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Editor's Note

Banana (Musa sp.), a member of Musaceae family, is commonly known as "Kala" in Bangladesh. This tropical fruit has a wide range of diversities represented by different species and varieties with distinct characters. Climate and soil are suitable for growing banana almost everywhere in the country throughout the year as backyard and commercial crop in the field. Some important local varieties are *Amrit Sagar, Sabri, Aita, Nepali Sagar, Gana Sundari* among others. It appears from BBS (FY2010-11) that banana is cultivated in about 53,000 hectare of land producing 8840 thousand MT with an average yield of 15 MT/ha.

Low yield, incidence of major diseases (Panama, Bunchy Top, Sigatoka, Anthracnose), banana fruit beetle, high post harvest spoilage, marketing glut during peak season are some constraints of banana which deserve attention for technological as well as management interventions. Development of four high yielding varieties (BARI Banana 1, 2, 3 & 4), protocol of tissue cultured plantlets, banana fruit beetle control by polythene cap, hot water treatment against anthracnose are some examples of BARI technologies, which are being transferred to the farmers in banana production zones. However, more research is needed on varietal resistance breeding for major pests and abiotic stress, post harvest management, diversified processed products and market related issues.

In our opinion, scope prevails to improve the yield and quality of banana through massive planting of tissue cultured plantlets of improved varieties, fertilizer application based on soil analysis, integrated pest management, weekly/timely irrigation, fruit care activities, harvesting properly matured fruits, proper handling, storage and transportation. If we can produce quality high yielding banana, it would be easier to enter export market competing with exporting countries like Thailand, Philippines etc.

Consumers like banana because of its year-round availability at an affordable price, good taste, high nutritive value and diversified uses.

Now-a-days, one of the major concerns of the consumers is related to forced ripening of immature banana using calcium carbide by dishonest traders for early marketing. These inferior quality bananas create health associated problems. Moreover, use of ripening chemicals accelerates the spoilage process shortening shelf life of banana. The real fact is that banana does not require chemical for artificial ripening as it produces ethylene naturally when harvested at proper maturity. However, banana after harvest can be covered with gunny bags or may be kept in ripening chamber having warm environment without any chemical treatment for proper ripening.

Production system of exportable banana in Philippines[1]

Mitul Kumar Saha[2]

Introduction

The banana industry in the Philippines was established in the late nineteen sixties when Stanfilco first planted Cavendish bananas for export to Japan. Extensive planting of bananas by Chiquita, Del Monte, Dole and Sumitomo that gave birth to the banana industry that is today. Since then it had grown and prospered, making the Philippines the second biggest exporter of Cavendish bananas **(Fig.1)** in the world.

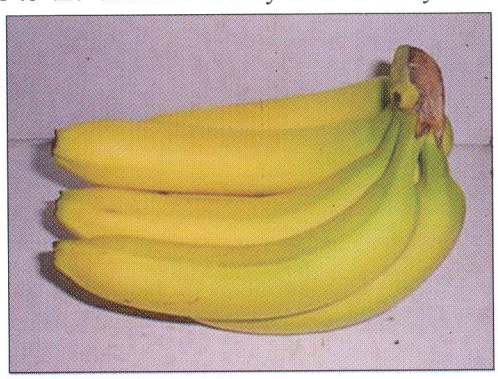


Fig.1. Popular Cavendish banana for export

[1] *This paper has been written based on the experience of study visit in Philippines*

[2] *Team Member of the Study Visit, Assistant General Manager (Supply and Value Chain, Marketing, R&D), Hortex Foundation, Dhaka-1207, Bangladesh, mitulecon@gmail.com*

These banana farms are located at Davao, in the Island of Mindanao Province[3]. Philippine banana industry is the 3rd largest producer next to India and China. It produced 9.17 million MT of banana with an average yield of 20 MT/ha. In respect of export volume (1.59 million MT) and value (US$ 319 million), Philippines ranked 4th next to Ecuador, Costa Rica and Colombia[4].

Composition and arrangement of study visit

Supply Chain Development Component (SCDC) of National Agricultural Technology Project (NATP), Hortex Foundation organized an overseas training cum study visit to Philippines from 30 March to 07 April, 2013 with the financial support from the World Bank, IFAD and Government of Bangladesh. The study team comprised of following members **(Fig.2)**:

1. *Md. Sujaul Islam, Farmer, Village: Khamarpara, Up: Mokamtola, Upazila: Shibganj, District: Bogra*
2. *Md. Ali Ashraf, Trader, Village: Raicho, Post Office: Kalirbazar, Upazila: Adarsha Sadar, District: Comilla*
3. *Mitul Kumar Saha, AGM (Supply & Value Chain, Marketing, R&D), Hortex Foundation, Dhaka-1207*
4. *Dr. Md. Abdur Rashid, Training & Communication Expert, SCDC of NATP, Hortex Foundation, Dhaka-1207.*

Fig.2. Four members' team headed by Dr. Md. Abdur Rashid

Prof. Lilito D. Gavina, Training Coordinator of the Study Visit and Director of Partnership & Special Projects under Don Mariano Marcos Memorial State University (DMMMSU), Bacnotan, La Union, Philippines-2515 facilitated the study visit by arranging scheduled training sessions, field visits, making appointments with the exporters and officials of Amigos Banana & JCY Distributor at Davao in Mindanao Province and Davao Five Star Banana Corporation, Technology Resource Centre (TRC), Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) under Department of Science and Technology (DOST), University of the Philippines Los Banos (UPLB) and International Rice Research Institute (IRRI). The training sessions were held at five different venues like DMMMSU, PCAARRD, Crop Science Cluster-Institute of Plant Breeding (CSC-IPB) under UPLB, Post-harvest Horticulture Training and Research Center under UPLB and National Institute of Molecular Biology and Biotechnology (BIOTECH, UPLB).

Banana varieties

Banana is one of the most important crops in Philippines both for domestic consumption and export markets having 91 distinct banana cultivars of which 47 desert types, 37 cooking types and 7 dual purposes (consumed either fresh or cooked). Major classification of banana is *Musa acuminata* - these are the table or dessert types of banana and *Musa balbisiana* are the staple or cooking types of banana. Most popular banana cultivars grown in the Philippines are Saba (most important cultivar), Tumok (known as giant Cavendish in Central America), Lakatan, Latundan, Bungulan, Cardaba. Some new promising varieties from INIBAP (International Network in Banana and Plantain- based in France) are FHIA 3, FHIA 17, FHIA 21 and FHIA23.

Production practices

In Philippines, four types of banana production practices are followed like i) large scale commercial plantations for export, ii) small & medium size plantations for domestic & export, iii) mixed crop production system for domestic market and iv) backyard plantation. Major sources of planting materials are from tissue culture (TC), eye buds of suckers and sword suckers of mother plants.

Tissue cultured plantlets **(Fig.3 in next page)** are preferred by farmers due to following advantages:

- ❒ free from virus diseases
- ❒ become true-to-type that is maintaining the characteristics of mother plants
- ❒ survive better under stress climatic conditions
- ❒ produce higher yield and shorten maturity period from planting to harvesting
- ❒ growth is uniform facilitating synchronized harvest
- ❒ available any month of the year for planting and thus ensure quality of supply banana in the market.

[3] *Davao City Chamber of Commerce & Industry, Inc.*
[4] *FAOStat 2011*

Fig.3. Uses of garden soil and coconut coir dust by 1:1 ratio at growing stage for TC plant preparation at CSC-IPB, UPLB

Some requirements of banana farming

Following conditions are needed at the farm:

- Tropical climate, optimum temperature is about 25-30°C
- Slight to moderately sloping land (less than 15% slope)
- Well drained, water retentive loamy soil having pH 4.5-7.0
- High nutrient content soil with at least 2% organic matter
- Planting in high land and avoid water logged areas
- Areas with low wind velocity (18-36 kph) and rainfall (20-60mm)
- Facilities for irrigation per week
- Two people should manage the first 4 ha of banana farm and then every additional of 4 ha, one full time employee is necessary.

Fertilization

During field plantation of banana, the amount and kind of fertilizers are applied depending on soil nutrient analysis, plant tissue culture analysis and plant nutritional requirement. For poor soils, fertilizers should contain N-P-K at a ratio of 3-1-6. The ratio is doubled when fertilizers are applied to young plants. The amount of fertilizer applied increases as the tree matures. At flowering and fruiting period, a tree needs five to six pounds of complete fertilizer.

Major diseases and insects

1. Bacterial diseases caused by *Ralstonia solanacearum* (race 3), bacterial wilt and fruit pulp discoloration.

Control measures:

i. Early detection and eradication of infected plants. Eradicating plants surrounding the infected area within 6m radius to prevent further spread.

ii. At least 3 month fallow period. Removal of sucker re-growths and weeds in the area.

iii. Tool disinfection with quaternary ammonium chloride. Strict quarantine (e.g. in infected mats in an area) and phytosanitary measures.

2. Virus diseases: Bunchy top, Mosaic and Bract Mosaic

Bunchy top disease- caused by banana bunchy top virus (BBTV)

Mosaic - banana strain of the cucumber mosaic virus (CMV)

Bract Mosaic - banana bract mosaic virus

These three viruses are transmitted by several species of aphids (in banana plantations, the common aphid is *Pentalonia nigronervosa).*

Control measures:

i. Use of virus free/screened tissue culture planting materials.

ii. Early detection and prompt eradication of infected plants to minimize spread.

iii. Mat and stem spray to reduce aphid population.

3. Fungal diseases: Panama Wilt, Sigatoka and Freckles

Panama/fusarium wilt - is caused by *Fusarium oxysporum f.s. cubense*

Sigatoka leaf disease - is caused by *Mycosphaerella fijiensis*

Freckle - is a leaf and fruit spotting disease of banana caused by *Phyllosticta musarum.*

Management measures of fungal diseases:

Panama wilt: Eradication of infected mat and use of resistant varieties.

Sigatoka: a combination of cultural and chemical methods (removal of diseased leaves and spraying).

Freckle: removal of lower, diseased leaves to reduce inoculums levels and polythene bagging of bunches

(Fig.4 in next page).

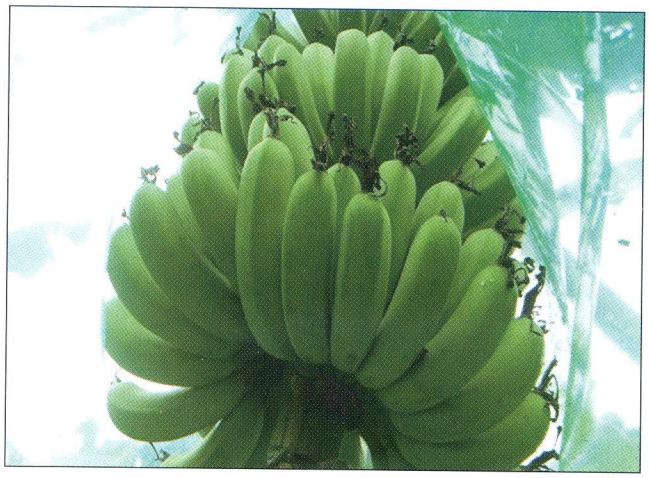


Fig.4. Polythene bagging of banana bunch for export

4. Major insects

i. Thrips: Bud injection with insecticide is recommended-

a. Confidor 100SL @1.50ml/L water (common name: Imidacloprid) or
b. Success 25SC @ 1.25ml/L water (common name: Spinosad) or
c. Agrimek 1.8EC @3.0ml/L water (common name: Abamectin-Bio).

ii. Aphids: Transmits "bunchy top" and mosaic viruses. Suggested management includes virus disease vector control, search & destroy strategy, control aphids in the site of infection during eradication of infected mat by application of Basudin 60EC @1.5g (common name: Diazinon) after chopping the infected mat, spray again with insecticide.

iii. Corm weevil: Cultural and mechanical method of management is sufficient to suppress corm weevil. However, implement pesticide application only when population count shows four (4) adult weevils per trap.

a. ***Cultural procedure:*** *Dig out remaining pseudostem of harvested mother plant with severe corm weevil damage and chop into pieces to hasten drying. In case, there is heavy infestation, this practice should be done even to newly harvested plant. However, instead of digging out, chop at the base at the ground level and cover with soil. Implement base cleaning to disrupt oviposition of gravid female weevil.*

b. ***Mechanical procedure:*** *Install 60 split pseudostem traps per hectare. Collect trapped adult weevil after 72 hours. Trapping of adult weevils will be done at one cycle a month for two months. Continue trapping in case population of the weevil is high.*

Contract farming in Davao, Philippines

In Davao, small-medium-large (01ha to 100ha plot size) type banana contract farming system is followed for export. Every exporter has own packing house and Quality Inspector. Growers (10ha-20ha) have also their own packing house. Under contract farming, company/exporters provided inputs (major fertilizers, pesticides) support to their contract farmers with production and post-harvest management technologies maintaining export quality as per set standards[5]. Company/Exporters followed current market price strategy for buying banana from their contract farmers as per fulfilling of set quality standard. Normally, exporters *(Davao Five Star Banana Corporation,* **Fig. 5**) provided per box (13.5kgs) price of banana to their contract farmers, 220peso (5.5 US$/13.5kgs), i.e. 16.30 peso/kg (0.40US$/kg) as per export standard. Every company followed their own standards for banana production and marketing.

Fig.5. Discussion meeting with Mr. Nelesen Te, Manager to know their contract farming system and set standards for export

Many of the large exporters in Davao followed over 100ha plot size for commercial banana production under contract farming system. DOLE (USA) have 20000ha of land under contract farming in Davao for export mainly to Japan, China, Korea, Dubai, UAE, Iran, Iraq and other Middle East countries. Other major importers of banana from Davao are SUMITOMU CORPORATION (Japan), Del Monte (Middle East), UNIFOOD (Philippines), SUMIFRU (Japan) and ROYAL (Japan). Cavendish is the major export variety, but in Japan highland mountain variety is also preferred.

[5] *The study team collected Davao Five Star Banana Corporation's own standards of BANANA MAN BRAND (Quality Specification, Defects with Tolerance and Defects with Zero Tolerance Indicators) maintaining their strict export quality. Interested exporters are requested to communicate with author of the article for details information about set standards of banana including cost & margin analysis of export.*

Harvesting and post harvest practices

Maturity indices

Degree of fullness of the fingers, i.e., disappearance of angularity in a cross section. Bananas are harvested mature-green and ripened upon arrival at destination markets since fruits ripened on the plant often split and have poor texture.

Harvesting

Employ two persons, one cutting the trunk and the other one to catch the bunch

Use shoulder pad to protect fruits

Avoid dropping fruit bunches

Minimum ten months are required for banana harvesting

Better harvesting time February to May

Quality indices

Maturity (the more mature the better the quality when ripe)

Finger length (depending on intended use and demand for various sizes)

Free from defects, such as insect injury, physical damage, scars and decay

As bananas ripen their starch content is converted into sugars (increased sweetness). Other constituents that influence flavour include acids and volatiles

Market preparation

Remove dried flower (floral) parts and dehand bunches

Trim the crown

Wash in 5% alum[6] solution (50gm alum/liter of water) to prevent latex staining

Sort fruits according to size and quality (free from defects, mechanical damage and overripe fruits)

Temperature & controlled atmosphere (CA)

13-14°C (56-58°F) for storage and transport, 15-20°C (59-68°F) for ripening and Optimum Relative Humidity 90-95%

Responses to ethylene for ripening

Most commercial cultivars of bananas require exposure to 100-150ppm ethylene 24-48 hours at 15-20°C (59-68°F) and 90-95% Relative Humidity to induce uniform ripening. Carbon dioxide concentration should be kept below 1% to avoid its effect on delaying ethylene action. Use of a forced-air system in ripening rooms assures more uniform warming of bananas as needed and more uniform ethylene concentration throughout the ripening. Ripe bananas are kept in a cool dry place avoiding refrigeration.

Responses to controlled atmospheres (CA)

Optimum: 2-5% O_2 and 2-5% CO_2. CA delays ripening and reduces respiration and ethylene production rates.

Post harvest life potential of mature-green bananas: 2-4 weeks in air and 4-6 weeks in CA at 14°C (58°F).

Exposure <2% O_2 and/or >7% CO_2 may cause undesirable texture and flavor. Use of CA during transport to delay ripening facilitates picking bananas at the full mature stage.

[6] *Hydrated Potassium Aluminum Sulfate (Potassium alum). More widely alums are double sulfate salts.*

Packaging

Fruits packed in crates (plastic crates, wooden crates and paper cartons) as tightly as possible to prevent bruising due to vibration during transport. Bananas are wrapped in perforated polythene sheets **(Fig.6)** to prevent abrasions which result in unsightly bruises during export.

Fig.6. Banana wrapping by perforated polythene

Banana processing

Minimal processing - washing, slicing, cutting, packaging and chilling

Secondary processing - processing to produce shelf stable products

Storage

Green and damage-free fruits are packed in 0.05mm polyethylene bags with ethylene absorbent. Bananas are stored at temperature not lower than 12^{0}C.

Value addition in banana

Fig.7. Processed Saba banana (chips for export)

The processing and value addition of banana increases returns to growers and can overcome price fluctuations. The main commercial products will be made possible from bananas are canned or frozen purée, juice, banana powder, flour, starch, flakes, stem candy, chips/crisps **(Fig.7),** canned slices, jam, ketchup and fermented products like wine, beer, vinegar etc. Further, banana fiber is manufactured into rope, sack and mat. Sheets of paper and paper boards are also made from banana peel. Banana blossom is also exported dried from Philippines.

Marketing channel

In banana supply chain, key actors are farmers, policy makers, private sector companies (financial support systems, technical services like infrastructure and research) and market services. Following marketing channels of banana in Philippines were observed during the study visit as under:

i. Farmer-Agent-Assembly points

ii. Farmer-Agent-Nasspit port-Manila port-City wholesale market-Retail market

iii. Farmer-Agent-Nasspitport-Manilaport-Provincial wholesale market-Retail market/Street vendors

iv. Farmer-Agent-Nasspitport-Manila port-Terminal market in another province-International buyer

v. Farmer-Exporters processing centre-Davao Sea Port (Mindanao)-Export market

Export market

The largest export markets of Philippines bananas are China due to flexible quarantine systems and without Maximum Residue Level (MRL) checking (only checking mealy bug in fruits). On the other hand, Japan and Australia markets are very strict because of maintaining strict quarantine and quality compliance. Other major export markets are USA (free market), European Union *(32% of world market),* Middle East, South Korea, Hong Kong, Singapore, Russia, New Zealand, Egypt, Canada, Japan, Australia etc.

Lessons learned

Some lessons learned from Philippines study visit are:

- ❒ Philippines use tissue culture plantlets for massive planting of banana
- ❒ Only five functional leaves are sufficient in each banana plant for quality production and minimum four functional leaves are needed at harvest time of banana
- ❒ Every commercial farm followed proper practices of fruit care operations and post-harvest management ensuring quality as per set standards
- ❒ Fruits age should be minimum of nine weeks but not exceeding 10 weeks and finger length will be 6.5// to 7// for export
- ❒ Minimum of 12 fingers/hand and uniformity of banana hands should be strictly followed for export
- ❒ Fruits from flooded areas will not be accepted for export
- ❒ Avoid rough, under cut and over cut crown trimming
- ❒ No high pack allowed, pack should be 13.5 to 13.8 kg/box for export **(Fig.8)**

Fig.8. Food graded banana carton is ready for export (each box contain 13.5 kg)

- ❒ Packing House Quality Inspectors have the right to stop processing/packing, if the Packers or Growers will not follow the specification given in the quality standard
- ❒ Defects with Zero Tolerance principle strictly followed for quality assurance to satisfy the international buyers.

Recommendations

- ❒ Promote commercial banana production by using tissue culture planting materials in Bangladesh.
- ❒ Promote concept of Good Agricultural Practices (GAP), FARM to MARKET approach and supervised group farming/contract farming system of banana in Bangladesh.
- ❒ For successful banana production, following fruit care operations should be maintained for better quality and productivity:
  - ➢ deleafing/fruit obstacle removal
  - ➢ propping/guying
  - ➢ deflowering
  - ➢ defingering
  - ➢ hand pruning
  - ➢ debudding
  - ➢ ribbon placement
  - ➢ color polythene bagging of immature fruits in the bunch of the plant
  - ➢ bunch spray.
- ❒ Awareness should be created for the banana farmers as per appropriate maturity indices for harvesting and quality control.
- ❒ Ensure banana washing/cleaning, hot water treatment immediately after harvesting, ripening chamber, storage facilities, cool chain transportation and packaging both for local and export market.
- ❒ Promote processed/value added banana products both for local and export market.
- ❒ More research and development activities are needed and intensifying germplasm management, collection, conservation, characterization & evaluation for varietal diversity.

Conclusions

Productivity and quality of banana can be improved in Bangladesh by planting tissue cultured plantlets. Integrated nutrition, water and pest management and adopting fruit care practices, timely harvest, proper storage and promoting natural ripening among other measures. It is expected that the trained persons of Hortex Foundation from the hands-on-training cum study visit will act as resource persons to train further banana producers, exporters and other stakeholders involved in the banana supply chain.

Hortex news in brief

The 92nd meeting of the Governing Body of Hortex Foundation (HF) was held on Wednesday, 17 July, 2013 at its conference room under the Chairmanship of Dr. S M Nazmul Islam, Secretary, Ministry of Agriculture, Government of the People's Republic of Bangladesh and Chairman, Hortex Foundation. The meeting discussed on various administrative issues and policy directives were given.

Production and marketing advisory services

In the reporting period July-September 2013, the Foundation provided production (08 nos.) and marketing (25 nos.) oriented support services to the different entrepreneurs, producers, exporters, NGOs and cool-chain transportation (52 round trips for 10 companies) support for different business organizations. The notable among the recipients including marketing services are:

Service recipients	Service provided on
Md. Habibur Rahman Khan, Managing Partner, Intent Agro, Jhenaidah (02-07-2013) and (18-08-2013)	As a new entrepreneur & exporter, provided advisory services regarding mushroom production and market linkage development. Further, linked with SCDO's of Kapasia, Belabo, Delduar, Sreemongal, Savar collecting fruits and vegetables for export to Spain. Also linked with Mysa Corporation for export quality packaging development and given export cost & margin analysis of green chili on UK market.
Shafiqur Rahman, Executive Director, SEHAF Bangladesh (NGO), Savar (02-07-2013 & 22-08-2013)	He was given services on fresh vegetables and fruits domestic and export business plan including marketing strategy of bio-fertilizers and pesticides at local market. Developed linkage with AgroBiz supplying vegetables to USA and Green Hort Enterprise, Savar for minimally processed vegetables.
Mr. Zia Hassan, MD, Fish N Fresh, Chittagong (07-07-2013)	As a new entrepreneur of fish marketing, given information on supply chain management of fish for their two outlets in Dhaka.
Mr. Zahid, Access Corporation, S K Mujib Road, Chittagong (09-07-2013)	As a new exporter, provided potato buyers list on Malaysia, Singapore, Sri Lanka, Nepal and Ukraine for export of diamant and granola variety potatoes.
Md. Mynul Islam, Kustia (14-07-2013)	Provided information on integrated farming of duck, pigeon, fish and vegetables incl. Good Agricultural Practices (GAP) and marketing strategy both for local and export markets.
Dr. M. Nazim Uddin, Scientific Officer, HRC of BARI (28-07-2013)	Provided updated data and reports of organic food and farming status in Bangladesh for The Asian Food and Agriculture Cooperation Initiative (AFACI)-BARI project meeting on Construction of the Asian Network for Sustainable Organic Farming Technology (ANSOFT) which was held on August 20, 2013 in Dhaka, Bangladesh.
APJORD Publication, CIRDAP (29-07-2013)	Provided comments reviewing the article on vegetables market integration in Bangladesh: An Empirical Study of Error Correction Model.
Md. Habibur Rahman Khan, Intent Agro, Dhaka (18-08-13)	As a new exporter, provided guidelines, suppliers & packaging industry address for fruits and vegetables export to Spain.
Md. Shahjahan Ali (Badsha), MD, Maa Moni Krishi Khamar, Ishwardi, Pabna & Director, Governing Body of Hortex Foundation (19-08-2013)	Linkage development with Rahim Afrooz (Agora), ACI (Shwapno) for local marketing of Custard Apple. Further, linked with Md. Iqtadul Hoque, Proprietor, M/S. Ahmed & Company, F/2 (80) Bashbari (1st Floor), Mohammadpur, Dhaka-1207 for export fresh Custard Apple in Middle East (mainly in Dubai).

Service recipients	Service provided on
Mr. Fazlul Karim, Managing Partner, AgroBiz, Motijheel, Dhaka (20-08-2013)	As a new exporter, he was given services on exportable fruits & vegetables list, 10 upazila CCMC contact address including SCDC products & potato international buyers list, potato export costing, article on potato. Further, linked with Kisan botanix and Syngenta procuring fresh potato for export to Malaysia and Singapore. He was also linked with Mr. Usman Goni, Ullokhola, Gazipur collecting tomato, brinjal, stolon of taro, YLB, green chilli for export to UAE, KSA, Malaysia and Singapore.
Ahmed Rahman Sagar, Managing Director, KTS Logistics Ltd. Dhaka (20-08-2013)	As a new freight forwarding/shipping company, linked with Mr. Kenny for pineapple, banana export to Russia, Georgia and Ukraine by sea shipment. Further, he was linked with Mr. Habib for fruits and vegetables export to Spain by air shipment.
Mr. Ershad Ahmed Bhuiyan, AGM, Taiwan Food Processing Ind. Ltd, Dhaka (21-08-2103)	Provided technical and cash incentive info on agro-commodity export designing project plan on canned pineapple and baby corn for 100% export to Taiwan, China, Japan and USA.
Mr. AFM Fakhrul Islam Munshi, Chairman, ADOB and Director, Governing Body of Hortex Foundation (21-08-2013)	Forwarded business opportunity query on natural honey export to Japan (100MT/Year) as set standard. The test for antibiotic, tetracycline, streptomycin, chloramphenicol and C13 tests are needed each lot before export by 290-300Kg/Iron-Can (60 Iron-Cans/20ft-Dry Fcl.
Dr. Md. Alamgir Hossain, PSO, Agricultural Economics Division, BARI (22-08-2013)	He was given services on updated export status of fruits & vegetables with market analysis report on year 2013 for their project on potentialities of major fruits farming, marketing system and price behavior in hill regions of Bangladesh.
BanglaDutch Developments Ltd. (26-08-2013)	Provided technical info on fresh pineapple quality management before harvesting, test kit for chemical detection and quality compliances of canned pineapple juice. Pineapple should be harvested after physical maturity as natural condition. Forced pineapple induction method can be introduced (using naphthalene acetic acid) for off-season production. Above 12% sugar is required for pineapple juice.
Dr. Wais Kabir, Executive Chairman, BARC (Aug. 26 & Sept. 26, 2013)	Provided status report on average per capita per day food requirement, desirable diet for Bangladesh including brinjal export statement during 2007-2012.
Md. Abu Layes, Rising Group, Mirpur-2, Dhaka (27-08-2013)	As a new entrepreneur, provided mango hot water treatment plant info both for domestic and export (Middle East) marketing from Chapainawabganj.
Md. Nasir Uddin, Baghdad Enterprise, Kazipara, Mirpur (08-09-2013)	As a new entrepreneur, he was given services on fruits & vegetables production and supply chain management system to involve trade business and supplier of fruits & vegetables from Keraniganj, Dhaka.
Mr. Reaz Uddin, Maximeenko Leonid, Ukraine (09-09-2013)	As facilitator, communicated with buyer of Ukraine promoting export of frozen vegetables and agro-processed items from Bangladesh through alibaba.com
APJORD Publication, CIRDAP (19-09-2013)	Provided comments reviewing the article on an economic analysis of apple production, area and yield in district Shopian (India).
Mr. Bimal Ch. Kundu, TCRC, BARI (19-09-2013)	Provided status of fresh potato export in Bangladesh during FY2008-09 to 2012-13 including potato article published at Hortex Newsletter.
Ms. Rahat Banu, Stamford University, Dhaka (19-09-2013)	Provided info and reports on Bangladesh agriculture highlighting GDP growth, employment, foreign exchange earnings, problems & prospects, forward & backward linkage industry, export status of fruits & vegetables.
Dulal Ch. Sarkar, Consultant, SOJAG (NGO), Dhamrai, Dhaka (23-09-2013)	Provided business plan for marketing of their lemon and aromatic rice both at local and export market.
Mr. Monjurul Islam, Advisor, BFVAPEA, Dhaka (Sept. 24 & 25, 2013)	Provided export status of fresh fruits and vegetables in Bangladesh during FY2004-05 to 2012-13 including success story on Pakistan mango export to UK maintaining GlobalGAP standard and shared interested buyer SAI INC. (saiinc@live.com) importing agro produces from Bangladesh.
Md. Mamun Hossain, Business Manager, Direct Fresh, Banani, Dhaka (29-09-2013)	As a new entrepreneur, he was given services on banana cold storage test result of BARI, post harvest management technologies incl. hot water treatment procedure for domestic marketing of banana in association with Fresh and Safe Agro Ltd.

Square Tissue Culture Lab Visit

Dr. S M Monowar Hossain, Managing Director and Mitul K. Saha, AGM (Marketing), Hortex Foundation visited Square Agro Development & Processing Ltd unit at Uttara, Dhaka on 17 August 2013 to see their tissue culture lab activities producing different varieties of banana *(Sagar, Kabri, Champa, Agnishwar, Sabri* and one Kenyan variety) potato, orchid and strawberry tissue culture plantlets. Square lab produced 25000 pieces of TC plantlets/year of different targeted crops. After lab visit, Hortex team attended in the meeting with the Square officials Mr. Jayanta Dutta Gupta, Ms. Nafisa Akhter Rouf among others. The meeting decided varietal diversity in supply network is very important. Square can explore new avenue on agro-export oriented program where Hortex can facilitate extending the supply network of TC planting materials, MD of Hortex said.

Discussion meeting with ADB TA Team

A discussion meeting held on 18 July 2013 at Hortex with the ADB TA Team including Mr. David A. Lucock, Financial Sector Consultant regarding agricultural food value chain in Bangladesh. Managing Director of Hortex Foundation emphasises farmers' empowerment in production and marketing management.

Consultation meeting with JICA Study Team

Hortex Foundation organized a consultation meeting held on 01 August 2013 with the JICA Fact Finding Study Team headed by Ms. Fumiko Ikegaya (Kaihatsu Management Consulting Inc., Japan) to identify major obstacles promoting agribusiness including potential areas where agricultural finance and technical assistance to be needed in Bangladesh. For addressing whole supply chain, the meeting identified specific three fruits like mango, banana and pineapple for intervention of Good Agricultural Practices (GAP) and traceability system maintaining quality and safety both for domestic and export markets. Hortex will play the facilitation role implementing any projects and let us do something as substantial basis, Managing Director of Hortex said.

Direct marketing of banana from Kapasia

AGM (Marketing), Hortex Foundation along with marketing expert of SCDC, officials of Fresh and Safe Agro Ltd. & Direct Fresh visited Manik Bazar, Khirati, Kapasia on 05 September 2013 assessing fresh & safe banana *(var. sagar, champa, sabri and Bangla Kala)* marketing from Kapasia to Dhaka city market using hot water treatment and quality packaging facilities for the private company *(joint collaboration of Fresh and Safe Agro Ltd and Direct Fresh)* with the support of SCDC and Hortex Foundation.

Nine farmers from banana Common Interest Group (CIG) and local traders attended in the meeting held at Manik Bazar. The farmers attended in the meeting reported that they are producing 04 types of banana like *Sagar, Champa, Sabri and Samay/Bangla as* the main crop in the area. They also reported that good quality banana sucker and tissue culture plantlets are not available in the area. They are using local sucker for plantation collected from neighbor farmers. Local traders are the main buyers of their banana, they added. They further expressed eagerness to inputs support; improve marketing techniques in selling banana with higher returns and direct linking with the marketing company.

Mr. S I Khan, Fresh and Safe Agro Ltd briefed to the farmers on his main objectives of the visit procuring quality banana from this area to ensure safe banana supply to the Dhaka City consumers. Marketing Expert, SCDC of NATP shared existing activities of SCDC in this area highlighting supply chain management and opportunities of banana direct marketing to Dhaka.

Mr. Mitul K. Saha, AGM, Hortex Foundation conducted meeting and shared necessity of banana quality improvement for domestic as well as export opportunities and brief of Hortex activities. Farmers expressed interest on direct marketing with the private companies as per demand. After meeting, the team visited Md. Zakir, Mr. Islam and Md. Fazlul Haque's banana garden and observed variety, size and quality of their produces.

Major workshop/seminar/meeting participation

During the period July-September 2013, Hortex officials attended a number of seminars, workshops, trainings and discussion/policy meetings on various issues related to production, marketing and export of agro-commodities. Some of them are as follows:

(i) In 01 July 2013, Dr. S M Monowar Hossain, Managing Director of Hortex Foundation presented power point presentation to 41st meeting of Agriculture Ministry related Parliamentary Standing Committee under 9th National Parliament at Cabinet Room of National Parliament on Hortex and SCDC activities including Hortex role on horticultural crops and other high value agro-commodities export during FY2012-13.

(ii) Meeting held on 10 July 2013 at Hortex with Kisan Botanix Ltd., Dhaka highlighting potato export. In this regard, linked with Mr. Zahid (Chittagong) supplying fresh potato for export to Brunei.

(iii) Hortex Foundation organized meeting of 6th National Working Group (NWG) for Organic Farming in Bangladesh held on 15 July, 2013 to finalize draft policy and standards of organic crops and aquaculture. The meeting also finalized 21 members for National Task Force (NTF) of Organic Farming in Bangladesh submitting to the Secretary, MOA and Chairman, Hortex Foundation. The meeting was chaired by M. Ahsan Ullah, Convener, NWG and Director, Governing Body of Hortex Foundation.

(iv) The end of assignment seminar for M Saidur Rahman, International Project Management Specialist (SCDC), organized by SCDC held on 23 July 2013 at Hortex conference room. Dr. Md. Abdur Razzaque, PD, PCU, NATP presided over the seminar.

(v) AGM (Production), Hortex Foundation attended in the workshop on strengthening food standard formulation in Bangladesh held on 23 July 2013 at Institute of Public Health organized by BSTI in collaboration with FAO Food Safety Project.

(vi) Managing Director, Hortex Foundation attended in the meeting with the Vietnamese Delegation including State Minster under Ministry of Agriculture and Rural Development, Vietnam held on 01 August 2013 at BARC, Farmgate, Dhaka.

(vii) SCDC organized seminar under draft report on post harvest management and quality assurance of high value horticultural crops held on 05 August 2013 at Hortex conference room. Dr. M L Chadha, Post harvest management & QA Specialist (International), SCDC presented the keynote paper while Dr. S M Monowar Hossain, MD of Hortex Foundation presided over the seminar.

(viii) Attended in the 42nd meeting of Agriculture Ministry related Parliamentary Standing Committee under 9th National Parliament at Cabinet Room of National Parliament held on 25 August 2013.

(ix) SCDC organized workshop on post harvest management and quality assurance of high value agro-commodities held on 03 September 2013 at Hortex. Dr. M L Chadha, Post harvest management & QA Specialist (International), SCDC presented the keynote paper. Dr. Wais Kabir, Executive Chairman, BARC was present as the chief guest while Dr. S M Monowar Hossain, MD of Hortex Foundation presided over the workshop.

(x) AGM (Marketing), Hortex attended in e-Learning course on the GLOBALGAP standard for Greater Market Access jointly organized by National Productivity Organization (NPO), MOI, GOB and Asian Productivity Organization (APO, Japan) held on 10-12 September 2013 at Global Distance Learning Centre, BRAC University, Aarong House (18th Floor), 66 Mohakhali C/A, Dhaka.

(xi) SCDC organized meeting highlighting CCMC based savings fund raising and operation held on 15 September 2013 at Hortex conference room under chairmanship of Managing Director, Hortex Foundation.

(xii) Meeting held on 16 September 2013 with M. Senthil Kumar highlighting his experience in Ghana on banana hot water treatment using immediate after harvest by 48-50^{0}C for 10 minutes benefiting shelf life increment, control ripening delay, disinfect of insects and diseases to keep the fruit long time storing at 13-15^{0}C and 85-90% RH for 6 weeks. Hot water treatment control enzymes to produce ethylene delaying 4-6 days. Before hot water treatment of banana, 80-85% harvesting index should be followed.

(xiii) Attended in the 43rd meeting of Agriculture Ministry related Parliamentary Standing Committee under 9th National Parliament at Cabinet Room of National Parliament held on 22 September 2013.

(xiv) Meeting held on 23 September 2013 with Mr. Afzal Hossain Bhuiyan, Manager-Public Sector Engagement/CSISA-MIiDE Bangladesh highlighting cool chain, mechanization and irrigation management for agro-commodities.

(xv) Meeting held on 23 September 2013 with the President and GS of BFVAPEA highlighting development of consortium submitting proposal jointly with BCAS on G4AW project under Netherlands Space Office.

(xvi) Meeting held on 26 September 2013 with Mr. Abdur Rashid, Managing Director, Foshol Ghar Ltd, Motijheel highlighting organic products marketing at 1000 households in Dhaka.

(xvii) Meeting held on 26 September 2013 with Mr. Nurul Hoque, Chairman & CEO, Agro Asia Impex Ltd, Dhaka highlighting fresh pineapple and banana export to Dubai and provided technical info on banana hot water treatment, pineapple processing including Hortex & SCDC publications.

Highlighted activities under SCDC of NATP

Supply Chain Development Component (SCDC) of National Agricultural Technology Project (NATP) being implemented by Hortex Foundation carried out 03 training programs on CCMC operational guidelines at Trishal and agro-based entrepreneurship development at Savar for developing supply chain in the project sites during the period under report. A total of 158 different stakeholders participated in the training program including 116 CIG farmers, 02 DoF officials, 11 LEAFs and members of 09 MMCs and 20 entrepreneurs. Out of 158 participants trained, 124 were male and 34 female. Resource persons were invited from East-West University; Specialists from DoF including National Experts of SCDC of NATP, Hortex Foundation.

Workshop on post harvest management and quality assurance of high value agro-commodities

SCDC also conducted 4 (four) workshops/seminars on post-harvest management and quality assurance of high-value agro-commodities, orientation on SCDC business model and CCMC market linkage development for sharing knowledge among the participants.

A total of 393 different stakeholders participated in the workshops including CIG farmers, traders, exporters, transporters, loaders, UPOs, UzPOs, MMC members, Upazila officials, PD of PCU, NCs of PCU, Director of PIUs, International Specialists of SCDC, Faculties of Universities, representatives from PKSF, BSTI, FAO, WB, Superstore Owner Association, Private Companies, Research & Government Organizations (i.e. BARC, DAE, DLS, DOF AIS, DAM) including Hortex & SCDC Experts. Out of 393 participants, 327 were male and 66 female. Resource persons from BAU, DAE and National/International experts of SCDC delivered their speech.

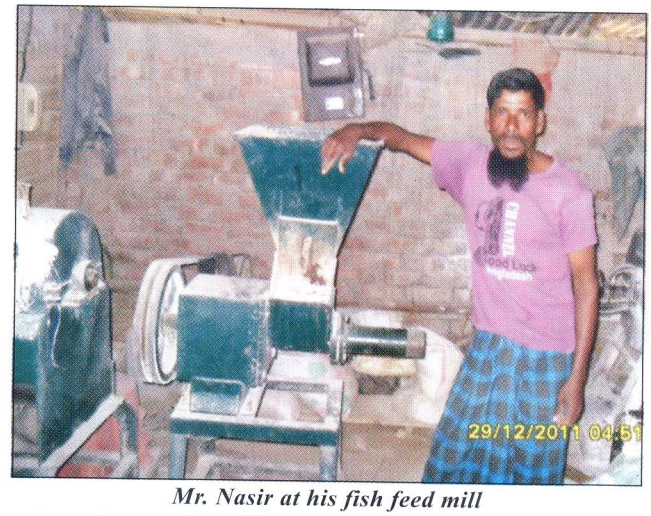
Meeting with the officials of private marketing companies where Nicola Drago attended

SCDC organized meeting with the marketing companies (Rahimafrooz, ACI, Timely Investment) at Hortex conference room and presented status paper to orient them about the progress of SCDC activities where Mr. Nicola Drago, Supply Chain Development Consultant/IFAD, the advanced team of 11th ISM of the World Bank attended.

SCDC, Hortex Foundation success story - 4

Nasir Uddin, a Successful SCDC Entrepreneur

Mr. Nasir Uddin, a small farmer of Nandura village of Atmul union under Shibganj upazila of Bogra district has set an example to start as a fish feed producer and showing a big success as an entrepreneur. Now, he is the owner of a fish feed mill (pellet machine) at Shibganj for manufacturing and selling fish feed to the fish farmers around the upazila. He was one of the farmers who had gone through the Business Development Training at Shibganj conducted by SCDC of NATP, Hortex Foundation.



Mr. Nasir at his fish feed mill

Initially, Mr. Nasir started his business by establishing a small rice mill in his village. Later on he was trained in 2010 by SCDC on business development. Thus, he has shown his interest by establishing a fish feed mill for expansion his business.

SCDC organized business development training and arranged exposure visit for Mr. Nasir in Adamdighi, Bogra and Mymenshingh to introduce him with the local fish feed manufacturer and machine already used over there. After the exposure visit, Mr. Nasir was motivated for establishing fish feed mill as an enterprise, which he was dreaming for long time but could not achieve due to lack of proper guidance and financial support. Mr. Nasir said that SCDC's training increased his knowledge and skills regarding fish feed manufacturing.

As a result of SCDC intervention, Mr. Nasir is now manufacturing the quality fish feed and selling at a lower price of Taka 25/kg which was earlier purchased by the fish CIG farmers at Taka 35/kg from the local market. CIG farmers harvested 55-60 kg fish/decimal of water body in a 90 days production cycle using local market feed. Now, fish production per decimal of water body increased to 70-75 kg using Nasir's fish feed.

CIG farmers expressed satisfaction as they got 30% higher fish yield by reducing the feed cost about 29% i.e. Taka 8-9/kg. Mr. Nasir is happy to earn Taka 12000/month from his fish feed enterprise and which also created employment opportunity for local women labor. Further, he invested some money earned from the fish feed enterprise to rear a milking cow and rented-in a piece of land for improving his livelihood and well being.

Local women labor is working at Nasir's feed mill

Mr. Nasir now feels proud for establishment and running the fish feed enterprise, his status in the community is up-scaled. People respect him for providing the services in the doorstep of the CIG farmers. Thus, his effort is not only contributing village economy, but also motivating youth to become a successful entrepreneur like him.

As recognition, SCDC sent him as one of the members of study visit team to Thailand in 2013 on post harvest management practices and marketing of fishes. On return, he shared his experience with the CIG and Non-CIG farmers on quality assurance of fish and feed.

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