



# HORTICULTURE AND MICRO IRRIGATION

**DOUBLING FARMERS' INCOMES**



India has witnessed voluminous increase in horticulture production. While India's post independence era primarily focused on food security, the priorities were later redirected to nutrition. This engendered a phenomenal growth in horticulture segment. India became the second largest producer of fruits and vegetables. Urbanization, increase in expendable income, changing customer preferences and globalization have all been instrumental in this growth. India's food basket now not only has increased presence of locally grown fruits and vegetables but also many imported ones. Horticulture with better returns on investments are a suitable candidate for the introduction of many new technologies. Micro Irrigation systems have become an important ally of horticulture.

### Indian Horticulture - A Spectacular Success

India is a prominent producer of horticultural crops in the world. Fruits and vegetables account for nearly 90% of total horticulture production in the country. The country ranks second in fruits and vegetables production. There has been a record production of horticultural crops with production

during the year 2016-17 reaching 300.6 million tonnes, 5% higher than in the previous year. Productivity for horticulture sector as a whole, has increased by about 3.45% in 2016-17 as compared to 2015-16.

In fruits, productivity has increased from 14.3 tonnes/ha in 2015-16 to 14.6 tonnes/ha in 2016-17. In vegetables, it has increased from 16.7 tonnes/ha in 2015-16 to 17.4 tonnes/ha. Production of fruits is estimated to be 93 million tonnes which is 3% higher than previous year. In vegetables also there was a palpable increase in production. A record production of 178 million tonnes of vegetables has been estimated which is about 5% higher than the previous year. With an increase of 7%, the production of Onion during the year 2016-17 is estimated at 224 lakh tonnes as against 209 lakh tonnes in 2015-16. Production of Potato in the year 2016-17 is estimated at 486 lakh

tonnes as against 434 lakh tonnes in 2015-16 which is 12% higher. With an increase of 10.5%, the production of Tomato in year 2016-17 is estimated at 207 lakh tonnes as against 187 lakh tonnes in 2015-16.

The First Advance Estimates for 2017-18 released by the Ministry of Agriculture also presents an impressive picture. The total horticulture production of the country is estimated to be at an impressive level of 305.4 million tonnes during 2017-18 which is 1.6% higher than the previous year and 8% higher than the past 5 years' average production. Productivity for horticulture sector as a whole, has marginally increased by about 1.3% in 2017-18 as compared to 2016-17. Production of fruits is estimated to be about 95 million tonnes which is 2% higher than previous year. Production of vegetables is estimated to be about 181 million tonnes which is about 1% higher than the previous year. Onion production in the in the current year is likely to be around 214 lakh tonnes as against 224 lakh tonnes in 2016-17, which is about 4.5% lower than the previous year. Potato production is estimated at 493 lakh tonnes as against 486 lakh tonnes in 2016-17 which is about 1% higher than the previous year.



**The country ranks second in fruits and vegetables production. There has been a record production of Horticulture Crops with production during the year 2016-17 reaching 300.6 million tonnes, 5% higher than in the previous year. Productivity for horticulture sector as a whole, has increased by about 3.45% in 2016-17 as compared to 2015-16**

Tomato production in the current year is likely to be around 223 lakh tonnes as against 207 lakh tonnes in 2016-17 which is about 7.7% higher than the previous year.

The record production during 2017-18 will mark the sixth straight year of horticulture production outstripping that of foodgrains (estimated at 276mt in 2016-17), suggesting a structural change in Indian agriculture where farmers are increasingly growing perishable commercial crops. Even in the drought years, when country's food grain production took a beating, horticultural production remained unaffected or stable. This is perhaps due to the fact that most horticulture crops are grown with assured irrigation and monsoon vagaries making a little impact on this sector. Eight vegetables that make up 74% of the total vegetable production in the country have 73% access to irrigation. The total vegetable production was highest in case of Uttar Pradesh (26.4 million tonnes) followed by West Bengal (25.5 million tonnes).

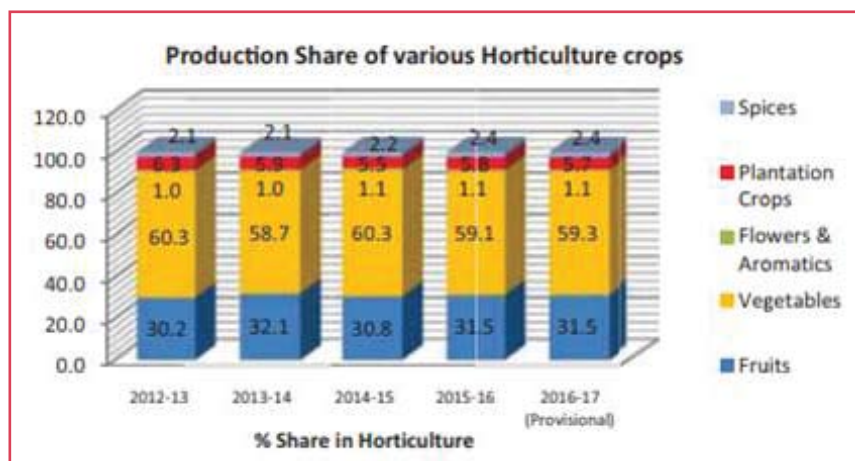
Great potentialities exist for cultivation of flowering plants. In addition to the beautification of the local landscape, flowers have great export value and are significant for beekeeping industry which too provides an alternate source of income to the Indian farmers. The highest production of flowers was recorded in Tamil Nadu (416.63 thousand tonnes) followed by Karnataka (280.92 thousand tonnes).

India has the largest domestic market for spices in the world. It is also the world's largest producer and exporter. The country accounts for over 20% of the global trade and within the Indian agri export basket the spices rank 7th in terms of value contribution. Indian spices exports have been able to record strident gains in volume and value. Spices exports have registered substantial growth during the last five years, registering a compound annual average growth rate of 7% in rupee terms and 5% dollar terms of value and India commands a formidable position in the World



Spice Trade. During 2017-18, a total of 10,28,060 tonnes of spices and spice products valued at Rs.17929.55 crores (US\$ 2781.46 Million) has been exported from the country as against 9,47,790 tonnes valued Rs. 17664.61 crores (US\$ 2633.29 Million) in 2016-17 registering an increase of 8% in volume and 1% in rupee terms and 6% in dollar terms of value. As compared to the target fixed for the period 2017-18, the total export of Spices has exceeded the target in terms of both volume and value. In terms of production volume, Chilli, Garlic, ginger and turmeric





constitute 75% of the total spice production. Andhra Pradesh ranks at the top in Chilli production followed by Telangana and Madhya Pradesh. In case of Garlic, India is the second largest producer after China. Madhya Pradesh, Rajasthan and Gujarat are the top producing states in the country. Ginger production in India is carried out in as many as thirteen states, with Assam, West Bengal and Karnataka ranked the top producers in 2016-17.

Plantation crops occupy less than 2 per cent of the total cultivated area (i.e. 3.82 per cent of total crop land) but they generate an income of around Rs. 16,000 million or about 12.72 per cent of the total export earnings of all commodities or 75 per cent of total earnings from the export of agricultural produces. India is the leading country in the total production of certain plantation crops in the world. Our production meets the share of 47 per cent in tea and 66 per cent in each of cashew and Arecanut. Plantation industry provides direct as well as indirect employment to many millions of people. For instance, tea industry offers direct employment to 10 lakhs and indirect employment to 10 lakh people, while-cashew processing factories alone provide employment to 3 lakhs people besides 2 lakhs farmers who are employed in cashew cultivation. During the current year the record production of Plantation crops (areca nut, cashewnut, cocoa

and coconut) is estimated to be around 18.3 million tonnes which is 10.2% higher than the previous year. The area and production is more in Kerala (1073000.7 ha and 4359000.9 MT) followed by Karnataka (679000.2 ha and 1401000.0 MT), Tamil Nadu (503000.0 ha and 3810.6 MT), Andhra Pradesh (289000.0 ha/and 1021000.2 MT).

Being one of the largest producers of fruits and vegetables, India also has a significant presence in the global market. Among the fruits, grapes occupy the premier position in exports with 232.9 thousand tonnes valued at Rs. 2,08,835 lakhs. Banana and Mango are have attained significant position in exports. Fresh vegetable (e.g. Peas, Potatoes etc.) exports have also been on the rise.

### India presents some very promising prospects for horticulture

The consumption pattern of the Indian population have changed over the years. More expendable incomes, urbanization and consumer awareness regarding the health benefits of consumption of fruits and vegetables have spurred the demand for fruits and vegetables. Consumption data from the National Sample Survey Organisation (NSSO) shows that





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while monthly consumption of cereals per person in rural areas declined from 13.4 kg in 1993-94 to 11.2 kg in 2011-12, consumption of vegetables went up from 2.7 kg to 4.3 kg during this period. A similar rise in consumption of high value products has been noticed in the urban centers as well.

Globalisation has played an important role in the transformation of food consumption patterns of Indian households by introducing them to newer tastes and choices. According to the Indian Council of Agricultural Research, the market for exotic products is growing at 15% to 20% per year. Agri farms across the country are leveraging

this growing demand for exotic vegetables and spices in the food services sector. Different types of vegetables like basil, lettuces, fennel, broccoli, leek, sweet corn, cherry tomatoes, baby corn, coloured pepper, zucchini are grown in Goa-based Palavi Agro Farm. Some farms such as 'Offering Farms' in the outskirts of Pune go as far as growing vegetables like baby rucola, wild arugula, butternut squash, malabar spinach and even chia, kale and baby kale to suit the finer palates of high



end restaurants. The Rajasthan government initiated the olive cultivation project with technical support from Israel in 2008. Seeing the ample possibilities, the state government formed the Rajasthan Olive Cultivation Ltd (ROCL) in the public-private-partnership (PPP) mode. Olive cultivation is at present spread over 800 hectares, of which 182 hectares is government land.

In terms of cultivation too, these agricultural commodities fare much better than the food grains. Vegetables are short duration crops that are mostly grown on small patches of land by marginal farmers, often in less than an acre of land. According to the latest Agriculture Census, as much as 67 percent of India's farmland are held by the marginal farmers with holdings below one hectare. As land holdings become increasingly fragmented, production of vegetables ensure quick returns to farmers, compared to the conventional food grains that take up to six months to harvest. The fact that farmers continue to grow perishables despite recurrent price fluctuations shows that returns are better for these compared to traditional foodgrains. This signifies a fundamental shift in Indian agriculture. Farmers are seemingly taking more risks by growing perishables where annual losses are as high as Rs. 32,000 crore.

India's varied agro climates supports a wide variety of fruits, vegetables, plantation crops and spices. With geographies as diverse as desert and tropical rainforest, hill and plains, India can continue to explore growing newer crops adding more diversity to the produce.

### Bottlenecks galore

Better incomes, urbanisation and higher consumption of fruits and vegetable seem to be driving demand for horticultural products and their cultivation. The returns from these crops are promising but at the same time are unstable.

### Mr. SS Mehta, President, Amla Grower Association

"There is a lot of scope to grow Amla in India provided attention is given to production of quality as it is said 'In North, Amla is grown while in the South it is cultivated'. Today in Tamil Nadu alone, over 75,000 acres of Amla is grown giving an annual income of over Rs.500 crore at farm gate. Tamil Nadu has the blessings of nature – Amla is available round the year. The farmer gets a price ranging from Rs.14/- to Rs.24/- per kg. We can still expand Amla Production as there is a market which is growing due to the awareness of health that is being spread. Similarly, there is a large scope for export of fresh fruits as well as processed products. The full potential of Amla is yet to be realized. If the procedures which are now overlapping are made single window, there is a lot that can be achieved. There are a lot of products in the market like Murabha, Candy sweet, Canda masala, recipes, shred in honey, chutney, pickle, juice, squash, jam, etc. Further there is a very large use in medicinal preparation as an input, powder capsules, tablets, etc. Organic agriculture in Amla is fully possible and should be supported, but the powers to be there should be a regulatory system to check the quality of the spate of organic inputs that are coming up. Despite the tremendous scope, very little field oriented research has been done in Amla. There needs to be a lot of work put in for much crops like Amla, Bael, Jamun, Mulberry, Phalsa, etc."



Prices crashing during peak harvest season and peaking during lean months are a regular phenomenon. The recent farmer protests that shook India highlighted this issue. This indicates the absence of food processing units that are located close to the farm gate. If there was one, the excesses could be utilized to develop them into products with longer shelf life and preventing the price crashes. A better cold chain network with pack houses and access to refrigerated transport can

also help to prolong the shelf life of fresh produce and earn better value for farmers.

Although there is a scope for different crops, the state departments are reluctant to pursue something new or radical. The departments promote the existing crops and new crops are rarely introduced. Farmers are not exposed to the market trends and are not able to gauge the opportunities existing in the market. Niche crops catering to gourmet cuisines fetch premium



prices. The states can explore the possibilities of the cultivation of the same and requisite know-how can be introduced by liaising with other countries. Indian farmers need market intelligence—a clearer idea on future demand and supply to make better crop choices.

Better access to markets, technology and intelligence can help translate the higher perishable production to higher earnings for farmers. Fragmented markets pose a major handicap for the farmers. Lack of cold chain facilities is equally detrimental. The markets across the country needs to be connected and a full fledged refrigerated facilities connecting the market can help stabilize the price across the country. This will not only help check inflation but also stabilize the income earned.

India falls short in terms of adoption of new technologies. New technologies are crucial in horticulture. The likes of green house technology, tissue culture, high density planting, protected

cultivation, hydroponics, automated irrigation etc., have already made their presence felt in Indian agriculture. However, these kind of technologies are restricted to few farms and not popular on a large scale. The country, if intends to maintain the current rate of progress in horticulture, should think of expanding the technological footprint. One such technology that has found to influence yield in horticultural crops is the micro irrigation systems.

### **Micro Irrigation Systems - Micro Managing Irrigation**

Micro – irrigation techniques, including drip and sprinkler irrigation, have emerged as an important water conservation technology. Besides, enhanced water efficiency, they have also been associated with better yields and hence better farm incomes. According to some estimates, the system can save electricity of 278 kWhr/ha for wide spaced orchard crops and 100 kWhr/ha for closely grown crops. The

continuous and uniform application of water across the field will also improve the quality of produce. Combining micro irrigation with water soluble fertilizers, fertigation is a recommended practice in horticultural crops. The fertilizer use efficiency can be increased up to 95% using this system when compared to conventional methods of water application. Moreover, micro irrigation is well suited to all soil types and undulating terrains as the water flow rate can be controlled.

At present, United States (1.64 million ha), China (1.67 million ha) and Spain (1.63 million ha) are some of the leading countries which have adopted drip irrigation. Considering the world's total irrigated area as 212 million ha, only 4.75% of it is currently irrigated under drip irrigation which shows the immense potential that still exists for this kind of irrigation. India, with a total arable area of 140 million ha with almost 42% of arable land irrigated, too has a huge potential for micro –

**T**he total coverage under Micro-irrigation in India is estimated to be 9 million hectares, which is about 13 % of the ultimate Micro-irrigation potential at 69 million hectare as reported by Micro-irrigation Technology Mission Report in 2005. Drip irrigation constitutes approximately 54 % of the total coverage under micro irrigation. The advantages of drip irrigation, which is by far, the most efficient sustainable irrigation technology available with us, are immense. They offer optimum utilization of agri-inputs in terms of water saving ( 40-50% ), lesser requirement of power, labour, fertilisers and plant protection chemicals. We know for sure that in our country, how scarce, these resources are. Yield maximization – both quantitative and qualitative have been observed with micro irrigation. It leads to substantial additional income. It enables uses of even marginal and otherwise un-cultivable area! It also eases farm operations and spare time to focus on other productive assignment.



**AVINASH THAKUR**  
CEO, Ajay Industrial  
Polymers Pvt. Ltd.

Government has so far offered immense support in spreading micro-irrigation technology. Capital subsidy support system has addressed capital intensity of this technology to a large extent. It has helped reducing the price of the system for farmers to the tune of merely 30-40 %. It is because of this support, farmers could come forward to adopt the technology, and taste the success. Other support has been in the form of extension activities, Incentives for importing irrigation components, various infrastructural support in putting up MI manufacturing plants, etc.

Smaller holdings have limitations in adopting technological advancement which is otherwise suitable for large holdings. Micro-irrigation System is blessing in disguise for such holdings. Huge water saving, coupled with high quality and enhanced production results in a quick return on investment. It helps in taking multiple crops from the same acreages of land and available water for irrigation. Superior quality fruits and vegetables fetch higher price in the market. Lesser engagement for weeding and other plant protection measures enable them spending time on other associated activities like – cow and goat rearing, pottery, etc. It helps getting additional income. Now a days there are specially designed micro-irrigation kits for small and marginal holdings which are available in the market, which is based on easy to install and simple to operate principle. There has been additional capital subsidy support for small and marginal farmers as well.

Still 87% of the MI potential is left to be covered. Since it has proven advantages and farming fraternity have seen it themselves, spread of this technology is going to go up in future, I believe. More than wish, there is the compulsion, as mentioned above and I am sure that the present as well as upcoming Government would continue providing various support systems to this industry. In coming years, the demand for quality products and service support will require quantum of skilled workers in this industry. Farm automation will consolidate further. The big ticket item, I foresee is adoption and spread of this technology in commodity crops. All in all a challenging but encouraging future ahead for all of us! "

irrigation which is still underutilized. Task Force on Micro – Irrigation (2004) estimated a potential of 27 million ha for drip irrigation based on the area under crops most suitable for that form of irrigation, the Indian Committee on Irrigation and Drainage (INCID) estimates a potential of 10.5 million ha.

In India, Maharashtra (0.48 million ha), Andhra Pradesh (0.36 million ha) and Karnataka (0.17 million ha) account for more than 70% of the total area under drip irrigation. However, the total area covered under drip irrigation (1.42 million ha) is still quite low as compared to the potential area of 11.6 million hectare. While Andhra Pradesh (50% of Potential) and Maharashtra (43% of Potential) have been able to bring substantial area under drip irrigation, other states lag far behind.

Despite these apparent benefits, farmers across the country have been reluctant to adopt this. "High initial costs make the technology unfeasible for small and marginal farmers. Low awareness levels about the technology; No understanding of the true 'value of water'; Delayed credit supply; Lack of training and capacity building; Poor extension work; Lack of skilled manpower for survey, designing and installation of the systems; Varied climatic conditions in the country and vast country size which takes time for penetration and Lengthy and cumbersome subsidy procedure are some of the challenges faced by this industry," says Mr. Anil Jain, Vice Chairman & MD, Jain Irrigation Systems Ltd.

Horticulture represents a significant opportunity for small and marginal farmers to enhance their income prospects. However, the perishability of the products interferes with the stability of the income earned. A suitable intervention from the technology side can elevate the income prospects and its permanency.



# 'Indian Retail Chain is inefficient for Selling Perishables'

**PICK N SERVE FOODS PVT LTD, the fastest growing Fresh Produce company in India with dedicated professional operations team for the management of the Contract Farms, supply chain management from Farm to Port till it reaches customer has two decades of experience in working with Fresh Produces like Banana, Pomegranates, Grapes, Mango, Papaya & strawberry. With the experience spanning two decades, PICK N SERVE FOODS PVT LTD. has dedicated farmers catering to their demands and a robust market to cater to. In a discussion with Agriculture Today, Subrata Mondal, MD & CEO, PICK N SERVE FOODS PVT LTD shares his perspective on the organized retail sector of perishables.**



## What are the apparent growth drivers behind organized retailing in fresh food category in India?

Health consciousness of the consumers, City based consumers, Growing Upper Middle Class are some of the drivers for retail growth in Fresh produces.

## What is the share of organized retailing in fresh food category in India?

There is no researched data yet on Pan India basis, but seems to be less than 1%.

## How has branding and packaging improved the marketability of perishables?

In India, perishables branding is a very nascent and recent phenomenon. Branding per se does not mean only labeling but to have loyal and repeat customers as the brand takes care of customers' requirements on regular basis and fulfill the promise.

## Has the advent of retail chains specializing in fruits and vegetables affected the farmers' income?

Majority of Indian retail chain is actually inefficient than alternate channels for selling perishables. This is primarily not understood by the retailers in India. Perishables are footfall drivers and not a segment for margin business for multi-product retailers. They earned money in other segments against footfall they will receive due to perishables. Hardly any retailers have understood the concept. For specialized perishables retail chains, the margin from perishables will come only when the demand is huge and fruit sales is at least 60-70% of the total perishables value. Until and unless the retail sales of perishables are 20-30% of the total market share in that particular region, farmers' income cannot be impacted positively.

## How do you procure fresh

## products? Is there any contract between the company and farmers?

We procure directly from the farmers and pay them higher than alternate market and that's why we can demand better quality. It is basically cash and carry on harvest and same day payment to farmers.

## Apart from procuring, are there any kind of services from your side to the farmers?

We help farmers for right selection of the seeds and fertilizers and pesticides and right package and practices for higher yields. These are free services as we have region specific and crop specific sourcing plan and need to work with the farmers for their best return to create a positive impact.

## How important is grading and standardization in horticulture?

This is important when you have the brands and dealing with retailers

either in India or abroad. Retailers across has their own standardization for acceptance of any produce. Each produce has its own standard for grading and specification depending upon the markets they operate.

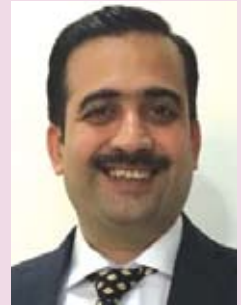
### What is the scope of organic fruits and vegetables in Indian retail space?

This is tricky. Demand is huge for organic fruits and vegetables as every citizen demands that. Nobody wants to feed their children with pesticides loaded fruits and vegetables. In India, there is a great need of disruptions into this segment and certified fruits and vegetables should sell on par with the conventional fruits and vegetables. This is not far away...actually the organic fruits and vegetables is cheaper than growing using synthetic fertilizers and pesticides but due to higher production and lesser cost. But, since the volume of certified produces is astronomical, the demand is actually never captured and those who can afford are only able to purchase, besides non-availability is another huge concern. Besides, if you measure the nutritional parameters of the fresh produces now and fifty years back, you can find, the quality of nutrition has drastically come down at 30% level only due to very high use of synthetic fertilizers and almost negligible or no use of FYM, organic manures. Soil has lost its quality and hence the fresh produces. Next revolution will come with higher nutrients, higher rate for this segments... this is too early for that kind of intervention but slowly picking up at conceptual level.

## 'Share of organized retailers in F&V category is increasing'

**Mr. Gopal Bihani, Head Farm Fresh, Big Bazaar - Future Group**

Fresh fruits & vegetable markets in India are mainly dominated by traders and unorganized retailers. This scenario is changing and the share of organized retailers is now visible with 8% - 9% share of the total market. The traditional habit of visiting daily vegetable markets has been on the decreasing trend and has started shifting to convenience store visits. The weekly / bi weekly visits to super and hyper markets for buying fresh produce & top up groceries have significantly increased.



The focus of direct sourcing has become sharper than before. We are closely working with more and more farmers and farmer groups. We have been educating them for sorting, grading and retail specifications and have also helped in fading out the middle men out which has increased their income. We are bringing farmers and customers closer to each other which is actually a win-win situation for both. Future Group has entered into a joint venture and has tie up with Andhra government to source Banana and Pomegranate directly from + 12,000 farmers in the State. We have also partnered in Food Tech India project (An Indo-Dutch National Importance project) in the state of Karnataka. This project is working towards reducing the food waste in India and transforming Dutch knowledge for better productivity of farm produce and contribute in doubling the farmers' income. We are aiming towards opening up more than 100 collection & distribution centers and connecting to 10,000 small stores coming up in next 5 years.

Grading and standardization in horticulture have become very important in this space. Retailers, Food Processors, Institutions, Hotels & GT all have their required specifications for fruits and vegetables. Grading and standardization also helps farmers in getting right price for the right product. With changing lifestyles and increasing consumer expectations, the grading and standardization in produce has become more important. Customers today demand a consistent quality, size and product standards throughout the year, and therefore keeping in line with this need it becomes important for retailers to give in depth attention to the grading process and ensure that they define product standards for their sourcing as it impacts their produce uplift by customers at the end of the day.

This segment also has its share of challenges. Fruits and vegetables are very highly perishable category and in our country more than 35% of the produce is going into waste. To make sustainable end to end farm fresh supply chain we need to reduce this food waste by increasing the farmer's productivity and having complete end to end cold supply chain along with adequate infrastructure facility. Transforming knowledge for best farming practices, fruit safety practices, use of right inputs etc. will help farmers in increasing their productivity. Providing infrastructure with cluster based approach i.e. pack house, cold storage and cold transport chain along with use of scientific packaging will further increase the shelf life of products and reduce food waste significantly. Government bodies, various NGOs, international organization has already started working on this along with support of retail marketing linkages. Saving in food waste will absorb the cost of end to end cold supply chain and make Farmers and Customers both happy.

# 'Indian Warehousing Market has a High Growth Potential'

Arya Collateral Warehousing Services Pvt Ltd provides cost-effective warehousing solutions at strategic locations anywhere in the country. They advise clients on storage and preservation norms for commodities and follow it through with impeccable execution for best quality storage strengthened by specialised quality testing and pest control mechanisms. These operations are supported by a web-based software application (with access to Clients), thorough Audit processes and adequate Insurance coverage. In an interview with Agriculture Today, Mr. Anand Chandra, Executive Director, Arya Collateral Warehousing discusses the extent of warehousing in India and the challenges in the sector.



## What is the outlook of warehousing in India?

Indian warehousing sector is valued at approximately Rs.60 billion with a capacity of around 110 million tonnes. The organized warehousing sector is roughly 70 % of total market and mainly occupied by industries like Agro,Retail, Pharma, FMCG, Auto etc. With the implementation of GST we may see free movements of goods across borders. This may further increase the requirement of warehouses at consumption centres (slightly away from the current tax benefit zones).

## What is the role of warehousing in horticultural products?

For horticultural products, we need temperature control atmosphere to increase the shelf life. We need more of cold storages with ambient temperature and conditions, which actually vary from crop to crop, e.g fresh veggies, fruits & flowers need to be stored at 0-2 degree Celsius, but it also requires precooling before

storing them in cold storage for increasing the shelf life. Humidity, Light, Carbon Dioxide level, Air circulation, Stacking and Loading rate are some of the other crucial factors to be considered for storage. Over supply during harvesting period is a major concern for horticultural crops. We often see news of Onion, Potatoes, Tomatoes being thrown away by farmers because of the low prices during this period. Small scale farmers incur heavy losses because of this. Cold storage is one of the major solutions for this problem, whereby farmers can store their produce for longer periods and sell as per market demand at favorable prices during off season. But again, there is acute shortage of cold storage infrastructure in India for storing fruits and vegetables. Currently, around 90% of the cold storages are used for storing potatoes only.

## What is the status of warehouse infrastructure available in

## India?

Warehousing service in India was started about 60 years earlier, with the set up of the Central Warehousing Corporation (CWC) in 1957 & Food Corporation of India (FCI) in 1964 by the Government. CWC is operating around 432 Warehouses across the country with a storage capacity of around 9.96 million tonnes providing warehousing services for a wide range of products ranging from agricultural produce to sophisticated industrial products. FCI is having around 128 warehouses across India with storage capacity of around 35.7 million tonnes for food grains. The State warehousing corporation spreads throughout the country with the network of around 1700 units having aggregated operating capacity of around 20.9 million tonnes. These are major Public institutions in warehousing sector. The Private Warehouses segment is highly fragmented which comprises own managed facilities of manufacturers as well as by their channel partners, apart from various

unorganized service providers. Many manufacturers have their own chains of storage facilities owned & controlled by their stockiest & distribution agencies. Private Warehousing Sector is estimated to have a capacity of 45 million tonnes, where 20-25 % is organized & rest is unorganized.

### What is the scope of private players in warehousing?

Indian warehousing market has a high growth potential driven by the Government's support initiatives, GST regime, 100 % FDI, Make in India program & increasing preference of logistics end-user companies to outsource activity to professional LSPs. Organized LSPs and those focusing on developing and managing Agro-produce warehouses are expected to benefit significantly. Private companies having capabilities to guide and support end users are likely to have significant growth opportunities. However, return on capital and / or payback period remains a challenge in Agro-warehousing post withdrawal of capital subsidy scheme by government.

### What are the challenges associated with warehousing in India?

Absence of the appropriate scale and quality of warehousing infrastructure, Lack of alignment of capacity, Low capital and operating efficiencies, Ability for handling multi-model interfaces, limited value addition for specific industry, insufficient automation, know-how & training of manpower & value based costing are the major challenges.

### What are the policy changes that you would expect from the government in the warehousing segment?

Both Central & state governments must play proactive role in developing large and smart infrastructures for warehousing and cold storages at strategic locations. They should also introduce Single window system to address investors / private player's challenges. On the Agro- warehousing / Cold storage front support from government in terms of land acquisition and capital subsidy will help in boosting investment in this sector.

### MR. TARUN ARORA, Director, IG International Pvt. Ltd

"India, with its diverse climate, is among the largest growers of fruits and vegetables in the world. It currently imports 3.50 lakh metric tonnes of fruits per annum, worth about INR 3,000 crore, which is expected to increase to INR 4,000 crore in two-three years.

Indians are also increasingly developing a taste for exotic fruits. The Indian fruit market has introduced a diverse variety of fruits to satisfy changing tastes of consumers. The growing purchasing power of people, prospering urban class and high exposure to the cultures of different countries are some of the reasons why people are opting for exotic fruits. As exotic fruits are high in vitamins, minerals, and fiber, a lot of health-conscious and young Indians are driving the demand for high-value, exotic fruits. Furthermore, the associations of specific fruits with a certain kind of lifestyle, or diet-charts being popularized by famous celebrities have resulted in high demand of exotic fruits, especially in the affluent belts of metropolitan cities. Indeed, the business of imported exotic fruits is expected to grow by 25 per cent over the next couple of years. Fruits like kiwi, avocados, premium apples, dragon fruit, cherries, blueberries and persimmons are some of the new fruits that have found favour in the Indian market.

In general, logistics is a problem in India – though not for us. Our fleet of over 70 refrigerated trucks is a big advantage in a country where transportation can be notoriously tough to execute. Additionally, our network of cold storage facilities allows us to provide a consistent supply of fresh fruit throughout India. As we know, India is the world's largest producer of many fruits and vegetables, but a huge gap exists between demand and supply due to enormous wastage experienced during post-harvest storage and handling caused by improper bagging without crating, lack of temperature controlled vehicles and the unavailability of cold chain facilities in various parts of country for preserving the produce. So to bridge this gap, there are certain areas which need improvement in terms of logistics and infrastructure such as Improving efficiencies and productivity in logistics operation; Attaining the ability to target logistics initiatives that drive business growth; Improving asset utilization; Improving end-to-end visibility and Demand-based packaging".



# ‘An Integrated Supply Chain will help contain the Price Fluctuation’

Adani Group, one of India's leading business houses, with revenue of over \$11 billion, has grown to become a global integrated infrastructure player with businesses in key industry verticals - resources, logistics, energy and agro. Adani Wilmar owns the 'Fortune' edible oil brand, India's edible oil market leader with a 19% share (consumer pack). It also owns and operates one of the country's largest edible oil production capacities. Adani Agri Logistics is a pioneer in bulk handling, storage and transportation (distribution) of food grains, and in providing an end-to-end bulk supply chain solution to Food Corporation of India and various state governments. Adani Agri Fresh established its presence in the horticulture sector through world-class packaging operations and storage facilities. These services ensure selection of only the highest grade of horticulture products for storage and consumption. It pioneered the controlled atmosphere storage technology for apples, transforming the apple growing and storage ecosystem of Himachal Pradesh, while creating a popular 'Farm-Pik' brand. In a conversation with Agriculture Today, Mr. Atul Chaturvedi, CEO, Adani Wilmar Limited discusses the horticulture prospects of India and the challenges facing the sector.



### **India's horticulture production has registered impressive growth year after year. What do you think are the growth drivers?**

Rising income of the middle class families and urbanization is driving the growth in demand for horticulture produce. Indian farmers have risen to the occasion to meet the increasing demand by growing more and more horticulture produce. Access to irrigation and participation of more small and marginal farmers in horticulture, higher income from horticulture are the major factors for the higher production.

### **How receptive has India been as a market for exotic fruits?**

The growing number of Indians travelling abroad expose them to different fruits and vegetables available elsewhere in the world. The growing middle class is also inclined to try out exotic fruits and vegetables. The growth in the sale of Kiwi fruit in India in the recent years is testimony to this changing preference. But had it not been for the cold chain infrastructure bottlenecks and the limited size of the organized retail in India, the growth in the consumption of exotic fruits and vegetables would have been much higher.

**The growing middle class is also inclined to try out exotic fruits and vegetables. The growth in the sale of Kiwi fruit in India in the recent years is testimony to this changing preference. But had it not been for the cold chain infrastructure bottlenecks and the limited size of the organized retail in India**

### **How can an integrated supply chain improve the economic prospects of a farmer?**

An integrated supply chain comprising pack houses, refrigerated trucks, cold warehouses and markets not only help balance the supply and demand of the horticulture produce but also maintains the quality of the produce for an extended period. This helps avoid glut in the harvest and also shortage in the off-season. An integrated supply chain not only helps the farmers but also the consumers and the economy as well by eliminating wastage. Adani Agrifresh's apple supply chain in Himachal Pradesh is testimony to the benefits to farmers, consumers and the economy.

### **Where does India stand in terms of**

### **improved infrastructure for storing perishables?**

As per the study conducted by National Centre for Cold Chain Development (NCCD) in 2015, the gap in cold store infrastructure is only 33 lakh MT which is just 9% of the total requirement. However, the gap in refrigerated trucks, pack houses and ripening chambers is more than 80%. Therefore we need to make more investment in the cold logistics segment.

### **In your opinion, can eNAM prove be successful in addressing the current problems in marketing of agricultural products?**

For eNAM to be effective, we need to have certain pre-requisites in place. Reforms in APMC Act to make a provision for electronic auction as a mode of price discovery, single license across the State to enable a national buyer to pay market fees at a single point, scientific sorting/grading facilities or quality testing machines, internet connectivity, storage facilities at the mandies etc., are some of the pre-requisites. Not all the mandies which are currently connected to the eNAM network have these pre-requisites in place. Only when we have these things in place, eNAM will be able to have any impact.

### **How can perishables fit onto the new concept of e-marketing?**

As stated above, eNAM has hardly had any impact in the marketing of agricultural products currently. When it comes to perishables, the challenges are even more. Therefore, eNAM has to become successful in handling the marketing of staples first.

### **How can the interests of the farmers producing perishable products be safeguarded from price fluctuations?**

An integrated supply chain will help contain the price fluctuation to a certain extent. For investments to happen in the supply chain, certain policy measures are needed such as removable of Essential Commodities Act, Stable export policy and incentives to the industry.

# 'Water is Neither Infinite nor Free'

Harvel Agua India Private Limited, involved in the manufacturing of BIS certified Agricultural Irrigation Equipments, was incepted in 1984. A promising Manufacturer, Exporter, Supplier and Service Provider, offering Drip Irrigation Equipment, Fertigation Equipment, Sprayers, Irrigation Sprinklers, Sprinkler Irrigation System, AZUD Filters and many more, Harvel is counted among the largest Manufacturers, Exporters, Suppliers and Service Providers assuring guaranteed quality & competitive price. In an interview with Agriculture Today, Primal Oswal, Managing Director, Harvel Agua India Private Limited discusses the scope and challenges associated with micro irrigation technology in India.



## What is the scope of Micro Irrigation in India?

Two of the most pressing challenges before India today are water scarcity and a growing population. The gap between food production and population increase, though alarming, has not yet reached a crisis situation but shall soon, unless immediate measures are taken to increase food production to keep pace with growing population. The present agricultural practises and methods in the country are highly water intensive and we are already drawing nearly 85% of country's scarce water resources for agriculture. There is really no way we can afford to draw any more water for agriculture. The only solution is to leverage technology to achieve the twin objectives of utilizing our available water resources to the optimum and increase food production. Micro Irrigation must be integrated into agriculture on a war footing and to that extent Micro Irrigation's scope is enormous.

## What is the current growth rate of the Industry in India?

Despite two successive drought

years in the recent past, the industry has come out of its consolidation phase and is growing at a healthy rate. The central outlay for MI has also increased from INR 1,000 Cr in 2015-16 to INR 3,100 Cr in 2018-19 which is one of the indicators of the Industry's growth.

## What according to you are the challenges associated with implementing Micro Irrigation across India?

Micro Irrigation has not been treated as a standalone programme and this aspect alone is one of the biggest challenges which have impeded its implementation across the country. Although, presently MI is part of Hon'ble Prime Minister's flagship programme 'Pradhan Mantri Krishi Sinchai Yojna' (PMKSY), its implementation is yet in the hands of States where policies are not uniform. Therefore, uniformity in process management and online tracking schemes are the need of the hour. Also States other than Maharashtra, Andhra Pradesh, Telangana, Karnataka, Gujarat, Rajasthan and Haryana, which alone account for more than 80%

of Micro Irrigation coverage, need to catch up with attractive policies to bring these States on the MI map. In addition, policies like 'on demand' Micro Irrigation as well as bringing Micro Irrigation equipment manufacturers under 'priority sector lending' shall greatly enhance the spread of MI on a pan India basis.

## What lessons can India learn from other nations with respect to establishing Micro Irrigation effectively?

Almost all the countries which are ahead of India in adopting Micro Irrigation technology identified Water Rights Laws as one of the key areas, the effective management of which could help them in the spread of Micro Irrigation. For example all water in Israel is common property resource and the government does accounting for every drop of water, ensuring good water governance. With such a tight water management policy, the farming community in Israel has no alternative but to leverage Micro Irrigation and that is why with a per capita water availability of less than 200 cum Israel is able to export high-value

agri-produce to Europe and other countries of the world. India needs to learn tighter water management policies from the world for scaling up of technologies. The government needs to emphasise that Water is neither infinite nor free. It needs to be priced such as to reflect its scarcity. Once that is done, the spread of MI technology will speed up.

### **How has the subsidy programme helped in popularizing the MI Systems in India?**

Drip Irrigation was introduced in India in early seventies in Agricultural Universities and other Research Institutions. However, the adoption of Micro Irrigation was very slow till early eighties mainly because of lack of awareness at the level of farmers. However, the formation of the National Committee on the Use of Plastics in Agriculture (NCPAH) by the Ministry of Petroleum, Chemicals and Fertilisers, Government of India, during 1981 addressed this aspect somewhat. Thereafter, successive government Schemes up to PMKSY with Central and State funding have kept Micro Irrigation afloat and in contention and to the extent it could be said that subsidies on Micro Irrigation have familiarized the farming community with the technology, if not exactly popularized.

### **In a country like India majority are small and marginal farmers, how effective and economical is Micro Irrigation?**

It is a fact that high initial costs make Micro Irrigation technology unfeasible for small and marginal farmers which constitute nearly 70% of India's farming community. Depending upon the nature of crops and the quality of material used, the installation of Drip Irrigation System requires an initial investment of Rs.1 to 1.25 Lacs per hectare. Even with financial assistance from government, such a relatively huge investment requires advance crop planning on the part of farmers and an assured income for the produce which is possible only for high value crops. Here the efficacy of the technology is not the question but the economics of it is

the concern. The solution lies in gravity based Drip Kits which can cater to farm areas as small as 500 – 1000 SqMtrs and are relatively affordable. The government needs a revisit on their policies for promotion of such kits and bring a majority of small and marginal famers within the ambit of MI technology.

### **What is the scope of Automated Irrigation System in India?**

Precision Farming and Extensive Agriculture are relatively new concepts for Agriculture in India where majority of farming is still done using traditional methods. Automation is required less for savings in labour costs but more with uniform irrigation and precision farming and therefore apart from some Agricultural Universities, Research institutions and a few progressive large agricultural farm holdings/ corporate farming, as of now Automated Irrigation is being used in urban landscapes for irrigating Golf Courses, Sports Fields, private farms and infrastructure projects. However, with the setting up of 'Centres of Excellence' under the aegis of Government of India, Precision Farming and Extensive Agriculture have received a boost and consequently automation of irrigation systems has received a fillip. As the rate of integration of

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technology into agricultural practises increases, Automation in Irrigation shall have a greater role to play in increasing productivity and cost reduction.

### **What is the future of Irrigation Systems?**

As is very well known, only a small portion of the cultivable land in the country is under some kind of irrigation and vast unending tracts, in fact majority of agriculture, still depend on the rain gods for their irrigation needs. Therefore, with ever depleting water resources, leverage of technology is the only way forward and thus future of Irrigation Systems will play an important role in water saving and increasing productivity.



# HORTICULTURE - BRIGHT SPOT OF KARNATAKA

## Status of Horticulture in Karnataka

Karnataka is one of the most progressive states with greater potential for horticulture. In the recent decades, owing to holistic support for horticulture development, the area under cultivation has increased to 20.36 lakh ha with production of 191.24 lakh MT and productivity of 9.39 MT/ha. With conversion of 19% of the area from traditional crops to horticulture. The state stands fourth and seventh in area and production respectively, in the Country.

With contribution to 5.74 % of the state's GSDP, horticulture produce is valued at Rs.43923.00 Crores. Presence of a well-established State Department of Horticulture and University of Horticultural Sciences have strongly contributed and empowered the growth of the sector. Besides, horticulture provides employment security to around 12 lakh farm families and 10 lakh subsidiary farm families.

On research side, developments from indigenous and open pollinated seed, usage of hybrids, seedlings dominance to grafts and tissue culture plants have led to a paradigm shift in crop improvement. Various public and private sector institutional mechanisms in research and development have complemented the multidimensional economic growth in the state. Professional education platform to generate technical human resources with skills and entrepreneurship capabilities in collegiate and universities system is worthy for productive growth.

Technological advances in protected cultivation, irrigation, nutrition, pest and disease management, high density crop and canopy management, inter and multi-storied cropping and mechanization applications, improved post-harvest and market



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Former Vice Chancellor  
University of Horticultural Sciences,  
Bagalkot, Karnataka

networks have all enhanced the value appreciation of various horticultural produce.

From policy perspective, state's policy frame work and investments from public and private sectors are congenial for horticulture growth in the state to become a forerunner for horticulture in the Country.

## Karnataka's advantages in Horticulture

With 10 different agro-climatic zones, the state is bestowed with opportunities to grow variety of tropical, subtropical, arid, semi-arid and horticultural crops. Horticulture sector plays a significant role in providing a product shift from conventional crops towards a more liberal and diversified agriculture sector. Horticulture brings a unique visibility in enhancing profitability, employment generation and balanced growth in processing and value added activities. Following successful launching and implementation of various developmental programmes, there has been a tremendous progress in-terms of area expansion and produce volume. The policy push on farmers' collectivization

has enabled to establish about 90 Farmer Producer Companies with 91000 farmer members which is a new path breaking inclusive growth mechanism.

Shift in dietary patterns towards high value nutritious diet has led to increase in demand for horticulture commodities, there by triggering supply. As a response to this, Institutional initiatives of horticulture produce marketing through establishment of HOPCOMS, Karnataka State Cooperative Marketing Federation (KHF) during 1998 was established and of market infrastructure for procurement, sorting, cold storage and other corporate institutions for bulk processing were created.

HOPCOMS has presence in 22 districts with over 400 retail outlets actively engaged in supply and transactions. Commodity based institutions such as Mango Board, Lime Board, Wine Board, Spices Boards, IFAB for flowers and fruit and vegetable commodity based marketing have augmented for end to end convergence. State has also promoted 290 private accredited nurseries with State Nurserymen Cooperative Society at the apex level which are catering to the needs and requirements of planting materials. At the Government level, presence of an exclusive Department of Horticulture established since 1963 with 3356 qualified technical personnel positioned at hobli/cluster level provides technical guidance and enables implementation of several developmental programs. Horticultural plantation farms numbering 405 and accredited nurseries producing horticultural produce seeds and planting material complement as a revenue model. The Department has established five high-tech tissue culture laboratories, three bio control laboratories, 12 skill



supportive training centers, mission programs on oil palm, medicinal plants, and apiculture. The state's budget for horticulture in the current year 2017-18 was Rs.1100 crores.

The capital city of the State hosts many research and development institutes such as IIHR, CIMAP, CFTRI, IAHS. Also, seven theme specific Centers of Excellence and 4 Indo-Israel and one Indo-Holland International collaborative programs contribute to R&D initiatives. Government interventions and policy initiatives such as agriculture policy of 2006; Karnataka State Food Processing policy, wine policy, organic policy have contributed to horticulture promotion. The varied agro-climatic zones (10's) provide a congenial environment for cultivation.

### Important Horticultural Crops of Karnataka

The cropping pattern in Karnataka is dominated by plantation crops such as Coconut, Arecanut, fruit and vegetable crops which are highly water intensive. Karnataka is one of the most progressive states and has greater potential for horticulture development and is a driving force for state's economy. The sector is emerging as a sunrise sector and is one of the fastest growing and most profitable ventures. The annual growth in area and production of horticulture crops in the state is around 5% to 9% respectively with productivity enhancement of 26% during the last decade.

The productive capabilities of farmers have resulted in the realization of enhanced productivity over average yields at the National level in case of lime, papaya, guava, pineapple, vegetables, sweet potato, watermelon, tamarind and turmeric. The area under horticulture in the state between the period 1960 and 2015 increased from 4.5 lakh ha to 19.77 lakh ha while on the production front, it increased from 25 lakh MT to 197 lakh MT. The importance of horticulture as a sector lies in educational, economical, environment and nutritional aspects which are transforming societal status towards quality lives.

### Challenges associated with horticulture farmers in Karnataka

The state ranks fifth in India in terms of total area under horticulture. Horticulture sector has been considered as a sunrise sector in Karnataka. During 2015-16, the State had 20.35 lakh hectares under horticulture crops with a total production of 191.21 lakh MT. Karnataka stands 3rd in farming area and 7th in production in the country. The average productivity of horticulture crops in Karnataka is 8.45 MT/ Ha. The area under horticulture crops has been increasing @ 5% every year while, the production has been increasing @ 9% annually. In spite of the tremendous growth, there are several challenges. Retaining farmers and

youth in the farming sector is itself a major concern and hence needs huge strategic efforts. The sector specific challenges broadly include; reduction in cost of production; low unit productivity; dearth of qualified and skill field working force; availability of quality seeds and planting materials; unorganized procurement; aggregation and market network system; wide price fluctuation; inadequate cold storages; low levels of technology adoption; mechanization, technology commercialization and higher postharvest losses. The productivity levels of some of the fruits like mango, papaya, guava, sapota, pomegranate and vegetables like tomato, onion and brinjal are at higher level relative to National average. However, the productivity levels are low in comparison of leading producers of these crops.

Karnataka being drought prone state requires new technological approaches and interventions for retention of farmer in agriculture and horticulture. Planting material plays an important role in the production of horticultural crops. Inadequate availability of quality planting material is one of the important deterring factors in development of a sound horticulture industry. At present 30-40% demand for planting material is being met by the existing infrastructure. Farmers do not have access to certified disease free materials as a result of which production; productivity and quality of the produce suffers. They mostly depend on the unregulated and unmonitored private sector in most of the states. The existing nurseries lack modern infrastructure such as greenhouses, mist chambers, efficient nursery tools and gadgets, implements and machinery. Ensuring quality planting materials by accredited scientific nurseries, establishment of food quality testing mechanism for pre and postharvest food safety; insurance support mechanism during natural disasters and calamities as safety net measures; remunerative alternate / substitute to saturated crops (like Arecanut) with multi tier planning; strengthening

of domestic marketing system through establishment of modern Horticulture markets. The pace at which the science has translated into outcomes in the field of agri-horti sector has been rather slow. There are several problems in commercial micropropagation like non-availability of proven and reproducible protocols in many desired crops, high production costs and sale price of tissue culture plants, inadequate quality control of tissue culture plants, inadequate availability and unorganized market of tissue culture plants, proper demonstration and technology validation for exploitation on commercial scale and there is no control over genetic fidelity and freedom from viruses in tissue cultured plant.

Indiscriminate and injudicious use of plant protection chemicals has resulted in development of resistance in pests and pathogens. Lack of fool proof quarantine measures is likely to further aggravate the threat of new pests and diseases in horticultural crops. Also, though Integrated Pest Management (IPM) aims at judicious use of cultural, biological, chemical, host plant resistance/tolerance, physical-mechanical control and regulatory control methods, there is no proper monitoring of the quality of bio-control agents being produced and traded.

Large number of farm equipments have been developed in the country for cereals, pulses and oilseeds. However, little attention is made in mechanizing fruits and vegetable production in the country. Some of the small equipments produced are not cost effective and also not up to the mark in-terms of quality. Stacking systems for vegetable crops lacks development and adoption, transplanting of vegetable seedling, low cost equipments for, spraying, pruning and harvesting of fruit crops, mechanization of planting and harvesting for ginger and turmeric, efficient irrigation systems, tools for nursery management, low cost weeding equipments for horticultural crops and equipments that help in reducing drudgery of women are

some of the existing challenges in mechanization of horticultural crops.

### Extent of value addition of fruits and vegetables happening in the state

Food processing sector which has been identified as a thrust area for development needs huge investments in logistics for supporting the value chain from farm to plate. Department of Agriculture in Karnataka is implementing the Agro-Processing scheme under which various agro processing equipments are made available to farmers, self help groups and farm women at subsidized rates.

In Karnataka, only about 1% of the total production of fruits and vegetables is currently being processed for value addition. About 25 – 30% of post harvest loss is estimated due to inadequate cold storage, required transport, poor handling, insufficient processing and other value addition facilities. An estimated Rs. 50,000 crore is lost annually in the marketing chain due to poorly developed storage infrastructure. At present, there are only 98 cold storage units having 2.97 lakh MT for handling fruits and vegetables. Of these units, 2 are in co-operative, 90 are in private and 6 are in public sector. According to assessment by the National Spot Exchange in 2010, the cold storage gap assessed is to the tune of 1997 metric tonnes. Therefore, ample scope is available for investing to strengthen the cold storage and transportation facilities. However, the problem of low occupancy percentage, high cost of electricity, high interest rates on loans and addressing technical parameters for storing different commodities still remain. Some of the other problems are, decentralized processing units, unavailability of raw materials on continuous basis, infrastructure bottlenecks, taxation policies and extension and awareness.

### Level of Organic Cultivation happening in Karnataka.

Karnataka is the first state to develop organic farming policy in the country,

with an intention of proposing an alternate model in over throwing the farmers' distress. Policy encompasses education, research and extension to promote organic eco-tourism and training on certification. Karnataka has taken some promising steps to promote organic farming and as a result an area of about 1,18,739 ha has come under organic certification. The State is bestowed with varied climatic conditions and soil types spread across ten agro-climatic zones. With an annual average rainfall of 1130 mm and a moderate temperature, the state of Karnataka provides ideal conditions to grow a variety of crops throughout the year. The State is also known for its excellence in horticultural crops and animal husbandry, and hence it is also referred to as the state with "Cafeteria of Crops". In addition, many farmers from the State are pioneers in organic agriculture and have developed many different systems and methods of cultivation through indigenous knowledge base, utilizing organic wastes and development of holistic pest and disease control mechanisms. The state has formulated policy on organic farming as early as 2004. However, since the policy formulated was less farmers centric, organic farming policy was formulated during 2017 with focus on collective farmer's centric approach. Karnataka state has approved a program of producing organic horticulture in mission mode program under NHM. The process of organic certification is underway with selected farmers. The Farm Universities and NGOs are involved in awareness generation, integrated planning and development of business plans. The Policy promotes development of large number of programmes for active participation of farmers to produce nutrition food in a sustainable manner by adopting eco-friendly farming practices. Due to large extent of lands in rainfed areas, steady and sustainability through organic farming appears to be slow process for transition. ■

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# Micro Irrigation - The Most Efficient Way to Deliver Water and Nutrients

In agriculture India is facing two major challenges and these are growing urbanization leading to less availability of land for agriculture and growing water crisis. Almost 50% of India faces high to extreme water stress. If you look at statistics you will find that only 40% of agricultural land is under some sort of assured irrigation and rest of the agriculture in India is still rainfed. With the growing population and increasing urbanization, the available agriculture land per person will further come down in coming years. This means we need to grow more food from less available land. Currently on 6% of net cropped area is under micro irrigation and only 13% of irrigated area is covered under micro irrigation. There is tremendous scope for micro irrigation in India, and to have assured irrigation is the key to food security.

Micro irrigation has been around 5 decades now. It is well known to be the most efficient way to deliver water and nutrients to plants and has proven 'knock-out' benefits, but global penetration is still limited – probably less than 10% of all irrigated land. And India is no different than the global trend and adoption. Initial cost of a complete micro irrigation system is still very high for an average farmer. Although 'permanent' solutions can

last for as long as 15 years, this cost remains a major inhibitor to large scale adoption. Hence farmers are dependent on govt support for subsidy and any subsidy scheme has its own limitations. Besides, micro irrigation is complex by nature. A farmer cannot install it by itself. It requires detailed hydraulic designs. Systems need to be maintained over a long period of time – tubing and filters need to be flushed, repairs must be made and emitters must be kept clean at all times to avoid clogging, often by injecting acids and other chemicals. All of this requires skilled labor which is difficult to find and requires training. The Return On Investments (ROI) for micro irrigation has been proven again and again, but if you remove the subsidy then ROI for normal farmer growing a regular crop has not been consistently high enough for massive adoption. In my views, it is very critical to bring down cost to a level where average farmer can adopt it without subsidy.

We need to find our own solutions and one of this can be to promote community irrigation schemes and forming of water user associations. This will help in pooling of resources and bringing the cost down for individual farmer. MP is doing very good job in creating the pressurized pipe network and farmers will be able to attach their micro ir-



**Kaushal Jaiswal,**

Managing Director, Rivulis Irrigation India Pvt. Ltd.

rigation systems at a later stage to the outlets provided at his farm.

Subsidy programme has also helped in popularizing MI system in India. Some of the states like Gujarat /Maharashtra/AP/TN have done real good job in popularizing it among farmers. But because of very high percentage of subsidy in some of the states where subsidy is as high as 90 to 100%, it leads to lesser area coverage limited availability of funds. It is very important to have a relook at the entire subsidy distribution and moderate the subsidy and cap it to a level to cover more farmers and bring more area under micro irrigation with existing fund availability.

In India more than 200 million farmers who own small tracts of land, affordability and initial cost of the system is an issue. To encourage these farmers, Govt of India has announced different schemes like PMKSY (Pradhan Mantri Krishi Seenchai Yojna) with the key objective of "Har Khet ko paani" and Govt is providing 50-90 % subsidy to encourage the farmers to adopt Drip Irrigation. It is definitely economical for the farmers who get the subsidy and effectiveness of the MIS is a proven fact.

