

## Knowledge Mapping Workshop

INTERNATIONAL NETWORK ON PRESERVING SAFETY AND NUTRITION OF INDIGENOUS FRUITS AND THEIR DERIVATIVES

19-21 September 2011

### Postharvest Management of Indigenous Fruits for Better Quality and Safety

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19 Sept, 2011

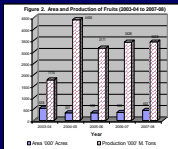
## Presentation Outline

- Introduction
- Current PH practices & value addition
- Problems of PHM and Value Addition
- Status of Quality Assurance System & Safety Hazards
- R & D Support in PH & Value Addition & problems of R&D institutions
- PH and Processing Technologies
- Recommendations
- Conclusion

## Introduction

- Growth in fruits & vegetables production has increased

- More than 70 fruits of which about 47 are indigenous grown in Bangladesh



Area & production of fruits

**Production of fruits: 3.49 Million tons**

- Post harvest handling practices are under developed
- Losses occur in different points of the supply chain.
- Estimated PH losses are about 25-45%.**

PH food loss translates not just into human hunger and financial loss to farmers but into tremendous environmental waste as well.

## Current Post-harvest Practices

- Harvesting is done at any time of the day
- Knowledge on maturity indices is often inadequate. **Sometimes immature and over mature produce are harvested.**
- Minimum sorting and grading is done
- No/little washing/cleaning & if washed, use dirty/polluted water
- Packaged in gunny bags, used fertilizer sacks, bamboo baskets, some cases plastic crates etc. - **provide little protections**
- Tightly & haphazardly packed fruits are transported through unventilated heavy loads

## Current Post-harvest Practices

- Traders/workers use full sacks and basket of produce as seats while transporting the produce to distant markets
- Unloading, reloading and handling are made roughly - **cause substantial PH losses**
- No storage facilities in the production areas or rural and urban markets
- Retail markets are unpaved, open to dust, rain and sun
- Fruits are kept in open space for sale



## Factors affecting PH Losses

- No established maturity indices
- Inappropriate and/or poorly-designed harvesting tools/equipments and harvest containers
- Inadequate field sorting, grading and packing protocols
- Faulty harvest & rough handlings
- Lack of collection centres and packing houses
- Inadequate cool chain facilities
- Poor containers and transport facilities
- Insufficient sanitary conditions
- Lack of knowledge about pre-cooling technology.

## Quality Loss at Harvest

- The maturity of fruits affects the quality & shelf life of fruits
- If fruits are harvested at immature stage, quality characteristics such as colour, size, shape, flavour and texture will be reduced
- If fruits are harvested at too mature stage, senescence may occur before the produce reaches to the consumer.



### Major causes of quality losses

- Acceleration of senescence (aging)
- Water loss
- Mechanical injuries
- Physiological disorders
- Disease infection
- Growth and development

## Value Addition in Horticultural Crops

- Value addition /processing of horticultural crops in general is weak in Bangladesh
- A lot of small-scale industries are manufacturing processed products, but use of indigenous fruits is very limited
- Consumer prefers imported products (jelly, juice, tomato sauce); imported from Bhutan, India, Pakistan, Malaysia, Thailand and Australia
- Export of processed horticultural products is low; but the growth is increasing rapidly
- Export of processed products from Bangladesh is about 22.98 million tons( US\$ 23.88 million) in 2007-08 to over 70 countries of the world.

## Value Addition in Horticultural Crops

- Export is confined mainly to the ethnic market (Europe & USA)- Prospects lies to enter into the high end markets with better quality control and improved packaging
- Prospects of processed foods in both local & export market is high- Dehydrated & canned products, IQF products, pickles, sauce, chutneys, mango pulps, pineapple concentrates, tomato paste and ketchup, fruit juices, potato chips and other potato products.



Star fruit candy



Papaya candy

## Value Addition in Horticultural Crops

- Potential exists to expand markets in North- Eastern India, Nepal, Myanmar, Srilanka and Malaysia and other Asian & African countries.



Aonla candy

- Export of IQF vegetables is also increasing gradually. Industries are heterozygous with great diversity in size of the enterprise, the technology employed, the quality of the products, and other related factors.

## Factors affecting Quality & Safety of Fruits

### Production level

- Quality of planting materials affecting the productivity
- Soil contains some heavy metals in certain regions
- Water used for irrigation may affects the produce quality and the environment
- Use of untreated manure spreads pathogens
- Imbalanced use of fertilizers degrades the soil & polluting the water, and
- Indiscriminate use of pesticides affecting the fruits quality.

## Production level

### Use of Pesticides in Bangladesh

(Metric Tons)

1997: 8,000  
2001: 15,960  
2005: 25,479  
2008: 48,690



During the period from 1997-2008, pesticide consumption increased 328% and per ha use increased around 600%.

*An alarming situation for public health*

### *Use of Pesticides*

- Selection of pesticides is not appropriate in all cases, while doses and frequency of applications are also not accurate in some cases and **use banned toxic pesticides**
- Majority of the farmers do not read the label of the bottle/containers (specifications) carefully and do not maintain any waiting period after spraying of insecticides before crop harvest (*PHI- Pre-harvest interval is not followed*),
- *The consumers become inevitably exposed to high levels of pesticide residues in their diets.*

### *Post Harvest Level*

- Deterioration of fruits quality and safety do not, however, stop at the farm
- Harvesting and traditional post-harvest practices also provides major impact on both quality and safety
- Poor packaging can have negative affects on quality and safety of fruits
- *No cleaning, and or washing with non-potable water invites the risks of microbial contaminations are high*
- Physical hazards & mechanical injuries are high



### *Diseases Infections*



Mechanical injury increases the susceptibility of produce to disease infection. Bruises, abrasions, cracks and wounds allow disease organisms to enter the produce.

### *Problems of PHM and Value Addition*

- Poor infrastructures (roads, bridges)
- Shortage of refrigerated transport, loading and unloading practices
- Inadequate storage facilities at the farm level and refrigerated storage at the markets and ports
- Lack of knowledge on temperature requirements and ethylene sensitivities of different commodities for mixed loading
- Lack of collection centers/ packinghouses /grading facilities
- Inadequate packing technology

### *Problems of PHM and Value Addition*

- Lack of national standards of fresh produce and poor enforcement of standards
- Inadequate knowledge of protection of the produce from microbial contamination and pesticide residues
- Limited availability of suitable varieties for processing and insufficient processing technologies
- Inadequate commercialization of new technologies
- Development of novel/niche products
- Inadequate skilled human resources and infrastructures
- Lack of processed product promotion.

### *Adulteration - Another Concern*

- Fraudulent traders & produce handlers using toxic chemicals (*Calcium carbide*) for ripening and poisonous colorants (those used in textile & tannery industries) to make food items attractive.
- Use of adulterants that contains poisons is unsafe and injurious to human health
- No systematic research so far has been made to know the exact component being mixed or causing the adulteration and the extent of contaminations of toxic chemicals to food items.

## Status of Quality Assurance System

- Quality control and standards is weak
- The country can not export fruits ( fresh & processed) in the upstream markets due to the inability to meet the plant health and food safety requirements
- Challenges facing in export of agro-products (fresh and processed) may become difficult to face if quality standards are not enforced
- Bangladesh is yet to comply with the basic requirement of traceability as per international market demand
- Produce quality are negatively affected during production process of crops and the marketing chain.

## R & D Support in PH & Value Addition

- In general, development of PHT/Agro-processing has not received research support as it deserves & in particular *underutilized fruits are highly neglected*
- Limited and isolated research efforts are made mostly in public sectors and very rare in private sector.
- Budget for R & D is very low and there is a critical shortage of qualified and specialized research staff to carry out the work.

## R & D Support in PH & Value Addition

- The universities and public sector R&D institutes have conducted considerable researches.
- Useful research results have been generated and extension of these results has generally been poor.
  - The linkages that exist between the university and the public sector and NGOs facilitate transfer of technologies to end-users is very weak.

## Problems of R&D institutions

- Inadequate and inappropriate infrastructures - laboratories, workshops, libraries which are not adequately equipped with facilities and tools for carrying out R & D work effectively
- Lack of adequate, competent and well-trained high-level manpower such as scientists, engineers, technologists, technicians etc.
- Inadequate funding - less than 5% of the funding for agricultural research is allocated to PH research areas [Kader, 2003].

## Processing Technologies of BARI

- Drying of vegetables by solar drier
- Preservation of banana, mango, pineapple slices in glass containers( 60-70% brix)
- Preparation of multi-fruit leather by mixing pulp of mango (50%), pineapple (25%) and jackfruit (25%)
- Preparation candy (jackfruit, papaya, carambola, pine apple), dehydrated jackfruit, pickles (olive, anola, golden apple, satkora), bar chutney, tamarind sauce, jam (bael, palmyra, mango), bael and jamun beverage, jam, pickles, chutney, banana chips, tomato pulp and ketchup, and preserve (morobba) from green papaya etc.

## Post Harvest Technologies

Applications of PHT can protect the deterioration of fruits quality & safety and increase the shelf-life of the produce.

### Post-Harvest Technologies:

- Grading, Packaging, Pre-cooling, Storage & Transportation

### Techniques of Reducing Losses

- Start with good quality produces
- Avoid physical damage
- Control environmental factors



## Post Harvest Technologies

- ❑ Careful harvesting, handling and proper sanitation practices are the pre-requisite for assuring quality & safety of fruits
- ❑ Pre-cooling, refrigeration and good packaging is essential for long distance markets.
- ❑ Use simple & inexpensive methods
  - Protection from exposure to the sun
  - Harvesting during cooler period
  - Provide ventilation in containers/transport
  - Careful handling to minimize injuries.



Pre-cooling

## Recommendations

- Develop maturity indices & protocols of washing, sorting & grading of fruits
- Create awareness on the importance of better post harvest practices
- Improve packaging technology
- Develop and/or adapt appropriate technologies for value addition and establish suitable facilities
- Encourage subsidy from government and investment from the private sector to establish packinghouse, grading and pre-cooling facilities
- Strengthen research, education & extension support

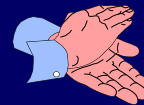
## Conclusion

- Excellent opportunities exists for improving indigenous fruits and access to foreign markets by improving production system and reducing PH losses & value addition
- Significant improvement needs in post harvest handling techniques including packaging, storage and transportation
- Strengthen R & D activities through multinational collaboration
- Improve quality standards and control measures to ensure quality and safety of fruits
- Provide technical support to the producers and handlers
- Improve technology transfer and communication systems

# Thank You



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Saleh, 19 Sept/11