

# BIO LIFE

Letter from Executive Director, Agribusiness

Volume 01 Issue 33 February 2015

## Innovation Leads to Success: ACI Plant Breeding

Conventional plant breeding resulting in hybrid varieties is a highly dynamic science that has experienced a tremendous impact on agricultural productivity over the last decades. ACI started plant breeding in 2008 with some experienced plant breeders and established three R&D stations gradually in Rural Development Academy (RDA), Bogra, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur and Bangladesh Agricultural University (BAU), Mymensingh. Over the course, it has developed a total of 26 competitive F1 hybrid varieties of various crops such as: Bottle gourd, Sponge gourd, Snake gourd, Ridge gourd, Pumpkin, Bitter gourd, Eggplant, Cucumber, Tomato and Maize etc. Besides, over 20 crop varieties are in the pipeline and will be released in due course. ACI has also a rich gene bank with more than 3,000 Germplasm of various crops that allows more testing & seeking opportunities for new varieties.

All of the varieties developed by ACI R&D are

performing very well in the competitive market, grower and at consumer level. We have a success story on Bottle gourd - Moina, Bitter gourd - Papiya, and Eggplant - Beguni. Bottle gourd - Moina is short bottle shaped with white spots and attractive green in color, weighs 1.5 -2.0 kg, heat and rain tolerant, round the year cultivable, and has a yield of 35-40 ton/acre. Papiya, a Bitter gourd is long, slender and attractive green in color, weighs 240 -280 g, has a yield of 14-16 ton/acre, and suitable for long distant transportation. It takes 40-45 days to first harvest. Eggplant-Beguni is cultivable year round, widely adapted and tolerant to bacterial wilt, has shiny purple and bottle shaped fruit, has high yielding and cluster (2-3) habit of fruit bearing. It weighs 110-130 g, yields 25-30ton/acre and takes 60-65 days to first harvest.

These three varieties have extended our innovations and we'll keep exploring more crop varieties to contribute to the agriculture sector of the country.



Bottle gourd - *Moina*



Bitter gourd - *Papiya*



Eggplant - *Beguni*

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The global agri-biotech market sustains growth reaching US\$27.8 billion by the end of 2014, according to the report released by BCC Research, a market research company based in the U.S.

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## Biotech Corner

### Use of Molecular Tools for Vegetable Breeding

Prof. Lutfur Rahman

Advisor, ACI Agribusiness & Head of Advanced Seed Research & Biotech Centre

Improved, adapted vegetable germplasm is the most cost-effective option for farmers to meet the challenges of a changing climate. However, most modern cultivars represent a limited sampling of available genetic variability including tolerance to environmental stresses. Superior varieties adapted to a wider range of climatic conditions could result from the discovery of novel genetic variation for tolerance to different biotic and abiotic stresses. Improved selection techniques are needed to identify these superior genotypes and associated traits, especially from wild, related species that grow in environments which do not support the growth of their domesticated relatives that are cultivated varieties.

In the past decade, genomics has developed from whole genome sequencing to the discovery of novel and high throughput genetic and molecular technologies. Genes have been discovered and gene functions understood. This has opened the way to genetic manipulation of genes associated with tolerance to environmental stresses. These tools promise more rapid, and potentially spectacular, returns but require high levels of investment. Many activities using these genetic and molecular tools are in place, with some successes. National and international institutes are re-tooling for plant molecular genetic research to enhance traditional plant breeding and benefit from the potential of genetic engineering to increase and sustain crop productivity.

The use of molecular markers as a selection tool provides the potential for increasing the efficiency of breeding programs by reducing environmental variability, facilitating earlier selection, and reducing subsequent population sizes for field testing. Molecular markers facilitate efficient introgression of superior alleles from wild species into the breeding programs and enable the pyramiding of genes controlling quantitative traits. Thus, enhancing and accelerating the development of stress tolerant and higher yielding cultivars for farmers in developing countries. Molecular marker analysis of stress tolerance in vegetables is limited, but efforts are underway to identify QTLs underlying tolerance to stresses. Studies indicate that stress tolerance is quantitatively inherited and in some cases tolerance is dependent on the developmental stage of the plant. Consequently, multiple genes are predicted to be involved with the expression of stress tolerance.

Studies on QTL analysis of stress tolerance is limited and may reflect the limited variation of these traits. Furthermore, the environmental influence on the expression of stress tolerance traits is high and makes phenotyping difficult. Identification of environmentally-stable surrogate phenotypes or component traits is necessary to effectively evaluate genotypes and genetic populations. This is a critical tool to identify the QTLs underlying tolerance to environmental stresses.

Environmental stress tolerance is a complex trait and involves many genes. Research on the physiology of stress tolerance has demonstrated that tolerance to a specific stress is determined by several component traits and controlled by corresponding genes. A combination of a genome-wide scan of expression, using DNA arrays, and QTL analysis could provide important information for identifying the major genes association with stress tolerance. The development of tolerant crops by genetic engineering requires the identification of key genetic determinants responsible for stress tolerance in model plants and the application of acquired knowledge on food crops. Our continually updated technologies, such as microarrays and related methodologies, enable both global and detailed analyses of expression patterns and functions of genes and promoters to find the targets for generating stress-tolerant crops. To introduce the identified target genes and promoters into crops, we are also developing genetic engineering technologies for rice, wheat, soybean, sugarcane, etc.

It is unlikely that a single method to overcome the effects of environmental stresses on vegetables will be found. A systems approach, where all available options are considered in an integrated manner, will be the most effective and ultimately the most sustainable, particularly for developing countries in the tropics under a variable climate. This holistic strategy will need global integration of efforts; the resulting synergies will produce impact more quickly than the individual institutions working in isolation could accomplish. For this to succeed, adequate and long-term funding is necessary, scientific results have to be delivered, best approaches utilized and effective methods sustained to deliver global public goods for impact.

## Innovations and New Products

### CHARMIL PLUS - Multiaction Skin Gel/Spray

Charmil is a scientific blend of herbal oils possessing anti-bacterial, anti-fungal, anti-inflammatory, anti-pruritic, vulnerary & miticidal properties. It is effective for a wide variety of skin infections like ring worm, eczema, dermatophytes, FMD, scabies & Pyoderma; all types of wound infections; Parasitic skin eruptions to lesion of mange & wounds. Each 10g of Charmil plus gel contains Azadirachta indica Kr. oil 2.00g, Cedrus deodara Ht. Wd. oil 5.00g, Pongamia pinnata Sd. oil 1.10g, Absorption base q.s. 10.00g. The composition of spray is: Deodar oil

50%w/w, Karanj oil 11%w/w, Solvent & propellant q.s. to 100%w/w. The key benefits of Charmil Plus are: Multiaction ensuring wide spectrum of protection against causative agents, Single solution to all kind of skin problems, Fly repellent action, Non-corticosteroid & do not interfere skin immunity thus prevents relapse, and Active wound healer. Charmil Plus is manufactured by Ayurvet and launched by ACI Animal Health on 4 January 2015. It is available as 25 gm tube and 100 ml spray.



### VITA-BIOTIC – Non-antibiotic Growth promoter and Antibiotic Reducer

On 14 January 2014, ACI Animal Health launched VITA-BIOTIC, a non-antibiotic growth promoter and antibiotic reducer. It is a carefully balanced mixture of medium chain fatty acids (MCFA), supplemented with aroma components in order to guarantee a positive effect on the feed conversion ratio of the animals. Each 100 g contains- Mono-, di- and triglycerides of fatty acids 16.60 g, Formic acid 8.30 g, Inulin 8.30 g, Oregano oil 0.50 g Hydrated magnesium silicate q.s. to 100.00 g. The synergistic mixture of formic acid, oregano oil and inuline has a pronounced anti-

microbial activity. Mono glycerides of medium chain fatty acids deactivated fat of enveloped viruses like Newcastle disease, Avian influenza and Fowl pox etc. Di-, & triglyceride of medium chain fatty acids stimulate villi growth. VITA-BIOTIC improves small intestine digestion, absorption efficiency, and FCR. It increases beneficial bacteria of stomach and intestine. It also helps to keep dry broiler litter and reduce the use of antibiotic. VITA-BIOTIC is manufactured by Vitafor Belgium. It is available in 100 g, 1 Kg & 25 Kg packs.



## Events and Activities

### Field Day on Hybrid Brinjal “Happy” at Rajshahi

A field day was arranged at ACI & RU Innovation Center, Rajshahi on hybrid brinjal “Happy” on 21 January 2015. The field day started at 3.30 pm and was arranged by ACI Seed. Prof. Dr. Aminul Haque, Chairman, Department of Agronomy and A.K.M. Abdul Bari, Professor, Dept of Crop Science & Technology, Rajshahi University were present as guests in the field day. About 70 farmers took part in the program. All the participants visited crop field of variety “Happy”. The farmers exchanged their view on “Happy”

with ACI team and gave their opinion on the use of this variety as they could correctly identify its market demand. They are now highly impressed by hybrid brinjal “Happy” because of its fruit-bearing capacity, shape, size, color, and weight. It also produces three to four fruits per clusters.

Dr. Akter Hossain, PDSM, ACI seed briefly discussed the production technology of “Happy”. A.K.M Abdul Bari and Prof Dr. Aminul Haque also gave briefing on “Happy”. Finally,

most of the farmers were motivated to cultivate Hybrid Brinjal “Happy” to get more profit compared to other competitive Brinjal varieties available at Rajshahi. This field day not only helped to transfer technology to the farmers through hybrid variety and but also assisted to make them aware quality product. This field day had not only helped to transfer technology to the farmers through hybrid variety but also assisted to make them aware of quality agriculture input products.



### Field Days on Tomato ‘ACI Super’ at Dinajpur and Bhola

In January 2015 ACI Seed arranged field days on hybrid tomato variety ACI Super at Dinajpur and Bhola districts. The first field day was held on 8 January 2015 at Brammon Vita village of Birganj, Dinajpur. Total 80 farmers attended the field day. On 28 January 2015, ACI seed organized another event at Choto Mainka,

Burhanuddin, Bhola. Starting from 3.30 pm, the event took place at the farming plot of Abdul Ali Soiyal and was attended by 60 local farmers. Officials from ACI Seed, dealers and retailers were also present in both of the field days.

Early yield, disease and virus--

resistant – these are the major characteristics of ‘ACI Super’ tomato variety. It weighs 100-120 gm and can be collected within 60-65 days. So it could easily get attention from the local farmers. This field demonstration has motivated the farmer to produce the variety in coming days.



## Events and Activities

### ACI Seed Arranged Field Days on Hybrid Cauliflower CLX33321

In January 2015, ACI Seed arranged two field days on hybrid cauliflower CLX33321 at Bhola. The first event was held on 22 January 2015 at Md. Khalil Mia's plot in Ratanpur, Sadar. The other field day took place at the plot of Md. Mak-suddin of Shatohat, Bhola Sadar on

31 January 2015. Total 130 local farmers got the opportunity to participate in these field days. Md. Mizanur Rahman, SO, Md. Masud Sardar, SO, Mr. Azad Mollik, PSO, dealers, and retailers of ACI Seed were also present.

The cauliflower variety CLX33321 is ultra white in color and heavy (3-3.5 kg). It can be collected within 70-75 days. These features got the attention of the farmers during the field days. ACI Seed will work further to promote the variety among farmers.



### Successful Balanced Fertilization Promotion with Innovision

On 24 January 2015, ACI Fertilizer was recognized as 'The Best Partner for 2014' by Innovision Consulting Private Limited for the successful partnership to promote balanced fertilization. The partnership program started in August 2014 and under this project ACI Fertilizer has already completed 154 Farmers Training Program, 23 Retailer Training Program, 22 DAE Meeting, 7

NGO Meeting, and more than 200 result demonstrations. In the project area, the overall sales were increased by 20% over last year.

ACI Fertilizer has already prescribed balanced fertilizer among more than 4000 farmers and traders through FRS System in Dhaka, Comilla, Chittagong, Jessore, Bogra, Kushtia, Barisal

area. FRS System is an online-based digital recommendation system of fertilizers for every specific Union all over the country developed by SRDI and Katalyst. The farmers can get crop specific fertilizer recommendation through FRS System at any time where internet access is available.



## Events and Activities

### Promoting Guti Urea & NPK Guti in Southern Region with IFDC

ACI Fertilizer has started working with IFDC for promoting Guti Urea and NPK Guti under a project named Accelerating Agricultural Productivity Improvement (AAPI) Project. Guti Urea is a productive technology for the farmers. The farmers can save 30-40% Urea by using this technology. The efficacy of prilled Urea is only 30-40%, whereas the efficacy of Guti Urea is

60-70%. Guti Urea and NPK Guti are very useful as a consistent supplier of Nitrogen to the plant. The yield is increased by 20-25% using Guti Urea.

ACI Fertilizer will execute 200 demonstrations of Guti Urea and NPK Guti along with the Micro Nutrients in Boro Rice in South Region of the country. The demonstrations will take place mostly in Jessore, Kush-

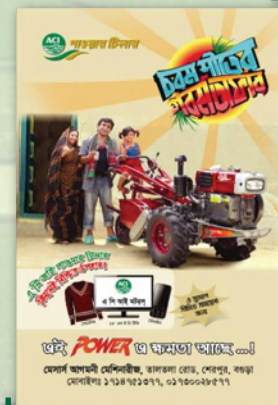
tia, Satkhira, Khulna, Barisal, Madaripur, Shariatpur & Bhola. In January 2015, more than 100 demonstrations have taken place already. Rest of the demonstrations will take place by February 2015. Through these demonstrations and promotions, farmers also get an opportunity to know about the products of ACI Fertilizer.



### “Chorom Sheeter Gorom Offer” Ends

“Chorom Sheeter Gorom Offer”, a winter promotional offer for the power tiller customers by ACI Motors, ended on 31 January 2015. Starting from 1 October 2014, customers of ACI power tiller had got assured gifts and prizes through scratch cards with each purchase. The gifts and prizes were 19” LED TVs, Mobile Phones, and Sweaters. This promotional offer created a buzz in the market and ACI Motors

had to extend the validity of the offer from 31 December 2014 to 31 January 2015. Apart from the scratch card based “Chorom Sheeter Gorom Offer”, customers got a 19” LED TV with every purchase from ACI Motors’ Exclusive Dealers’ Shop.



## Events and Activities

### ACI Motors' Promotional Activities

With the winter promotional offer, ACI Motors had arranged a number of activities during the last quarter of 2014. These were Retailer meeting, Mechanics meeting, Opening Exclusive Dealer Shop (EDS), Dealer shop merchandising, Media adver-

tisement, Promo materials distribution etc. A Retailer Meeting took place at Chittagong on 17 October 2014. Besides, Exclusive Dealer Shops (EDS) were opened in Habigonj, Natore, Rajshahi. On the other hand, meetings with mechan-

ics of ACI Power tiller and Diesel Engine were also held in total 6 places from October to December 2014. These are: Bogra, Dhamrai (Dhaka), Natore, Rajshahi, Khagrachari, and Habiganj.



Photo: ACI Motors Retailers' Meeting at Chittagong



Photo: Exclusive Dealer Shop Inauguration at Habiganj



Photo: Mechanics Meeting at Natore and Khagrachari

### ACI Cropex Starts Export to Taiwan

ACI Cropex has started exporting sesame seed to Taiwan. "After the recent success of exporting quality sesame seed to China with great customer feedback, this expansion of export is another milestone for the journey of ACI Cropex", said by Mr. Md. Mustafizur Rahman Khan,

Marketing Manager, ACI Cropex . As Taiwan joins the list of its export destinations, ACI Cropex is continuously exploring new markets in the international arena.



### More ACI Cropex Wholesale Points Underway in Dhaka City

In January 2015, ACI Cropex has taken an initiative to open some new wholesale points in Dhaka City apart from Kawran Bazar, one of the largest wholesale marketplaces in Dhaka city. It has already 2 wholesale points both for fish and vegetables for the wholesalers at Kawran Bazar. For the new wholesale points, one location for fish has

been selected initially which is at Mohammadpur. Moreover, all of the wholesale points are outside of the conventional wholesale market. With this new initiative, not only the wholesalers but also the retail consumers will be able to visit these points and buy their necessary products.





## Events and Activities

### ACI-IAP-SIDA Project Successfully Held 4 Field Days

ACI in collaboration with the Innovation Against Poverty (IAP) Program of the Swedish International Development Cooperation Agency (SIDA) has been funding a project to promote climate smart sustainable agriculture in the coastal belt of Bangladesh. In January 2015, field days were held in 4 project locations

of Patuakhali and Barisal after successful field demonstrations of various vegetables and Boro rice. The crops including tomato, cauliflower, bottle gourd and rice were grown from ACI's seeds and supervised under modern agronomic practices. Around 230 farmers along with local extension officers were

present and spoke highly of the demonstrations held. Cultivation of vegetables is not very popular in the coastal belt, but farmers have now shown interest to grow vegetables from next season after ACI-IAP-SIDA intervention.



## Agri-tech & Communication

### Global Agri-biotech Market Hits US\$27.8B in 2014

The global agri-biotech market sustains growth reaching US\$27.8 billion by the end of 2014, according to the report released by BCC Research, a market research company based in the U.S. The global market for agri-biotech was US\$26.4 in 2013. With the projected compound annual rate of 11 percent over the next five years, it is expected that the global market for agri-biotech might reach US\$46.8 billion by 2019.

"North America and South America are the leading geographic markets for agricultural biotechnology prod-

ucts," the report said. "South America and Asia are projected to post high growth rates in their markets due to favorable regulatory climate and new transgenic crops," the report added. It was also stated in the report that biotechnology tools, such as DNA sequencing, biochips, RNA interference, synthetic biology and genomic editing tools "comprise a small but high growth segment of the industry."

(Source: Crop Biotech Update, International Service for Acquisition of Agri-Biotech Applications. [www.isaaa.org](http://www.isaaa.org))



### Cover Crops can Sequester Soil Organic Carbon

A 12-year University of Illinois study shows that, although the use of cover crops does not improve crop yields, the practice does increase the amount of sequestered soil organic carbon using three different soil management systems.

U of I soil scientist Ken Olson evaluated plots that were subjected to no-till, chisel plow and moldboard plow treatments with and without hairy vetch and cereal rye cover crops. "By 2012, we found that the soil tillage plots that had cover-crop treatments had more soil organic

carbon stock than those without cover crops for the same soil root zone and tillage treatment," Olson said.

In fact, Olson said that the no-till system, with cover crops, sequestered the most soil organic carbon when compared to the pre-treatment from the year 2000 no-till baseline soil organic carbon stock.

(Source: Agriculture and Food News, Science-Daily. [www.sciencedaily.com](http://www.sciencedaily.com))



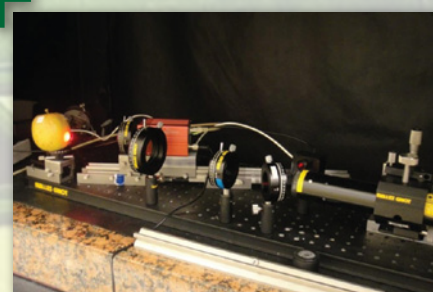
### Laser to Determine Best Moment to Pick Fruit

The ability to detect when to harvest "climacteric" fruits -- such as apples, bananas, pears and tomatoes -- at the precise moment to ensure "peak edibility" in terms of both taste and texture may soon be within reach for farmers, thanks to the work of a team of researchers from Saint Joseph University in Lebanon and the Université de Bretagne Occidentale de Brest in France.

As the team reports in a paper published in The Optical Society's (OSA) journal Applied Optics, they recently demonstrated a laser biospeckle technique capable of detecting fruits' climacteric peak.

What's the significance of this climacteric peak? "Fruits are divided into two categories: climacteric or nonclimacteric fruits," explained Rana Nassif, a postdoctoral researcher affiliated with both Saint Joseph University and the Université de Bretagne Occidentale de Brest. "Climacteric fruits continue their maturation off the tree or vine, so these fruits emit ethylene and are characterized by a climacteric peak -- indicating a maximum ethylene release.

(Source: Agriculture and Food News, Science-Daily. [www.sciencedaily.com](http://www.sciencedaily.com))



## Agri-tech & Communication

### Agri Research Centers to Mine Genetic Treasure in Seed Banks

Agricultural gene banks cease from simply serving as storage of plant seeds, but will now be used to find traits that can be utilized to develop better crop varieties.

The new initiative, called DivSeek aims to unlock the potential of crop diversity stored in gene banks around the world and make it available to all so that it can be used to improve productivity, sustainability

and resilience of crops and agricultural systems. DivSeek is an effort of an international consortium of 69 public sector partners, including CGIAR Consortium of International Agricultural Research Centers.

Read more at <http://www.divseek.org/>

(Source: Crop Biotech Update, International Service for Acquisition of Agri-Biotech Applications. [www.isaaa.org](http://www.isaaa.org))



### Organic Mulch Lets Insect Pollinators Work

As interest in organic agricultural and horticultural practices continues to grow, so does the need to identify alternative weed control practices. Mulching, a common practice used to control weeds and reduce the need for tillage, can also reduce insect pollinators' exposure to harmful pesticides; however, finding the right mulch materials that allow pollinators to flourish can be challenging. Caitlin E. Splawski, from The Ohio State University Department of Horticulture and Crop Science, researched the effects of several types of organic

mulch on squash bees, an important pollinator of squash, pumpkins, and gourds. "Crop pollinators that use agricultural fields for nesting deserve consideration," Splawski said. "Zucchini squash has a high pollination demand, and the native, ground-nesting squash bee (*Peponapis pruinosa*) provides the majority of the crop's pollination requirement in some environments."

(Source: Agriculture and Food News, ScienceDaily. [www.sciencedaily.com](http://www.sciencedaily.com))



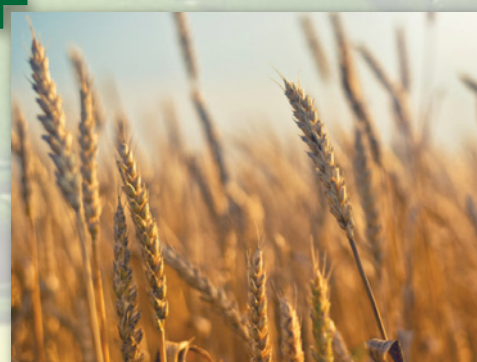
### Agriculture Origins Could Shape Future of Food

Agricultural decisions made by our ancestors more than 10,000 years ago could hold the key to food security in the future, according to new research by the University of Sheffield. Scientists, looking at why the first arable farmers chose to domesticate some cereal crops and not others, studied those that originated in the Fertile Crescent, an arc of land in western Asia from the Mediterranean Sea to the Persian Gulf. They grew wild versions of what are now staple foods like wheat and barley along with other grasses from the region to identify the traits that make some plants suitable for agriculture, including how much

edible seed the grasses produced and their architecture.

Dr Catherine Preece, who worked on the study with colleagues from the University's Department of Animal and Plant Sciences and Department of Archaeology, said: "Our results surprised us because numerous other grasses that our ancestors ate, but we do not, can produce just as much seed as wild wheat and barley. It is only when these plants are grown at high densities, similar to what we would find in fields, that the advantage of wild wheat and barley is revealed."

((Source: Agriculture and Food News, ScienceDaily. [www.sciencedaily.com](http://www.sciencedaily.com))



## Agri-tech & Communication

### Calves and Their Mothers Have 'Conversations'

Researchers have been eavesdropping on 'conversations' between calves and their mothers — measuring the process of how cows communicate using detailed acoustic analysis for the first time.

The team from The University of Nottingham and Queen Mary University of London, spent ten months studying the ways cows communicate with their young, carefully examining acoustic indicators of identity and age. They identified two distinct maternal 'calls'. When cows were close to their calves, they communicated with them using low frequency calls. When they

were separated -- out of visual contact -- their calls were louder and at a much higher frequency.

Calves called out to their mothers when they wanted to start suckling. And all three types of calls were individualized -- it was possible to identify each cow and calf using its calls. It has long been thought that cows use individualized calls to communicate with each other, but this study confirms the theory -- and identifies particular types of mother-offspring contact calls in cattle.

(Source: Agriculture and Food News, ScienceDaily. [www.sciencedaily.com](http://www.sciencedaily.com))



### DNA Sequencing Technology in Understanding Antibiotic Resistance

The development of superbugs becomes an issue due to its threats to human health. This is due to the increased antibiotic resistance of certain infectious organisms such as bacteria affecting the safety of animal and the quality of its products. With this, Colorado State University researchers, Dr. Paul Morey and Dr. Keith Belk are leading the study of the process and mechanism involved in the development of superbugs in beef and dairy cattle industry. This will be conducted using DNA sequencing technology.

The use of this technology will help






in understanding how antibiotic resistance is developed and transferred from livestock to humans. Comparisons between the traditional and organic process under different environments will be done to further identify the resistant genes and mechanisms associated with it. The production systems involved in the livestock industry will also be examined to assess whether it can trigger antibiotic resistance.

(Source: Crop Biotech Update, International Service for Acquisition of Agri-Biotech Applications. [www.isaaa.org](http://www.isaaa.org))





### Believe it or not!

-  **Honey Bees** visit 50-100 flowers during one honey collecting trip
-  Occasionally, a hen will produce **Double-yolked eggs** throughout her egg-laying career
-  A professional shearer can shear a **sheep** in less than 2 minutes and will remove the fleece in one piece
-  There are about 600 kernels on each ear of **corn**
-  **Pigs** can't sweat as they have no sweat glands



### Calorie Chart

Fresh Fruits		
Type	Quantity	Calories (Kcals.)
Whole Milk	225 ml (1 cup)	150
Paneer (Whole Milk)	60 gm	150
Butter	1 Tbsp	45
Ghee	1 Tbsp	45
Butter Milk	225 ml (1 cup)	38

Source: [www.nriol.com](http://www.nriol.com)

### Agro Tips

Some symptoms of boron deficiency (in absence or low supply) are: dying growing tips and bushy stunted growth, extreme cases may prevent fruit set. Some crop-specific symptoms include:

- **Cabbage**- distorted leaves, hollow areas in stems.
- **Cauliflower**- poor development of curds, and brown patches. Stems, leafstalks and midribs roughened.
- **Pears**- new shoots die back in spring, fruits develop hard brown flecks in the skin.
- **Strawberries**- Stunted growth, foliage small, yellow and puckered at tips. Fruits are small and pale.

Boron is an essential micronutrient for plant growth and development, but is required in very small quantities. Although Boron requirements vary among crops, the optimum boron content of the leaves for most crops is 20-100 ppm. Excess boron can result in boron toxicity and the toxicity level varies between plants.

## Readers' Corner

### Sharing is Caring!

You may have seen Bonsai trees, in reality or at least in pictures. But how many times you enjoyed visiting a miniature garden of Bonsai trees? As we all know, Bonsai, a Japanese term as well as art, is the art of growing ornamental, artificially miniaturized varieties of trees and shrubs in pots. With the widespread art and practice of nurturing Bonsai trees, artisans develop a number of aesthetic miniature gardens of Bonsai trees. These photographs are the results of consistent effort and care of those artistic minds who have taken Bonsai to a newer level.

How about a tour to the garden of Bonsai Trees?



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