware of the limited impact of these activities in terms of stimulating increased demand, and it became a 'box-ticking exercise' in order to meet log-frame targets.

The SCOPE program would have benefited from a stronger focus on supporting MSEs to promote their tofu and tempeh to consumers. There was one initiative with a small number of MSEs to introduce packaging with branding showing that the tempeh was hygienic. However this met with limited success as MSEs were reluctant to invest in the more expensive packaging materials. This is not surprising, as MSEs had no confidence that the improved packaging would result in a higher price from consumers. The willingness of consumers to pay a small premium for a product with branded packaging and clear hygienic status remains untested. If successful, this would provide a huge incentive for MSEs to adopt clean production practices (and get PIRT certification). More concerted effort by SCOPE to test this market potential would have been beneficial, and should be pursued in future programming.

What evidence is there of systemic change in the 'core function'?

The aim of facilitating system change in the four supporting functions, described above, was to in turn stimulate system change in terms of the *production and sale of clean tofu and tempeh* (the 'core function' of the market system). This section assesses the extent to which sustainable systemic change emerged in the core function (see Figure 4).

FIGURE 4: INTENDED SYSTEM CHANGES IN THE 'CORE FUNCTION'



Increased demand for clean tofu and tempeh

The SCOPE program's direct marketing interventions almost certainly had no impact on consumer purchasing behaviour. The messaging was too general, did not link consumers to the products, and, in the absence of branding, consumers would have been unable to identify clean tofu and tempeh in the marketplace. The campaigns also failed to recognise that tofu / tempeh consumers purchase the product from retailers in their local area and would not be willing to travel to specific outlets to purchase the clean products.

There is some evidence that increased promotion of clean tofu and tempeh by MSEs (supporting function 4) led to increased consumer demand, despite SCOPE including minimal interventions to support this. 39% of MSEs reported that they are able to sell their tofu or tempeh more quickly since making the switch, which closely corresponds to the 34% of MSEs that educate their consumers 'sometimes' or 'often'. SCOPE would have benefited from a deeper understanding of these dynamics, which could have led to interventions strengthening MSEs' ability to promote their product more widely and effectively and increase their sales further.

The success of Rumah Tempeh Indonesia (RTI), the factory in Bogor selling tempeh through supermarkets to middle- and upper-income consumers, is the clearest example of SCOPE interventions resulting in increased consumer demand for a premium clean product. Prior to SCOPE there was no tempeh whatsoever available in supermarkets. Sales of almost 12,000 kg of tempeh per month by the program end are an indication that several thousand customers at least now know about the product and have purchased it. The scale is still small, with tempeh for this new market being produced by a single microenterprise employing just two full-time staff. But the rate of growth is very high, in terms of not only sales but also the number of supermarkets stocking the product, and it seems likely that the number of customers buying the product will continue to expand rapidly.

MSEs purchase and use clean equipment and practices

The number of MSEs purchasing and using clean equipment and practices is the most important measure of system change in the core function. **The SCOPE program resulted in 771 MSEs switching to clean**

production equipment (234 tofu MSEs and 537 tempeh MSEs), an impressive outcome and only just less than the ambitious program target of 800 MSEs.



The SCOPE program resulted in 771 MSEs switching to clean production equipment

However, not all MSEs are using equipment that they purchased themselves (Table 4). A large number of MSEs in non-target areas received equipment free from government or a KOPTI (238 MSEs). Almost as many operate their business in a factory owned by another MSE that purchased equipment (202 MSEs), so they are using the new equipment but have not purchased it themselves.

TABLE 4: NUMBER OF MSEs ACCESSING CLEAN EQUIPMENT, PER PROVIDER

| Provider of clean equipment | # of MSEs |
|--|------------|
| Private sector retailer (purchased) ⁴ | 331 |
| Rented from other MSEs | 202 |
| Ministry of Industry (free) | 145 |
| KOPTIs (free) | 87 |
| Other (free) | 6 |
| Total | 771 |

The total number of 331 MSEs that purchased equipment does not yet constitute scale in terms of the market system. With thousands of tofu and tempeh MSEs operating in Jakarta alone there is huge potential for more widespread uptake of clean technology. A number of factors constrained more widespread uptake and will need to be overcome in future programs in order to reach scale, as shown in the table below.

TABLE 5: FACTORS CONSTRAINING MSE PURCHASE AND USE OF CLEAN EQUIPMENT

Low numbers of equipment retailers with

A greater number of equipment retailers are crucial to expand the market system and increase up-take. Improved last-mile distribution and promotion by these retailers will help to generate increased sales.

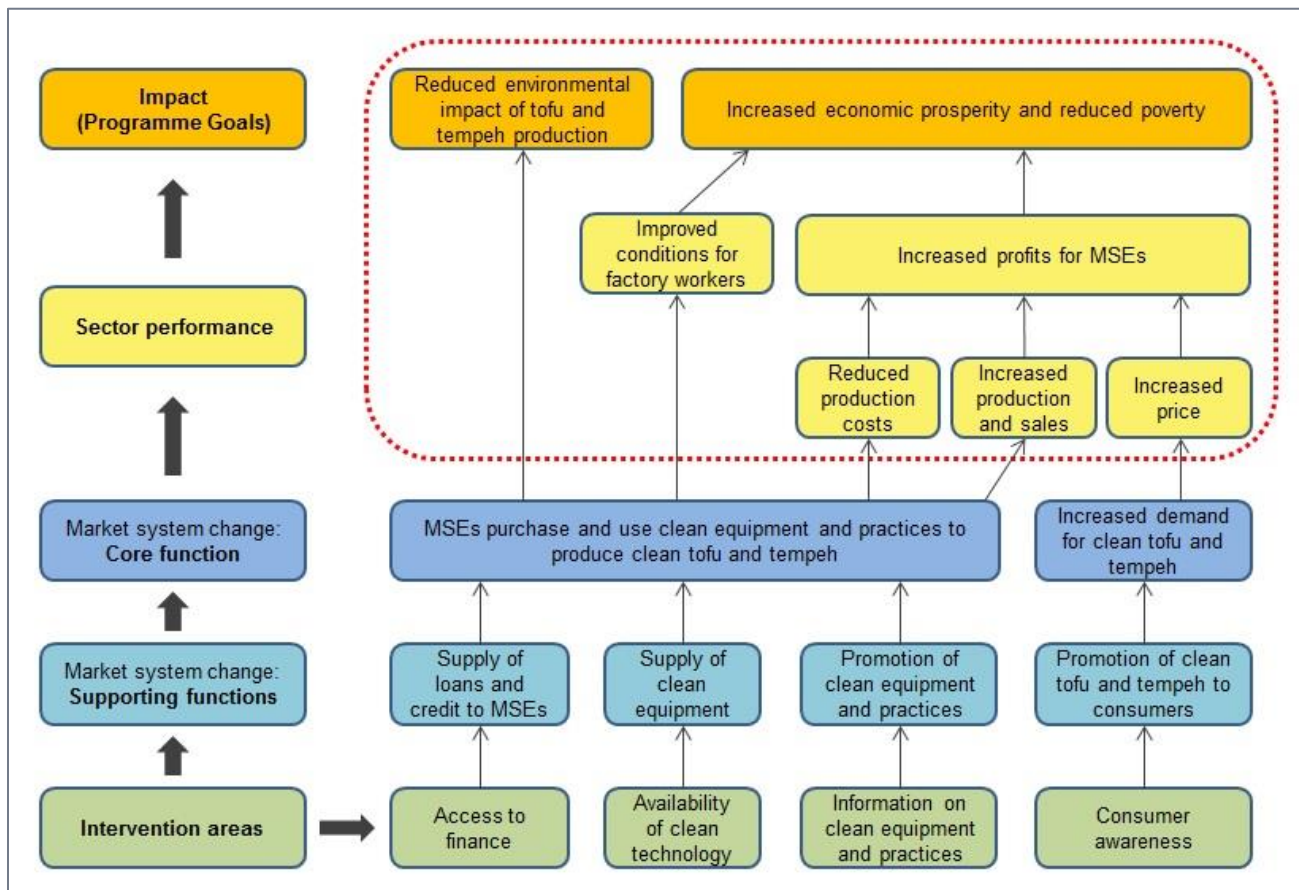
⁴ Of these 331 MSEs, 87 purchased with the support of a voucher providing a 25% subsidy

| | |
|---|---|
| limited reach | |
| Lack of access to credit | SCOPE was unsuccessful in facilitating loans to MSEs by financial service providers. Improving access to credit is crucial for the new market system to reach scale and the lease finance model offers the greatest potential to achieve this. |
| Rising price of LPG | The price of LPG increased by 29% between February 2012 and December 2014, the result of a depreciating exchange rate and rising international fuel prices. This acted as a disincentive for MSEs to make the switch to clean production; 25% of MSEs that had not switched said that 'LPG is more expensive than firewood' was the most important reason, second only to 'lack of capital' (44%). |
| Lack of a clear economic incentive for tempeh MSEs | Cost benefit analysis conducted by SCOPE showed that for tempeh MSEs, switching to clean equipment had a small net increase on their cost of production. Far more tempeh MSEs that made the switch were motivated by non-economic factors (53% identified a cleaner kitchen or less smoke as their main motivation) than by economic factors (26% identified time savings, cost savings, increased sales and an improved product as their main motivation). Nevertheless, a clear economic incentive would likely have led to greater uptake by MSEs. This could be achieved by supporting MSEs to effectively brand their product and therefore increase the price they receive. |
| Unavailability of LPG | The Government of Indonesia subsidizes small 3kg canisters of LPG intended for household and cottage industry use. Tofu and tempeh MSEs use several of these in one day and many struggle to find adequate supplies in local shops. |

What evidence is there of impact on sector performance and program goals?

This section will assess the extent to which the switch to clean production practices had the desired impact in terms of sector performance and the two main overall goals of the SCOPE program: Poverty reduction; and reduced environmental impact of tofu and tempeh production (Figure 5).

FIGURE 5: INTENDED IMPACT ON SECTOR PERFORMANCE AND PROGRAM GOALS



Sector performance: Increased profits for MSEs

Switching to clean production practices **increased profits** for 38% of MSEs (approximately 292 enterprises), a proportion that was roughly the same for tofu and tempeh producers. The average increase in profits for these businesses was substantial at 25%. 12% of MSEs experienced a fall in profits after making the switch, while 48% said their profits were unchanged.

There are three mechanisms by which the switch to clean production theoretically could have contributed to this increase in MSE profitability: first, by decreasing the per-unit cost of production; second, by enabling an increase in output and sales; and third, by improving the quality of the product and therefore the per-unit price received by an MSE.

The clearest impact of the switch to clean production is on the **quantity of production and sales**. Production increased for 37% of MSEs (282) that made the switch, and the average increase in output for these businesses was impressive at 49%⁵. For 15% of MSEs the quantity of output decreased, but the

⁵ The average increase in production for tofu MSEs was 63%, significantly higher than for tempeh MSEs (42%). It is important to note that this data is from the endline study, however the study was only conducted in factories that made the SWITCH, meaning that there was no control group comparison.

average fall was much lower at just 9%. The remaining 48% of MSEs experienced no change in production. The main cause of the increase in production levels was the efficiency gains of using the new equipment in terms of time saved⁶.



The switch to clean production resulted in higher profits for 38% of participating MSEs, with an average increase in profits of 25%

Switching to clean production practices resulted in **reduced per unit production costs** for some MSEs, but this did not have a significant impact on profitability. Cost benefit analysis for tofu producers showed that expenditure on energy decreased on average by 20% per year (US\$1,950) as a result of the switch. For tempeh producers, however, expenditure on energy increased by 33% per year (US\$212). The increase for tempeh MSEs is explained by low expenditure on firewood before the switch (as scrap wood was often collected for free from streets and building sites) and increases in the price of LPG which rose by 29% in the course of the program.

The effect of the switch on **the quality and price per unit of output** received by MSEs is the most difficult to assess with confidence. The quality of output seems to have improved as a result of the switch to clean practices; 47% of MSEs said their customers had noticed an improvement in quality, compared with 45% who said their customers had not noticed any change. Furthermore, 39% of MSEs reported being able to sell their tofu/tempeh more quickly, suggesting their product is more desirable for consumers. Less clear is the extent to which this improved quality resulted in a higher price per unit of output. In numerous interviews and focus group discussions, MSEs repeatedly complained that customers are extremely price-sensitive and even though the quality has improved they are not able to increase the price for risk of losing their buyers. In the survey of MSEs, only 1.4% of respondents said the biggest benefit for them is higher value tofu / tempeh. The evidence suggests that improved quality contributed to MSE profitability by making it easier for them to find customers and therefore increase production and their market share, not by increasing the price they received.

Sector performance: Improved conditions for factory workers

The SCOPE program also recognised that the switch to clean production by MSEs could improve conditions of workers in the tofu and tempeh factories, in terms of both economic conditions and also non-monetary benefits. In total there are 3,932 workers in the MSE factories that switched to clean tofu and tempeh (2,178 workers in tofu MSEs and 1,754 workers in tempeh MSEs).

Two possible improvements to **economic conditions for factory workers** are increased jobs and better pay. The SCOPE program did not affect the number of workers in tofu and tempeh MSEs. 68% of MSEs that switched reported no change in the number of their workers, while the number reporting an increase in workers was the same as reported a decrease (15% for both). However, workers in MSEs that switched to clean production practices benefited from very substantial increases in wages. After upgrading equipment,

⁶ In a survey of MSEs, those that increased production found it difficult to explain the reasons for their increase (47% said they didn't know), but 42% said that the increase was due to the new technology being quicker.

the daily wage paid to workers increased in 43% of MSEs, benefiting 2,095 tofu and tempeh workers (in 335 factories)⁷. Wages increased on average by 26% (\$ 1.48 per day) for workers in tofu factories, and by 20% (\$ 1.06 per day) for workers in tempeh factories. In focus group discussions, MSE owners cited their increased output and profits as the main reason for increasing wages, as a means of encouraging staff to work efficiently with the new equipment. The increase in wages equates to a net income gain for tofu and tempeh workers of over \$1 million each year. This is an impressive outcome, although without comparable data from a control group of tofu and tempeh MSEs that did not switch, it's not possible to establish accurately the degree to which this improvement can be solely attributed to the technology switch.

Factory workers also benefited from significantly reduced working hours as a result of MSEs switching to clean production practices, an unanticipated but significant improvement in **non-monetary conditions**. 57% of MSEs reduced the hours their factory was operating after upgrading their facilities, made possible by enhanced production efficiency. The reduction was significant, with hours worked falling from an average of 8.3 hours per day to 7.1 hours after the switch, a decrease of 14%. A second improvement was to the physical working environment in MSEs, in particular less smoke. A qualitative survey of factory workers was not part of this study, so it is not possible to establish the degree to which workers placed value on this change. However, for MSE owners, who usually also work in the factory themselves, this was identified as the single biggest benefit of switching to clean production⁸.

FACTORY WORKER BENEFITS

Workers in 43% of MSEs that switched to clean production practices benefited from substantial increases in wages. Wages increased by an average of 22% for more than 2,000 tofu and tempeh workers representing a total net income gain of over \$1 million each year.

Factory workers also benefited from significantly reduced working hours, with the average length of working day falling from 8.3 to 7.1 hours per day. Photo Credit: Thatcher Cook for Mercy Corps



⁷ Wages decreased in less than 1% of factories

⁸ 43% of MSE owners identified less smoke and a cleaner kitchen as the biggest benefit they have found from the switch. The next biggest factor was the time efficiency gain from the switch, chosen by 26% of MSE owners.

Goal 1: Poverty reduction

The final, and crucial, step in the analysis is to assess the extent to which the sector performance outcomes, described above, had an impact on SCOPE's first program goal to contribute to poverty reduction.

The theory of change for SCOPE posited that improved business performance of tofu and tempeh MSEs would increase their owners' profits, helping to lift them out of poverty. In practice, although profits increased substantially for a significant number of MSEs, this causal logic did not hold true. A survey of the poverty-level of MSE owners conducted as part of the learning study found that owners were relatively well-off, so increasing their incomes did not contribute to poverty-reduction goals.

Nevertheless, SCOPE did have a significant impact on poverty reduction. This impact, however, came as a result of the somewhat unexpected outcomes in terms of factory worker conditions⁹. An estimated 2,095 workers experienced increased wages that were at least partly due to the switch; 2,351 workers experienced a reduction in working hours; and over 3,000 workers have benefited from an improvement in their physical working environment. The PPI scorecard survey was not conducted for workers, but with average wages in the sector of less than five US dollars per day, workers benefiting from these improvements are far more likely to constitute the 'poor' than owners of MSEs.

Goal 2: Reduced environmental impact of tofu and tempeh production

SCOPE's second program goal was to reduce the environmental impact of tofu and tempeh production, at the local level and through contributing to mitigation of environmental damage nationally and globally.

Local environmental impact

POVERTY LEVELS OF MSE OWNERS

The SCOPE team used the Progress out of Poverty Indicator (PPI) scorecard to measure the poverty likelihood of MSE owners that had switched to clean production practices. The main finding was that owners of tofu and tempeh MSEs cannot be classified as poor, according to Indonesian government definitions.

The average PPI score for MSEs was 49 out of 100, giving an average poverty likelihood of just 1.4% against the Indonesian national poverty line. No MSEs had a poverty likelihood of 50% or higher compared with the national poverty line, and only 7 MSEs (5%) had a poverty likelihood of 50% or more when compared with the higher 150% national poverty line. Interestingly, the average PPI score for MSEs that have not made the switch is almost the same (47 out of 100), suggesting that, among the surveyed MSEs at least, there is no pattern of richer MSE owners being more likely to make the switch than poorer MSE owners.

⁹ It should be noted that improvement in conditions, including better pay for workers, was itself a result of improved performance and profitability.

Prior to the SCOPE program, production of tofu and tempeh produced significant quantities of waste water, solid waste and smoke. The SCOPE program had a negligible impact on water and solid waste pollution, in the handful of factories that adopted biogas digesters. However, the main way that the SCOPE program helped to address local environmental pollution was through reducing local smoke pollution.

As a result of SCOPE, 76% of tempeh production (from 537 MSEs) and 69% of tofu production (from 234 MSEs) is now produced using LPG. This has resulted in cleaner air in tofu and tempeh factories and, since most factories are located in the heart of residential areas, has also meant less air pollution in surrounding homes. Interestingly, 7.7% of MSE owners identified ‘fewer complaints from neighbours about smoke’ as the biggest single benefit from the switch, indicating that air pollution was previously a serious problem for their neighbours and likely a common cause of dispute.

National and global environmental impact

By catalysing a switch to clean production technology for 771 tofu and tempeh MSEs, SCOPE was successful in reducing the amount of firewood used in the sector. This reduction in firewood use contributes towards reducing the pressure on forest stocks in Indonesia and has led to a reduction in carbon emissions that contribute to global warming.

Switching to clean production practices did not displace firewood altogether, as some MSEs continued to use a combination of LPG and firewood, for example at times when LPG was unavailable. However MSEs on average reduced firewood use by 73% as a result of the switch. Table 6 shows the estimated annual reduction in firewood and carbon emissions as a result of the SCOPE program.

TABLE 6: REDUCTION IN FIREWOOD AND CARBON EMISSIONS

| | Tempeh MSEs | Tofu MSEs | TOTAL |
|---|-------------|-----------|---------------|
| Total reduction in firewood per year for MSEs that switched (tonnes) | 12,906 | 43,568 | 56,474 |
| Total reduction in carbon emissions per year for MSEs that switched (tonnes) | 20,103 | 69,080 | 89,103 |

PART C: LESSONS LEARNED AND RECOMMENDATIONS

Lessons learned

This section reflects on lessons learnt from the SCOPE program. The first set of lessons is program-specific while the second set reflects on some characteristics of implementing market development programs in the off-grid energy sector.

Programmatic lessons learned

Market development approaches can be successful in simultaneously achieving dual environmental and pro-poor goals, but technical and market assessments need to be particularly rigorous to ensure one goal does not undermine or dilute the other. Mercy Corps originally envisaged that the pro-poor impact of SCOPE would arise from increased profits for tofu and tempeh MSE owners, helping to lift them out of poverty. However, as this study found, MSE owners are relatively wealthy and increasing their incomes did not directly contribute to poverty reduction. The SCOPE program nevertheless had an impressive pro-poor impact. However, this was instead the result of increased wages and shorter working days for low-wage workers in MSEs that made the switch. This was not part of the original program design and was a somewhat unanticipated outcome of the SCOPE program.

This highlights the need to pay particular attention to poverty analysis of beneficiaries when designing market development programs with additional non-economic goals. Early assessments of tofu and tempeh MSEs, for example, should have included analysis of the poverty level of owners and also factory workers. Understanding these dynamics may have influenced the intervention design, including the technology selected and the distribution channels for equipment.

Recommendation: Conduct rigorous, targeted assessments during program design, to identify clearly the expected environmental impact and pro-poor impact of the market system change. As the market system develops, the environmental and pro-poor impact should be assessed, to check that the theory of change assumptions are valid.

Market assessments during proposal development are often rapid and incomplete, and are no substitute for detailed assessments and intervention re-design during program start-up. Market assessments conducted during the SCOPE proposal development were rapid and consequently of limited depth and incomplete. However, during program start-up there was an implicit assumption that the proposal design was optimal and based on detailed assessments. There was no pause for reflection or re-design of interventions at the start of the program, and the proposal document in general was used as a blueprint for implementation.

For some intervention areas this was not a serious problem as the program design and logic proved sound, but in others it undermined the program objectives and led to wasted program time and resources. The most obvious example of this is SCOPE's intervention targeting consumer awareness and demand for clean tofu and tempeh. Activities were implemented through a direct implementation approach which was poorly designed and had minimal impact. The SCOPE team were fully aware that these activities were largely ineffectual in terms of contributing to overall program goals, and activities became a time-consuming box-ticking exercise to ensure log-frame targets were achieved. SCOPE would have benefitted immensely from detailed market assessments of tofu and tempeh consumer preferences and purchasing behaviour, which could have been used to significantly re-design this set of interventions from the start.

Recommendation: During program start-up program managers and teams should be encouraged to challenge the program logic and design, and be empowered to re-design interventions where necessary.

On-going market analysis and reflection is also crucial throughout the course of the program, to respond to successes and failures and implement the program adaptively. Mercy Corps is increasingly recognising the importance of an adaptive management approach. This aims to empower teams to seek

new opportunities and experiment, using rapid feedback loops to adapt and scale interventions up or down in response to changing circumstances and new information.

Although there were a few instances of the SCOPE team managing interventions adaptively in the face of changing circumstances and knowledge for the most part the program was not set-up to be managed adaptively. For example, the SCOPE team rarely found time for points of reflection, occasions to step back and reflect on the big picture and the effectiveness of their interventions. The first such meeting only happened at the end of the second year, by which time it was too late to change things significantly. Ideally these points of reflection should be happening at least once a quarter for market development programs, in

AN EXAMPLE OF ADAPTIVE INTERVENTION DESIGN

One example of the SCOPE team demonstrating flexibility in the design of interventions was their approach to certification for MSEs that switched to clean production. Initially this was intended to be a 'green' certificate issued by government, but when the government initiative stalled the team instead began working to establish an independent voluntary green certification scheme. As the team learnt more about consumer preferences, it became clear that green certification would not be an effective means of marketing tofu and tempeh to consumers. SCOPE adapted the design again and identified the government's PIRT certificate for food hygiene as an option that would best mobilise consumers and this became the focus for the intervention.

MISSED OPPORTUNITIES FOR ADAPTIVE MANAGEMENT

A program managed adaptively allows teams to build on observed successes to replicate them more widely and can identify new interventions that will contribute to the desired market system change. The following examples show how adaptive management could have been used in each case to improve SCOPE impact:

Building on successes: One interesting development in the course of the program was the partnership between an equipment reseller and a lease financing company CV Gemilang, which developed independently of Mercy Corps. The lease financing model they agreed proved very successful, in contrast to the failure of financial institutions supported by SCOPE to introduce appropriate loans for the sector. Yet despite the success, the meeting with CV Gemilang for this learning study was the first time Mercy Corps had met their staff. A program taking a more adaptive approach would have sought to learn from the success of this development and explored opportunities to replicate it more widely, either through other lease finance companies or by supporting CV Gemilang to replicate it in their 15 other branches in Jakarta and nationally. Expanding the availability of lease financing could have been a significant driver of success in terms of more MSEs purchasing clean equipment.

New interventions: Establishing effective distribution channels for clean equipment was not explicitly included as an activity in the SCOPE proposal and no specific budget was allocated for this. Because of this, last-mile distribution was not a major focus for the team. A greater focus on program learning and feedback loops would have empowered the team to use monthly equipment sales data to learn from successes and identify constraints. This type of analysis and follow-up interviews with businesses would have shown that retailers were only achieving sales to their existing clientele (cooperative members or existing business customers) and would have highlighted the need to expand distribution channels and points of sales. Managed adaptively, SCOPE would then have been able to make this a priority area for a new intervention.

which the context, and in particular staff understanding of the context, can change very rapidly.

Recommendation: Tips and other guidance should be provided to program managers implementing MSD programs, on leadership and management practices that will enable flexible and adaptive programming.

The ability to manage a programme adaptively can be hindered by organisational structures and working culture and the external enabling environment. The SCOPE team's ability to implement adaptively was hindered by the siloing of team members into specific areas of responsibility (for example one staff was working on access to finance; another was working on consumer awareness activities; and another on PIRT certification). This led to staff focusing on achieving their own individual activities and indicator targets, with limited collaboration across activity areas, and resulted in missed opportunities for synergies between different interventions. For example activities supporting MSEs to adopt branded packaging was not aligned with consumer awareness-raising activities. It also meant team members had little incentive to identify new ideas for more effective activities, as their performance was measured against the narrow definition of activities and targets in their respective focus area.

SCOPE was also constrained by restrictive donor regulations that made even small changes to activities and staffing extremely difficult. The log-frame, with indicators for each activity, meant the SCOPE team felt locked into rolling out the prescribed number of trainings and events, even when these were not proving effective. Changing these activities and reallocating budget lines required a formal grant modification from the donor, a process that was not encouraged and could take several months. When it became clear that insufficient staffing level was holding back program progress, SCOPE was not able to respond by adding additional personnel, despite the program ending up with a significant underspend.

Recommendation: Ensure program teams have a clear understanding of the flexibility they have to change and introduce new interventions. In many instances, clear and open dialogue with the donor right from the start of the program can help to create a relationship of trust and shared ownership that will create a more permissive environment for nimble and adaptive programming.

Staffing levels for SCOPE were insufficient for an MSD program and in particular the program suffered from not having staff focusing on supporting and mentoring private sector actors. The SCOPE team developed deep relationships with the KOPTIs based on mutual understanding and trust, but with other private sector actors engagement was much more 'light-touch', in large part because SCOPE lacked the staff time to engage more deeply. This limited the ability of SCOPE to work with market actors to identify opportunities for greater impact; for example, more active engagement and facilitation with equipment manufacturers and retailers could have helped them develop broader and more effective last-mile distribution channels.

The understaffing problem was also exacerbated by high staff turnover, with three senior staff members (out of a team of seven) leaving at the mid-point of the program. This was perhaps most disruptive in terms of the impact on relationships with key partners, in particular KOPTIs. SCOPE management estimate that the slow process of building personal relationships and trust with KOPTIs was set-back by at least three months when personnel changed.

Recommendation: During regular reflection points in the program, staff structures and responsibilities should be reviewed to identify gaps.

Non-economic incentives can be a key driver of market system change, but a lack of clear economic incentives is nevertheless still a major hindrance to uptake by market actors. Far more MSEs that switched to clean production were motivated by non-economic factors (53% identified a clean kitchen and less smoke as the primary motivation) than by economic factors (26% were motivated by time savings, a higher value product or increased sales). MSE owners placed a high value on having a clean working environment, and the SCOPE team and KOPTIs were successful in promoting this vision of modern production.

Nevertheless, where clear economic incentives are lacking they can result in sluggish system change, and this appears to have been a factor in the SCOPE program, where the increasing price of LPG acted as a disincentive for MSEs to purchase clean equipment; 25% of MSEs that had not made the switch gave 'LPG is more expensive than firewood' as the primary reason, the second most common reason after lack of capital. A lesson from the SCOPE program is the importance of undertaking careful and detailed cost benefit analysis (CBA) very early in the program. The SCOPE program developed CBAs (comparing all costs of tofu and tempeh production using traditional production with the clean technology and practices), only in the final year of the program, which meant businesses retailing to MSEs were not able to give them clear guidance. A clear CBA developed earlier in the program would also have helped the SCOPE team quantify potential risks, such as rises in LPG prices, which could undermine the targeted market system change. It could also have been used to shape program strategy, for example providing impetus for interventions that increased the ability of MSEs to market clean tofu and tempeh effectively providing a clearer economic incentive.

Recommendation: Detailed cost benefit analysis (CBA) of the intended market system change should be conducted as early as possible in the program. This will inform the detailed design of the intervention strategy, and can also be used as a marketing tool by system actors promoting the change.

Market development in the energy sector

The SCOPE program highlights several distinctive characteristics of applying market system development (MSD) approaches to the energy sector:

Designing and testing appropriate energy technologies can take a long time and can result in technological 'dead-ends', which is problematic for programs with a typical 3-year duration. The SCOPE team spent more than a year of the program supporting the design and testing of a vacuum cooker, investing significant staff time in this process, which ultimately proved unviable due to the difficulty in using it and the time and cost necessary for maintenance. In other Mercy Corps energy programs, in particular those promoting cookstoves (which tend to be produced locally in contrast to household solar technologies), this is also a significant challenge.

Recommendation: MSD programmes in the energy sector should avoid including an R&D component where possible, instead seeking to integrate existing technologies with adaptations as necessary. When R&D is unavoidable, programmes should facilitate private sector actors to work together to develop the designs themselves, as SCOPE did for most new technologies, which will reduce the risk of inappropriate designs, reduce pressure on program resources and accelerate the design process.

Low consumer awareness of new energy technologies creates a barrier for rapid uptake and economies-of-scale among market actors. At the same time, direct engagement in marketing and awareness-raising by NGOs or other non-market actors is often ineffective. Prior to the SCOPE program, awareness of clean production technologies among tofu and tempeh MSEs was extremely low

(only 10% said they had ‘some information’ or ‘a lot of information’), so generating awareness of the new equipment was a major challenge for the SCOPE team and private sector partners. This is typical of many Mercy Corps programs in the energy sector, for example those facilitating new distribution channels for solar products or cookstoves.

The pressure to rapidly achieve a sustainable scale often leads Mercy Corps to engage in some direct marketing as a one-time boost to market uptake, as was the case with the SCOPE program. Face-to-face awareness-raising by the SCOPE team seems to have contributed to market take-up to an extent¹⁰, but this non-systemic approach is time intensive for program staff and in some contexts can be counter-productive (in a similar study of a Mercy Corps solar energy program in Timor-Leste, sales were found to be among the lowest in areas where Mercy Corps had the most visible presence). SCOPE investment in mass marketing to consumers, on the other hand, was completely ineffective, as it failed to build a connection between tofu and tempeh retailers. In Indonesia, Mercy Corps’ media messaging could not compete with the widespread and sophisticated advertising machinery of businesses, as is often the case given limited NGO budgets. In other energy programmes Mercy Corps has found that supporting private sector actors to invest in their own face-to-face marketing has been far more effective, which was not a significant focus for SCOPE.

Recommendation: As much as possible, focus on supporting market actors to conduct consumer awareness-raising themselves as part of their business-as-usual marketing practices. If direct marketing by the implementing organisation is seen as necessary, ensure this is closely aligned with businesses’ marketing and sales activities. Use of mass media for awareness-raising, which is inevitably de-coupled from businesses’ marketing and sales practices, is likely to be effective only in fairly exceptional circumstances. **For new energy technologies, ‘up-front’ trust is particular important to stimulate market demand, and interventions focused on building this trust are crucial.** For tofu and tempeh MSEs, the purchase of new clean technology was a large and one-off investment, and this is typical for other market development programs in the energy sector, such as household solar lighting products. This is in contrast to many other MSD programs (for example in the agriculture sector), in which consumers can often start with small purchases of products or services, and increase these over time based on frequent repeated transactions and growing trust.

The SCOPE team and the KOPTIs recognised the need to rapidly build ‘up-front’ trust in the clean equipment, and this led to an increased focus on model factories and peer-to-peer visits to demonstrate the new technology in action. One private sector partner also facilitated visits for potential customers to the factories of MSEs that had already purchased equipment, to meet the owner and try the technology for themselves. Supporting market actors to develop this trust is essential to success in other MSD energy programs, and in household solar and cookstove programs a trusted warranty, or products sold by trusted retailers, has helped address this challenge.

Recommendation: The importance of building trust should be given high priority from the program start. Forums enabling dialogue between market actors, in particular consumers and retailers, can be helpful in

¹⁰ 22% of MSEs said that Mercy Corps was most important in persuading them to make the switch, with only KOPTIs more influential at 33%.

identifying the particular challenges of building trust in a given context, and identifying effective solutions that can feed into intervention design.

Market development programs in the energy sector are vulnerable to fluctuating energy prices, which creates uncertainty around technological choices. The price of LPG increased by 29% in the course of the SCOPE program, creating a disincentive for tofu and tempeh MSEs to purchase clean technology ('LPG is more expensive than firewood' was the second most important factor in MSEs not purchasing equipment, after 'Lack of capital'). In the SCOPE program dual-fuel technologies helped to mitigate this uncertainty; the manufacturer of steam boilers for tofu production responded to requests from MSEs and developed a design that could use firewood or LPG, so MSEs were able to switch between firewood and LPG depending on price and availability. Developing a detailed and clear cost benefit analysis (CBA) for the new technology can also help to reduce uncertainty, for example identifying the price at which a new technology is no longer cost viable.

Recommendation: When implementing MSD programs in the energy sector, assess the likely impact of energy price fluctuations on the market system, as part of the CBA process. This information will help to inform technology and intervention choices, and can be used by market actors to help inform their decision-making about whether to purchase energy products.

The public good characteristics of energy access, and the externalities that energy consumption produces, mean that MSD programs in the sector often have to navigate the prominent involvement of government. During the SCOPE program, government was very quick to respond to the new designs for energy efficient technology; province-level line ministries purchased sample equipment from retailers and distributed it free to MSEs in their area, and the MoI introduced recommended standards for the sector. This type of government intervention is common in other Mercy Corps energy programs and can have a positive or negative impact on the emerging market system. Government has the reach and influence to be a powerful force for promotion of new technologies and energy practices, but unfortunately often see this as synonymous with free hand-outs, which can undermine nascent markets. For the SCOPE program, distributions were largely in distant provinces so the main target market in Java was not affected, and government involvement played an important role in building momentum among key stakeholders. Mercy Corps has rarely found it fruitful to persuade government to stop distributions altogether but has had success advocating that government only do distributions in areas far from the target consumer market.

Recommendation: MSD programs in the energy sector should seek to anticipate the key risks posed by possible government policies and interventions in the sector, and also ways in which they can play a catalytic role. Government agencies should be engaged early, and it usually best to be as transparent as possible about the risks their policies may present. Advocacy objectives with government should be realistic, taking into account the incentives of government agencies and individual staff within them.

Biogas technology offers significant potential for food processing in urban environments; however significant R&D is required for this to become a viable and scalable solution. The SCOPE programme experimented with biogas as an alternative fuel to LPG. With high density of organic waste, initial tests and demonstrations showed real promise for particular market segments. However, the team recognised significant barriers. The challenge in collateralising the technology and the large physical space required for biogas plants made it impossible for many producers operating in high density parts of Jakarta.

Recommendation: Future programming addressing tofu and tempeh production in the target area should focus on the development of appropriate financial products to allow biogas technology uptake, as well as R&D in partnership with local market actors to develop more flexible technology designs.



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