

SELCO Foundation seeks to inspire and implement solutions that alleviate poverty by improving access to sustainable energy to underserved communities across India in a manner that is socially, financially and environmentally sustainable. SELCO Foundation demonstrates the role of clean energy and energy efficiency across areas of wellbeing, livelihoods, health and education.

# Scaling [ ecosystems for ] Technology Innovation

LIVELIHOOD EDITION



+91 (0)80 2649 3145  
info@selcofoundation.org  
# 690, 15th Cross, 2nd Phase J P Nagar,  
Bangalore: 560078

India is a vast country rich with geographical, social and cultural diversity which changes from district to district. A one stop solution to improving livelihoods via sustainable energy cannot work as the market conditions are not homogenous. They are geographically, economically and culturally different. For long term effective income generation solutions to evolve, customized eco-systems have to be established and innovations need to happen in technology, finance and delivery models. If each part of the ecosystem is scaled, it leads to an enabling environment for the default scale of income generating products or services for the poor. By outlining stakeholders, mapping the gaps and providing example case studies, this document brings to light the challenges of creating the eco-system for livelihood enhancement for the poor via sustainable energy.



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# Background

Over the last decade there has been tremendous focus on the un-electrified and under electrified areas of the world. Numerous incentives, investments and philanthropic monies have been allocated to encourage the diffusion of different types of lighting systems: mostly solar but also other forms of sustainable energy. Attention has been on various models like individual home lighting systems, micro and mini grids to grid interactive systems to provide basic energy access.

For poor populations however, the critical lifeline to get out of poverty is gainful employment. **There is a clear-cut case that access to energy can pave the way for those very opportunities: provided many pieces of the eco-system puzzle are put in place.** The critical pieces being availability of efficient, need-based technology, affordable cash flow based financing and access to markets: each of which are a challenge in themselves and presently require good amount of philanthropic monies to put in place. SELCO Foundation since its inception in 2010, has a targeted focus on technology & finance for livelihoods that can pave the path to sustainability and impact at the bottom of the pyramid.

The challenges in the **technology** arena is multifold. The spectrum could be from non-availability to highly inefficient substitutes. For example, in the case like blacksmiths one still must rely on centuries old methodology while in the case of rice mills there has been no importance given to the efficiency of the motors being used. As most of these populations lie under the informal sector there is a severe lack of documentation of problems and thus there is a dearth of solutions.

The variance of income streams make it perplexing for local financial institutions to offer standard **financial products** which in the present forms could be either unaffordable for the poor or would have a mismatch because of the cash flow scenarios. One of the primary reasons why some of the financial products are expensive because they are designed for consumptive loans and not for asset building loans.

The third pillar is the **access to markets**. Market linkages for the informal sector is the most complex, time consuming and expensive proposition if not dealt with in a strategic manner. SELCO Foundations vertical on livelihoods demonstrates the critical link between sustainable energy and poverty reduction. The aim of the Foundation is to produce a set of processes and models that could serve as a template for other income generation-solutions to piggy back on.

Over the past 5 years, SELCO Foundation piloted and scaled numerous livelihood based interventions for the poor using sustainable energy. These interventions, encompass technology innovations, efficiency of appliances, tweaking the financial products and catalyzing market channels for the poor. A typical livelihood solution developed is a suite of options (for that particular sustainable energy powered energy efficient livelihood) for new and existing entrepreneurial, group, cooperative or hybrid ownership models within various contexts which include, un-electrified, diesel run, under-electrified and electrified scenarios. In each of scenarios, financial savings, removal of drudgery, enhanced productivity and time efficiency lead to better income opportunities and sustainable growth for rural and tribal livelihoods.



# Ecosystems approach to Scaling Sustainable Livelihood Solutions

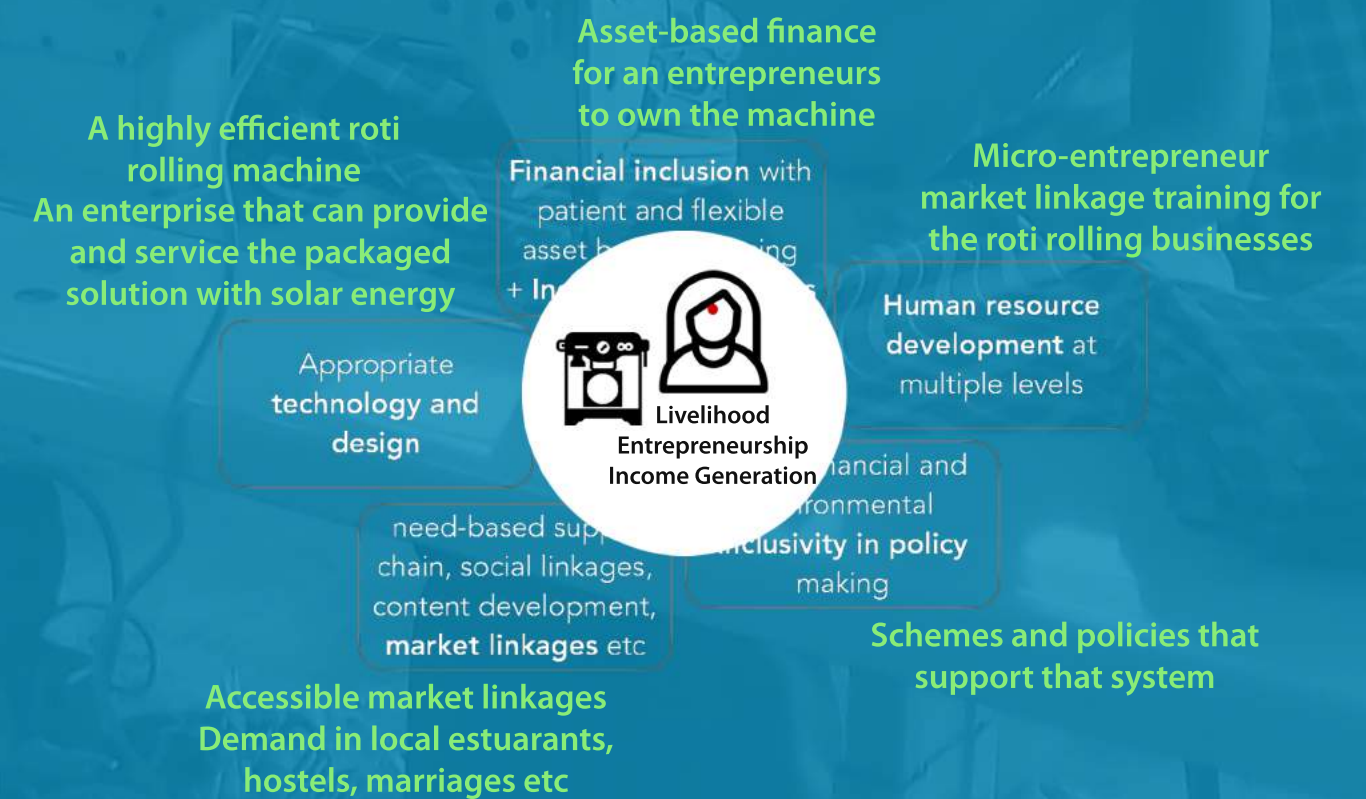
The scale up mantra has been peddled across sectors since the dawn of the second industrial revolution / industrial capitalism. The obsession with scale has made its way across donors, investors, inventors, innovators, enterprises, academics etc. Every stakeholder is either planning for scale or diminution to achieve scale or is frustrated with not reaching their desired scale. Currently in the development sector the product or the service is kept at the centre as what needs to be scaled with the other factors being ignored. To truly make impact via scale, the ecosystem around the end user and the enterprise serving the end user needs to be built upon and laid focus on. It is the scale up of the ecosystem that leads to the default scale up of sustainable livelihood solutions, to enhance incomes. SELCO Foundation strongly believes that access to energy alone, in itself, does not impact livelihoods. To improve incomes via sustainable energy comprises of numerous processes and stakeholders. For a sustainable energy enterprise or NGO to attempt solving livelihood issues in a silo means they would have to play the role, not only of improving sustainable energy access, but also play the role of technology suppliers, financiers, trainers and market linkage providers: that would be rare and in many cases onerous. In a mature ecosystem, multiple stakeholders exist and prosper to ensure the flow of linkages or opportunities that create enabling environments for citizens to survive, rise and thrive. **Civil society, private and public stakeholders play key roles in improving aspects of livelihoods to permanently alleviate poverty.** Hence the role of sustainable energy solution providers is to catalyze and enhance these missing ecosystem factors in order to demonstrate the linkage between sustainable energy and development: thus, demonstrating the capability of decentralized energy to transform communities. Sustainable energy is a powerful tool to build and mobilize the missing gaps in the ecosystem. If each part of the ecosystem is scaled, it can yield a default or automatic scale of the product and service which is also extremely critical. For long term effective solutions to evolve, customized eco-systems have to be established and innovations need to happen in technology, finance and delivery models.

SELCO Foundation's core focus and uniqueness has been to shift away from scaling up the invention itself and instead focus on scaling up the enabling factors that lead to the creation and scale of sustainable inventions. It focuses on identifying the types of stakeholders that lead to the success of an intervention in any one segment or geography and institutionalizing or influencing those or similar stakeholders across under-served geographies.

For example the solar powered roti (bread) rolling solution consists of: a highly efficient roti rolling machine, asset-based finance for an entrepreneurs to own the machine, schemes and policies that support that system, micro-entrepreneur market linkage training for the roti rolling businesses and an enterprise that can provide and service the packaged solution with solar energy. The enabling stakeholders or factors that needed to be supported or influenced in such a case included rural financial institutes, technology providers, the solar based enterprises, training institutes etc.



The Ecosystem - From an End User Perspective



Example of building the ecosystem for micro entrepreneurs to access appropriate technologies



# The Ecosystem

for Increasing Incomes and Improving Livelihoods

## Technology and Design

- Access to efficient technologies which are and will build long term assets/ investments
- Income generating technologies which cater to the actual need and capacity/market of the entrepreneur/cooperative
- Last mile supply chain of efficient technologies

## Finance

- Asset based financing
- Financing based on perceived cash flows
- Affordable cost of capital
- Appropriate repayment mechanisms

## Capacity Building/ Skill Development

- Options and alternatives to sustain/ improve efficiency in existing vulnerable businesses
- Opportunities to begin new sustainable businesses
- Knowledge on best practices

## Policy

- Recognition of informal/ micro livelihoods in micro and small enterprise financial schemes
- Sustainable energy recognition in sector specific schemes (agri, artisan/ craftsmen, manufacturing etc)
- Skill building government programs and schemes for enterprise building at grassroots level
- Large need-based schemes for risk funds for end user finance

## Channels/ Linkages

- Access to stable input sources (backward linkages)
- Access to strong and consistent- existing and newer markets (forward linkages)

### THE GAPS

### STAKEHOLDERS

### KEY SUPPORT AREAS

- Vendors or Suppliers for efficient need-based technologies
- Solution Providers or system integrators with focus on last mile delivery and servicing
- Research and development labs focused on efficient livelihood solutions

- Nationalized Banks
- Credit Cooperative Societies and Cooperative Banks
- Rural Regional Banks
- Micro-Finance Institutes

- District or Village level: Industrial Training Institutes Vocational Training Schools
- Agriculture Training Centers
- NGOs for skill building
- Microbusiness/ grassroots incubators

- State and National Level Government Bodies
- Apex banks
- Rural and tribal ministries, councils and departments

- Vendors/ Suppliers/ Enterprises/ Institutes/ End Users providing input and output channels
- Producer Companies
- Cooperatives
- Aggregators
- E-commerce platforms

- Research and development capital, capacity building and purchase agreements with vendors and suppliers of efficient productive appliances
- Working and expansion capital for technology/product vendors or dealers and last mile sustainable energy enterprises
- Incubation and training of sustainable energy enterprises/ system integrators implementing the solution.

- Financial Institute (FI) training and awareness programs
- Target setting with Financial Institutes (Circulars/ MOUs)
- Developing loan products with FIs
- Financial Innovation for unlocking loans (Risk fund/ guarantees, Interest subvention for vulnerable livelihoods)

- Demonstration labs for efficient productive appliances
- Training modules on technology usage, business planning, access to finance, product diversification and marketing

- Broadening definition and efforts on skill development to cover innovation and entrepreneurship/ enterprise development at a grassroots level
- Incentives and targets for micro and small grassroots businesses to adopt energy efficient and sustainable-energy driven solutions.
- Taxation designed to encourage sustainable value chains.

- Providing access to relevant networks and connections with stakeholders.
- Exposure visits, expert mentorships, workshops



# Sewing Machines

Tailoring is one of the most common primary or secondary incomes in rural areas, every village and town in India have over active 3-4 tailors. Tailoring is either taught at a young age, or women join skill development institutes to learn the skill.

**Problem:** Currently the only solution available for tailoring entrepreneurs or production units in rural and tribal areas is a manual sewing machine. The powered machine available in the market are not an option due to power cuts, lack of electrification or expensive operating costs, hence these tailors have very little opportunity to improve their productivity, expand or diversify within their current local markets.

**Solution:** Solar powered efficient sewing machines for domestic businesses, small production units and manufacturing centers with appropriate financing available for the combination.

## Impacts

**Reduction of drudgery** - Based on qualitative interviews it was found that the intervention enabled people to go from a manual to much more faster and convenient means of livelihoods. transformational impacts were found especially in cases of physical weakness, disability and very remote vulnerable entrepreneurs running manual machines. All entrepreneurs have recorded a significant level of reduction of drudgery.

**Improvement of Incomes** - In a sample study over 70% of micro entrepreneurs claimed have doubled to tripled income levels due to improved productivity after the intervention. Most of these were existing sewing machine entrepreneurs.

Getting clothes made locally is a preference of most Indian families, hence many tailors were not able to meet the local demand or even expand their markets to school uniforms, inputs for small tailoring businesses/ markets or supplying to other towns and villages.



## Technology and Design



- Efficient motor, belt and pulley for the solution to work effectively, Variable frequency Drive for industrial machines
- working with local motors and belt and pulley providers to improve quality and develop a better appropriate product
- working with manufactures for providing the appropriate technical solution as a package, possible purchase agreements underway
- Training and mentorship support for 3 sustainable energy enterprises on supplying solar efficient sewing machine as a solution (building channels, technology know-how and supply chain, finance etc)

## Finance

- loan product within over 5 financial institutes in different states - linking enterprises with the loan product
- part of over 30 banker training programs conducted last year across 3 states led to circulars and
- target setting with banks for over 1550 micro entrepreneurs for availing solar driven livelihood solutions

## Capacity Building/ Skill Development

- implemented as a demo and training model in over 30 Vocational Training Centers
- 50 sewing machine Industrial Training Centers in rural and tribal areas linked with enterprises and financial institutes

## Policy

- Rural Self Employment Training institutes, initiated by 3 national banks have adopted the solution as a part of their training and loan programs
- Institutionalized under Sind Mahila (women only) special Loan Scheme (8% interest) and MSME scheme
- Paper on efficiency in sewing machine motors for Bureau of Energy Efficiency

## Channels/ Linkages

- 120 Cooperatives, 60 NGOs like Myrada, Best Practices, Orbitz Sampark etc have adopted the solution and actively are becoming the channel for identification and entrepreneur information/ support centers



# Roti Rolling

Roti (flat bread) is a staple diet across India, women and men alike make rotis in order to consume at home and take to work.

**Problem:** Roti making is drudgerous process, many households prefer buying rotis from small local entrepreneurs, more ever the potential to make and sell rotis in shops, restaurants, hostels, institutes, marriages or funerals is immense at a local level itself. Manually rotis take around 70 seconds to make, and inefficient Alternate Current roti machines have high operating costs are cannot be reliably run.

**Solution:** Solar powered efficient roti rolling machine for domestic businesses and small production units with appropriate financing available for the combination.

## Impacts

**Reduction of drudgery and better productivity:** The solar roti rolling machines have enabled entrepreneurs, partnerships and self help groups to increase their productivity from 50, 100 or 200 rotis a day to 500-1000 rotis a day. It takes about 5-15 seconds for each roti to make, depending on the entrepreneurs experience. All units have been able to tap new markets due to increased productivity.

**Improvement of Incomes:** In most cases roti rolling entrepreneurs or self help groups have mentioned a seasonal spike in income which has triple or quadrupled their income levels. The newer entrepreneurs need 6-8 months to build consistent market linkages. In 3 cases entrepreneurs have taken second loans and purchased more solar roti rolling machines post the first intervention. At least 30% of the entrepreneurs have been able to diversify their product through the machine.

The machine has also been tested and tweaked for varieties of rotis and papadams and has multiple applications. Once the business stabilizes and grows they also typically ask for packaging, labelling and kneading machines.



## Technology and Design



- Retrofitting the inefficient (450W) motor with a Direct Current 150W motor, making the solar system much more affordable and sustainable to own and run
- Enabled the local technology manufacturer to source efficient motors and supply appropriate retrofitted technical solution
- Redesigned roller mechanism for more hygienic and better quality roti rolling
- Mobile roti rolling demo van established with 2 enterprises.

## Finance

- Loan product within over 3 financial institutes in 2 different states - linking enterprises with the loan product
- Part of the product mix target while setting targets with banks for over 1550 micro entrepreneurs for availing solar driven livelihood solutions
- Demonstrated and part of curriculum for all rural regional banker training programs.

## Capacity Building/ Skill Development

- Partnership with skill building NGO Best Practices to develop curriculum and start roti rolling innovation center
- 3 District Agriculture Training Centers (DATCs) host solar roti training programs periodically.
- Part of the SKDRDP (rural cooperative) training center with footfall of over 20,000 trainees per year.

## Policy

- Institutionalized under Sind Mahila (women only) special Loan Scheme (8% interest) and MSME scheme.

## Channels/ Linkages

- Local institutional market channels have been built by partner NGOs like Best Practices, Kotra Adivasi Sangha and MYRADA.
- Learnings on market linkages by analyzing the first 50 micro entrepreneurs- become part of training curriculum.



# Blacksmith Blower

Blacksmiths are one of the very few traditional artisanal workers community who have survived to exist in rural economy even today mainly for two reasons: majority of agricultural production emanating from small and medium land holdings. and preferred designs of hand tools used in agricultural production and post production vary considerably from region to region making it difficult for industrial mass manufacturers to penetrate into rural and tribal areas.

**Problem:** Low income, low productivity and labour shortage, increased cost of raw materials, unavailability of charcoal, and additional labour/ operational costs to operate a manual/ inefficient blowers are all adding to the burden of blacksmiths making it difficult for them to depend on their traditional artisanal work for a living.

**Solution:** An energy-efficient furnace blower along with a speed controller for blacksmiths that is cost-effective with an attractive payback period that reassured better livelihoods for blacksmiths.

## Impacts

**Reduction of drudgery and better productivity:** All blacksmith interviewed and evaluated reported a significant transformation from their previous mode of operation. Reduction of drudgery for women, children, blacksmith, farmers and blacksmith help was evident in all cases. Due to the controller ease of use has been evident post intervention.

**Savings and income increase:** The savings from the solution enable the blacksmith to own the solution within a very short period of time (12-16 months) and have an increased level of income by 20-30% at the very least.

Blacksmith blowers come in light and heavy blower variants for different types of blacksmiths to adopt the solution. Angle grinders and power hammer tools are also being worked upon to package with the blacksmith blower.



## Technology and Design



- Developing a new efficient blacksmith blower and controller
- Working with 2 local fabricators and electronics manufacturer to product the new products and supply them to enterprises
- Technology and supply chain support for 6 enterprises to replicate the solution across 3 states

## Finance

- Loan product within over 3 financial institutes in different states - linking enterprises with the loan product
- Part of over regional banker training programs and 2 blacksmith cooperatives
- Part of target setting with banks for over 1550 micro entrepreneurs for availing solar driven livelihood solutions

## Capacity Building/ Skill Development

- Implemented as a demo and training model in 6 Micro Finance Training institutes and Training NGOs
- Solution is also a part of tribal Industrial Training Institutes in 2 states
- Rural Entrepreneur Development Institute (EDI) incubates blacksmiths based on the current solution.

## Policy

- Blacksmith cooperatives become a partner for innovation and development for efficient and sustainable blacksmith solution
- Institutionalized under low interest programs for vulnerable blacksmiths under NABARD (National Bank for Agriculture and Rural Development)

## Channels/ Linkages

- Local channels and demand in place, currently no efforts for product diversification and market linkages underway.



# Conclusion

Through the ecosystem approach- efficient income generating products, financial models, training programs etc. are institutionalized within existing and new stakeholders. By 2020 SELCO Foundation would have developed over 100 effective sustainable energy driven energy efficient livelihood interventions and built the ecosystem for many of those to be scaled up and replicated across poor populations in various geographies. The learnings from the ecosystems approach and the livelihood interventions challenge the current solutions being provided to solve the 'off-grid' or un-electrified problem and provide a direction for the role that renewable energy enterprises and solution providers need to play.

Holistic solutions that use sustainable energy as a catalyst create a level playing field for the poor to prosper. Interventions need to happen at the individual level, community level, stakeholder level and at the state level for to truly transform societies. The ecosystems approach ensures that **processes that have led to unlocking parts of the ecosystem get documented, replicated and scaled up.** Removal of drudgery and access to income generation solutions via asset ownership is the key for all entrepreneurs, innovators, self help groups and cooperatives at the bottom of the pyramid to ensure social security in a sustainable manner.

