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General

Energy market systems development: Lessons from the urban food processing sector in Indonesia

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Picture 1: Product line from Rumah Tempe, the projects first model processing unit (Source: Mercy Corps Indonesia)

Scaling Sustainable Consumption and Production of the Soybean Processing Industry in Indonesia (SCOPE) was a three-year market development programme funded by the European Commission. The programme sought to address high resource intensity in the Indonesian tofu and tempeh sector, which employs approximately 285 000 low-wage workers in an estimated 85 000 enterprises. Through catalysing a shift in the production practices of micro and small tofu and tempeh enterprises in Jakarta, Indonesia, the programme stimulated uptake of cleaner production practices using clean burning fuels, hygienic equipment and process improvements. This learning study describes the key findings and lessons learnt through implementation.

Introduction

In Indonesia, tofu and tempeh produced from soybeans are a staple source of protein consumed by millions every day. Yet their production is highly energy-intensive and is a major source of local pollution and carbon emissions. Mercy Corps assessments calculated average carbon emissions for tofu and tempeh factories of 273 tons per day, which implies estimated carbon emissions for the sector of over 200 million tons per year. Micro and small enterprises (MSEs) represent the bulk of production and emissions, predominantly relying on firewood and inefficient and unhygienic equipment such as open fires and oil drums. The tofu and tempeh sector employs approximately 285 000 low-wage workers in an estimated 85 000 MSEs. (Bank of Indonesia, 2011).

Mercy Corps' Scaling Sustainable Consumption and Production of the Soybean Processing Industry in Indonesia Programme (SCOPE) funded under the European Commission's Switch Asia mechanism, spotted the potential in the market system for tofu and tempeh to achieve the two programmatic goals of promoting energy efficiency and reducing environmental impact; and of contributing to poverty reduction through improvements in the profitability of tofu and tempeh MSEs. To achieve these goals SCOPE aimed to catalyse a shift to clean production using clean burning fuels, and efficient and hygienic equipment such as stainless steel vats and steam boilers.

The programme was designed to address the key barriers to a market-driven switch to cleaner and more efficient production. These were: the lack of availability of appropriate clean technology in the local market; the lack of information and awareness among market actors; lack of financing options for investment in technology; and low demand from daily consumers for tofu and tempeh that is produced in a cleaner, healthier environment.

Project description

SCOPE used a market systems development (MSD) approach to stimulate systemic change in the tofu and tempeh sector for achieving large-scale and sustainable impact. The strategy aligns with those taken by other Mercy Corps MSD programmes in the energy sector such as the Energy for All Programme in East Timor (market system development for household solar and cookstove products), however this was the first

Picture 2: Typical tofu and tempeh production site in Jakarta (Source: Mercy Corps Indonesia)

time Mercy Corps applied the approach to an urban micro-processing sector. SCOPE was predominantly implemented using a facilitation approach to stimulate commercially-driven investment by private sector actors, with minimal grants or subsidies provided by Mercy Corps. SCOPE implemented interventions targeting four identified constraints:

Sustainable supply of clean equipment: SCOPE partnered with existing equipment manufacturers to develop and promote a business case for producing high-quality processing equipment.

Promotion of clean equipment and practices to increase demand: SCOPE facilitated market relationships and provided capacity-building support for equipment manufacturers, resellers and KOPTIs (tofu and tempeh cooperatives) for the promotion of clean technology.

Supply of loans to MSEs: SCOPE supported existing commercial financial entities to offer loan products suitable for target MSEs, and facilitated their linkages with producers.

Consumer awareness: The SCOPE team directly implemented activities that included mass media promotion on television, radio and in newspapers, and coordination with consumer awareness groups.

Project impact

The SCOPE programme met with varying degrees of success in catalysing sustainable market system change. In stimulating the sustainable manufacture and supply of clean energy equipment, SCOPE achieved impressive results; three partnering manufacturers have become market-driven suppliers of clean energy technology and have continued to sell equipment beyond the end of the programme and an additional five manufacturers also spontaneously entered the market and are producing competing technologies for sale to MSEs (known as 'crowding in'). The programme has also stimulated new distribution channels and proactive promotion of clean energy equipment by retailers and KOPTIs, and this too appears to have excellent prospects for sustainability, though the geographic reach of these distribution channels remains quite limited. On the other hand, SCOPE met with minimal success in stimulating a sustainable market system change in terms of the provision of loans to MSEs by financial services providers and in the promotion of clean tofu and tempeh products to consumers by MSEs.

As a result of these changes to the market system stimulated by the SCOPE programme, 770 tofu and tempeh MSEs accessed clean technology from the suppliers within the project and adopted improved practices or processes, only slightly less than the ambitious target of 800. This outcome has had an impressive impact in terms of the dual programme goals, reducing environmental impact and contributing to poverty reduction.

From an energy perspective, the switch to clean burning fuels, largely LPG and some biogas, had a significant environmental impact. Firewood-usage among these MSEs fell by 73%, leading to an estimated direct emissions reduction of 260 000 tons of CO_2e (assuming equipment lifecycle of three years.

Switching to clean production practices resulted in significant increases in profits, with 38% of switching MSEs reporting at least a 25% increase in profit margins. Almost 4000 workers were employed by the 770 MSEs that switched and the poverty impact of SCOPE was achieved as a result of improvements in their working conditions; more than 2000 workers benefited from an average 20% increase in wages (compared with less than 40 workers that experienced a reduction in pay) and 2300 workers also benefited from a 14% reduction in working hours. MSE owners credit these changes to increased outputs, profits and efficiency improvements particularly in terms of time-savings.

Lessons and recommendations for energy market development programme practitioners

1. R&D for new technology solutions can take a long time and can result in technological 'dead-ends,' limiting potential programme impact.

The SCOPE team spent significant staff time for more than a year to support the design and testing of a new vacuum cooker, which ultimately proved non-viable. Deciding whether or not to invest in local technology R&D is a significant challenge in other Mercy Corps' energy programmes that have a production component, in particular those promoting cookstoves.

Recommendation: MSD programmes in the energy sector should avoid including an R&D component, instead seeking to integrate existing technologies with adaptations as necessary. When included, R&D activities should be conducted by the commercial actors themselves with programme implementers playing a facilitation role.

2. 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 programme, awareness of clean production technologies among tofu and tempeh MSEs was extremely low (<10%). Generating awareness of the new equipment options was thus a major priority and challenge. The

pressure to rapidly achieve scale builds the temptation for non-market actors to engage in some direct marketing as a one-time boost to consumer awareness and market uptake, as was the case with the SCOPE programme. Yet the programme's investment in mass marketing to consumers was ineffective as it did not build a clear link between the producers and retailers, and it could not compete with the widespread and sophisticated advertising of large corporations.

Recommendation: MSD programmes in the energy sector should focus on supporting marketing and promotion by private sector partners. Any direct investment in marketing or awareness-raising should have a very clear objective and timeframe. Large-scale marketing should only be attempted where the audience is clearly defined and relatively confined.

3. For new technology investments, up-front trust in both the technology and the suppliers is important to stimulate market demand, particularly larger scale technology.

For tofu and tempeh MSEs, the purchase of new clean technology represented a large and one-off investment. This is typical for market development programmes in the energy sector. By contrast, consumers in many other sectors, such as the agriculture sector, can often start with small purchases of products or services and increase purchases 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. This led to an increased focus on model factories and peer-to-peer visits to demonstrate the new technology in action.

Recommendation: Intentional strategies for building trust in technology solutions and suppliers are essential to success in energy technology market development programmes. Formal warranties can do this to some degree, but demonstration installations and peer-to-peer visits are effective ways to build in the technology while also increasing interaction between suppliers and consumers.

4. Energy market development programmes are particularly vulnerable to fluctuating energy prices and government subsidy shifts, which creates uncertainty around technological choices.

The price of LPG increased by 29% in the course of the SCOPE programme, creating a disincentive for the MSEs to purchase clean technology. 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. MSEs were therefore able to switch between the two depending on price and availability.

Recommendation: The development of multiple technology or fuel options for consumers is the best way to avoid subsidy price risk. Conducting a detailed and clear cost benefit analysis (CBA) for new technologies at the start of the programme can reduce uncertainty by identifying the price parameters for various options.

5. The public good characteristics of energy services, and the externalities that energy consumption produces, mean that energy market development programmes often have to navigate the prominent involvement of government.

During the SCOPE programme, government was quick to respond to the new designs for energy efficient technology; province-level line ministries purchased sample equipment from retailers and distributed it for free to MSEs in their area, and the Ministry of Industry introduced recommended standards for the sector. This type of government intervention can either 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. Unfortunately, promotion is often taken to be synonymous with free hand-outs, which undermines nascent markets. For the SCOPE programme, free distributions were largely concentrated in non-target locations, and government played an important role in building momentum among key stakeholders.

Recommendation: Early engagement with government during the design phase can create conditions for positive government support. Although it is rarely possible to persuade government to stop free distributions altogether, advocating for distributions in areas far from the programme target consumer market is possible.

6. 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 in the target area should focus on the development of appropriate financial products to allow technology uptake, as well as R&D in partnership with local market actors to develop more flexible technology designs.

Recommendations for donor policy makers

1. Clean energy market development programmes should include inception phases to allow time for more detailed market analysis and any required technology R&D.

The SCOPE programme based intervention strategies on the results of market analysis conducted during proposal phase which, although sufficient for high level strategy setting, was not in depth enough to inform a nuanced implementation strategy. Pressure to begin concrete activities from the programme start limited the ability to invest time in a full cost-benefit analysis and market segmentation, which would have greatly benefited the programme.

Picture 3: Combining clean energy with high hygiene standards at Rumah Tempe (Source: Mercy Corps Indonesia)

2. Funding agreements should encourage programmes to re-evaluate intervention designs and change course as learning increases, rather than restricting changes to original designs.

Adaptive management 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 learning. The ability to manage programmes adaptively is vital to the success of any market development programme. This is particularly true of the energy sector due to the high prevalence and variability of energy subsidies, and the rapid advancements being made in energy technologies.

SCOPE was constrained by restrictive donor regulations that made even small changes to activities and staffing extremely difficult, as well as by a team culture that did not encourage significant adaptation. A log-frame that included indicator targets for each activity meant the SCOPE team felt locked into rolling out the prescribed number of trainings, even when these were not proving effective.

3. Energy MSD programmes need to invest in sufficient staffing levels to be effective. Facilitation approaches rely on the team's ability to spend time with key actors, building relationships, problem solving and building trust in technology.

The SCOPE team developed deep relationships with the KOPTIs based on mutual understanding and trust, but engagement with other private sector actors was 'light-touch.' In large part, SCOPE lacked the staff time to engage more deeply, which limited the programme's ability to work with market actors to identify opportunities. For example, more active engagement and facilitation with equipment manufacturers and retailers could have helped develop broader and more effective last-mile distribution channels.

4. Efforts at increasing uptake of clean energy technology can and should take a MSD approach where real cost-benefit and return on investment can be demonstrated. At the same time strategies should be encouraged that explore and promote non-market incentives.

Non-economic incentives can be a key driver of market system and behaviour change, but a lack of clear economic incentives is a major hindrance to uptake by market actors. During SCOPE, 53% of MSEs identified their motivation for switching to clean production as non-economic factors (a clean kitchen and less smoke) in comparison to the 26% who attributed economic factors (time savings, a higher value product or increased sales).

Nevertheless, uncertain economic incentives can result in sluggish system change. This appears to have been a factor in the SCOPE programme, where the increasing price of LPG acted as a disincentive for 25% of the MSEs to purchase clean equipment.

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Authors' profiles

William Baron is a technical specialist in Mercy Corps' economic and market development (EMD) technical support unit. Particular areas of focus are the intersection of market development, conflict and governance programming, and the application of MSD approaches in the energy sector in fragile states. He has worked for Mercy Corps for more than five years, including designing, managing and advising on a diverse portfolio of market development initiatives.

David Nicholson leads Mercy Corps' Technical Unit for Environment, Energy and Climate (EEC), which supports programmes across the Mercy Corps global portfolio. EEC is focused on helping field teams address energy access through programming designed to accelerate market-based clean energy solutions for the base of the pyramid, while also supporting the integration of climate and ecological systems thinking into Mercy Corps development and humanitarian programming.

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