

PARI India Study Visit Report

Report on 8-day study visit to India by PARI partner country members



Program of Accompanying Research for Agricultural Innovation

www.research4agrinnovation.org



zef
Center for
Development Research
University of Bonn



PARI STUDY VISIT REPORT

Table of Contents

Table of Contents	1
REPORT ON STUDY VISIT TO INDIA.....	3
Introduction	3
National Bank for Agriculture & Rural Development (NABARD)	3
Background & evolution of credit system	3
Indian economy.....	4
Agricultural transformation in India	4
Challenges in Agricultural Credit	4
Making Innovations work for small farmers.....	5
NABARD's innovation platforms	5
NABARD & Agricultural Infrastructure.....	6
Research and Development for financing Agriculture	6
Kisan Credit Card (KCC).....	6
Joint Liability Group (JLG)	7
Linking Indian Agriculture to African Agriculture	7
NABARD Research and Development	7
NABARD Consultancy Services-NABCONS.....	8
FARA & NABARD	8
Lessons for Africa.....	8
Challenges in NABARD.....	9
Major takeaways/outcomes	9
Jain Irrigation Systems Limited.....	9
Leadership Lessons from JAIN	10
Jain and Capacity Development	10
Building from the scratch.....	11
One product-one quality	11
Global coverage	11
Jain Irrigation packages	11
Irrigation filters.....	12
Fertigation systems	12

Engineering crop geometry	12
Food Biotechnology.....	13
Food processing.....	13
JAIN Biogas.....	13
JAIN Solar	13
JAIN Dam	13
JAIN in Africa.....	14
JAIN in Kenya	14
JAIN in Rwanda	14
JAIN Integrated Irrigation Project.....	14
Ranthal Irricare	14
FARA and JAIN	14
Key outcomes.....	15
Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI).....	15
National Innovation Foundation (NIF).....	15
Uberization farming.....	16
.....	16
Amul.....	16
Gujarat Co-operative Milk Marketing Federation Ltd. (GCMMF).....	16
Amul procurement facility	17
Pethapur Village Dairy Co-operative Society	17
Amul Animal Health Services.....	17
Governance.....	17
From Cow to Consumer (C2C)	18
Global Outreach	18
Amul Foundation	19
Major takeaways	19

REPORT ON STUDY VISIT TO INDIA

Introduction

During its 2016 Annual Research and Planning Meeting held in Nairobi, the Program of Accompanying Research for Agricultural Innovation (PARI) planned a study visit for researchers from the African PARI partners. The study visit took place between 22nd and 29th of October 2017 and sought to enable African researchers in the agriculture field to connect to key stakeholders in India, facilitate inter-continental learning on issues of mutual interest to Africa and India, and identify and possibly initiate joint research activities between the African and Indian partners.

Participants during the included representatives from the lead organizations in the 12 African partner countries, representatives from the Forum for Agricultural Research in Africa (FARA) and the Center for Development Research (ZEF) of the University of Bonn, Germany.

The 1-week meeting, which was coordinated by Indian Council for Research on International Economic Relations (ICRIER), exposed participants to many technologies and models along the PARI thematic interest (mechanization; nutrition; vocational training; technology scaling; climate change). Participants visited organizations engaged in agricultural value chains. This report summarizes the activities during the visit and identifies some of the more salient lessons

The one-week visit was jointly coordinated by FARA, ZEF & ICRIER and offered participants the opportunity to learn from the Indian National Bank for Agriculture and Rural Development (NABARD), Jain Irrigations Systems Ltd, Society for Research and Initiatives for Sustainable Technologies and Institutions” (SRISTI) and National Innovation Foundation (NIF), Uberization facilities and Amul Dairy, Anand.

learned during the visit. The participants visited the Indian National Bank for Agriculture and Rural Development (NABARD), Jain Irrigations Systems Ltd, Society for Research and Initiatives for Sustainable Technologies and Institutions” (SRISTI) and National Innovation Foundation (NIF). In addition, the study visit was conducted at Karnal to see uberization and farms in Haryana. Finally, participants learned lessons on the white Indian revolution upon visiting Pethapur Village Dairy Co-operative Society and Kaira Milk Union, Anand (Amul Dairy, Anand).



National Bank for Agriculture & Rural Development (NABARD)

Background & evolution of credit system

The National Bank for Agriculture and Rural Development (NABARD) of India came into existence 3 years after the country gained independence. Set up on 12 July 1982 based on the recommendations of B. Sivaraman Committee, (Act 61, 1981 of

Parliament), NABARD is an apex development financial institution in India and took over the functions of the Agricultural Credit Department (ACD) and Rural Planning and Credit Cell (RPCC) of Reserve Bank of India, and



Team members at NABARD

Agricultural Refinance and Development Corporation (ARDC). It is one of the premier agencies providing developmental credit in rural areas. NABARD therefore serves as a bank and service provider in the agricultural sector of the country, facilitating development and supervising rural banks.

PARI partners had the opportunity to learn how the agricultural development of India was prioritized immediately after independence, as articulated in a document written over a period of three years which has been in use since. The fact that this document remains relevant to date, is a testimony of the foresight of the founding fathers of India. However, India's agricultural development has evolved over period based on response to the country's needs that have also evolved from time to time.

Indian economy

India is the second most populous country in the world (1.2 billion) and is expected to be the most populous country in the next 20 years. As the 4th largest economy with agriculture accounting for 40% of the country's GDP, India has the second largest in labour force. Predominantly rural, with more than half the population below 25 years, the country has an opportunity for leveraging demographic dividends. India is currently undergoing structural transformation transitioning from agriculture-led economy to

service-led economy and is the world's fastest growing economy, growing at 7.5%.

Agricultural transformation in India

Small farmers constitute more than 85% of the landholders in India. Although India is the largest producer of milk and spices, and among the largest producers of wheat, rice and sugar, the country's agriculture thrives on extreme temperatures (-15 to +50°C), posing challenges to the sector. The agriculture highly depends on rainfall especially for small farmers with many regions susceptible to climate. In response to the need for transformation, Indian agriculture has been shifting from food grains to non-food grains and cash crops.

Challenges in Agricultural Credit

From the onset, credit issue was identified as key in promoting sustainable agricultural development in rural India. As early as 1950s, credit flow to agriculture was mainly from government under the umbrella of cooperatives, which functioned based on commodities, including sugar cooperatives, cotton cooperatives, milk cooperatives as well as artisans. However, over a period of three decades (from 1950 to 1980), different cooperatives emerged, which further underscored the need for a credit system. However, it was not until 1969, that mainstream commercial banking got into agriculture. Earlier challenges included low literacy level, few researches, poor access to technologies, etc. However, this saw the emergence of research institutions around the time. Thus, the cooperative credit system, cooperative processing system, cooperative value addition system and research system became consolidated in the Indian agricultural strategic plan. Together, they ushered in the green revolution of India, the heart of which is NABARD. Despite the successes recorded, India's main agricultural challenges remain fragmentation of land, small land holdings, market value chains and climate change.

Addressing these challenges would consolidate the integration of farmer in to the market system to improve their gains and empower them to withstand possible calamity by opening the economy and providing safety nets.

A consistent solution that has evolved along with the many challenges of agricultural production is in the form of innovation driven by farmers themselves. Thus, NABARD is mainstreaming innovation system with help from World Bank and other international agencies to gain from experience in this respect.

Making Innovations work for small farmers

India needed to control food price because of the numerous famines and scarcity, which were compounded by lack of foreign exchange to import food. This forced the country to look within and come up with innovative solutions to control price and ensure that maximum return of what consumers spend goes to the farmers. In addition to putting control on food price, government also subsidizes many farm inputs, power and credit. In a joint project with Organisation for Economic Co-operation and Development (OECD), ICRIER is comparing 50 countries to evaluate producer support estimates (PSE). Currently India has recorded high negative numbers when compared to China, Israel, US and Japan. Despite these, the effort remains ensuring that farmers get the maximum benefit of their production giving 60—80% of what consumers spend on farm produce. Achieving that requires revolutionary institutional innovation as shown by the Indian milk revolution. This is an important lesson to Africa and must be extended to crops. With respect to climate change, another institutional innovation in the form of crop insurance has been revamped as a way of protecting the farmers from the effect of climate

Innovation works when farmers get the maximum benefit of their production by gaining 60—80% of what consumers spend on farm produce

change, ushering in a massive change in crop insurance system. NABARD is the first agency in India to receive funding from the United Nations for a climate resilience project.

NABARD's innovation platforms

A cumulation of more than 20 years of experience has allowed the bank to develop several programs including tribal development programs, watershed development programs, natural resource management programs, rural financial programs. In terms of marketing, the bank also facilitates the development of new and already existing networks. For example, the social group linkage, which the largest microfinance program in the world. This program emerged because of an action oriented research on credit and different development programs with involvement of the civil society which aimed to provide access to financial services to rural farmers. Today, about 100 million rural women are part of this program involving 5000 civil society organizations. This represents an important innovation platform that provides access to financial services to farmers who ordinarily would not have such access.

NABARD also facilitates institutional development. For example, the bank has helped small microfinance banks with access and capacity on ICT banking system. NABARD started experiments on watershed development with funding from the German government resulting on the establishment of 1.8 million ha of watersheds in the country. NABARD has been engaged with climate programs (e.g. green climate fund), with every state government giving support in terms of action plan and planning.



Discussions at NABARD

NABARD & Agricultural Infrastructure

The bank recorded a credit flow of 159 billion USD in 2016 with a balance sheet of 54 billion USD. NABARD is massively involved in developmental projects on rural infrastructure, irrigation, warehousing, provides direct loans etc., serving as the biggest catalyst in agricultural and rural development. About 43% of loan goes to agriculture and irrigation and 34% goes to rural connectivity. Thus, the genetic code of NABARD is development, accounting for 50% of the bank's human resources. NABARD has built close to 1,000km of rural bridges and 0.43 million Km of rural roads. Of late, NABARD has been involved in a program on rehabilitating degraded soils with support from Kreditanstalt für Wiederaufbau KfW and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). One country in Africa participating in this program is Burkina Faso. The bank has mobilized over a 100 million USD over the last decade and over a million families have benefit from this development project.

Other functions include provision of input for government policy formulation, advisory services to governments, product development, financial access programs, R&D, consultancy service etc.

Research and Development for financing Agriculture

NABARD is involved in Policy formulation and priority settings which are aligned with national priorities and emerging issues and aligned to SDGs based on national mission. The R&D unit NABARD also studies past trends in credit dispensation to increase credit absorption capacity and bring out ways on how to address regional imbalances.

In financing agriculture, the guiding principles of NABARD are based on sustainable growth, equity, livelihood and rural employment generation, gender empowerment, social justice, efficient utilization of resources and climate resilience, strengthening rural economy and promoting inclusive growth.

The mode of financing agriculture may be direct or indirect. This include refinancing of rural financial institutions for lending to rural development sector, infrastructure development projects, supporting farm innovations and development of innovative models. The bank has two specific funds dedicated to innovation one of which is rural innovation funds, which support the bottom-up innovations system. One of such innovations was developed on land water fisheries using date palm leaves. The bank supports the promotion of produce aggregation through farmer-producer organizations, comprising of 500-1000 farmers coming together to aggregate their produce so that is becomes amenable to storage and marketing that giving them access to better price. Currently, there are around 2,000 of such organizations. NABARDS supports technology transfer using farmers club, where farmers are trained by farmers that have been trained by research institutions. NABARD supports natural resource based projects, which are often not funded by commercial banks.

Kisan Credit Card (KCC)

NABARD has developed an innovative cyclical credit system in what is known as Kisan credit card (farmer credit card). The card offers credit with sanctioned limits by the bank for a period of

five years, from which the farmer can withdraw to purchase inputs. The farmer may augment the credit using extra deposit, which reduces the interest.

Joint Liability Group (JLG)

Another innovative program that seeks to provide access to credit to farmers that may not be in possession of bankable guarantee in the form of land ownership etc., thus being excluded from formal banking. To address this, the bank came up with the concept of Joint Liability Groups (JLG) which comprise of 5-10 farmers to guarantee each other. The bank links them together to access credit for farming activities. A useful instrument for farmers with immediate need for money is negotiable warehouse receipt, which offers cash to the farmer without having to immediately sell his or her produce at cheap rate. The receipt offers 70% of the value of produce in loan while storing it in a warehouse.

NABARD also trains other banks on how to lend to agriculture projects. Direct financing to state governments and private entities for the creation of agriculture infrastructure (irrigation, big warehouses, bridges, roads, rural energy, solar pump sets, agroforestry, farming system, organic and low-cost farming, value chain development, promotion and documentation of best practices of agriculture, capacity building, business incubation and technical handholding).

Linking Indian Agriculture to African Agriculture

In line with an earlier discussion with African Development Bank (AfDB), NABARD has packaged a program that explores areas of possible collaboration between Africa and India in agriculture. Given the high level of similarity between African and Indian farming systems, there is a need for Indo-Africa green revolution. Possible areas of collaboration can include; technology transfer (HYV seeds through seed village program; water sector (micro irrigation, drip and sprinklers); organic fertilizer (neem

coated urea); watershed; organic farming system and agronomic practices (climate smart agriculture); duty-free tariff scheme involving India and Africa. Other areas include Infrastructure: hard & soft infrastructure (software for running cooperative societies); road, large and medium irrigation; post-harvest losses; infrastructure development; climate change; farm mechanization; intervention in credit delivery; capacity and skill development as well as policy & institutional development.

NABARD has identified a few African clusters where interventions may be made on a group of value chains. These are grouped based on regions/areas:

North Africa: Wheat and agriculture
Sahel: Sorghum, millet and livestock

West Africa: Rice,

Savannah: Maize, soybean, dairy & poultry
Africa; tree crops and cash crops (coffee, cocoa etc.)

NABARD Research and Development

NABARD has set aside funds for research and development activities in agriculture which are funded in-house or externally. The fund supports studies on innovation conducted by the bank itself or universities and research institutes outside the bank, with professorial chairs and centres of excellencies in different parts of the country. While there currently is no fund to support research in Africa, a few of the technologies developed from some of the research are being used in Africa (for example a small tractor introduced in Kenya). The bank has pioneered the support of R&D in biotechnology and tissue culture beginning from 1980s. Other research themes include microcredit delivery, product development, farming system, indigenous technologies, price discovery. The fund also supports dissemination of research findings through seminars, workshops and publication.

NABARD Consultancy Services- NABCONS

NABARD has a consultancy subsidiary with experience of 14 years in agribusiness sector in different areas. The unit is responsible for connecting NABARD to other entities including Africa. Most of the consultancies have been with the government of India and the provinces in the country. NABCONS sees lack of connectivity between banking sector and the farmers in Africa

In terms of collaboration & partnerships in Africa, NABCONS can facilitate cooperation on watershed development, microfinance, infrastructure, innovation etc. Of late, there has been interest on setting up parallel institutions in some countries in Africa. NABCONS offers its services to Africa countries in this respect. Indeed, the experience of NABCONS in African countries is that the main issue is lack of credit. India has experience to transfer some of the strategies for mitigating this through NABCONS. Example of assignments conducted by NABCONS in Africa include sugarcane and irrigation project in Tanzania and some other projects in Sudan, Ethiopia, Nigeria, Tanzania, Mozambique and South Africa. It is important to note that NABCONS has the freedom to employ people outside NABARD thus offering employment opportunities to partner countries. The Indian ministry of foreign affairs has requested NABCONS to set up an institute for capacity development in Malawi. While India is still not out of the woods, it is ready to work with Africa to share and care for each other. One possible area of immediate collaboration between India and Africa may be the solar industry in which India has set up a target of 100GW by 2022. Having worked with GIZ from Germany, which has the highest solar generation per capita in the world, India is in position to partner with Africa to integrate solar energy in agriculture and adopt.

As Africa prepares to take all that NABARD (and India) can offer, the continent needs strong champions like Dr Verghese Kurien (the milkman of India) to take up the pains to deliver the needed change

FARA & NABARD

The enablers for the progress made in India are beyond the money needed. In the last four years, it has come out clearly that among the BRICS, India is doing well and the role NABARD played in this is clear. The sum of this progress is in the enablers. Luckily, the

leadership of AfDB has lent financial muscle to implement Technologies for Africa Agricultural Transformation (TAAT), under which FARA is responsible for the capacity development component of TAAT and therefore seeks to push the collaboration between Africa and NABARD under that project. NABARD can serve as a one-point entry for FARA to connect the 55 African countries into the different agricultural innovations.

As Africa prepares to take all that NABARD (and India) can offer, the continent needs strong champions like Dr Verghese Kurien (the milkman of India) to take up the pains to deliver the needed change.

Lessons for Africa

The DNA of growing in NABARD is that the work is directed to communities. The bank looks at communities the can develop a project and then own it. This represents the most important criteria for any development project NABARD engages in. The second criterion is to look for partnerships to invest and fund. The third is selecting area of work where the benefit will be large in terms of community and scale and is scalable. Following this, the bank starts with the project as a pilot, sells the project to government for upscaling, replication, monitoring and evaluation to add value. As a catalysing agency, passion, commitment and the desire to succeed form part of the principles at NABARD. The bank also takes advantage of technology to ensure fiduciary discipline and has the willingness to be

scrutinized by the society to ensure probity and accountability based on social audit system.

Regarding mechanization, there are two components: mechanization in agriculture and mechanization for agriculture. The former involves the use of machineries by farmers themselves, which is increasingly becoming uberized, automated levellers etc and the latter serves to deliver these technologies in the hands of farmers like emerging uberization of technologies

Challenges in NABARD

There have been challenges in the decadal programs of NABARD, but things improved. Following different stages of consolidating NABARD's programs, the major challenge in the first decade was how to improve rural agriculture and development. In the second decade, it was institutional development decade, when self-help groups, microfinance banks, cooperatives etc. leading to the development of KCC. Thus, the second decade was critical for innovation and institutional stability. Third decade was the decade of investment within which the bank had started building infrastructure, emerging among the largest shareholders and promoters of commodity exchange. The fourth decade has come back to institutional innovation. One of the innovations that helped strengthen the activities of the bank is a government policy that dictates that 18% of lending in all banks must go agriculture. Banks that do not comply are made to pay 2% of the lending to NABARD. This has been possible because NABARD has earned the trust and support of the central government.

Major takeaways/outcomes

1. FARA would like to take the discussion on the possibility of adopting the KCC system forward. The expectation is the AfDB will support the concept. Accessing credit in Africa has been a nightmare to farmers and youth, as such KCC will go a long way in addressing the problem. NABARD will provide more details on the KCC

regarding challenges (there has been very low default), evolution and prospects of adoption in Africa.

2. FARA will, in the context of TAAT advance discussion on vocational training in partnership with NABARD.
3. Having a dedicated farmer oriented credit facility is a phenomenal change and can break the clutches of money lenders. Africa's mobile money may be integrated into the KCC system.
4. NABARD is ready to serve as a one-point entry for FARA to connect the 55 African countries into the different agricultural innovations available in India.
5. There is need for vegetable revolution the same way as there was milk revolution in India. This should also be adopted in Africa. The Indian revolution should focus on TOP (tomato, onions and potato).
6. Every research must always take into consideration market access that guarantees the best prices (domestically and internationally) to farmers without the need to put break on the market. This involves more engagement with the policy makers.
7. NABARD has initiated Electronic National Agriculture Market (ENAM) that facilitates access to better market for farmers.



Jain Irrigation Systems Limited

Jain Irrigation Systems Limited was founded on the philosophy of leaving the world better than you find it and that is why it focuses on society. The company prides itself as committing to never engage in any activity that will harm the society of environment. Its pillars are: "hard work

with international universities where it offers fellowship and sends some of its experts on supervisory teams. JAINS conducts short term training to different trainees (students, farmers, extension agents etc), in collaboration with World Bank and USAID, who finance some of the programs.

Building from the scratch

The entire JAINS facility used to be a barren land which was worked upon from the scratch to establish the modern farm that it is. Not a single drop of water leaves the facility without being reutilized where 40 wells have been dug, with the water taken to the hill from which the entire farm is irrigated using solar power. From this facility, the company grew to deliver its products to over 126 countries through 6700 dealers and distributors worldwide, reaching over 4.5 million farmers

JAIN works with biotechnology generating tissue culture materials for farming systems, from where 80 million plantlets of banana are produced via primary and secondary hardening facilities as well as independent R&D and virology labs. Similarly, a modern Bio- tech lab equipped with all modern and state-of-the-art facilities meet the needs of continuous genetic improvement and validation program in cultivators of onion, banana, mango, pomegranate etc JAIN also uses ultra-high-density plantation technology using mango, cashew and citrus by changing crop geometry to make it more viable.

One product-one quality

JAINS has one single quality across the globe. Each product sold in India has the same quality as that sold abroad leading to its receiving many awards and recognitions on quality, export, R&D and fair business as well as on science and technology.

Global coverage

JAIN has 12 manufacturing units in India and 18 outside India (none in Africa). However, JAIN



Fertigation

has recently opened offices in Darussalam, Kigali, Ethiopia and Lagos. The plants outside are primarily on irrigation and food processing; 6 in the US and a technology hub in Switzerland on R&D and machinery. The choice of locating the technology hub in Switzerland allows for creating the right equipment at reduced cost.

Jain Irrigation packages

JAIN Irrigation is also the largest manufacturer of plastic pipes in India covering a wide range of



Jain Irrigation packages

pipes and fittings. The company annually process over 300,000 MT of 14,000 products by extruding pipe/sheet and injecting moulds of PVC, PE, PP & CPVC along with other engineering polymers like Polycarbonate, Polyamide, PBT, ABS etc. JAIN provides solutions for various plastic piping systems that are used in conveyance of fluids, semisolids, gases and cables.

Irrigation filters

Irrigation solutions are developed based on farmland to take into consideration soil condition, as such for each condition, there are customized solutions. For example, a persistent problem with drip irrigation system is clogging. In order address this, there is need to clear the water system suitable to the soil. JAIN has developed different filters in this respect. A centrifugal filter is capable of filtering soil. It is noteworthy that almost all the river water in Africa, carry huge amount of silt. Thus, any drip irrigation there must use sand-silt filter, which eliminates 80-90% of silt in water. Other filters are designed in such a way that they contain silica layers that trap algae. The filters are automated and capable of detecting the levels of contamination.

Fertigation systems

The fertigation system allows for direct application of fertilizer. Drip irrigation may be used even in areas where there is enough water as it represents an efficient method of delivering fertilization. However, 60% of the increase in yield recorded using drip irrigation system is because of fertigation and not the irrigation itself. The precision agriculture system with integrated fertigation and regulatory sensor is economically



Jain Irrigation Systems

viable and advantageous in that it improves yield by more than 25% as such return of investment is guaranteed in 12 months. The system is wirelessly controlled and connected to mobile phone, with high precision developed using

laser perforations. In areas infested by rodents, pipes designed to repel the rodents may be used. White coloured tubes are for green houses. These models can be adopted by governments and small communities.

Engineering crop geometry

JAIN has developed an improved system of growing mango using a technology of continuous pruning in which the mango never grows more than 1.2M but is surrounded by taller mangos that serve as umbrellas to control light. The system is named Ultra High-Density Orchard (UHDO). The mango is hand harvested and is the world highest production recorded 27 metric tons per ha produced after the third year of planting. The national average is 6 tons/ha.



Ultra-High-Density Orchard - Mango

The second highest in the world is from Brazil which is 21 tons/ha. JAIN is currently transferring this technology to 3,000 farmers in southern India. There are 120 germplasm of mango in the facility. The technology has been adopted in Kenya. The technology is economically viable 180,000 rupees per ha is required for establishing one ha. This covers all input in the first year. In subsequent years, 28,000 rupees are required for maintenance. One kilogram of mango sells for 10 rupees.

Food Biotechnology



Tissue culture generated banana

The tissue culture facility of JAIN produces 80 million plantlets of banana at full capacity and with semi-automated primary and secondary hardening facilities as well as independent R&D and virology labs. Similarly, a modern Bio- tech lab equipped with all modern and state-of-the-art facilities meet the needs of continuous genetic improvement and validation program in cultivators of onion, banana, mango, pomegranate etc.

Food processing

JAIN processes tropical fruits like mango, banana, and pomegranates into purees, concentrates, juices and IQF products. In case of mango, the facility receives 1000 metric ton per day, which is processed into juice, pulp or pouch and frozen. The fruits pass through processes of washing, sterilization, peeling, pulping and packaging. The fruits do not contain any additive

The company has a dehydration facility where onions & vegetables are dehydrated. The spray drying unit processes gooseberry and other fruit purees into powders.

JAIN Biogas



Jain Biogas

The agricultural and fruit processing waste generated in JAIN facility are processed and converted into biogas to generate power of 1.6 MW capacity along with waste heat for refrigeration and soil conditioner.

JAIN Solar Energy Systems

JAIN produces solar water heaters, solar water pumps, PV panels, and solar lighting appliances that conserve scarce natural. JAIN produces PVC sheets can replace wood as a substitute for building material. Others are solar water heaters and photovoltaic lighting systems.

JAIN Dam

JAIN constructed a dam to meet the water requirements of the industries where 50% is used by JAIN and the other 50% given to the government. The total storage capacity of the dam is 2 million cubic meters



Visit to Jain Dam



Interacting with Jain's model farmer

JAIN in Africa

JAIN in Kenya

JAIN executed a community based integrated 1000 ha irrigation project in Kenya for the National Irrigation Board of Kenya with 1-year agronomic support for the growers and the department officers. The project was planned from the scratch in Kipini, located around 200km from Mombasa. The total area was 800 acres comprising of 3 sites separated by around 25km each. A gravity-run irrigation system was established for farming and drinking. Agronomic services and inputs were provided to each of the farmers whose income level increased to 500USD after 2 years. Crops grown include water melon, eggplant, pigeon pea, maize. The total cost of the project was 8 million USD.

JAIN in Rwanda

Another project was executed in Rwanda in partnership with Rwandan Agricultural Board (RAB). The total area of the project was 200ha and located around the border with Uganda. Of



Location of Jain's project in Rwanda

this, 110 ha was irrigated with sprinkler and 90 ha with drip irrigation powered by electricity. The project was part of the resettlement program of government with each farmer holding 1 ha. The agronomic services were also provided. Funds for the project was donated by Indian Government. The total cost of the project was 10 million USD.

JAIN Integrated Irrigation Project

Ranthal Irricare

With the ultimate objective of helping small farmers to improve their agricultural production, JAIN executed a project in Ranthal village in the state of Himachal Pradesh. The project was supported by government. It is a centralized irrigation system that supplies large areas of farmland in a concept known as resource to root approach. The Ranthal project is world's largest community based micro irrigation project with a size of 5,000ha, covering 15,000 farmers. The entire system is operated through a wireless irrigation management system.

The global adoption of this system is increasingly becoming inevitable as cost decreases. The project was designed from the scratch and involved capacity building and market linkage. JAIN is developing apps that allow for transmission of images of crops grown from the project, for possible diagnosis of disease as well as marketing. The network is integrated with a metering system although it is not fully used due to bureaucratic constraints.

FARA and JAIN

JAIN is open to explore how the company can work together with FARA to tap into the knowledge and knowledge products from the centre of excellencies. Africa is still largely up for grabs. However, there are some converging forces and taking this convergence and what it offers Africans. Africa has the potentials and what is left is for these potentials to be translated into actions. Translating these potentials is a

question of capacity, which can be greatly enhanced working together with great players like JAIN. In the grand scheme of things and with the very laudable vision of the founder of JAIN, which is leaving this world better than we found it, it is possible that JAIN may be able to help leave African continent better than it found it.

Key outcomes

1. As FARA will advances the agricultural research and development in Africa, capacities are lacking at different levels. FARA would therefore like to take up discussion with key individuals at JAIN to see how partnership between the two can be forged.
2. FARA would like to encourage JAIN to consider investing in the promotion of livestock industry and improving access to water as a way of reducing zoonosis and minimizing communal clashes between farmers and pastoralists. JAIN has already constructed several reservoirs in many of its places of operation in the form of village tanks.
3. Given that Africa only explores 2% of its irrigation potential, FARA wishes to explore possibilities of collaboration for building capacity in water management in the context of TAAT. Modalities would involve training cycles through which 3-4 groups of Africans are exposed to some of the technologies at JAIN to fly FARA's model of technology to impact.
4. In mapping Africa and undertaking modelling activities around economic benefits and technologies, including irrigation, to identify areas of investment. FARA and PARI would like to align to these projects for research and upscaling purposes.
5. In all projects, integration with market is fundamental



Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI)

PARI visited SRISTI is a developmental voluntary organization that seeks to strengthen the creativity of grassroots communities, including individual innovators. It supports eco-friendly solutions to local problems being scouted, spawned and spread by the Honey Bee Network for over 26 years.



Visit to implements fabrication centre



National Innovation Foundation (NIF)

National Innovation Foundation was set up in



Exhibition at the NIF

March 2000 with the assistance of Department of Science and Technology, Government of India. It is India's national initiative to strengthen the grassroots technological innovations and outstanding traditional knowledge. Its mission is to help India become a creative and knowledge-based society by expanding policy and institutional space for grassroots technological innovators. PARI visited an exhibition of some of the innovative products generated by the foundation.

Uberization of farming

PARI visited the Basmati rice growers of Karnal in Haryana and interacted with the Indian farmers, Mandi officials, traders and other stakeholders. The Karnal farmers of Basmati rice mainly harvest by hand in an area of 2,000 ha. Farmers receive input from cooperative, which collaborates with several companies around the world including Syngenta through Kisan Club. India accounts for over 70% of the world's basmati rice production, most of which comes from Karnal. Other areas of basmati rice production in India are in the states of Punjab, Himachal, Pradesh, Delhi and Bihar.

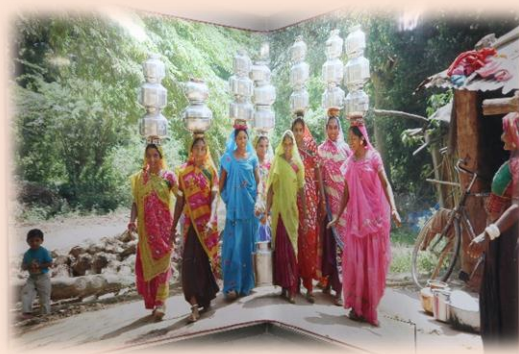


Basmati rice growers of Haryana

Amul

Amul

Gujarat Co-operative Milk Marketing Federation Ltd. (GCMMF)



The symbol of white revolution of India

Founded in 1950 in Anand within the state of Gujarat, Amul is an Indian dairy cooperative that led to what is now known as the white revolution of India, which was spearheaded by Tribhuvandas Patel under the guidance of Sardar Patel and Verghese Kurien. Amul is managed by the Gujarat Co-operative Milk Marketing Federation Ltd. (GCMMF), which today is jointly owned by 3.6 million milk producers in Gujarat.



Pethapur Village Dairy Co-operative Society

Amul spurred India's White Revolution, which made the country the world's largest producer of milk and milk products. In the process Amul became the largest food brand in India and has ventured into markets overseas.

Amul procurement facility

Pethapur Village Dairy Co-operative Society

PARI visited Pethapur Village Dairy Co-operative Society, whose procurement facility collects milk twice a day 6-8 am and 6-8 pm. Pethapur collects 80 million liters per day which is then supplied to the milk union at the district where there is manufacturing facility. In Gujarat, there are 18 district unions and 69 across India. Amul sells 7,800Mt of cattle feed per day, which is given based on physiology of the animal. The transaction for the delivery of feed is cashless and deducted from the milk supplied (a farmer that sells a milk of 10 dollars and buys a feed of 4 dollars is credited with 6 dollars) with 1.2 million bank accounts opened using a payment cycle of 10-15days. Indian cattle/buffalo produces around 4-5Lof milk per day. Average crossbreed is 9L per day. Upon delivery at the local milk collection centre, the milk is analysed to measurement of fat and solid non-fat (SNF). Acceptable values for buffalo milk is a minimum 6% fat and 9% of NFM, while for cow, fat should be between 3.5-4.5 % and 8.5% SNF. Every milk producer needs to pour the milk into a cuvette which is used to measure the fat and SNF and computed to calculate the price.

Date:	FAT	LITRE	Sam.	LITER	Ru.
27-10-2017	0	5.7	99	364.3	15207.52
Shift: Evening			Cow:	9	57.0
Time: 06:59:37 PM	4.4	D 6.3 C 4.5 Total	100	421.3	17026.05

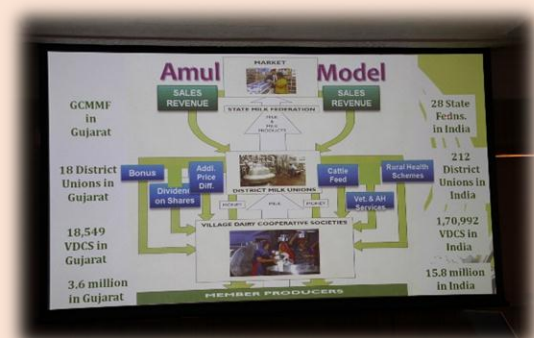
Quantitative & qualitative analysis of delivered milk

Amul Animal Health Services

Milk collected from animals that are found to be infected by mastitis is rejected by the society. The society has a dedicated team of 900 doctors in Gujarat that deliver extension services and treatment. In 2016, 5 million animals were inseminated (cost of 10 rupees per cattle) by the doctors. The cost of treatment per cow is a flat rate of 70 rupees, which is deducted from the farmer's account.

Governance

The operations of Amul are democratized such that there are 10 chairmen who eventually elect the chairman of the entire cooperation in a democratic manner. Farmers are in full control of the entire value chain and are assisted by professionals, whom they recruit themselves. Out of 18,000 societies, up to around 4,000 are exclusively run by women.



The Amul model

Government audits accounts, supports the board with government representative and supervises activities of Amul.

From Cow to Consumer (C2C)

Up to 12 million litres of milk is supplied in a pouch daily. The amount of milk required per unit is known beforehand which is transmitted around 4pm to the plant to meet the market demand. The milk is kept in bulk milk cooler. Farmer get 80-85% of the milk price. Average collection of milk per day per centre is around 3,000L. The value chain from farmer to consumer, there are 32 legs, village dairy cooperative to the plant to the consumer.



Amul plant

In total, Amul has 3.6 million small landless farmers organized in a unique model with three levels: milk collection; cooperative and plant. The model effectively establishes the linkage between the producer and the consumer while eliminating the middle men in a concept known as from Cow to Consumer (C2C).



Packaging butter

The entire value chain from procurement,



Delivery of chilled milk from district cooperative to Amul plant

processing to marketing, is managed by the farmers themselves, with key aspect being marketing.

All farmers are paid the same price, which is established by professionals. Every year, Amul invests around 152 million USD and sources money through loans from banks.

Global Outreach

Amul products are now available in more than 60 countries in the world comprising of different products: milk, chocolates, cheese. Milk transportation improved from tanks to train. It is often said that 2025 Km the longest distance milk has travelled in the world and that was achieved from Amul from Gujarat.



Amul products

Amul Foundation

Amul Foundation engages in a several CSC activities especially with respect to supporting children's education.

Major takeaways

1. Challenges for Amul include the constant desire of farmers for higher price; youth running away from farms; leadership (political & professional).
2. To address threat of market flooders, India does not include milk in free trade agreements. This prevents importation of milk in to the country.
3. Amul marketing strategy is such that when a new product is generated, it is not given the name Amul until it proves itself in the market.



