



Hand in Hand: The BAPNET Story

As a single fruit, banana can already satisfy ones sweet craving and some nutritional requirements. As a bunch, it serves more varying purposes and more people get to benefit. Same is true with BAPNET.

Photo by Bioversity

Unknown to many, banana originally came from the Arabic word 'banan' which means 'finger'. The golden yellow fruit that tastes sweet when ripe indeed resembles a row of fingers that taper to a hand. As a single fruit, it can already satisfy ones sweet craving and some nutritional requirements. As a bunch, it can serve more varying purposes and more people get to eat and benefit from the fruits. In like manner, a single finger can only do so much, but a hand can do a whole lot more especially if it has firm grip.

The Banana Asia Pacific Network (BAPNET) operates very much in the same way. As a network of countries and institutions, it has been proven to have achieved and accomplished much for the benefit of the banana industry in the Asia Pacific region.

It was in 1991 when the Asia Pacific Network (ASPNET) was formed recognizing the need to pool efforts and resources to hurdle the challenges looming the global banana R&D, and the banana industry in general. Original network members include Australia, China, India, Indonesia, Malaysia, Philippines, Thailand, and the Taiwan Banana Research Institute (TBRI). Good works do not remain unnoticed, hence, the eventual expansion of its membership covering Bangladesh, Sri Lanka, Vietnam, Cambodia, Papua New Guinea, and the Secretariat of the Pacific Community (SPC) in Fiji.

ASPNET was relaunched in Sri Lanka in 2001 as BAPNET with the signing of a Memorandum of Agreement between the then International Plant Genetic Resources Institute (IPGRI), now

Bioversity International, and the Asia Pacific Association of Agricultural Research Institutions (APAARI). Papua New Guinea and Myanmar are the latest additions to BAPNET, bringing it to a 15-strong R&D collaborative group.

Networking in Motion

BAPNET is guided by a Steering Committee (SC) composed of country or institutional representatives (usually head of National Agricultural Research Systems, NARS, or institution or designated nominee) among BAPNET members. The SC provides the direction and implements the set programmes for global and national banana R&D.

The SC meets regularly at least once every two years. Bioversity Commodities for Livelihood

Next page...2

(CfL) Programme for Asia-Pacific (Bioversity) assumes a strategic role as regional coordinator and secretariat of the network. Bioversity serves as the thread that weaves together BAPNET and other Bioversity-coordinated regional networks and other networks such as the ProMusa and MusaNet. It harmonizes network activities and consolidates information and knowledge products for circulation to BAPNET members, affiliate networks and others who could potentially benefit from the resulting R&D works. Together with BAPNET members, Bioversity develops projects that address priority research areas.

Fruits of Labour

During SC meetings, committee members review and thoroughly discuss trends and emerging challenges that beset the banana industry in the global and local scale. From there, key priority research areas that should be addressed by BAPNET are identified. Research areas usually dwell on *Musa* germplasm, conservation and use, pest and disease management, production system improvement, *Musa* information development and exchange, and capacity building, among others. In the recent BAPNET SC meeting held on November 2-5, 2010 in Hanoi, Vietnam, two critical issues requiring urgent attention surfaced: pests and diseases and climate change adaptation and mitigation.

1. *Musa* Germplasm Management and Use

BAPNET has identified germplasm collection, conservation and characterization as a key priority research area where it will constantly work on. Complementing this pursuit, National Repository, Multiplication and Distribution Centres (NRMDC) were established among BAPNET member countries.

NRMDCs ensure steady and accessible supply of introduced and local superior varieties.

Likewise, Bioversity has been supporting local germplasm and wild relatives collection missions across the region. This further reinvigorated national gene banks and expansion of accession collections.

Some banana accessions were shared to Bioversity's International Trade Centre (ITC), based in Leuven, Belgium, for long-term conservation. The *Musa* Germplasm Information System (MGIS), a database system, was set up by Bioversity to facilitate characterization of *Musa* accessions housed in ITC and to serve as repository of readily available and accessible information for research purpose.

BAPNET also participated in the International *Musa* Testing Programme (IMTP). IMTP is a collaborative effort coordinated by Bioversity to evaluate elite *Musa* varieties produced by breeding programmes worldwide as well as promising germplasm from the International *Musa* Germplasm Collection in Leuven, Belgium.

Continue to P. 5

BAPNET Members:

1. Australia - Department of Primary Industry and Fisheries (DPI&F)
2. Bangladesh - Bangladesh Agricultural Research Institute (BARI)
3. Cambodia - Cambodian Agricultural Research and Development Institute (CARDI)
4. China - Guangdong Academy of Agricultural Sciences (GDAAS)
5. Fiji - Secretariat for Pacific Community (SPC)
6. India - Indian Council of Agricultural Research (ICAR)
7. Indonesia - Indonesian Centre for Horticulture Research and Development (ICHORD)
8. Malaysia - Malaysian Agricultural Research and Development Institute (MARDI)
9. Papua New Guinea - National Agricultural Research Institute (NARI)
10. Philippines - Philippine Council for Agriculture Forestry and Natural Resources Research and Development (PCARRD)
11. Philippines - Department of Agriculture-Bureau of Agricultural Research (DA-BAR)
12. Sri Lanka - Horticultural Crop Research and Development Institute (HORDI)
13. Taiwan - Taiwan Banana Research Institute (TBRI)
14. Thailand - Horticulture Research Institute (HRI)
15. Vietnam - Fruit and Vegetable Research Institute (FAVRI)



Stephen Weise, director of Bioversity presents his paper during the BAPNET SC Meeting.



Participants of the 7th BAPNET SC Meeting held on 2-5 November 2010 at Hanoi, Vietnam pose for posterity.

BAPNET CALLS FOR STRONGER ALLIANCE

A meeting of minds by key players in banana research took place in the 7th Banana Asia Pacific Network (BAPNET) Steering Committee Meeting held on November 2-5, 2010 in Hanoi, Vietnam. A biennial activity, the meeting gathered together representatives from 14-member countries in the Asia-Pacific region to elevate discussions on pressing and priority R&D issues in the region. Other possible areas of collaboration among National Agricultural Research Systems (NARS), Bioversity International (Bioversity), and other Bioversity-coordinated networks (ProMusa and MusaNet) were also identified to complement the scaling up efforts of banana R&D.

The four-day meeting began with Dr. Nguyen Van Bo, president of this year's host, Fruit and Vegetable Research Institute (FAVRI) - Vietnam Academy of Agricultural Sciences (VAAS), welcoming the attendees and expressing his appreciation for the long-standing partnership particularly in the conservation and use of germplasm. The meeting was a blend of discussions and planning workshops which focused on two vital issues affecting the

banana industry: climate change and pests and diseases. The meeting kicked-off with Dr. Agustin B. Molina, executive secretary of BAPNET and regional coordinator of Bioversity Commodities for Livelihood (CfL) Programme in Asia Pacific, presenting a review of BAPNET as a regional platform of banana R&D collaboration.

Dr. Stephan Weise, director of Bioversity CfL Programme, gave a comprehensive discussion of a modeling study of the global impact of climate change on banana production, which was followed by Dr. Nicolas Roux's presentation on climate change and genetic resources. Dr. Roux is a senior scientist coordinating the Musa GR and Genomics project of Bioversity. Country presentations followed laying the backdrop of local scenarios and researches in the banana industry.

In the presentations, research gaps that became apparent were on mitigation in two levels: mitigation on the impacts of climate change and of the increasing incidence of pests and diseases. It was in the light of these pressing concerns that Dr. Weise reiterated Bioversity's

commitment in working with national partners in addressing important R&D issues particularly those which affect small-scale farmers.

An equally important part of the four-day activity was the conferment of the Pisang Raja Award to two scientists in the region for their outstanding contributions in advancing banana R&D in the local and international realm. Awardees were Dr. Yi Ganjun, director of the Institute of Fruit Tree Research in Guangdong Academy of Agricultural Sciences, China, and Dr. Chih-Ping Chao, researcher of the Taiwan Banana Research Institute (TBRI) in Taiwan.



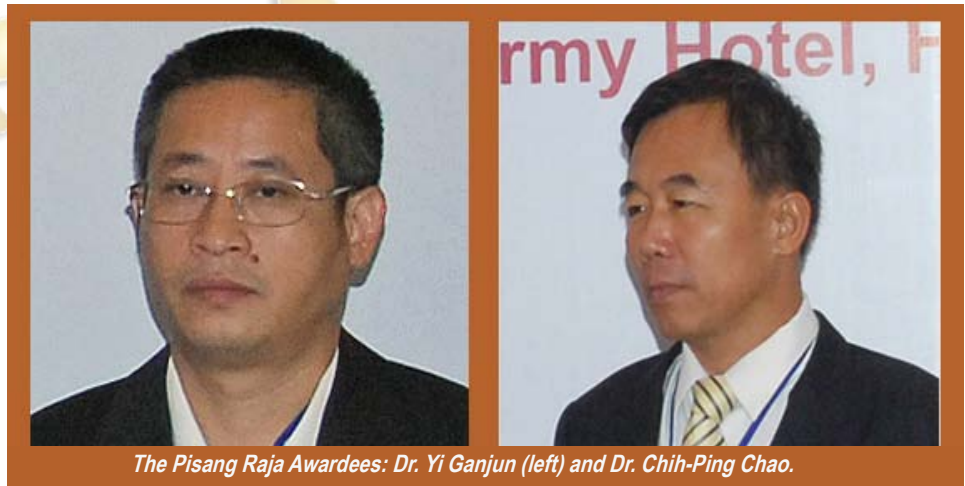
FORTHCOMING:

***Proceedings of the
7th BAPNET Steering
Committee Meeting***

NARS SCIENTISTS HONOURED

For their exceptional contribution in advancing banana R&D and related initiatives, Dr. Yi Ganjun and Dr. Chih-Ping Chao were accorded the Pisang Raja Award by the Bioversity International and the Banana Asia Pacific Network (BAPNET) on November 2, 2010 in Hanoi, Vietnam during the 7th BAPNET Steering Committee Meeting.

A Chinese national, Dr. Yi Ganjun concurrently holds key positions as the director of the Institute of Fruit Tree Research (IFTR), Vice-President of the Guangdong Academy of Agricultural Sciences (GDAAS), and a member of the BAPNET SC. Dr. Yi actively promotes the science and practice of banana R&D being the man behind the creation of the Banana Research Center at IFTR-GDAAS. He also endeavors to strengthen the capacities of banana researchers across China and to harmonize the national banana



The Pisang Raja Awardees: Dr. Yi Ganjun (left) and Dr. Chih-Ping Chao.

R&D. He helped curb the incidence of the Tropical Race (TR) 4 of Panama disease in the national and global scale. The Pisang Raja Award was another feather in the cap of a Taiwanese plant pathologist, Dr. Chih-Ping Chao. Dr. Chih-Ping's studies on disease management against Foc TR4 significantly contributed to the sustainability of the Cavendish banana industry in Taiwan. His dedication in promoting and carrying out banana R&D at the Taiwan Banana Research Institute (TBRI) earned for him the award alongside his selfless sharing of knowledge and expertise on the use

of disease-free planting materials against Banana Bunchy Top Disease (BBTD), participation in the implementation of the International Musa Testing Programme (IMTP) including facilitating the contribution of Cavendish soma-clones from TBRI for the IMTP phase IV. The Pisang Raja Award was established in 1994 by the Asia-Pacific Network. Pisang is the common term for banana in Malaysia and Indonesia while Raja is a title given to the region's nobility which can only be attained through demonstrated leadership, performance, intelligence and wisdom.

Dr. H.P. Singh was conferred the Kadli Ratan Award, the highest award bestowed by the Association for the Improvement in Production and Utilization of Banana (AIPUB), for his outstanding contribution in the field of banana research and production.

Dr. Stephen Weise, director of Bioversity Cfl, was also granted the AIPUB Fellow Award.

The awarding took place during the Global Conference on Banana held in Tamil Nadu, India in December 2010. The activity was jointly organized by AIPUB and the National Research Centre for Banana.

In the photo: Dr. Stephen Weise (3rd from left) hands over to Dr. Singh (3rd from right) the Kadli Ratan Award, while the other awardees strike a pose.



BAPNET Bulletin is a regional mechanism to improve the dissemination, utilization and access to information on banana and plantain in Asia and the Pacific, coordinated and published by Bioversity International's Asia-Pacific Office. For article contribution or inquiries, write us at:

Bioversity International – AP, c/o IRRI, Khush Hall
College, Laguna 4031, Philippines
Tel/Fax. (63-49) 5360532
E-mail: inibap.bapnet@cgiar.org
Website: <http://www.bioversityinternational.org>

Technical Adviser
Agustin B. Molina, PhD

Managing Editor and Writer
Bernadette P. Joven

Editorial Staff
Vida Grace O. Sinohin
Jayne D. Generoso

Bioversity International is the operating name of IPGRI and INIBAP.

2. Pest and Disease Management

Bananas and plantains are very susceptible to pests and diseases. Huge plantations can be easily wiped out and banana varieties totally eradicated by this formidable tandem. In the 1950s, the news about Panama Disease decimating Gros Michel hit the headlines worldwide. A wide range of other pests and diseases continue to render the banana industry fragile in different countries and regions in varying proportions.

BAPNET contends that production of healthy seedlings, through tissue culture and virus indexing, is one of the ways to answer these problems. Mindful of this technological solution, training programmes on tissue culture and virus indexing have been conducted in the region with the help of BAPNET members from countries with more advanced technologies such as Australia, Taiwan and India. In the Philippines, a delivery system of affordable and clean seedlings has been worked out in the framework of public-private partnerships.

BAPNET is currently working on developing a comprehensive Fusarium wilt research for Asia and the Pacific, which would provide a mapping of disease incidence and identity of races in the region to determine suitable strategies for disease management and quarantine procedures and protocols.

3. *Musa* Information and Development Exchange

Information and knowledge that do not reach the target audience or clientele are considered futile. To optimize the benefit from regional banana R&D, Bioversity proactively disseminates global and regional information and initiates communication strategies and activities. These would enhance information and knowledge sharing among stakeholders in the banana industry, using varied platforms.



Pests and diseases remain to be the major constraints in banana production. (Photos by BPJoven)

The Knowledge Resource Centre (KRC) has been set up by Bioversity to address the need for relevant and need-based information from and in the region. Consolidated information and knowledge materials are also repackaged in print and online forms that can easily be and openly accessed in the internet. The BAPNET Bulletin, the official quarterly newsletter of BAPNET managed and published by Bioversity, continues to thrive because of the active contributions from members.

4. Capacity Building

Bioversity organizes trainings to address the capacity building requirements of scientists and technicians in the region. So far, more than 150 scientists and technicians have benefited from these trainings on a range of topics (e.g. virus indexing, tissue culture, cryopreservation, biotechnology, germplasm characterization, nematology, information management, and disease and pest management). Bioversity and BAPNET co-organizes conferences, hosted by BAPNET member countries, to serve as avenues for strengthening collaborations, heightening information sharing, and building capacities.

What Makes It Work?

Healthy collaborations, active involvement and committed service

between and among BAPNET members produce good results in as far as sustaining the network and underlining its relevance in the region and the global banana industry. BAPNET has been an efficient and effective mechanism and platform in advancing banana R&D for the last two decades.

The productive and strong partnership between Bioversity and BAPNET enable the successful implementation of network programmes and activities. All these efforts translate to richer and up-to-date banana R&D, more efficient resource sharing, and more countries and sectors in the region benefiting from all these initiatives.

At the opposite end of the impact pathway, the smallholder banana farmers could strike a better chance at alleviating themselves from poverty, at best, in improving their living conditions. Need we say more? BAPNET illustrates a real case of networking at work. It serves to affirm that collaborative alliances render programmes and activities more productive and successful, thus, gaining and producing more benefits in the process. Indeed, many hands make light work.

(Repackaged from the original paper of Dr. Agustin Molina, presented in the Global Conference on "Meeting the Challenges in Banana and Plantain for Emerging Biotic and Abiotic Stresses," held last 10-13 December 2010 at Tamil Nadu, India, organized by AIPUB and NRCB)

Heads Up *China* Banana Industry



China continually explore researchable areas and develop new technologies to bolster the banana industry amidst the twin challenges of pests and diseases and climate change. (Photos by YGanjun)

China is the third biggest banana producing country in the world (FAO, 2008) next to India and the Philippines. The country has cultivated bananas for centuries but it was only in the mid-1980s that the industry started to flourish. From traditional methods, China has labored to improve its banana production system, thus, leading to bountiful harvests and the rapid development of the industry.

In 2009, China has expanded the area planted to banana reaching to about 311 thousand hectares (FAO). With the expansion comes the exponential increase in production volume of about 0.821 million tons per year registering a yield of 26.38 t/ha. The domestic banana produce supplies 90% of local demand and only a miniscule (10%) is imported from other countries. The improved system generates employment for nearly 1 million Chinese nationals.

Though, truth be told that the industry remains plagued with major concerns that delimits its growth such as recurrence of pests and diseases, freezing and cold weather, strong typhoons and weak market set-up and network. Nevertheless, modest progress has thus far been achieved and the industry holds vast potential

for development due to several enabling factors.

Windows of Opportunities

1. Price of banana in the local market is favourable. At present, domestic production of banana costs 600-1000 RMB/ton (US\$ 89.86-149.76 at 1 RMB=US\$ 0.150) with farm gate price of 1000-2400 RMB/ton (US\$ 149.76-359.44); while the CIF price for imported banana is about 3900 RMB/ton (US\$ 584.09), excluding tariff and transportation fee.
2. The quality of domestic banana has high acceptance in terms of taste, flavor and texture. Imported bananas may stand out in terms of appearance (color, arrangement of clusters, length and thickness of fingers, and absence of blemishes and defect), but still, domestic bananas remain superior. Although compared to imported ones, the class 1 and 'extra' class local bananas are rather small, their appearance and other traits are nearly identical to that of imported ones.
3. Market for domestic banana holds huge potential. At present, China imports about

500,000 tons of banana annually to meet the demand of high-consuming group. This huge demand alone is enough reason to develop the industry to be able to meet the high demand.

Recognizing these opportunities, the Chinese government implemented structural and systems reforms to the banana industry to achieve greater economic advantage.

Restructuring of agricultural systems

1. Establishment of industrial belts

The restructuring of the agricultural systems, under the auspices of the agriculture department, brings to focus key areas where agro-ecological conditions are most ideal for growing bananas and where they would most likely thrive. Resources and efforts were skewed toward four banana industrial belts in Guangdong, Guangxi, Hainan, Yunnan, Fujian and Sichuan provinces.

As a result, Guangxi contributed 21.01% to the gross output value

BAPNET identifies pests and diseases, climate change as key research priorities

Banana remains to be a popular fruit in the global scale not only for its nutritional value but also because of its economic importance especially to smallhold banana farmers of developing countries. Hence, key players in banana R&D continue to up-scale efforts to address the pressing and emerging issues in the banana industry.

Last November 2-5, 2010, the Banana Asia Pacific Network (BAPNET) Steering Committee met in Hanoi, Vietnam to address two vital issues confronting the industry today—climate change and pests and diseases. These twin challenges place the industry in peril that if left unchecked would impact the industry immensely.

In attendance in the said discussions-planning workshops were heads of National Agricultural Research Systems (NARS) from the 15-member countries in Asia Pacific involved in banana research. With the overarching objective of rendering the banana industry sustainable, the participants identified priority research focus along the two thematic areas of mitigating the effects of climate change through production system approach and germplasm management and use; and mitigating banana wilts, particularly the dreaded Tropical Race 4 of Fusarium wilt now affecting Asia.

Mitigating the Effects of Climate Change

Changes in the global climate are palpable as evidenced by hotter days, stronger and more frequent typhoons and drought, among others. These changes bear implications in the banana production; although, the breadth and depth are yet to be determined.

After much discussion, workshop participants came up with the

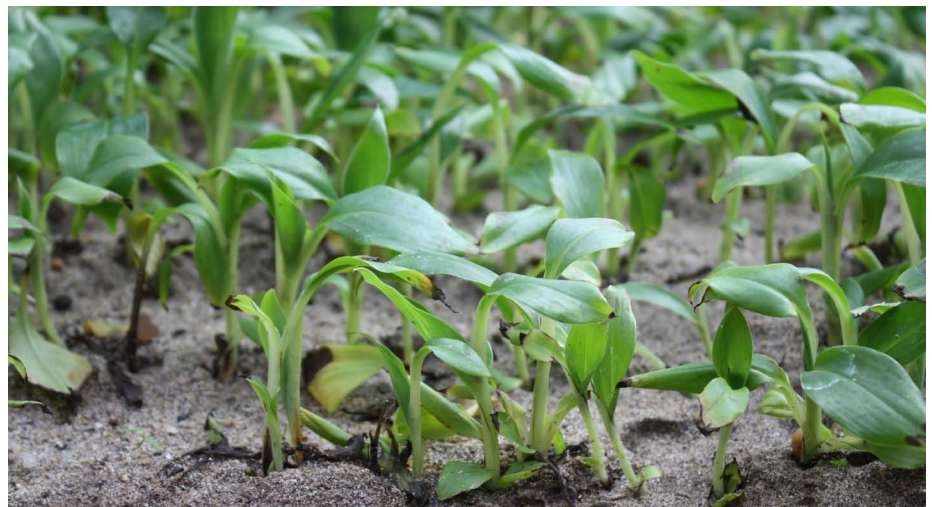
following recommendations and action points:

- There is a need to understand the impacts of climate change on banana production and to develop a suitable model to assess impacts;
- It is essential to fully understand parameters and variables needed to develop a reliable predictive model of the extent and impact of climate change;
- Mitigation strategies should be determined that would include production systems adaptations;
- Management, conservation and use of Musa germplasm are important climate mitigation and adaptation tool; and
- Evaluation of the responses of various cultivars in the region to stresses brought about by climate change such as flooding,

Regional Office of Commodities for Livelihoods Office of Bioversity in Asia Pacific, to aid in the immediate identification of opportunities and areas for research collaboration.

Managing pests and diseases
Pests and diseases are perpetual foes that deter advancements in banana production. A major threat to bananas is Fusarium wilt, a fungal disease, which can practically wipe out an entire banana industry if left unrestrained.

Cases in point were Malaysia and Indonesia, which fell victims to this virulent disease in the early 1990s, destroying banana plantations, thus, adversely affecting the local banana industry. More recent reports tell of incidences of Fusarium wilt spreading across the Asia-Pacific region, though, not



Research priorities need to be revisited and refocused to respond to the potential impacts of climate change in the banana production systems and the industry, in general. (Photo by VGSinohin)

drought and potential changes of pests and diseases must be carried out.

The development of a regional research plan/proposal was also raised in the discussions. Another point of agreement was the creation of BAPNET Task Forces, to be coordinated by the

yet in alarming proportions. Even then, the situation could be likened to an “accident” just waiting to happen; hence, urgent response is paramount.

In this light, the participants zeroed in on Fusarium wilt as a top research priority, specifically covering the following areas:

Continue to Next Page

1. Understanding diversity of pathogenic forms in relation to virulence and resistance of cultivar, of which the generation of geographical maps of *Fusarium* in Asia and the Pacific is imperative;
2. Identification of ways and means to mitigate banana wilts through appropriate biological controls, cropping system, crop management, cultural management, and measures to prevent disease spread;
3. Understanding of varietal responses and mechanism of resistances; and
4. Conducting genomic studies of pathogens.

Participants also underscored areas of potential collaboration in the regional and global levels, particularly in the following activities:

- Conduct of regional surveys, collection, and characterization of *Fusarium* isolates as basis for the adoption of standardized protocol;
- Development of regional maps of the distribution of *Fusarium* races as basis for the development and implementation of quarantine policies;
- Establishment of repository centers of *Fusarium* isolates (i.e., Mycoteque);
- Enhancement of national and regional capabilities in diagnostic;
- Varietal evaluation for wilt resistance using standard protocol and sharing of information/results (including germplasm exchange);
- Public awareness campaign for disease prevention and to influence policy makers and regulatory agencies;
- Conduct of basic research among institutions and sharing results/information;
- Development of mechanism for information sharing;
- Sourcing of regional/national funding to support activities; and
- Sharing of existing mitigation

activities and carry out multi-locational validation.

It is evident that much needs to be done in the research arena if the industry is to remain responsive to the challenges and needs of the time. But the downright show of unwavering support, through fruitful collaborations among NARS, Bioversity International and other Bioversity-coordinated networks (BAPNET, ProMusa and MusaNet), serves to affirm that the industry will continue to thrive and rise above these challenges, through hell and high waters, so to speak. ☺

Heads Up from P. 6

of fruits; Qinzhou and Pubei produced 53.33% and 22.6%, respectively, of the whole country's gross agricultural output value; and the towns of Dacheng and Wuli in Pubei produced 80% of the town's gross agricultural output value from 90% of their paddies planted with banana. Clearly, implementation of this reform has helped boost the local and national economy.

2. Enhanced production techniques

China constantly explores production systems that brings in high-yield and quality produce, and would effectively combat pests and diseases. Among these fresh initiatives are: acclimation of rooted plantlets, development and promotion of special fertilizers for banana, off-season banana production that can wither wind and winter chill, water-saving irrigation techniques for bananas in the uplands, and irrigation schedule according to the numbers of leaves (leaf area) and the growth of bunch, bunch management and harvest for improving fruit quality. Also, improved micropopagation technology has yielded about 65% of planting materials.

The interplay of all these enabling factors and dedicated and serious

efforts of the Chinese government are keys to bolstering the industry. With sustained efforts and effective resources management, China could easily maintain its position in the global banana industry. What's more? Developments in this realm would most likely expectedly trickle down to smallhold banana farmers and other marginalized rural communities, giving them a more decent and better living conditions.

(Repackaged from the paper presentation of Chunyu Li, Ruibin Kuang and Ganjun Yi during the 7th BAPNET SC Meeting on 2-5 November 2010 in Hanoi, Vietnam.)

Ongoing Research Projects of the National Agricultural Ministry

1. Banana New Varieties Breeding Project
2. '948' Project of Agricultural Ministry
3. Guangdong Cooperation Group on Preventing and Controlling Musa Fusarium Wilt Race 4

Outputs of R&D

1. Collection, conservation, evaluation and utilization of banana germplasm
2. Conservation of over 300 accessions in the genebank of IFTR
3. Breeding of new quality such as 'Guangdong No.1' (AAA, cavendish), 'Guangdong No.2' (AAA, cavendish), 'Dafeng No.2' (AAA, cavendish), Guangfen No.1 Fenjiao (ABB)
4. Evaluation of the introduced clones resistant to Foc 4 like FHIA-02, FHIA-03, cv.Rose, FHIA-23, GCTCV-119, FHIA-21
5. Genetic diversity and phylogenetic classification of banana germplasm
6. Banana cellular and molecular biology
7. Cryopreservation of *in vitro* shoot tips of banana by vitrification and its regeneration
8. Isolation, fusion and regeneration of protoplast
9. Developmental biological research with SSH-gene chip
10. Establishment of embryonic cell suspensions for cultivars and important germplasms
11. Development of a simple and efficient protocol of agrobacterium-mediated transformation of banana
12. Transformation of some resistant genes