



Sustainable Energy in Cotton Value Chain

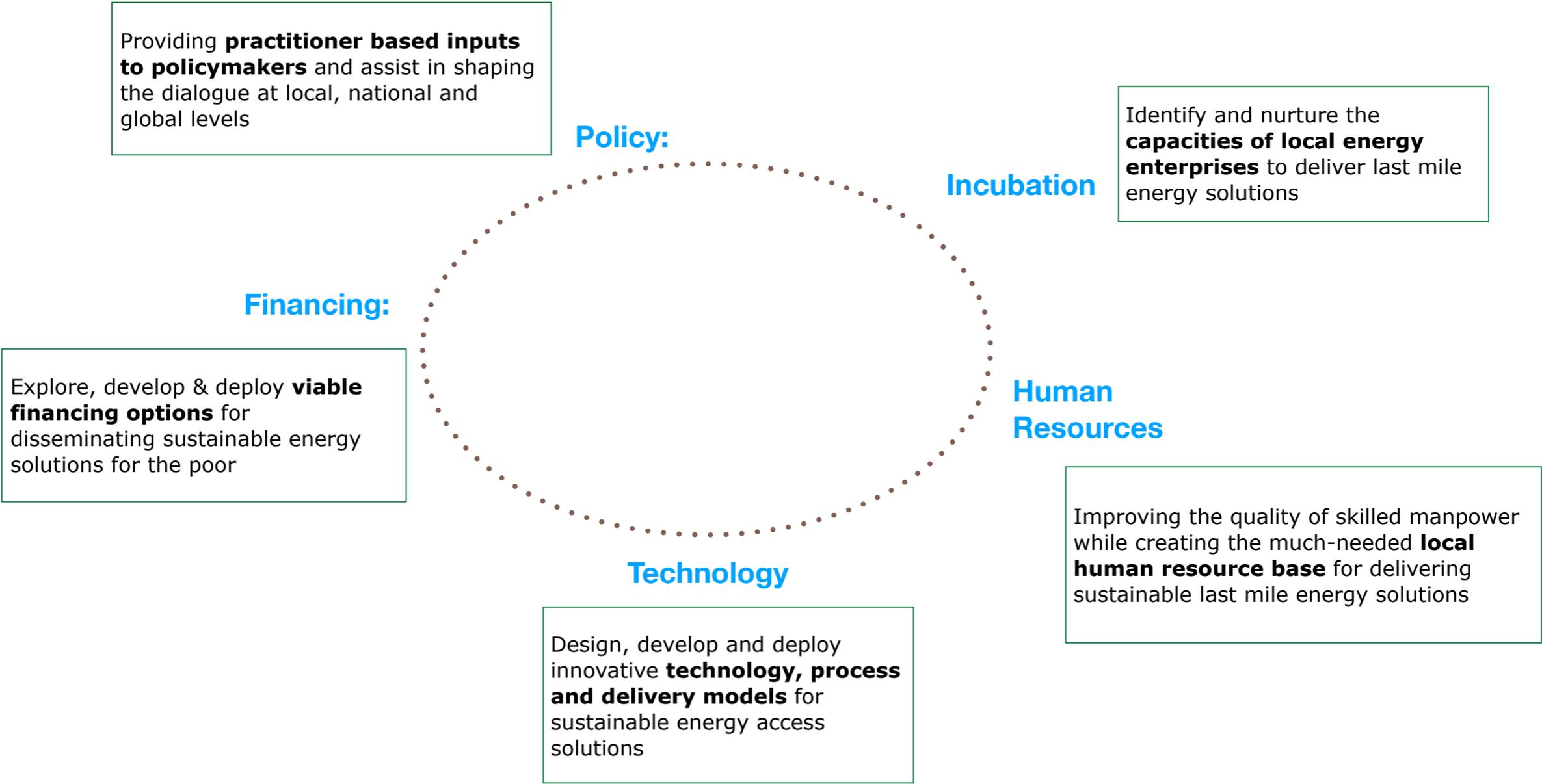


SELCO Foundation

Sustainable Livelihoods through Ecosystem Approach

SELCO Foundation partners with micro and small entrepreneurs to provide sustainable energy solutions together with efficient technologies that are contextualised to their needs. Additionally, access to livelihood solutions can be made sustainable only when it is developed around a specific user ecosystem. The ecosystem approach enables scaling and replication of technology solutions to larger user group.

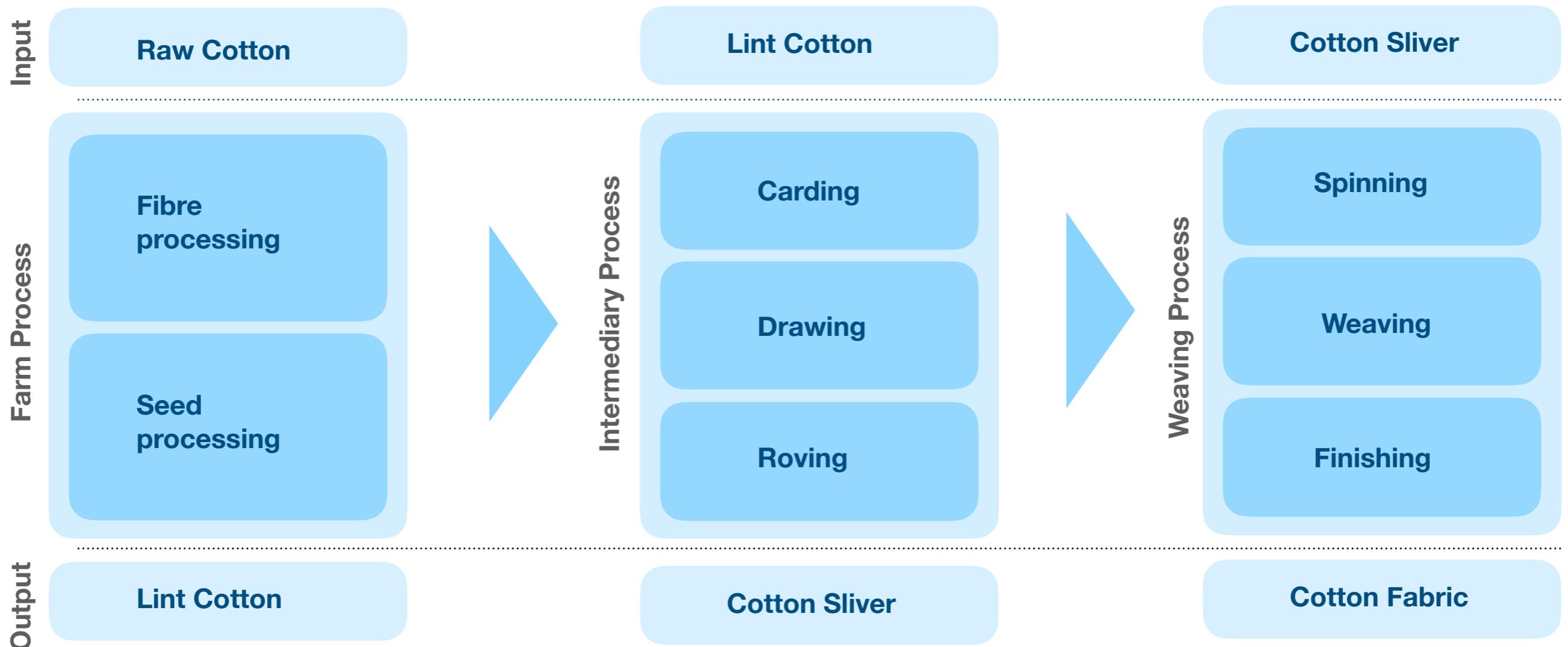
Ecosystem components:



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Understanding Cotton Value chain

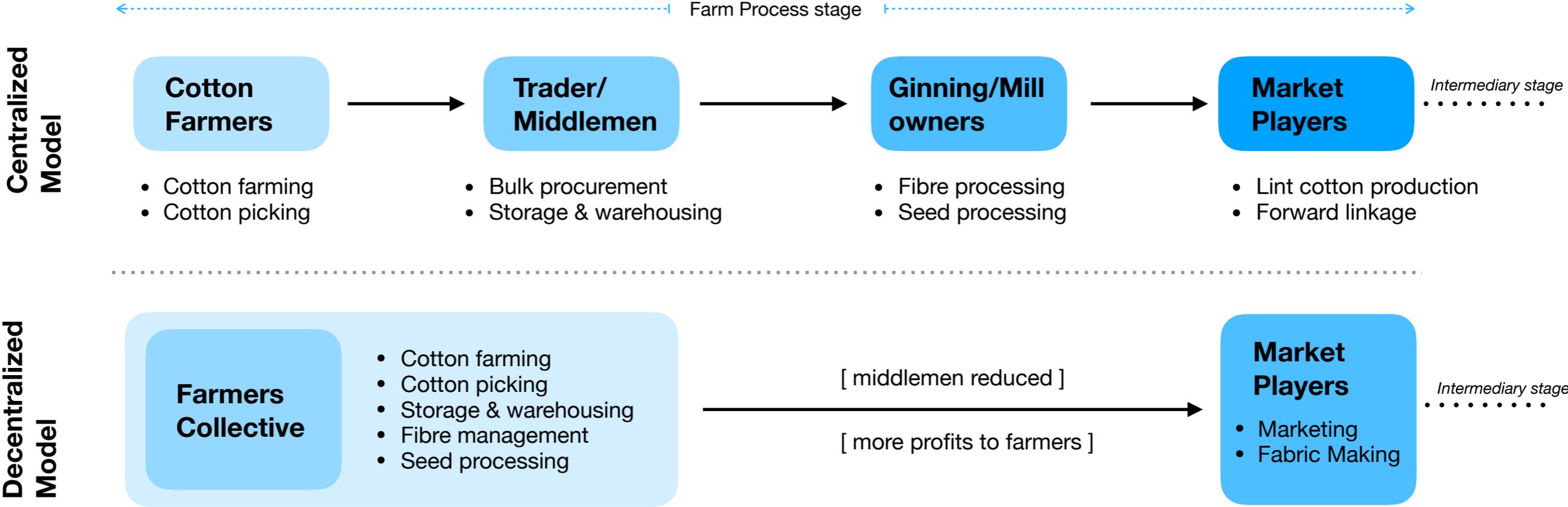
The textile industry in India, after agriculture, is the second-largest employment generating sector in India. It offers direct employment to over 35 million in the country. India is one of the largest producers as well as exporters of cotton yarn. The cotton value chain is long and complex value chain comprising of multiple nodal points. This is because the supply chain itself has multiple players having their own specialised roles in performing specific set of activities. But for the sake of simplicity and understanding, we can bucket the process under three main sections - Farm process, Intermediary process and Weaving process. There is a unique opportunity of decentralized sustainable energy at the farm process level.



Sustainable Energy in Cotton Livelihoods

Players in Centralized and Decentralized model at farm level

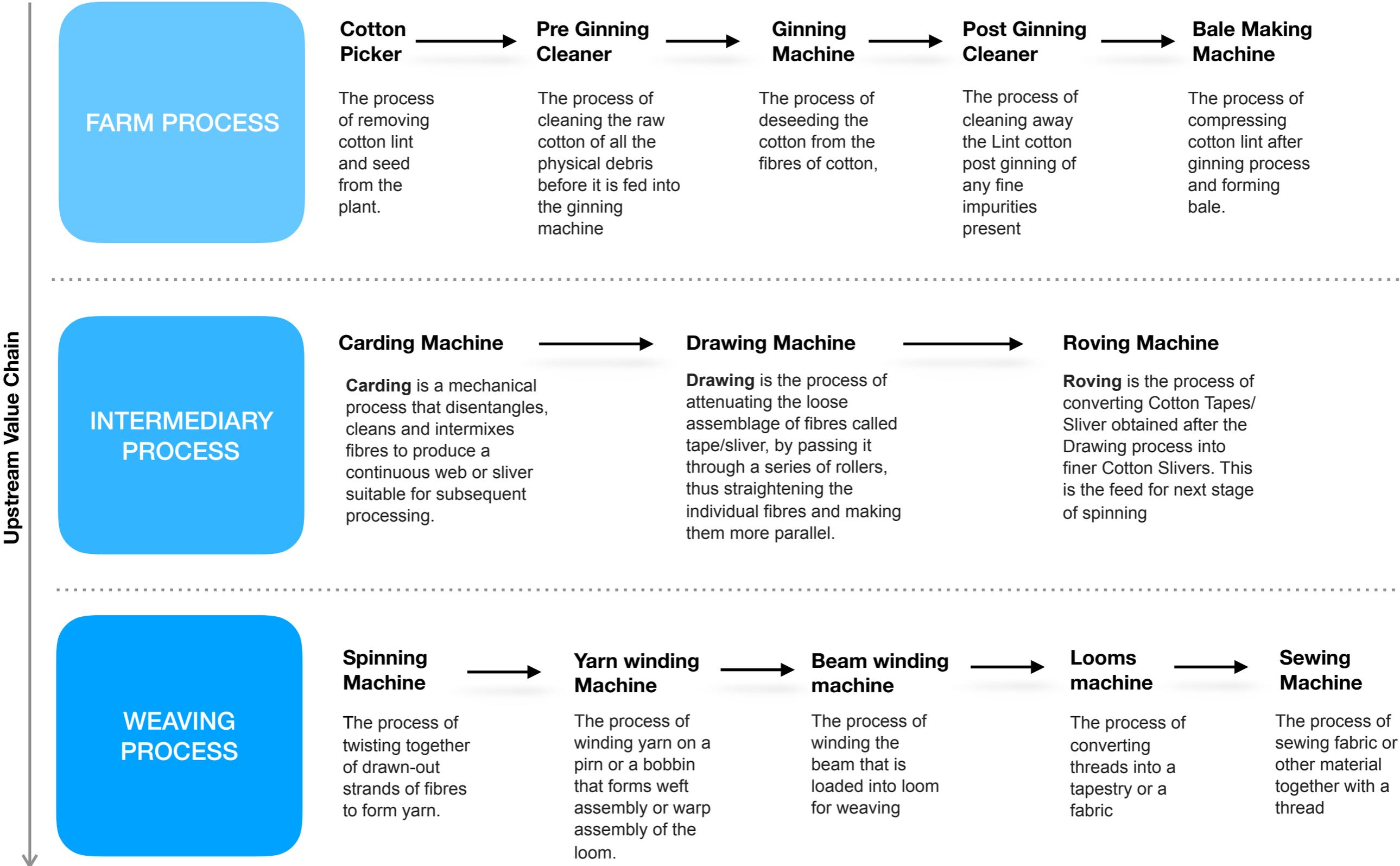
A long string of intermediary players already exist in the farm level; this include traders, middlemen, ginning and mill owners. Towards a large part, they dominate the profit margins and asset holding dynamics in the lower cotton value chain i.e especially in farm processing level. This is mainly due to the controlled and centralized architecture of processing units in the hands of a few. In the proposed decentralized model, the control of basic processing units is expected to vest within the actual producers of cotton.



The decentralized model allow the farmer collective to gain access to small-scale cotton processing machines. Now the process of storage, fibre management and seed processing is proposed to be under one decentralized centre at the farm level. This arrangement undermines the middlemen/traders who were usurping higher profit margins in the earlier model. In this way, the original producers have regained their rightful position and due profits from their produce.

Energy+Tech Interventions in Cotton Value chain

Tracing technology within each process level



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Farm Process level

Solar Cotton Picker

Presently, cotton picking is largely practiced manually in farms where daily wage labourers are hired to carry out the task. Cotton Picker helps to increase productivity of manual picking cotton, and reduce the drudgery and the injuries that hand picking may cause to fingers.

Key Features:

- An LED is mounted for better visibility
- Energy system consists of 15Wp solar module and 84 Ah battery
- It provides the battery back of upto 6 hours



Solar Ginning Machine

Generally, ginning machines are centrally situated in a textile mill. Cotton growing villages being geographically distant from mill, farmers have to incur heavy transportation costs for ginning their cotton. A solar powered DC energy efficient ginning machine for small scale or decentralized use was designed by SELCO foundation.



Key Features:

- The capacity of processing is 6-8 kgs per hour.
- It has the autonomy of running for 3 hours per day independent of the grid.
- The motor rating of 1hp , 230V was integrated within the system design.
- The Solar PV module of 250 Wp, 24V specification was used to power the machine
- It can support short staple (Desi) variety of cotton which is not possible in centralized machine.

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Weaving Process level

Solar Cotton Charkha

The manual charkha or spinning machine involves hard labour work and is very challenging for the spinners. Moreover, the hand shaft rotates at varying values of about 35-40 rpm, which results in low productivity resulting in low income. Solar Charkha is designed such that each spinner can use dual charkhas at the same time.

Key Features:

- The solar 10-spindle charkhas employs 80W, 24V PMDC motor.
- It gives 7-8 hours of autonomy each day.
- Flexibility to increase the speed up to 75 rpm with a speed controller resulting in increase in production.



Yarn Winding Machine

Yarn winding machines are currently manually operated, and function by turning the flywheel which sets the machine in motion, causing a large amount of drudgery. Now motor is connected to the flywheel.



Key Features:

- A 0.25 HP AC motor placed on the frame of the machine with a 3 hours backup.
- It is able to run for 10 hours continuously at a higher RPM in comparison to a manual operated machine.

Beam Winding Machine

The continuous hanks have to be wound around warping beam which is loaded into the loom. An inverter-based system was designed which is independent of grid connectivity.



Key Features:

- A 0.5 HP motor was employed powered by two 250Wp solar module.
- Back up time of 3 hours
- Unique gear arrangement converting low torque high rpm to high torque low rpm output.

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Weaving Process level

Solar Efficient Loom

Weavers spend laborious hours doing monotonous repetitive movements to create fabric or tapestry. Competition from power looms, low wages, imported goods have disincentivized manual weavers. An innovative efficient loom was designed that reduced the stress and strain and improved productivity.

Key Features:

- There are three typologies of technical solutions - manual efficient, solar efficient and drive by wire loom.
- Solar efficient looms uses BLDC motor with rating of 850W.
- Solar module of 400Wp and autonomy of 8 hours.



Solar Sewing Machine

Tailoring is one of the most important livelihoods in India. Traditional tailors who generally serve local customers in small cities and villages use a manual sewing machine. However, manual machine has lower productivity and involves physical drudgery. Moreover, power-cuts are another cause for loss of income for these entrepreneurs.

Key Features:

- Depending on scale, there are two variants that employs PMDC motors of sizes 60W and 80W.
- Depending on motor size, the machine is powered by either 60Wp or 75 Wp.
- The solution is designed to give autonomy of upto 8 hours



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Featured Case

Tailoring Entrepreneur in Kalahandi, Odisha



Ramsingh Kabadi is a 35-year-old male entrepreneur from Kalahandi District of Odisha. He used a manual sewing machine and was unable to keep up with his orders, especially during the wedding and festival seasons. Even though Ramsingh had electricity at home, he did not want to shift to a motorized sewing machine because of the erratic and poor supply of the grid and instead wanted to get a solar system installed.

Impact

Today, Ramsingh is able to meet the seasonal demands and keep up with the orders, resulting in higher income. Increasing his productivity by 1.5 times per hour, Ramsingh has seen an immediate increase of INR 2500 per month. Further, a solar light in his shop allows him to work through later in the evenings as well thus, allowing him the flexibility to take large number of orders.

Weaving Collective in Gillesugar, INGRID



Two looms were installed in Gillesugar, a refugee settlement in the premises of INGRID. It was to provide an alternate employment opportunity to the women who work as daily wage labourers in agriculture or construction. A nine-month training was given to ten women under two master weavers with a stipend.

Impact

Now, these women are able to manage the procurement of yarn and production of fabric by themselves. These women have become self-sufficient by weaving sarees, shirts, towels, stoles and earning more than their previous daily wages.

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Way forward

Development of Sustainable Cotton clusters

Bringing innovation and sustainability within cotton cluster in potential areas for improved efficiency, convergence and scaling in the value chain

Unlocking Affordable Finance

Access to finance has been critical factor in acquisition of novel technology. Also information and knowledge on different asset financing and policy support needs to disseminated to end-user

Shift towards decentralized technologies

The weaving technologies that are currently available are centralized and housed within large textile mills. This poses a burden to an average cotton farmer. It is time to move towards decentralized and small-scale technologies.

Expanding Operations & Services

Most of the decentralized technology is based on DC systems. In such cases, the servicing network is in the nascent stage, especially in remote areas. Local energy enterprises or entrepreneurs with such expertise has to be activated.



Solar Amber Charkha being used at Janapada Seva Trust in Melkote



Solar Sewing machine used by household entrepreneur in Karnataka