

NEWSLETTER

ISSUE 01 | 2018

GREEN INNOVATION CENTRES FOR THE AGRICULTURE AND FOOD SECTOR - INDIA

CONTENTS

EDITORIAL	1	MEET AND GREET	16
PROJECT OVERVIEW	3	EVENTS	17
FIELD BYTES	5	KNOWLEDGE PRODUCTS	19



Ministry of Agriculture & Farmers Welfare
Government of India



National Centre for Cold-chain Development



german
cooperation

DEUTSCHE ZUSAMMENARBEIT

Published by

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



Jonathan Ziebula, Project Director, GIZ

FOREWORD BY THE DIRECTOR

GREETINGS FROM THE GREEN INNOVATION CENTRE INDIA AND WELCOME TO THE KICK OFF EDITION OF OUR NEWSLETTER!

“Everything you see is ours, grown by us. We are so proud!” With these passionate words, a farmer group presented their fields and first harvest since they started working with our project during a field trip in June. Every time I talk to farmers, I realise how convinced they are about our innovations and how excited to try and adopt them.

Their opinion is the best feedback we can get – confirming that we are moving in the right direction!

Moving forward in this direction, 2017 was a very exciting year for our project. It started with a visit by Dr. Friedrich Kitschelt, State Secretary, Federal Ministry of Economic Cooperation and Development (BMZ), followed by many exposure visits, field days and trainings throughout the whole year. In the summer, we hosted an international workshop on optimising the potato value chains and moved to our new office in Jayanagar, Bangalore. On time for potato harvesting season, a film team accompanied our field staff and talked to farmers and entrepreneurs in our project regions, documenting their lives and stories in a documentary. The year ended with the Green Innovation Centre Regional Conference in Kenya. A delegation of 10 members, including our official partners, Mr. Dinesh Kumar, IAS, Joint Secretary, Ministry of Agriculture, Govt. of India, Mr. PC Ray, IFS, Commissioner, Department of Horticulture, Govt. of Karnataka and Mr. Borkar, Project Director, ATMA, Pune represented Green Innovation Centre India at the conference. Read up more about all of the major events and workshops that took place in 2017 in our events section.

Through all these activities and our daily work, we were able to strengthen our relationship not only to our partners from the Govt. of India and implementation partners, but also with the farmers. Together we share the belief that our market oriented innovations will help farmers and businesses in up and downstream sectors to unleash the potential of Indian horticulture in the long run. This belief is in consonance with the Government of India's plans in the recently launched Budget 2018-19, stressing the importance of increasing farmers' incomes, focusing on the TOP-crops tomato, onion and potato, and improving avenues for agro-processing. You will find more information on this topic on page 11-12.

We take this newsletter as an opportunity to share with you our activities, best practices and achievements in the past year and to initiate another dialogue. Looking forward to 2018 with further cooperation and learnings!

Enjoy reading!

Best, Jonathan

MESSAGE FROM NCCD

SALUTATIONS FROM THE NATIONAL CENTRE FOR COLD-CHAIN DEVELOPMENT (NCCD), A PARTNER TO THE GREEN INNOVATION CENTRE INDIA!

The Hon'ble Prime Minister of India has put forth his vision to double farmers' income, laying it down as a challenge to all involved stakeholders. This should not be viewed merely as a one-time target, as the achievement will demand a changed approach, in thought and action, which will lead to many more progressive developments. The Green Innovation Centre India has picked up this gauntlet and is implementing innovative interventions that will foster farming as a market linked enterprise and will thereby lay ground for long term socio-economic and environmental gains.

Like all commercial enterprises, the farming system also comprises three broad activity segments - inputs, production and monetisation. The business of agriculture necessitates the integration of multiple value chains, where each independent activity collaborates with others to function as a supply chain system. This holistic supply chain is made optimal when it is market led, shares knowledge, cooperates using standardised operating procedures and captures greater value from each unit of material, i.e. output. The Green Innovation Centre will touch on each aspect of the supply chain, through imparting exposure, training and support in the production process, and in the post-production or monetisation phase of the farming system. Innovation in each activity phase will add value to the actors and a system approach will reduce wasteful use of resources, making farming sustainable.

The Green Innovation Centre is presently focusing on activities that relate to tomato and potato, in specific producing regions of Maharashtra, Karnataka and Andhra Pradesh. However, it will also aim to demonstrate how these can be linked with the wider national market and that farms need not be limited by boundaries when it comes to markets. Besides optimising on inputs and cultivation, the project will promote all opportunities that result in gainful economic productivity for the farmers. The entire approach is that farmers are enabled to capture value from every ounce produced and that the market opportunity is not limited by distance, time or form of the product. This newsletter is intended to update the readers of the various practices, projects and achievements that result from project interventions. It is also intended to invite comments and inputs that will aid the centre in fulfilling its objectives. The consequent learnings from such inputs will form an important part of the success of all the Green Innovation Centre.

I am sure that this will lead to progressive betterment, not only in India, but will also benefit the other countries where the Green Innovation Centre is carrying forward this grand mission. I commend all the activity leaders at the Green Innovation Centres and also welcome all the readers to partake in this mission.

With best wishes,

Pawanexh



Pawanexh Kohli, CEO, NCCD

2 PROJECT OVERVIEW

GREEN INNOVATION CENTRE INDIA began working in India in 2015. Our activities aim at supporting farming enterprises and businesses in and along potato and tomato based value chains in four selected districts of the Indian states of Maharashtra, Karnataka and Andhra Pradesh.

1

TRUST IS THE BASIS

In order to disseminate our innovations sustainably, it is important to work together with farmers and let them see and experience by themselves, how the innovations work and how they can benefit from them. This approach builds a level of trust – the basis of our project.

2

INNOVATIONS ARE THE KEY

We work closely with farmers by providing assistance and advice on suitable farm innovations, starting with the usage of improved seedlings, adopting efficient farming practices like drip-irrigation or machinery, and even trainings in Good Agricultural Practices (GAP). The objective is to produce more from the same land with fewer inputs.

3

TOGETHER WE ARE STRONG

Another guiding principle of our project is the belief in farmer collaboration and co-operation. The position of farmers in the market, both as buyers and sellers, needs to be strengthened from the bottom-up. For this reason, we help them in coming together and setting up producer organisations and companies so that they can benefit from collective learning and experiences.

4

AGRICULTURE SKILL BUILDING

In cooperation with the Welthungerhilfe, we promote so-called Green Colleges - schools which offer certified trainings in agriculture and green skills for youth farmers, through training, advice and farmer field schools in the sector of production, marketing and creation of business plans.

5

CO-OPERATION WITH THE PRIVATE SECTOR

We work closely with private companies through Private Public Partnerships. AVID (Apple Value Chain Interventions for Development), our partnership with Bayer, aims at supporting traditional small-holder apple growers in the North-Indian states of Himachal Pradesh and Jammu & Kashmir by showcasing good agricultural practices in apple cultivation. In order to promote mechanisation we co-operate with local service providers as well as with Grimme and Lemken, both suppliers of soil preparation, planting and harvesting machines. Together with technology partners and farmers, we are testing machines on innovation farms – because we are convinced that the usage of modern machineries could help the agriculture sector in India to become more profitable, sustainable and efficient. Other companies also support our training activities.

6

POLITICAL SUPPORT

Our project is implemented in cooperation with the Ministry of Agriculture, Government of India, and the National Centre for Cold Chain Development (NCCD) along with several private companies, research institutions and civil society organisations. All project activities are conducted in line with the Government of India's policies and contributes to the target of 'doubling farmers income' by 2022.

Our success is based on these six strategic cornerstones as well as our partners' shared commitment to the sustainable improvement of the agricultural sector in India.

PERIOD: November 2014 – March 2022

OBJECTIVES:

- **Increase incomes:** For 75,000 small-scale farming enterprises
- **Employment Growth:** Create a minimum of 1,000 new jobs
- **Increase productivity:** Improve farm productivity by 30 percent
- **Education and training programs:** Provide training for 90,000 people (especially women and youth.)

» Green Innovation Centres for Agriculture and Food Sector is part of Germany's Federal Ministry for Economic Cooperation and Development (BMZ) special initiative "One World No Hunger". This initiative aims at addressing poverty and hunger in the world. «

FROM THE FIELD TO THE SCREEN

The team of Isar film joined our field staff during their work in our project areas and got in touch with farming communities – from the daily auction at Madanapalle's tomato market to a potato cold storage in Pune. The results are a collage of visually stunning insights into our activities, highlighting powerful stories of farmers and rural entrepreneurs.



» See the full film by clicking on the picture. «

NOTES FROM THE FIELD - ARCHANA MAHATO



“TOMATO FARMING HAS CHANGED MY LIFE”, says Archana Mahato, a resident of a small village called Pitidri, located in Manbazar – II Block in Purulia district, West Bengal. The district lies in the rain shadow region of the state. Hailing from the backward Kurmi community, Archana is one of the many marginal farmers in her village, owning and operating less than two hectares of land. Talking about the harsh conditions facing farmers in the region, Archana recalls: “We used to cultivate paddy, brinjal, tomato, cabbage and pumpkin in small quantities and had a few animals, but our life depended on wage labour. We were barely able to make ends meet.” Reliance on wage labour to make ends meet is a common problem affecting India’s small and marginal farmers. Returns from agriculture are often too little to cover household expenses, forcing farmers to work as labourers during the cultivating season as well.

EVOLUTION TO A TOMATO FARMER

After joining the Green College in 2017, Archana learned improved farming practices – crop selection, intercropping, mixed cropping, integrated nutrient management, integrated farming and agro-ecological practices. “Now we cultivate a variety of nutritional crops like brinjal, tomato, chilli, bitter gourd, banana, pumpkin and beans. But, our major earnings come from tomato cultivation”, Archana states confidently after her training. Her experiences with the new tomato farming methods she describes as follows: “Earlier we used to cultivate only for our household use, but now after learning these new farming methods, we grow tomato on 60 decimals land. Our tomato production has increased and it has also improved in quality. The demand for tomato in the market is good, so we are able to earn extra income.”

“We don’t depend so much on wage labour now. My children are studying in high school and college. The whole situation of my family has improved”, Archana adds with a smile.



SMALL LEARNINGS AND BIG ACHIEVEMENTS

Archana’s special pride and joy is her nutritional garden where she uses the crop residue and cow dung for vermicomposting. “We can use this also as food for fishes and ducks which we are growing in our small pond. From this we get fish and eggs for our family; it also gives us a good income.”

Integrated farming approaches involve adopting two or more agro-processes that are complimentary to each other and do not compete for scarce resources. Several field studies conducted in India have ably demonstrated the positive effects of integrated farming for the incomes and nutrition of farmer households, and also helps improve the climate resilience of farm lands and crops.

GREEN COLLEGES

» Since January 2015, Green Innovation Centre India has been working with **Deutsche Welthungerhilfe** to increase the number and effectiveness of vocational training facilities for farmers in rural India. The aim is to improve the livelihoods of small farmers and to promote entrepreneurship and employment in the green sector to stimulate the rural economy in the long term. The colleges offer both, short term (15-30 days), as well as long term certificate courses (six months). Courses are designed and taught keeping in mind the value of such activities in the local eco-system and the needs of the communities. By providing a mix of theoretical, practical and experiential learning, lessons also include soft skills such as business plan development, marketing, entrepreneurship, motivation, conflict resolution, leadership and communication skills. The **Green Colleges** hope to combine traditional knowledge with modern techniques to transform rural youth into ‘ecopreneurs’ to enable them to have better access to finances, market and technology. The following story is about **Archana Mahato** who was trained by the Green College promoted by Welthungerhilfe and its partner Society for Promotion of Wastelands Development (SPWD) located in Ranchi district, Jharkhand, India. «

ROHKADI FARMER STUDY GROUP - TRACTORS, SUCCESS AND MORE...



ROHKADI VILLAGE is located in Junnar block, Pune district, Maharashtra, approximately 30 km away from the nearest town, Narayangaon. Green Innovation Centre India began working in Rokhadi in September, 2016 and formed a **Farmer Study Group (FSG)** of 20 interested tomato farmers.

Owing to good profits from tomato cultivation in the prior season, 11 of the FSG members decided to invest their profits by purchasing new tractors. Initially, only six out of the 20 members of the FSG owned a tractor. The rest of the farmers had to hire tractors regularly, which led to an increased cost of cultivation and also difficulties in procuring tractor services in a timely manner. Five farmers who owned old tractors decided to replace them and purchase new ones. Generally, the market price for one tractor is 7.24 lakh INR (9078 Euros). However, on account of the combined purchase, the group was able to negotiate with the vendors and decrease the price for one tractor to 6.06 lakh INR (7600 Euros).

Recently, the Rohkadi FSG celebrated their one-year anniversary. During the past year, the group managed to save nearly 2.5 lakh INR (3135 Euros), with each member saving 1000 INR (12.5 Euros) per month. For the anniversary celebration, project members, nursery owners, traders, input shop owners, all group members and other farmers from the village were present. They

shared their experiences, the adopted innovations and achieved results. Under the guidance of the project, the FSG has created Participatory Technology Development (PTD) farm plots to test and innovate in Good Agricultural Practices. These include the use of healthy seedlings, Enriched Neem Cake application, neem oil spray, planting of border crops like maize, improved nutrient management, and the application of white mulch. All farmers who adopted these better practices were able to achieve higher yields (about 20% higher), while reducing their cultivation costs by 40% at the same time.

Seeing these positive experiences, many more farmers have approached the project to join the FSG. As a result, two additional groups are about to be formed in Rokhadi. Apart from tomato production, they are now also active in organising training on onion cultivation. Their team spirit goes beyond the field and work: Members demonstrate a caring attitude towards other members by supporting each other in times of need. Recently, the FSG supported a village farmer with 50,000 INR (627 Euros) for a medical emergency in his family.

Rohkadi FSG is setting an example in the region as a model farmer's group. It will surely inspire many more farmers to work together to implement new and sustainable agricultural practices and to increase their incomes.

FROM FARMER GROUP TO TOMATO HUB

ROHKADI VILLAGE | JUNNAR TEHSIL | PUNE DISTRICT

NOVEMBER 2016: The **Pragat Tomato Producers Farmers Development Group** was formed.

JANUARY 2017: Registration of the group under the Agriculture Technology Management Agency (ATMA)

NOW: 20 young and innovative farmers are cultivating tomato in nearly 75-80 acre in one season. This was not always the case. Four to five years back the region faced a huge attack of white fly and nematode which leads to a loss of the crop during the last three to four years. When the Green Innovation Centre started working in their area in 2016 these youngsters were brought together.

“BEFORE THE FORMATION OF OUR GROUP, each member cultivated tomato on their own way - based on traditional experiences, purchasing inputs and selling their produce individually”, explains Nilesh Gholap, the president of the group. “The project trained us on land preparation and supported with trainings on diseases, nutrient management and need of healthy seedlings. On PTD (Participatory Technology Development) plots we can experience visible differences in the cultivation methods of tomatoes compared with farmers practices we used before. Also many exposure visits on tomato cultivation and marketing helped us gaining and transferring practical knowledge and sharing this knowledge with others.”

The newfound strength within the group did not only lead to collectively purchase of input and management of their savings, it also strengthened their bargaining power with the suppliers.

Rohkadi Village has the same distance to Mumbai, Pune and Nasik. In this area Rohkadi tomatoes are well known in markets for their quality. Soon the village became tomato hub.

“Since using the project innovations and advices we could increase our produce from 16 - 18 tonnes to 40 tonnes per acre in a season. That is awesome!”, explains one of the farmers.

But still some issues remain: “Getting proper prices for our products is still very difficult. We used to focus mostly on production as the market is available in three nearby cosmopolitan cities. Now we decided to form a Farmer Producer Company. We hope that this will help us improving the marketing of our products and value addition so we can fetch better incomes from agriculture.”

But their hard work had already paid off: The Agricultural Technology Management Agency (ATMA) and the Department of Agriculture, Maharashtra have evaluated the farmer group in the Pune district on the basis on organic farming, group farming, collective purchasing, input procurement through group, technology adoption and transfer.

ON 10TH MARCH 2018

the Pragat Tomato Producers Farmers Development Group got rewarded with the first prize at Pune district level in Maharashtra from the Agriculture Minister Govt of Maharashtra, a great honor for all members!



ENRICHED NEEM CAKE AS THE SOLUTION FOR NEMATODE

TACKLING NEMATODE AND FUNGUS ATTACKS WITH BIO-PESTICIDE: ENRICHED NEEM CAKE TRAINING PROGRAM IN JUNNAR, MAHARASHTRA

Junnar block, in Pune district, Maharashtra is located in a high rainfall area and is mainly a vegetable growing belt. High rainfall and humidity make the entire region vulnerable to incidents of nematode and other fungus attack on vegetable crops. A nematode is a very small worm, which can be seen only under a microscope. It moves through the water and enters the root system of plants blocking the flow of water. In some cases, the nematodes also act as vectors spreading plant viruses between crop plants. Generally, when organic matter in the soil decreases, chances of nematode attack increase. Nematode and other fungal attacks have destroyed many farmers' vegetable crops in this region.

Prior to the intervention by the Green Innovation Centre, farmers used Ethyl Bromide and Methyl Bromide to tackle the nematode problem. Both of these chemicals are banned in many European countries since they can contaminate water sources and cause water pollution. A few farmers had also used bacterial input as treatment, but without yielding any positive results. Both of these methods are ineffective to solve the problem of nematode and fungus attacks.



NEEM CAKE

Learn more about how to make **ENRICHED NEEM CAKE** on page 21.

GREEN INNOVATION CENTRE INTERVENTION

After a careful study of the ground level problems affecting farmers, the project got in touch with Dr M. S. Rao (Principal Scientist at the Indian Institute of Horticultural Research, Bangalore) who has considerable experience in sustainable integrated nematode, disease and pest management strategies in vegetable crops.

Working together with Dr Rao, a solution for the nematode and fungus attack on crops in the project area in Maharashtra was found. Through the use of bio-pesticides, the nematode and fungus attacks could be easily averted through the application of the Enriched Neem Cake technology.

Under the guidance of Dr Rao, a series of training and demonstrations were arranged to enable a Farmer Study Group to learn the techniques of preparing Enriched Neem Cake and its application on their farms. The training courses demonstrated how preparation of Enriched Neem Cake requires minimal costs and yields better results than chemical pesticides. Now farmers of the Farmer Study Group feel not only more confident in their own ability to make bio-pesticides. They also are better equipped to tackle nematode and fungus attacks on their crops.

DR. RAO

Meet and Greet with Dr. Rao on page 16.

POTATO PLATFORM: COLD STORAGE TRAINING

POTATO PLATFORM MEETING IN HASSAN, KARNATAKA

A three-day workshop on seed potato handling was held in December, in Hassan, Karnataka. Close to 60 people participated in the event, representing various stakeholders of the potato value chains - seed growers, farmers, cold storage owners, researchers from All India Seed Potato Program and Central Potato Research Institute, private service providers, and government representatives. In the 2017 season, seed potatoes which were purchased from Jalandhar (Punjab) had shown delayed and uneven germination. The workshop set the goal to get to the root of the problem. The combination of factors which lead to this problem were identified and possible solutions in line with a joint action plan adopted.

EARLY HARVESTING OF SEED POTATOES

At Jalandhar, it was observed that early harvesting (due to the 31st December obligation to remove haulms from seed potato fields) could be a reason for the delayed and uneven germination of potato seeds. No treatment was given to the seed potatoes in Jalandhar post their harvest and prior to transportation. This could cause cross-contamination if some diseased seed potatoes were inadvertently shipped along with healthy seed potatoes. All participants recommended that seed treatment had to be done post their harvest and prior to transport, a suggestion, which, the seed potato farmers from Jalandhar agreed to do. In order to get further support, farmers from Jalandhar invited researchers and potato farmers to visit their plots during the growth stage of seed potatoes for the next cycle.



POTATO TRANSPORTATION

There are no potato transport protocols earmarked by transport companies in the region. Transporters use ordinary trucks, which are not equipped with systems to allow proper aeration of the seed potatoes. This leads to poor aeration during transport along with high temperatures and humidity. To solve this problem, cheap aeration systems can be attached to trucks. During follow-up collaborations with vendors and partners, details on the construction, purchase and management of these systems will be worked out. In addition, drivers and transport staff will receive training on the handling of seed potatoes to reduce spoilage during transportation.

POTATO COLD STORAGE

Upon receiving the transported seed potatoes at the cold stores, potatoes are mostly manually sorted and graded. Mechanising the sorting and grading processes would result in speeding up the entire storage process and reduce handling damages. Generally, the cold stores are kept at 1 to 2 degree C, whereas researchers recommended a constant temperature between 4 to 6 degrees. Two weeks before distributing the seed potatoes, temperatures should be raised to about 15-20 degrees C. With the exception of raising temperatures to 15-20 degrees, cold storage owners from Maharashtra agreed to implement the above recommendations. They claimed that even without increasing temperatures, they were still able to sell seed potatoes as table potatoes. Two cold store owners planned to purchase the intelligent potato technology marketed by Solentum. This would enable them to record temperature, CO2 levels, and humidity during the transport and storage of the seed potatoes.



BEST PRACTICES FOR POTATO FARMING

The freshly transported seed potatoes should not be immediately planted and should undergo prior conditioning. Researchers informed farmers about pre-sprouting techniques in a well aerated shaded area. However, on-farm space constraints are still an issue. Farmers want to plant the seed potatoes quickly to achieve an early harvest so that a second crop can be grown on the same land. Though cropping intensity is important for incomes, the same could be achieved through staggering the sowing and harvest pattern on sections of the same land.

Overall the workshop underlined the relevance of joint effort of all partners. Such knowledge sharing and collaboration between seed producers and farmers is the way the value chain for potato cultivation can be strengthened.

BUDGET ANALYSIS FOR THE AGRICULTURE SECTOR: 2018 - 2019

The Government of India presented the budget on 1st February, 2018. The Government has reiterated the importance of increasing farmer's incomes, enhancing agricultural productivity, improving avenues for agro-processing and promoting farmer co-operation and organisations. The main features of the budget for the agriculture sector are as follows:

1 MINIMUM SUPPORT PRICE (MSP) TO FARMERS

the MSP for notified crops would be 1.5 times the production costs of farmers. The government has accepted, in principal, a long standing demand from farmer's organisations and policy experts of including the costs of family labour to the overall cost of production while calculating the MSP for crops. Despite this increase, there are still demands from certain sectors to increase the MSP to include rents and interests on fixed assets of the farmers. Increasing MSP for farmers is not an easy task for the government and has to be delicately maneuvered keeping consumer costs and retail inflation in mind. This, more often than not, proves to be challenging for the government on account of different political pressures from the supply and demand sides.

2 ELECTRONIC NATIONAL AGRICULTURAL MANDI (ENAM) DEVELOPMENT

The government has decided to expand eNAM across 585 Agriculture Produce Market Committee (APMC) markets by March 2018. Other developments on the eNAM platform include the incorporation of United Payment Interface (UPI) through the Bharat Interface for Money (BHIM) app. Currently, only 416 markets across 14 states and one union territory are integrated with the eNAM platform. Incorporating markets currently outside the eNAM ambit and providing uniform services to farmers, producers and sellers across the platform will prove to be a challenge to the government in the coming year.

3 GRAMIN AGRICULTURAL MARKET (GRAM) DEVELOPMENT

An outlay of 2000 crores INR (250 Million Euros) has been allocated to upgrade existing rural periodic markets into Gramin (rural) agricultural markets which would be linked to eNAM in the near future. These GrAMs would operate outside ambit of Agriculture Produce Market Committees (APMC) and serve as aggregation hubs at village level. The development of market infrastructure through GrAMs will be beneficial for farmers who cannot travel to district level APMCs. Local markets can become aggregator centers of direct sales to bulk buyers and procurers. This could potentially provide farmers with much needed forward market linkages and protection from erratic price fluctuations.

4 CROP INSURANCE

13,000 crore INR (1.6 Billion Euros) has been allocated to crop insurance schemes - Pradhan Mantri Fasal Bima Yojana and the Weather Based Crop Insurance Scheme - to stabilise risk and protect farmers from adverse weather, crop damage and poor prices.

5 IRRIGATION REFORM

2600 crore INR (326 Million Euros) has been allocated for irrigation development in dry farming areas and adoption of efficient irrigation practices.

OPERATION GREENS

Perhaps, one of the most important announcements in the budget has been the proposal to launch Operation Greens with an initial funding of 500 crore INR (62 Million Euros). Operation Greens aims to promote farmer producers organisations (FPOs) and co-operatives, agro-logistics, professional management, and processing facilities. The operation aims to aid farmers to aggregate and access markets and to develop a supply chain mechanism on the lines of Operation Flood, which ushered the milk revolution in the country. The organized supply chain will also help control the erratic fluctuations in the prices of three crops in particular - onions, potatoes and tomatoes. This is the first time that such a crop specific program for onions, tomatoes and potatoes has been launched in the country.

Budget 2018-19: Agriculture requires a holistic approach and is not merely about cultivation. A paradigm shift effected by adopting an enterprise approach for agricultural policies and programmes.

Farmer Producer Organisations (FPO) of less than Rs. 100 crore turnover exempted income tax for first five years - to encourage professionalism in post-harvest value addition.

Organic farming by Village Producer Organisations (VPO) and FPOs to be encouraged in large clusters, preferably of 1,000 hectares each.

Cluster based cultivation & development to achieve economy of scale in the horticultural supply chain through FPOs/VPOs.

Operation Greens on lines of operation flood with a focus on agri-logistics, processing & professional management. Total of Rs. 500 crore allocated.

Agri-Market Infrastructure fund of Rs. 2,000 crore to set up 22,000 GrAMs (rural level markets & aggregation hubs), and upgrade 585 APMCs.

Institutional mechanism to develop policies on price and demand forecasts, futures & options and Exim policies for agriculture.

Institutional credit for agriculture to be boosted by enhancing the target of credit to Rs. 11 lakh crore.

Minimum Support Price (MSP) for kharif crops to be at 1.5 times the cost of production.

Launch a restructured Bamboo mission with Rs 1,290 crore to promote the sector holistically. Bamboo is "green-gold".

Irrigation development (PMSY) allocation increased to Rs 2,600 crore. Focus on 96 districts where less than 30% land holding is with assured irrigation.

Fisheries & Aquaculture Infrastructure and Animal Husbandry Infrastructure Development Funds - total corpus of Rs 10,000 crore.

Allocation to Ministry of Food Processing Industries doubled to Rs. 1,400 crore. To promote agro-processing financial institutions for this.

Women Groups (SHGs) to be encouraged in organic agriculture under NRLM. Allocation to NRLM increased to Rs 5,750 crore

Govt to spend Rs 14.34 lakh crore in rural areas for the creation of livelihood and infrastructure (roads, houses, toilets, etc.).

PM's Gram Sadak Yojna Phase-III to include road links to GrAMs, etc. GrAMs to also be on eNAM and exempt from APMC regulations.

Kisan Credit card opened to Fisheries and Animal Husbandry farmers to meet their working capital needs.

The budget's focus on agriculture is largely positive – emphasising the need and potential of catalysing efficient markets. However, concerns remain as to whether the budget can actually achieve the ambitious target of 'doubling farmer's income by 2022'. The three most critical issues facing Indian agriculture today are erratic supply into markets, low productivity and environmental and climate change. While market reforms have featured significantly in the budget allocations, there needs to be sustained focus on issues of farm productivity and climate resilience of agriculture as well. Budgetary allocations aside, the farm sector in India needs consistent monitoring, oversight and guidance on the part of both government and private stakeholders to prevent large-scale farmer distress and crisis, which is taking root in various states across the country. A lot more commitment and effort needs to be put in to ensure that Indian agriculture can be made more efficient, sustainable, profitable and resilient for India's farmers.

MARKET INFORMATION SERVICES FOR TOMATO FARMERS

ANDHRA PRADESH MAHILA ABHIVRUDDHI SOCIETY (APMAS), a partner of the Green Innovation Centre, provides market prices for tomatoes to farmers in the project areas of Chittoor district through short message services (SMS). The prices cover the four major tomato markets in the region, mainly - the Agriculture Produce Marketing Committee (APMC) markets located in Madanapalle, Punganur, Palamaner and Kalikiri in the district. Daily the APMC sends tomato market prices to the project staff by 2:00 pm. The project assistants consolidate the data and forward the information across to more than 2100 farmers in the local language - Telugu, through a SMS. These messages are also sent to project staff, FPO leaders and the officials of government departments.

WHAT DATA IS PROVIDED TO FARMERS?

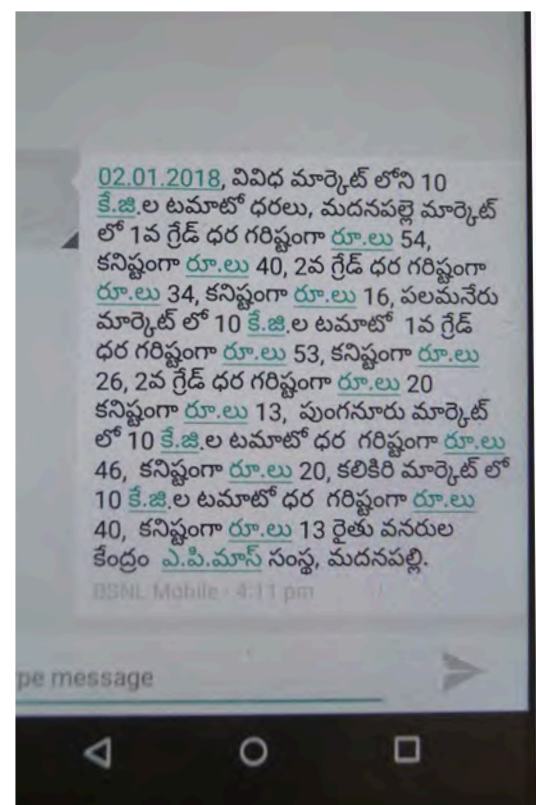
The farmers are provided with data on tomato prices per 10 kg of produce with minimum, maximum and modal prices based on the first and second grade (quality) of tomato. Since the messages are sent in Telugu, it is easier for farmers to understand. Furthermore information on government schemes, farmer events and weather data are provided through SMS.

HOW CAN FARMERS USE THE DATA?

Farmers can use the data in the following ways:

1. Learning about the market prices of tomatoes based on quality and grades of tomatoes.
2. Deciding about where to transport harvested tomato produce - which APMC market is close by and offers best prices.
3. Understanding seasonal prices and deciding whether to take up tomato crop cultivation or not.
4. Delay or pre-pone crop planting based on the market prices.
5. Government schemes – availability of input subsidies to farmers.
6. Events / exhibition information on tomato crop to participate in.
7. Daily weather reports.

There is an increasing demand from farmers to know other terminal/private market details too, for which the project is planning to expand services in the next phase, i.e. 2018–2019.



FARMERS' RESPONSES FROM THE FIELD

Farmers have expressed happiness about the information received and are keen to avail services through the project. They confirmed the usefulness of information to predict prices for their tomato produce post-harvest. If the harvested produce is quoted at a lesser price by buyer agents, farmers are then able to show these prices to commission agent and use them as a basis for bargaining.

As almost all the farmers have smart phones, there is scope to use this technology for promoting good agricultural practices in tomato cultivation. Several agro-based applications are now available on mobile platforms, which can be used for pest and disease management in the tomato crop, as well.

Using mobile based technology to provide actionable inputs to tomato farmers has the potential to reduce cost of production and help increase productivity. Useful and timely information on prices, weather conditions, and good practices will only help farmers make better decisions and reduce risk. Such efforts by the Green Innovation Centre need to be further strengthened and expanded to other regions for wider dissemination.

3 FIELD BYTES: INSTITUTIONAL DEVELOPMENT



MS. SWAROOPA, 36, is a small farmer living with six family members at Reddyvari Palle Village, in Nimmanapalle Mandal, Chittoor District, Andhra Pradesh. A graduate in science, Ms. Swaroopa joined a women's Self Help Group (SHG) called 'Sri Rama' 15 years ago. Since joining, she has played an active role in the functioning of the SHG. Soon the group identified her undeniable spirit, skills and leadership qualities and elected her as SHG leader. As the leader of the SHG, she has mobilised bank loans and other government programs for her group. Due to the leadership qualities of Ms. Swaroopa, the group in Reddyvari Palle has been identified as an 'A' grade SHG.

MS. SWAROOPA – WOMAN, FARMER AND SOCIAL LEADER.

GREEN INNOVATION CENTRE INDIA IN NIMMANAPALLE

The project works in Nimmanapalle, a mandal in Chittoor District. This mandal comprises of 11 Gram Panchayats, including Reddyvari Palle panchayat. Currently, there are 18 farmer groups with 224 farmers as members in the panchayat. To facilitate the development of farmers' institutions, the project has placed project managers and Horticulture Extension Officers (HEOs) at the mandal level. Rythu Mitras (farmer facilitators) have also been placed at the panchayat level to promote, facilitate and strengthen Farmers Producer Organisations (FPOs) across various levels.

After conducting awareness campaigns in all 11 panchayats certain progressive farmers were identified for mobilisation and formation of FPOs. Over the course of the campaign, Ms. Swaroopa was identified and placed as a Rythu Mitra (farmer facilitator) for Reddyvari Palle panchayat. Based on her work experience and skills, she was recommended by the Village Development Committee of the Gram Sabha for this position.

MS. SWAROOPA, FARM FACILITATOR AND MOBILISER

Though women actively participate in a majority of agricultural activities, it is very hard for them to join in FPOs due to various socio-economic reasons. A primary reason for this is the fact that lands are not registered in women's names and the general perception that only men are considered as farmers. Therefore, a core mandate of the project aims at involving 35% women's representation in all activities, including the formation and membership of FPOs.

In other Panchayats in the region, the project staff is faced with several challenges in mobilising women to join FPOs. As a Rythu Mithra, Ms. Swaroopa has played a dynamic role in the entry of women farmers into FPOs. Thanks to her tireless efforts, 60% of the members in Reddyvari palle Panchayat FPO are women. The success of her efforts is evident in the fact that Reddyvari Palle FPO has more women members than male members, unlike all others in the mandal. The FPO has also grown to be one of the largest Grama Rythu Samakhya (village farm association) in the mandal.

There are several factors that have contributed to Ms. Swaroopa's development as an effective leader and good facilitator. She regularly makes house visits to families in her panchayat to enquire about their wellbeing and motivate them. Other Grama Rythu Samakhya office bearers also support her in mobilisation of women. One factor has contributed immensely to her success: her friendly nature and dedication makes it easy for women farmer to communicate and socialize with her, building a trusting and open foundation for cooperation.

Ms. Swaroopa is now a model woman farmer, leader and a dedicated Rythu Mithra in Nimmanapalle Mandal.

PROMOTING FARMER PRODUCER ORGANISATIONS: EXPERIENCES FROM ANDHRA PRADESH

In Chittoor district, Andhra Pradesh, the Green Innovation Centre India in co-operation with Andhra Pradesh Mahila Abhivruddhi Society (APMAS) promotes Farmer Producer Organisations (FPOs) with a special focus on women and youth farmers. FPOs represent the interests of farmer and producers through greater cooperation amongst members, who otherwise operate individually in an uncertain market. FPOs also contribute to improving the framework conditions for agricultural production (e.g. low-cost access to inputs such as fertilizers, pesticides) and strengthen their position in activities that involve collective bargaining.

THE PROJECT PROMOTES A THREE-TIER STRUCTURE OF FPOS

1. Farmer Groups

In the first step, individual farmers (women & men) at a habitation level are mobilised into informal Rythu Sanghams (Farmer Groups). Each Rythu Sangham consists of 10 to 20 farmers. Clearly laid down criteria is followed in identifying the farmers.

2. Farmer Associations

In the second step, Rythu Sanghams are incorporated as Grama Rythu Samakhya (GRS) at the Gram Panchayat level (Village level Association of Farmers Groups). Each GRS consists of 10 to 20 Rythu Sanghams. GRS will be registered under the Andhra Pradesh Mutually Aided Co-operative Societies (APMACS) Act, 1995.

3. Farmer Producer Organisations

In the final step, several GRS are federated into a Farmer Producer Organisation (FPO) at the mandal level. FPOs will be registered under Producer Companies Act/ APMACS Act as an apex body.

PROGRESS

The project has been effective in mobilising farmers, both women & men, enlisting them in farmer groups at the primary level, village level association of farmers groups at the secondary level and into a FPO at the apex level, by organising a number of entry point activities. Several awareness meetings and training programs for farmers were also hosted/ conducted. In the past two years, the following has been achieved:

- More than 4,800 farmers were mobilised into the three-tiered FPOs with a share capital of 65,000 Euros.
- 35 Village Farmers Associations (Grama Rythu Sanghams) were formed and 22 registered as co-operatives under the APMACS Act, 1995.
- Participatory plans and strategy development were facilitated for Grama Rythu Samakhyas.
- Registration of apex FPOs under APMACS Act, 1995, in Ramasamudram mandal and as a Producer Company in Madanapalle, Nimmanapalle and Palamaner mandals were initiated.
- In all four project mandals, Village Farmers Associations accessed Green Innovation Funds (GIF) of about 47,000 Euros under the project. This was invested on bulk procurement of fertilizers, seeds, cattle feed, and in establishing custom hiring centres as per the needs expressed by the farmers.
- To understand FPO promotion in the State of Andhra Pradesh and to identify the challenges faced by FPOs, four regional workshops on FPOs were conducted with stakeholders, in collaboration with the Department of Horticulture, Government of Andhra Pradesh.

LEARNINGS

1. There is a keen interest among farmers to come together to address some of the common problems they face, particularly the exploitation by the commission agents in the markets as well as the pesticide shop owners. In addition to these, the farmers also want access to various government schemes.
2. The FPO mechanism has helped improve access to inputs at lower costs, thereby reducing production costs. However, FPOs are unable to fully extend these gains by linking with a wider market, without external collaboration. Further strengthening of FPOs is needed in the post-production phase.
3. FPOs must have their own staff (at least a chief executive officer) and funding support for a period of at least three years for them to become self-reliant business entities.
4. FPOs require strong mentoring and capacity building support, based on the values and principles of co-operatives, in the areas of good governance and business planning to grow and serve their members effectively.
5. Farmers' Associations and FPOs need greater support from all government and non-government actors to enable them to have access to better technology, finance and markets.

MEET AND GREAT WITH DR. M.S. RAO



DR. MAHENDRAKAR SRINIVASA RAO is Principal Scientist at the Indian Institute of Horticultural Research (IIHR), Bangalore. His main expertise lies in developing bio-pesticides for sustainably integrated nematode, disease and pest management strategies in vegetable crops, fruits and flowers using bio-agents, *encomyorrhiza* and botanicals.

Through the work being conducted at IIHR, Dr. Rao has identified the molecular basis for the mode of action of *Pseudomonas luorescens*, *Trichoderma viride* and the biochemical basis of *Bacillus subtilis* induced systemic resistance mechanism in capsicum. He has also developed mass production protocols of effective bio-pesticides such as *Paecilomyces lilacinus* – 1% W. P., *Pochonia chlamydosporia* – 1% W.P., *Pseudomonas luorescens* – 1% W. P., *Trichoderma*

harzianum – 1% W. P., and *Trichoderma viride* – 1.5% W. P., which have been registered with the Central Insecticide Board and Registration Committee (CIB&RC), Ministry of Agriculture, Government of India. Till date, these bio-pesticide technologies have been commercialised and transferred to 465 industrial licensee's across the country.

Through Dr. Rao's efforts, integrated nematode, disease and pest management technologies have been transferred among thousands of farmers, NGOs and research organisations, in almost all states in India. Several of these efforts have been initiated through the All India Co-ordinated Research Project of the IIHR and the Government of India. Based on Dr Rao's work, approximately 1000 crores INR (125 Million Euros) worth of bio-pesticides is produced in India every year. Lakhs of farmers have benefitted from these technologies and it is estimated that an amount of over 2,000 crore INR (250 Million Euros) has accrued to farmers every year. Currently, various technologies developed by him are being used on over 10 lakh hectares of farm land around the world.

Currently Dr. Rao holds seven international patents and one national patent for his pioneering work on bio-agents and bio-pesticides. He is a member of several important national associations and committees on agricultural sciences, bio-technology. His work has also been recognised both nationally, as well as internationally.

» We use this chance to thank Dr Rao for his continued co-operation and partnership with Green Innovation Centre India! «

POTATO VALUE CHAIN WORKSHOP HASSAN, KARNATAKA, JULY 2017



An exposure seminar titled ‘Optimising Value Chains – Potatoes’ was organised by the Green Innovation Centre India and the German Agricultural Society (DLG). 38 participants from four countries took part in the seminar, where everything was about one thing only - potato.

Practical insights, such as field visits, meetings with local farmer organisations and processing companies offered a lot of space for discussions and exchange of ideas amongst participants, which included - the members of the global Green Innovation Centre’s potato working group (including Tunisia, Kenya, India and Germany) with partners from the Department of Horticulture, Government of Karnataka, civil society organisations, research and implementation partners (such as Welthungerhilfe, University of Wageningen, The International Potato Center, AFC, and the DLG). Drawing from this wealth of knowledge and experience, similarities as well as country-specific differences were identified and discussed - from the main focus within the value chain (promotion of high nutritious potatoes, organisation and innovation) to the weight of a potato bag. While in India, a sack of potatoes weighs 50 kilograms, Meshack Ronoh, from Kenya, remained unimpressed, “At home, a sack weighs 80 kilos,” he said.

Collaboration with farmers’ organisations is an important concern for all participants. It not only supports the transfer of knowledge, but also the self-organisation of farmer groups. “The organisation and contents of the meetings and field days are determined independently by the farmers. We project coordinators only take a consultative role,” said Ravindra Reddy from the Green Innovation Centre India. “They are proud of their work and results, and want to share their experiences with other farmers,” Reddy concluded. Rima Gmati from the Green Innovations Centre Tunisia agrees, “Our farmer groups consist of about 20 people who bring four to five different experiences on topics such as cooperation with traders, use of apps or finances. The groups live from plurality and the members can only benefit from it!”

Another important topic that came up during the discussions was the plant disease phytophthora and its effects on the potato crop. Within the last eight years, farm land area under potato production in Hassan has declined from 50,000 hectares to only about 15,000 hectares. The decline is partly attributable to the recurrence of phytophthora disease in the potato plant. In areas of high humidity and a temperature above 26° C, the disease spreads rapidly across the potato growing belt in South India. Geert Kessel, scientist at the University of Wageningen, has been conducting researching on the topic for the past 18 years. “Fighting phytophthora is like risk management. Most farmers have theoretical knowledge, but only in the field can the situation can be assessed and dealt with properly.” Participants also had the chance to learn at a training session on spraying crops to practise methods of fighting the disease effectively.

Jonathan Ziebula, Project Director, was pleased, ***“The international working group offers an ideal exchange platform for the partners in the different countries - a great strength of our global programme!”*** he noted.

GLOBAL INITIATIVE: REGIONAL CONFERENCE NAIROBI, KENYA, DECEMBER, 2017

One of the last highlights of the past year was the regional conference of the Green Innovation Centres in Kenya with participants from the 14 countries of the global initiative. Green Innovation Centre India was represented by a delegation of 10 participants including team members and official partners from the Ministry of Agriculture (MoA), Government of India (GOI); the Joint Secretary, Mr. Dinesh Kumar, IAS, MoA, GOI, New Delhi, Mr. PC Ray, IFS, Commissioner, Department of Horticulture, Government of Karnataka, and Mr. Borkar, Project Director, ATMA, Pune. The delegation was active in working groups on potato farming, mechanisation and organic agriculture, as well as in several field trips and workshops on gender and youth employment. The large number of participants and their diversity of backgrounds lead to a very fruitful exchange. At a competition on market place innovations, all countries presented one innovation. With the model nursery approach, India ranked third in the competition. Many thanks go out to the creative presentation prepared by the team! We are already looking forward to the regional conference 2018, taking place in Benin!



» Green Innovation Centres for the Agriculture and Food Sectors
Regional Conference in Kenya «



» Green Innovation Centre India – Annual Partner Meeting «

ANNUAL PARTNER MEETING BANGALORE, KARNATAKA, NOVEMBER 2017

A three-day planning workshop was held to update all partners on the current state of development of the various programs of Green Innovation Centre India. After a stock-taking of the current status quo in regard to project implementation, the programme was dedicated to open discussions and strategy development, aided by inputs from Mr. Prabhas Chandra Ray, IFS, Commissioner, Department of Horticulture, Government of Karnataka, who joined the opening ceremony. Partners worked out linkages and common difficulties that they faced in implementation and planned strategies to overcome challenge in the field. At the end of the workshop, a common ground for future project implementation and co-operation between all implementing partners, in the short and long run was set.



» Stakeholder Workshop with Bayer «

STAKEHOLDER WORKSHOP WITH BAYER SHIMLA, HIMACHAL PRADESH, OCTOBER 2017

Green Innovation Centre India and Bayer jointly organised a stakeholder workshop on integrated apple value chain models with win-win linkages for various stakeholders. The workshop was conducted as part of the Apple Value Chain Interventions for Development (AVID) Public Private Partnership and its ongoing efforts to engage with private companies working in the field. The workshops' purpose aimed at eliciting perspectives and constructive inputs from actors representing the government, public sector enterprises, research organisations and independent agricultural fertiliser experts; along with representatives of the food processing, retail, agrochemicals, and fertilizer sectors. During the day insights on ongoing AVID initiatives, opportunities for exchange between stakeholders and initial thoughts on frameworks for inter-institutional co-operation in the long-term amongst all key stakeholders were provided. The Chief Guest of Honour, Mr. J.C. Sharma, IAS, Principal Secretary, Horticulture Department, Government of Himachal Pradesh, inaugurated the workshop, initiated a short discussion on the future of the apple industry in the state and unveiled training manuals developed by the AVID program.

AN EXPLORATIVE STUDY ON THE POTATO MARKETING CHAIN IN THE STATE OF KERALA, INDIA

by Sharon Paul for AFC (Agriculture and Finance Consultants) / ETC Consultants Pvt. Ltd. Bangalore

INTRODUCTION

Potato is the world's most important root and tuber crop and the third most important food crop in the world after rice and wheat. The Food and Agriculture Organisation has declared it as the "food of the future", due to its potential to contribute towards food security. Farmers in developing countries prefer potato cultivation to ensure a stable income, as potato provides high productivity and stable yield. India and China contribute to around 1/3rd of the global potato production.

The pattern of production and consumption of potato varies within India due to the diverse landscapes and different agro-climatic conditions across the country. The climatic conditions in the north Indian states of Uttar Pradesh, West Bengal, Bihar, Punjab, Gujarat, and Madhya Pradesh are conducive to potato cultivation. Together, these states constitute more than 72% of potato production in India. In the southern part of India, cultivation of potato is mainly concentrated in the states of Karnataka, Maharashtra and to a lesser extent in Tamil Nadu. Due to adverse climatic conditions, potato cultivation in Kerala is limited to the hilly regions of Vattavada and Kanthalloor in Munnar, which cannot feed the population of Kerala. As a result, the state is highly dependent on imports from other states to meet its consumption requirements of potato as well as other vegetables. In Kerala, an average urban and rural resident consumes 0.436 kg and 0.394 kg respectively per month (5.23 kg and 4.73 kg per year). With an average family size of 4.2, Kerala requires a total of 9845 tons of potatoes per month for household level consumption, a majority of which has to be imported from other states.

A trading chain has evolved to facilitate imports of potatoes to Kerala. The local potato markets of Trivandrum, Ernakulam and Thrissur districts provide a suitable base to understand the trade chains of potato and its impact on prices. The analysis is based on primary data collected from interactions with officials and distributors in the markets in Trivandrum, Ernakulam and Thrissur, and secondary data on the market wholesale and retail price of potato in Kerala for the last five years from the Department of Economics and Statistics.

IMPORT OF POTATO TO KERALA

On account of low production, potato cultivated in Munnar district is mainly marketed in the local markets itself. A few markets in neighbouring Ernakulam, Alwaye and Perumbavoor also procure potatoes from Munnar, but in lesser quantities. A majority of the potato imports in the state come from the Mettupalayam market in the neighbouring state of Tamil Nadu. While the Horticulture Corporation Department and other private traders import only 1.65 tons of produce per day from the potato cultivating areas in Kerala, an average of 68 tons of potato is imported daily from the Mettupalayam market in Tamil Nadu.

METTUPALAYAM MARKET

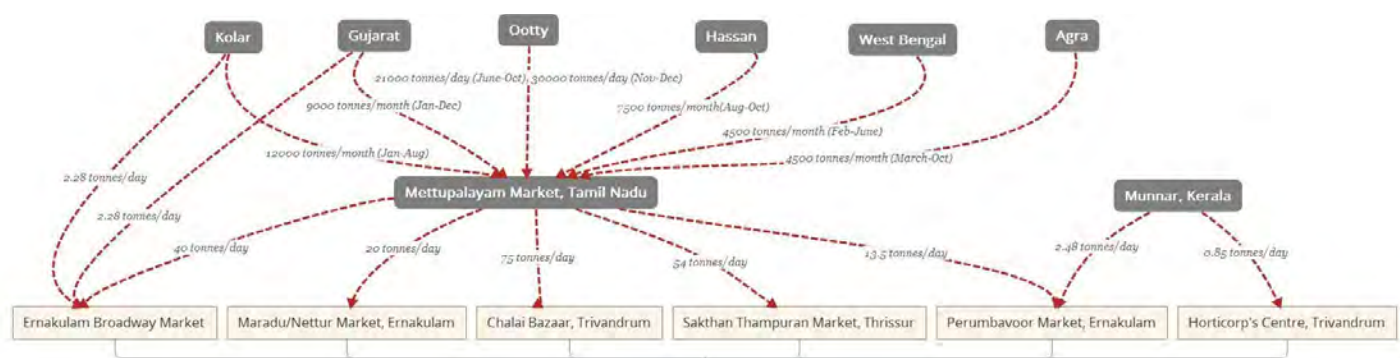
Mettupalayam market plays a major role in the marketing chain of potato in Kerala. Potatoes from Ootty, Kolar, West Bengal, Agra, Gujarat and Hassan are imported to Kerala via Mettupalayam on a daily basis. It consists of 70 private potato traders and commission agents and one government trading agency. Potatoes from these various sources are graded according to the size and quality, and packed in sacks of 45 kg at the mandis (stores) in Mettupalayam market, which are then procured by the wholesale and retail merchants in Kerala. Mettupalayam also houses 12 cold storage facilities to ensure a continuous supply of potato to Kerala throughout the year.

Figure 1 indicates that a large share of potato is imported from Mettupalayam market to all the major markets in Trivandrum, Ernakulam and Thrissur. Some markets like, Chalai in Trivandrum, Maradu in Ernakulam, and Sakthan Thampuran Market in Thrissur, depend completely upon Mettupalayam for potato procurement.

Kerala is an important destination for traders in the Mettupalayam market, with 70% of all potato produce passing through the market being exported to markets in Kerala. The major share of produce unloaded at Mettupalayam market comes from Ootty, constituting 37% of all the traded produce and the lowest from West Bengal (5%) and Hassan (5%).

COSTS INVOLVED

There is great variation in the costs involved in the procurement and distribution of potatoes. For instance, wholesale traders in Kerala pay 56 INR on average as rent and 11.8 INR as loading-unloading charge per sack. However, traders in Chalai, Trivandrum pay almost double the state average. Each wholesaler employs around 15 to 25 labourers for grading, packing, etc.



» Figure 1: Import of potato to the markets in Kerala «

WHOLESALE AND RETAIL PRICES

The price of potato differs according to the season as well as source. Wholesale merchants in Kerala markets pay an amount ranging from 800 to 1200 INR per sack to the commission agents from Mettupalayam as product price. During the off-season, the price ranges from 900 to 1800 INR and traders pay 1350 INR on average. The average rate during the season for potatoes is 970 INR. Due to higher demand, potato cultivated in Ooty (Nilgiri hills) fetch higher prices all-round the year and the rate has never gone below 1000 INR per sack. The potatoes sourced from Hassan are of low quality and costs about 800- 850 INR per sack. An average margin of 25 INR is imposed by these wholesale merchants before selling it to retailers.

The final price of potatoes depends on all the costs incurred and therefore varies accordingly. An analysis of potato prices in Kerala reveals that both wholesale and retail prices have increased over the years. The wholesale price of potato has increased from 1480 INR/ quintal in 2011 to 2096 INR/ quintal in 2015, while the retail price shows a shift from 18 INR/ kg in 2011 to 28 INR/ kg in 2016.

The highest price of potato in the last five years was recorded in 2014, with an average wholesale price of 2734 INR/ quintal and retail price of 32 INR/ kg for the same time period. The highest reported wholesale and retail prices of potato in the last five years were 3418 INR/ quintal and 39 INR/ kg respectively.

CONCLUSION

Kerala is an important market for potatoes, with consistent demand for the produce from other states. An analysis of price of potato in the state of Kerala shows an increasing trend over the years. The Mettupalayam market ensures continuous supply of potato to Kerala through its cold storage facilities and losses during transport and at the market are negligible.

Green Innovation Centre India works in Hassan, Karnataka, with farmers, cold storage owners and actors across the potato value chain to improve market linkages. Even though located barely a few hundred kilometres from Kerala, Hassan contributes only a small share to potato imports in Kerala, approximately 7%. Produce from Hassan continues to be of lower quality and thus attracts a lesser price. Additionally, potatoes from Hassan are only available during the season ranging from August to October, whereas potatoes from Gujarat are available year round. Enhancing the market share of Hassan's potato produce in the Kerala markets will require improvement in the quality of potato production and also increasing the longevity of the potato harvest season. This will help potato farmers in the region establish credible future linkages for their produce.

PRODUCTION OF BIO-PESTICIDE ENRICHED NEEM CAKE

A: PREPARATION OF STOCK MIXTURE (This should be ready at least one month before planting)

The below application is for one acre of land, approximately 4000 sq.m. The Enriched Neem Cake preparation needs to be done in a shaded area, away from direct sunlight. It is advised to prepare the mixture on a polythene sheet to avoid contact with the soil and external sources.

1. Take 1 Metric Ton (1000 kg) of dry Neem-Cake on Polythene sheet or on a cemented platform covered with shed net.
2. Add the following **contents** in the neem cake
 - 4 kg Trichoderma viride (2×10^9 bacterial count)
 - 4 kg Pseudomonas fluorescens (2×10^9 bacterial count)
 - 4 Kg Paecilomyces (2×10^9 bacterial count)
3. Combine all the ingredients properly and sprinkler water on it. Make sure to keep the moisture level at 25 to 30%. (Avoid adding too much water at this stage.)



Cover the neem cake with the remaining polythene sheet and open it again at every interval of five days. After opening, mix thoroughly and cover it again. Repeat the same procedure for 20 days. After 20 days, the mixture will become whitish on the top. It signifies that the bacteria count has multiplied in numbers. The Enriched Neem Cake is now ready for application. Farmers can store the cake for up to six months in smaller store bags in a cool and dry area.

B: APPLICATION

1. Soil application:

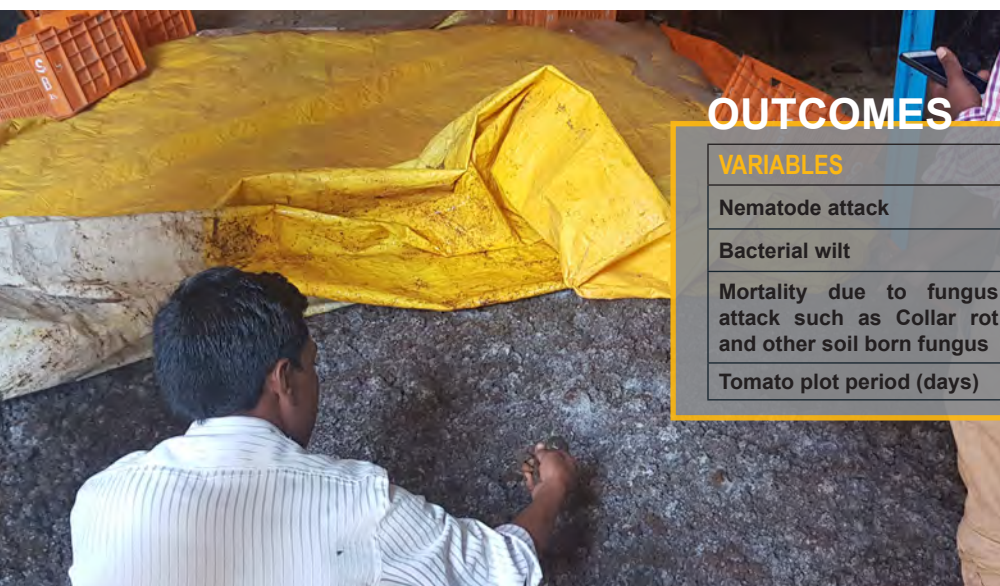
- Add 50-60 kg of Enriched Neem Cake for every tractor load of farm yard manure. Average application per acre of land is 5 tractors of farm yard manure combined with 250-300 kg of Enriched Neem Cake.
- Apply on tomato beds as basal dose before sowing seeds or transplanting saplings.

2. Application through drip irrigation system:

- Add 10 kg of Enriched Neem Cake to 100 litres of water. Blend the liquid properly and filter it. Apply the solution through drip and incubate it for 2 days. Apply this solution at a regular interval of 30 days.

3. Spraying solution:

- Add 5 g of Enriched Neem Cake to every litre of water. Spray the solution at a regular interval of 30 days.



OUTCOMES

VARIABLES	EXPERIMENTAL	CONTROL (CHEMICAL)
Nematode attack	Very less	Moderate-High
Bacterial wilt	Less	High
Mortality due to fungus attack such as Collar rot and other soil born fungus	Not appeared	High
Tomato plot period (days)	120-130	105-110

THANKS TO OUR PARTNERS!



... AND MANY MORE.

PUBLISHED BY:

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Registered offices:
Bonn and Eschborn

GREEN INNOVATION CENTRES FOR THE AGRICULTURE AND FOOD SECTOR – INDIA

No. 38/43, 1st Floor
10th A Main Road, 5th Cross
1st Block, Jayanagar
Bengaluru – 560 011
India

RESPONSIBLE:

Jonathan Ziebula
E: jonathan.ziebula@giz.de
Project Director

AUTHORS:

GIZ, AFC/ETC, APMAS, WHH

EDITOR, DESIGN AND LAYOUT:

Gloria Stratmann

PHOTO CREDITS:

GIZ, AFC/ETC, APMAS, WHH

To (un)subscribe please send an E-Mail to greeninnovationcentreindia@giz.de

GIZ is responsible for the content of this publication.
On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ)

Bangalore, India
May, 2018