SELCO FOUNDATION

Dairy Value Chain

Decentralized Renewable Energy and Energy Efficiency for Productive Use

Background and role of energy

Dairy farming is an important source of income for 70 million rural households in India that produce an estimated 139 million tonnes of milk annually. The average milch cattle holding is between 1 and 2 animals, and the milk production system is scattered over a large number of dairy farmers, producing an average of less than 4 kg milk per day.The smallholder milk production system needs adequate support and strength to compete in an evolving market as it is one of the primary livelihood sources for millions of dairy farmers.

In India, 80% of milk production is contributed by small and marginal farmers. The pursuit of grazing lands for fodder, water and other inputs has pushed the practise of dairy farming towards remote fringe zones. These zones do not necessarily have access to the grid or even if it's available, the question of reliability and affordability arises. Thus, the income potential of small and marginal dairy farmers are not fully realized. India is still facing challenges of poor milk quality, low yield, lack of infrastructure and a fragmented production. A number of infrastructure related bottlenecks are still present in both back-end and front-end supply chains. Integration of decentralized sustainable energy provides a unique opportunity to address these challenges.

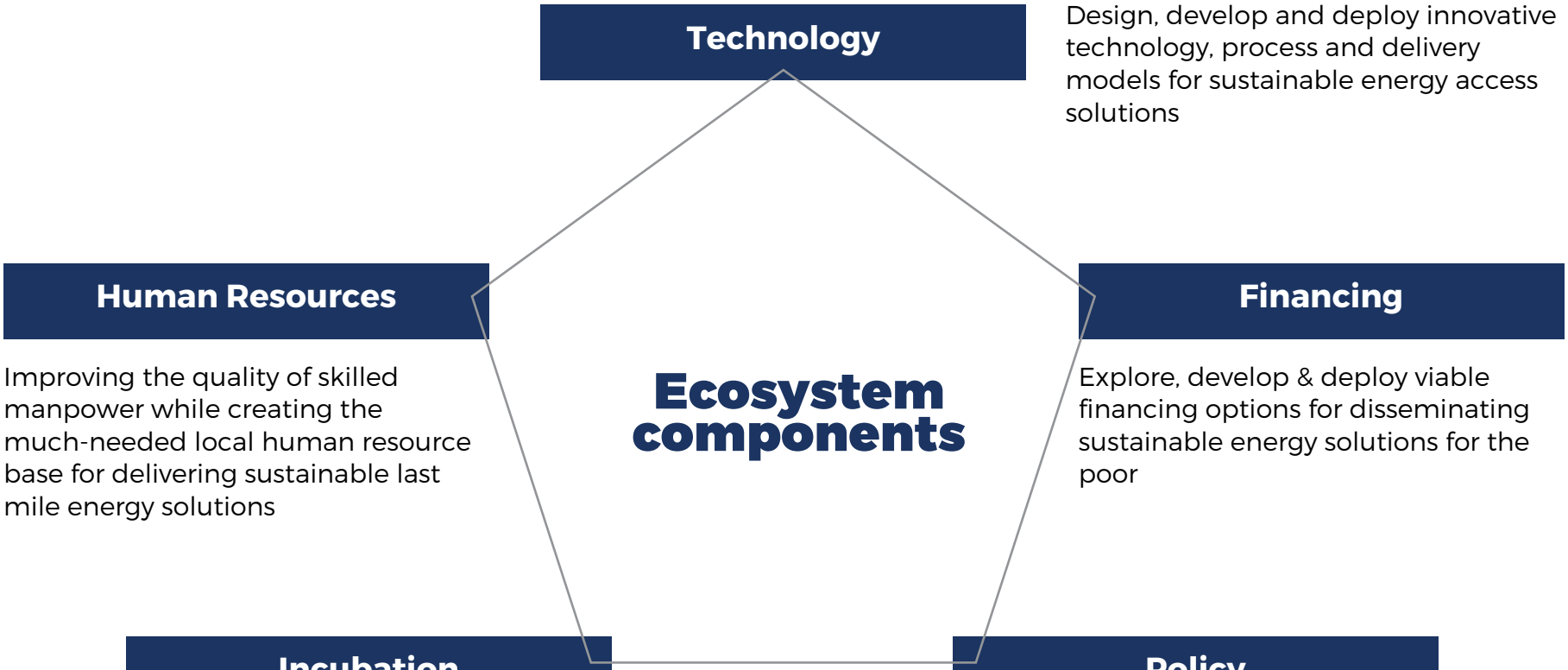
70% Thermal energy is utilised in powering chilling and storage units, sterilization processes, spray drying, evaporation, pasteurisation etc and 30% Electrical Energy is utilised for pumps, homogenisers, standardisers and also for refrigeration and cold storage throughout the value chain, milk processing, packaging and value add services

Making small dairy farming globally competitive: myth or reality
Wouter Kolff - The Hindu | Updated on December 29 '14

Greening the Indian Dairy Value Chain - Energypedia

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.



Approach

Sustainable Built Environments

Increased yield

Better quality output

Reduced drudgery

Energy Efficiency

Increased hygiene

Well being of cattle

Sustainable Energy

Opportunity for product diversification (curd, butter, khova)

Dairy value chain - Stakeholders, Activities & Technologies

INPUTS

Feed Supplier

Co-operatives

Veterinarians

Individual Dairy Farmer/ Entrepreneur

Fodder Growing
Hydroponics,
Water Pumps

Feed Manufacturing
Chaff Cutter

Artificial Insemination Vaccination
Cold Storage Units and Carriers

PRODUCTION

Unorganised Individual Farmers

Individual Farmers with Co-operatives

Individual Farmers with Companies

Cattle Breeding & Rearing
Lighting
Cattle Water Sprayer + Pump
Biogas
Water Heater

Milking
Milking Machine
Can Chiller

COLLECTION

Co-operatives

Private Entrepreneurs

Milk Collection Center

Village Collection Center

Milkman - Contractor/Trader

Doorstep Collection (Transport)
Refer Vehicle
Can Chiller

Storage
Medium / Large Chilling Unit
Water Heater

Quality testing
Weighing Machine
Milk Testing Machine

PROCESSING

Milk Processing Center

Bulk Milk Center

Informal Value Added Businesses (eg. Snack maker, local sweet shop)

Milk Processing & Value Add Milk Products
Sweet Meat Machine (khowa)
Sweet Meat Stove (Khowa)
Butter Churner Machine
Pasteurization Unit
Production Unit (Curd, Milk Powder, Paneer, Cheese)
Ice Cream Making Machine

Packaging & Transportation
Packaging / Bottling
Water Heater
Chilling Unit (Cold Storage)

RETAIL

Wholesaler

Milk Shops & Booths

Restaurants

Milk Bars & Shops

Sales and Value Addition

Cold Storage / Refrigeration
Freezer
Mixies / Blenders
Butter Churners
Other: Light, TV, Mobile Charging

CONSUMERS

Urban

Rural

Self Consumption (eg. farmers, local households)

Storage and Value Addition

Refrigerators
Butter Churner

Fodder

Fodder/forage/feed is a major component of goat farming. Fodder management is a key factor in successful and profitable goats. Green fodder plays a major role in providing essential nutrients and ensuring goat health.

A steady supply of green fodder of various varieties is essential, but large numbers of livestock traders do not own land. They must then rely on the commons for their fodder needs. If they do have land, the cost of cultivation is high due to high costs or non-availability of inputs such as water or labour. Climatic conditions, such as the drought-like features in large parts of the country, further the difficulties faced by livestock traders.

Adoption of a hydroponic fodder system drastically reduces feed costs and the need for land, while ensuring year-round access to nutritious fodder.

INPUT

Hydroponics

Hydroponics system is a state of the art technological intervention for growing green fodder or leafy vegetables. In a dairy value chain for cattle feed, It is a viable method of producing fodder not only enhancing milk production but also bringing about qualitative change in milk produced by improving the content of unsaturated fat, Omega 3 fatty acids, vitamins, minerals and carotenoids

Key Features of Hydroponics:

- Enhanced fodder security - With hydroponic units, availability of fodder is ensured year-round, without being affected by the vagaries of nature.
- 5-25 times higher yield vs. volume of field crops - Hydroponic units require very little land to cultivate, which is quite useful for livestock traders who are marginal land-owners.
- Only 5-10% of water required as against field crops. Traditional methods require between 60-70 liters of water to produce 1 kg of fodder. Hydroponic techniques can bring that figure down to just 2-4 liters per kilo of fodder.
- Irrigation by speed & time controls thereby saving water and fertilizer.
- Automatic pump operation, which allows no user interaction for switching.
- Reduced fodder wastage - Every part of the plant can be consumed with minimal wastage, contributing to lower input costs and corresponding boosts in farmers' incomes.
- Hydroponics is a pesticide-free method, and significantly reduces risks of contamination of feed.

Technical Specifications:

Seed input per rack	<4kgs (4 trays)
Fodder production per rack	25 to 30kgs* (Depends on seed type)
Operating Temperature	Up to 50 Degrees.
Power required	0.1 Units a month (0.0034 KWH/Day)
Solar	40W Panel, 12V
Battery	40Ah Battery
Pump	40Watt DC Diaphragm Pump, 12V.
Feed/Cattle	25-30/2-3 medium cattle.

CASE STUDY

Solar-Powered Hydroponic Methods for Sustainable Fodder Management

GOPAL POOJARY, DAIRY FARMER, MOODUBIDRE, KARNATAKA

A rural dairy farmer in Daregudde, Moodubidre, Dakshin Karnataka, Gopal Poojary is an organic farmer and dairy farmer. He owns land of 3 acres, and 4 milch cows, 2 heifers, and 2 under-gestation cows.

Gopal Poojary wants to propagate organic farming systems practices to the large number of farmers in the areas who often come to visit his farm to see for themselves.

The presence of such a system serves many purposes:

- It acts as a demonstrative unit the adoption of the technology ow the hydroponics can be applied not
- It shows how hydroponics aren't limited to fodder: they can be used to produce high-value crops such as vegetables at economical rates
- It carries the message of sustainability by providing a live example of a food chain free from pesticides and other chemicals.

INPUT

Chaff Cutter

A Chaff cutter is a mechanical device used to cut the straw or hay into small pieces so as to mix it together and feed it to cattle. This improves animal digestion and prevents animals from rejecting any part of their food. The cutting of crop residues, thereby increases the consumption and palatability of feed, and reduce wastage. As per today's scenario the population of livestock is drastically increased. So to increase the productivity and reduce the physical effort required for running the machine the motorized machineries came into existence it is best for dairy farmers. Presently fodder cutting machines are electric driven as well as hand operated or engine driven.

Small pump

The operation of solar powered pumps is more economical mainly due to lower operation and maintenance costs and has less environmental impact. These can be surface or submersible in nature from 0.5 to 10HP

Types of Chaff Cutter

Technology is classified ● Based on Cutting Mechanism ● Cut chaff dropping Position ● Based on Feeding System

Type	Throw-away type	Blow-up type	Flywheel type	Cylinder type / Horizontal type
Photo				
Chopping capacity	400 Kg/hr	500Kg/hr	200-300 Kg/hr	150- 250 kg/hr
Specs	3HP	5HP	2HP. 3HP	2HP, 1HP
Fodder type	Bamboo, Dry Grass, Straw, Corn Stalk, Fresh Grass	Green and dry, straw	Green and dry	Green and dry

INPUT

Dairy health care service and prevention of diseases is a priority for maintenance of a healthy stock for optimum production and yield by providing protection from the ravages of diseases through treatments and preventive vaccinations. Creation of suitable infrastructure for breeding is also important to ensure biodiversity and disease control. Government and private veterinary services extend support to even training for scientific rearing and care for livestock.

Types of care at district, block and village level

District Level Hospitals

Day-to-day treatment, immunization, vaccination, Artificial insemination, surgical intervention etc. of livestock and bird are carried out by the Veterinary Assistant Surgeon

Block Level Hospitals

Day-to-day treatment, immunization, vaccination, Artificial insemination, surgical intervention etc. of livestock and bird are carried out by the Veterinary Assistant Surgeon

Sub centres, Mobile clinics Artificial Insemination clinics

Veterinary activities like in treatment, pregnancy diagnosis, immunization (vaccination) and artificial insemination services
Demonstration and breeding farms for rearing and technologies

INPUT

Vaccine Cold Storage

In areas with erratic power supply, effectiveness of vaccines reduces considerably even though vaccine storage is available. Solar Vaccine storage is an effective storage technology in these scenarios.

Temperature level	4 ^{0}C
Holdover period	4 to 7 days at ambient temperature 43 ^{0}C
Storage capacity	27 to 99L
Solar Capacity	235 to 470Wp

Cold Storage Carrier

Portable Vaccine Carriers are required for transporting vaccines from health facilities with refrigeration to outreach sessions where refrigeration and ice are not available. The vaccine storage capacity of vaccine carriers is between 1 litres to 2 liters.

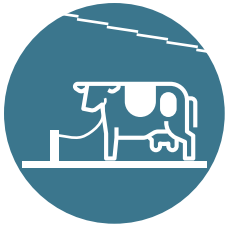
- Keeps at constant 4 degree temperature at all times
- It has a holdover period of 12 hours measured at ambient temperature of 43 degrees.

Temperature level	4 ^{0}C
Holdover period	12 hours at ambient temperature 43 ^{0}C
Storage capacity	2L

PRODUCTION

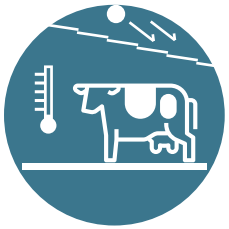
For efficient management of cattle, a thermally comfortable and efficient shed for housing cattle is critical. Poor planning and design can result in increased operational costs to the dairy farmer. Conditions of heat stress, congestion and access to feed and water can negatively affect yield and quality of milk. Housed along side the cows will be the feed and water dispensers, appliances for milking, cleaning and sanitisation as well as for comfort i.e. lighting and fans or cooling application dependant on climate type.
The interventions are true for both open/ loose housing type and closed barn style cattle sheds. Closed sheds are preferable in regions of high heat stress, lack of available land for grazing and urban or peri-urban regions

Gaps and Needs



Behavioural restrictions associated with the use of tie-stall systems

Limited access to water, quality feed and fodder leads to inappropriate consumption of feed and affects protein levels in the cows



Heat stress affects cattle

- Reduction in fertility & calving rates
- Low milk components
- Susceptibility to infection

PRODUCTION

Design for cattle wellbeing and comfort
Location of the cattle housing

- Cattle housing should be at a higher elevation for rainfall and drainage for the wastes of the dairy to avoid stagnation.
- The long axis of the Shed should be set in the north-south direction to have the maximum benefit of the daylighting

Dimensions of cattle housing

- Total Area per cow : 75 sqft for social and personal space
- Size of cow cubicle : 4ft x 9ft
- Area of calf pen : 20ft x 20ft
- Feed alley : 3ft - 6ft
- Feed trough : 2ft wide and 2 ft high
- Water trough : 2ft wide and 2 ft high
  Length to be 15ft to 20 ft to avoid pushing over
- Resting area: 40 sq ft per cow

Roof of cattle housing

- Height of the roof to be 8ft -16 ft on the eaves and 15ft to 25 ft at the centre
- The roofing to be made of insulated roofing sheet with heat reflective paint or Tiles
- The roof to allow adequate natural light to facilitate easy herd movement (uniform 100 Lux for general and 200 Lux for task lighting)
- Provide ridge ventilation to facilitate natural ventilation

Orientation of the Building - Longer facades of the cow shed to face the North South direction to reduce heat gain

Dominant wind direction to be used to allow maximum natural ventilation

All Roofing materials to be insulated to avoid heat build up during harsh summer days and nights. Overhangs and shading to be provided at 3-4ft outside the shed

Flooring of Cattle housing

- The bedding area must both be slip re- sistant and dry
- The stall floor should slope 2% towards a drain away from the edge of the operator pit.
- Where floors are made of concrete about 6 inches thick, bedding of paddy straw should be used for lying areas.

Material and design strategy need to engage the cattle's sensory stimuli especially hearing i.e. metal sounds (roof) during rains can induce stress in cows and affect yield

Appliances like foggers, misters, evaporative cooling pads and fans/ exhausts to be integrated for heat stress relief

References -
Pashu Sakhi Module - National Rural Livelihoods Project
The Danish Agricultural Advisory Center | November 2002

PRODUCTION

Milking Machine

An efficient milking machine was designed with a DC motor powered by the solar system. It has reduced the milking time by 50% over the manual process. It also leads to hygienic milk collection and reduces the labour cost.

- The milking machine used an efficient DC motor of 120W.
- It has the autonomy to run for 2 hours per day independent of the grid.
- 75Wp solar module was used to power the system.

Solar Water Heater

- Hot water from the solar Water heater can be used for clean the BMC & Milking Machine

Capacity	100 L - 500 L
Type	ETC
Temperature	60 - 80

Milking Parlour

- A milking parlor is part of a building where cows are milked on a dairy farm. Cows are brought to the milking parlor to be milked and are then returned to a feeding and/or resting area.
- Cows may also be milked in their housing area using bucket milkers or a pipeline milking system.

Power Consumption	1HP
Type	4 Cluster
Processing capacity	10 min for each cow

Pressure Pump

- Pressure pump is used to clean the cow shed & cow

Power Consumption	1HP
Cleaning capacity	500 sq. ft in 15 min

PRODUCTION

Farm details (All system are designed for milking twice a day and three times a day cleaning of shed)

Farm details	Micro Farm < 10 cows	Small Farm 10-20 cows	Medium Farm 20-25 cows
Total number heard	10 cows	10 - 20 cows	20 - 25 cows
	6 milching and 4 calfs	2 milching and 8 calfs)	16 milching and 9 calfs
Production per day	120 - 140 litre/day	200 - 240 litre/day	280 - 320 litre/day
Size of Total shed	750 - 800 sq.ft	1500 - 1750 sq.ft	1875 - 2000 sq.ft
Total fodder require	250 kg/ day (usage hour - 1 hour 15 min)	250 - 500 kg/ day (usage hour - 1 hour - 2.5 hours)	500 - 625 kg/ day (usage hour - 2.5 hour - 3 hours)
Milking machine usage	2 hours	3 - 4 hours	4.5 - 5.5 hours
Solar System Capacity (Milking machine, chaff cutter and pressure pump with lights)	Panel 2.5 kWp Battery 150 Ah, 96 V Inverter 6 kVA, 5 kW, 96 V	Panel 4.5 kWp Battery 200 Ah, 120 V Inverter 7.5 kVA, 6 kW, 120 V	Panel 5.9 kWp, Battery 300 Ah, 120 V Inverter 7.5 kVA, 6 kW, 120 V

CASE STUDY

Individual entrepreneur, Shilpa Chandrashekar, milking machine, Karnataka

Context

Shilpa Chandrashekar and her husband are dairy farmers from Bettahalli village, Mandya district, Karnataka.This has been their primary occupation over the years. They have a farm size 12 cows of which 8 provide milk. She is able to milk 40 liters per day and sells at the Karnataka Milk Federation, where she makes INR 24- INR 26 per liter. Thus making an average income of INR 1000 per day.

Pre Intervention Scenario

- It took 15 mins to milk a cow manually and milking is carried out twice in a day. This resulted in physical strain and exhaustion as Shilpa spent 4 hours a day just milking the cows.
- With a lack of labour to milk the cows for support and the village facing frequent power cuts, Shilpa did not invest in a machine to milk the cows

Technological solution

Shilpa has a adopted a single cluster 150 watt solar powered milking machine also adopted the lighting solution (2 light system for her house and 1 light system in the cow shed) which was financed linked to the Karnataka Milk Federation scheme which subsidised INR 15,000

Impacts, Testimonial

“I was hesitant in adopting the milking machine initially because it felt like an expensive prospect. However, I would not have been able to practice my livelihood today without it. After my husband’s accident I have to manage all the work myself. Due to the lockdown, KMF collection centres are only open in the morning and evening between 4.45-6.00. With such odd timings, my family cannot help and I cannot hire labour because of the lockdown. The intervention has been very helpful to us.”
- Shilpa Chandrashekar, Dairy Farmer

CASE STUDY

Eshwar Gowda

an entrepreneur with 8 milching cows and associated with the local Cooperative Milk Collection Centre at Baidabettu. Udupi faced a lot of issues with constant power cut and invested in a Solar powered Single cluster milking machine with financing from KVGB Bank. The loan amount was INR 64,000 with interest rate of 12.5% and margin money of INR16,000 linked with subsidy scheme from KMF.

Financial Model recommendations
Milking Machine

Total cost - INR 80,000		
Subsidy %	20	0
Subsidy Amount/ Unit (INR)	30,000	0
Loan Amount (INR)	50,000	50,000
Interest Rate %	10.5	10.5
EMI (INR)	1,950	1,950
Loan Term (Years)	3	3

BIOGAS

Biogas is the mixture of gases produced by the breakdown of organic matter in the absence of oxygen (anaerobically), primarily consisting of methane and carbon dioxide. Biogas can be produced from raw materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste or food waste.

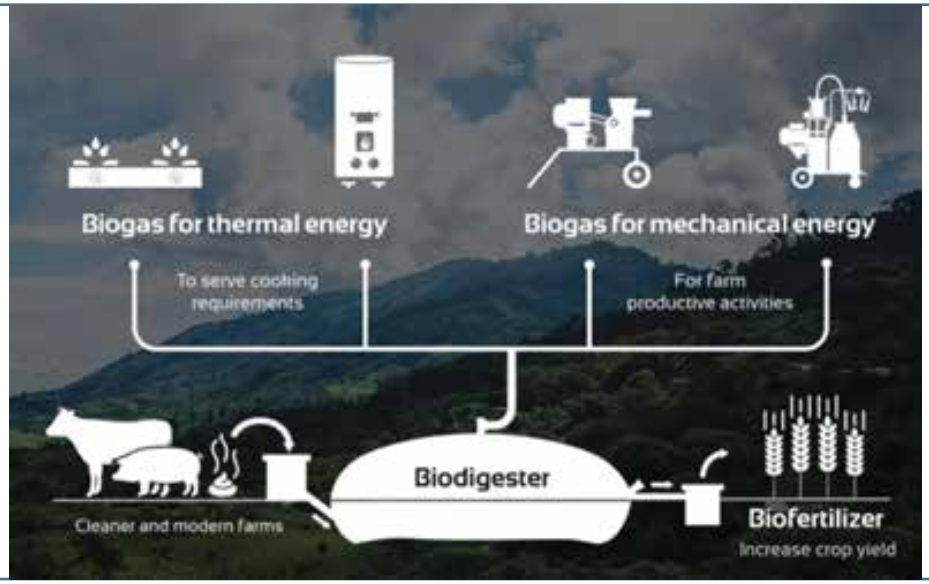
The cow dung easily available in the dairy farms can be used as raw material for the production of the biogas. The biogas produced can be used for making khoya sweets on site in the dairy farm. Also, the biogas generated can also be used for cooking and other applications in the dairy farm.

Below are the various models of Biogas digesters

Option 1: For areas with temperature above 23 °C. (Warm Climate)

Option 2: For areas with temperatures range from 10 °C to 15 °C (for cold climates)

Option 3: For areas with temperatures range from 15 °C to 23 °C (for temperate climates



Images from Sistema Bio

COLLECTION

Milk collection is usually centralised in nature catering to milk producers in a region. The location is determined by the number of milk producers, volume of milk and transportation time from members to the centre (at times twice a day). The collection and hence cold storage of milk can be with an individual farmer, farmer collective or private enterprise with varied ownership models. The collection centres are also points of testing and weighing of milk.

Can chiller

The Can Chiller shall be used for cooling the raw milk after milking in order to conserve the quality of milk and check the growth of microorganisms. It is intended for daily collection of milk. It should use the standard Aluminum/SS Milk Cans of 40 Ltr capacity to cool the milk, the system besides cooling also serves as a storage for chilled milk cans by ensuring rechilling at regular intervals prior to transfer of milk for onwards transportation for further processing. The Can Cooler shall be designed to cool milk in standard Aluminum / SS milk can of 40 ltrs capacity and shall have following components. The milk shall be chilled to 4 Deg C maximum within 3 hours.

KMF

Karnataka Cooperative Milk Producers' Federation Limited (KMF) developed a federally funded programme called Support to Training and Employment Programme (STEP), as one of the measures to ensure wellbeing of women in the traditional informal sector. Smooth functioning of these centres became a challenge in absence of basic equipments like portable Milk testing equipment, weighing scales - compounding to an absence of reliable power undermining efficient functioning.
522 units led by women were energized by solar power – thus resulting is savings of INR 5-7 thousand per system, cumulatively saving INR 31 crores. Lowering the operational costs of the centres, thus resulting in higher savings and boosting income for members, in terms of more dividend earnings for members.

Technical Specifications:

Description	Details
Capacity	4 cans/day (40litre each)
Temperature at the end of the chilling cycle	3HP
Duration of Chilling Cycle	3 hrs
Rechilling to maintain the temperature	3 hrs for each milking
Power supply	230 V, Single Phase AC
Power Requirement	1200 W
Refrigerant	R - 404 A

PROCESSING

As a dairy producer, you can add extra value to your milk by processing and marketing your own products, such as cheeses, bottled milk, yogurt, ice cream or butter. Enterprises invest in value add services to maintain small family businesses, improve income levels and diversification for more aspiration livelihoods for sustenance. Branding of products and marketing additionally are incorporated at this stage of livelihood.

Sweet Making machine (Khowa)

Khova or mawa is dried evaporated milk solids and forms the base for almost all sweets. Both khova making and pedah making requires constant stirring attention which can be a drudgery task.

Key Features:

- Tested with efficient motor sizes varying from 0.5HP to 0.75HP with capacity of 65 litre, 130 litre and 180 litre.
- It can produce 1 kg of khova from 5 litres of milk in under 50 minutes.

Sl No.	Khova making machine model	Motor HP	Per batch processing capacity
1	**110 L LPG Gas model**	0.5 hp,24 V	30-35L/batch
2	**110 L biowaste model with blower**	0.5 hp,24 V & 30 W blower	30L/batch
3	**200 L LPG Gas mode**	0.75 hp, 24 V	50L/batch
4	**180 L biowaste model with blower**	0.75 hp, 24 V & 50 W Blower	40-50L/ batch

PROCESSING

Chilling Unit (Bulk Milk Chiller)

Bulk milk chillers are basically for community usage. Capacity ranges from 150 L to 2000 L. Bulk milk chiller cools milk from 35 ºC to 4 ºC. It also ensures that the milk remains within the desired temperature (4ºC) till the time milk reaches dairy processors, by storing the milk in the tank.

Key Features:

- It will chill the milk from 35 ºC to 4ºC in 3 hours for 200 -2000 L.
- Provides thermal backup

Bulk Milk Chiller

- The Chilling tank is used to cool down raw milk from 36ºC to 4ºC to storage temperature at dairy farm or milk collection.
- Inbuilt cooling backup in form of ice for grid outages or non solar hours

Rated Cooling Capacity	500 L
Power Consumption	1.7 kW
Recharging time	6 hours

Energy System

Solar Module (kWp)	5
Thermal Backup	70 MJ
Battery (Ah)	100 Ah, 48 V
Inverter	3 kVA, 48 V

PROCESSING

Butter Churner Machine

A butter churner is a device used to convert cream into butter. This is done through a mechanical process, frequently via a pole inserted through the lid of the churn, or via a crank used to turn a rotating device inside the churn.

An efficient solar powered agitator was developed which is aimed to be versatile, user friendly, ergonomic and aspirational especially for rural unelectrified households. As a larger context, this device can also be a means of livelihood generation. For this solution, an old DC fan motor was used to churn the butter and this innovation was born out of a need to have a low cost locally manufacturable solar powered kitchen appliance that would be useful in remote regions of the country where grid supply is erratic or none.

Key Features:

- 14W DC motor was used which was more efficient than the available AC motor driven butter churner in the market.
- The presence of the switch on/off button gives flexibility in operations.

Other value add services with DC solutions for
Pasteurisation unit
Production unit (Curd, Milk Powder, Paneer, Cheese)
Ice Cream Making Machine

CASE STUDY

Manjunath Degavi, Bailonghal (Karnataka)

Manjunath Degavi engaged in dairy farming as a secondary occupation with 4 cows and average monthly income of INR14,800 through sales to a local cooperative. He was reliant on manual practices and methods of milking and employed 2 workers. In 2016, he invested in a milking machine. With improved efficiency and significant rise in earnings, he was able to further invest in two more milking machines, chaff cutter, khova maker and biogas digester in 2019 to diversify and increase his income levels. He now owns 22 cows and with the cumulative addition in income he was able to buy 4 acres of land for marigold farming.

On an average generates 200 liters of milk for which he charges Rs. 22- 32 per liter based on the season and demand. Additionally by adopting the Khova maker he has added value to his existing venture. On an average 30-50 kgs of khova is made twice a month. The khova maker has an output of 5kgs for 1 liter of milk. The khova is sold to sweet shops in nearby towns.

With the support of bank loan from KVGB bank, Manjunath was able to acquire both DC milking machines and khova making machines. He has successfully repaid a loan of 700000 in a period of 2 years. Further with improved income and savings, Manjunath was able to self finance biogester and additional two milking machines.

CASE STUDY

Amboli is a remote unelectrified and drought prone village situated 25 kms from Dharwad town in Karnataka. The village is home to 17 Gowli Maratha families who are traditional cattle rearers and own 250 cows and buffaloes. The community sells milk in neighbouring villages which is their primary source of income.

Input

Inadequate fodder led to malnourished cattle due to the community capacity to only provide dry fodder. The cattle were hence producing less quantity and quality of milk. The high cost of procuring fodder also eats into a majority of household income. Households buy dry grass/hay worth Rs. 40,000 for 3 months. The hydroponic system installed required 1/5th the land and at a ratio of 1:5 of seed to fodder. Additionally, a solar powered pump was installed. Due to this intervention, fodder grown by one family can be fed to 17-20 cows.

By-product of production

The community depended heavily on firewood for cooking and water heating. With restrictions from the forest department and the abundant waste from the cattle, an intervention with biogas for cooking and for khowa making was introduced. The system output was equivalent of 2 LPG cylinders of gas per month.

Value add

1 kg of kawa requires 5 litres of milk where each liter in the market sells at Rs 22 per ltr.

RETAIL

Cold Storage / Refrigeration

Most of the decentralized solar refrigeration solutions were installed to strengthen the local dairy value chain in the last mile retail delivery. This also gave additional income to existing small businesses.

Key Features:

- The retail fridges are available in three size segments: 100L-150L, 150L- 240L & 240L and above
- Based on sizes, the solar components are designed with panel capacity varying from 200 Wp to 1000 Wp.

Way forward

Developing efficient dairy technologies

Research and development in technologies for cooling, yield increase, farmer drudgery reduction as well as cattle wellbeing.

Development of Sustainable Dairy Enterprises

Identification and innovating with key stakeholders like farmer groups and private enterprises within the value chain nodal points. Development of models and process for decentralised mechanisms of production, collection and processing.

Access to Financing

Alignment with policies, schemes and financial institutions to disseminate with entrepreneurs and farmers.

Developing models for Sustainable and Green Cattle Sheds

Templates and guidelines for thermally comfortable and energy efficient cattle sheds for improved quantity and quality of milk, cattle health and value addition of services

Thank you

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