

Leverhulme-funded International network on preserving safety and nutrition of indigenous fruits and their derivatives.

Catalytic research projects

Background

The network's knowledge mapping workshop in Dhaka, 2011, identified several research gaps. To underpin the development of a larger research proposal, network partners are undertaking short research projects during 2012 to analyse supply and demand of key underutilised species, assess maturity indices and develop new nutritional products. These are summarised below:

Bangladesh: Maturity Determination and Quality Criteria for Jackfruit

Researchers' names with institution: Dr Modan Gopal Saha, Dr Md Nazrul Islam, Md. Mainuddin Molla, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur-1701

Rationale:

Average annual production of fruits in Bangladesh (3.25 million ton) is insufficient to allow everybody to eat the currently recommended dose of 85g of fruit per day. Jackfruit (*Artocarpus heterophyllus* Lam.) is the national fruit of Bangladesh, accounting for 23% of total fruit production in 2008-09. However, a significant proportion of the fruit goes to waste each year due to lack of proper maturity assessment and seasonal gluts. A survey carried out in May – July 2010 highlighted the main indicators of maturity used by producers and intermediaries in three areas of Bangladesh. These included visual observations of the flatness of the spines on the fruit, signs of fruit cracking, the colour of the fruit and the colour of the leaf at the top of the fruit stem. Ripening techniques included chemical ripening agents and inserting a metal rod into the fruit. Research is needed to determine whether these traditional maturity indicators and ripening methods are effective and how they might be improved.

Aims: To minimise quantitative and qualitative post-harvest losses of jackfruit (*Artocarpus heterophyllus*) and uplift food and nutritional security

Objectives:

- To determine the maturity indices of jackfruit
- To extend the storage life of jackfruit
- To study the physico-chemical composition of jackfruit



Photo: Susanta Roy

Activities:

Fruit will be harvested from jackfruit trees at the BARI research station in Gazipur at varying ages (days after fruit set) during the 2012 harvest season. A number of physico-chemical properties will be measured together with the 'traditional' observations (flatness of spine, fruit cracking, colour, leaf colour) identified in the 2010 survey.

India: To standardise the technique of preparing a fruit leather by blending indigenous fruits pulp (Bael and Aonla).

Name of the species: Bael (*Aegle marmelos*) and Aonla (*Emblica officinalis*)

Researchers' names with institution:

Dr Sunil Saran, Dr Susanta K Roy and Dr Shailendra K Dwivedi, Amity International Centre for Post-Harvest Technology and Cold Chain Management, Amity University, Uttar Pradesh, sector-125, Expressway Noida, UP-201303, India.

NGO: Mr Bharat Bhusan Tyagi, CEO, Voluntary Association for Rural Development & Agriculture Necessities (VARDAN), Pariwar Sansthan Village & post- Behta, Tehsil Siyana, Dist. Bulandshahr(UP)

Rationale:

A recent UNICEF report suggests that nearly 40% of the undernourished children in the world are located in India. A number of fruits indigenous to India and adjoining countries like Sri Lanka and Bangladesh are highly nutritious but underutilized. Bael (*Aegle marmelos*) and Aonla (*Emblica officinalis*) are two indigenous species which grow abundantly in Bangladesh, Sri Lanka and India, and have the potential to meet the demands of high nutrition and low cost. However, both fruit are very difficult to eat fresh and therefore need to be processed into an acceptable product so that growers get a remunerative price and consumers benefit from the nutritive value of the fruit product.

Aims: The projects aims to standardise techniques for preparing fruit leather by blending bael and aonla pulp and evaluating the nutritional, microbiological and organoleptic parameters of the product.

Objectives:

- To study the physico-chemical composition of bael and aonla pulp.
- To standardise the blending technique and method for preparing the fruit leather.
- To identify the ideal packaging of product for better storage life (e.g. for use in midday school meal programmes).

Activities:

Fully mature and ready-to-eat bael and aonla fruits will be selected for pulping. Different pulp blends will be evaluated for their nutritional, chemical, microbiological (for food safety) and organoleptic characteristics. A recipe for fruit leather from blended pulp plus sugar, acid, pectin, preservatives, etc. will be determined. Different dehydration processes (solar and mechanical) will be tested. The product will be packaged and stored for 6 months at ambient temperature, during which time it will be analysed to determine physico-chemical, microbiological and organoleptic properties at 0, 3 and 6 months.



Bael fruit (left) and Aonle fruit (right) (Photos: Susanta Roy)

Cambodia: Market demand study on fresh products and derived products of banana, jackfruit and cashew apple in Phnom Penh Market

Name of the species: Jackfruit (*Artocarpus heterophyllus*), Cashew (*Anacardium occidentale*), Banana (*Musa spp.*)

Researcher's name with institution: Dr HUL Seingheng, Director of research, Institute of Technology of Cambodia, BP. 86, Russian federation, Phnom Penh, Cambodia.

Rationale:

Banana, jackfruit, and cashewnut apple are traditional fruits for Cambodian people with many varieties are sold in both local markets and supermarkets. However, there is no complete information about the market demand for these three types of fruits in Cambodia. To encourage and facilitate future investment in these fruits, information is needed about their production and demand.

Aims and Objectives:

- To identify the (annual) evolution of supply of the tree types of fresh and processed products of banana, jackfruit and cashew apple in the capital city of Cambodia
- To identify the evolution of demand for these products
- To determine the evolution of the sale's price of each type of fruit

Activities:

The proposed research will have three stages:

- Desk research to obtain secondary data on production and use.
- Qualitative research (through interviews) on demand and behaviour/attitude of consumers/producers towards the three fruits
- Quantitative (survey) research to determine the seasonal evolution of production/price/consumption levels in Cambodia for these three species.



Vietnam: Added-value for cashew industry by producing reduced-fat cashew apple chips.

Name of the species: Cashew (*Anacardium occidentale*)

Researchers' names with institution: Dr Pham Huu Yen Phuong, Duong Thi Ngoc Diep, Nong Lam University, Linh Trung Ward, Thu Duc District, Hochiminh City, Vietnam and Dr Max Reynes, CIRAD.

Rationale:

Cashew nuts are an important agricultural product in Vietnam but there is little commercial use for the highly perishable cashew apple by-product. Initial screening carried out by CIRAD suggests that the cashew apple could be processed into nutritious chips. More research is needed to determine the best methods for achieving this in an economic manner.

Aims and Objectives:

This study will compare different methods for dehydrating cashew apple chips with the aim of producing a nutritious and marketable product that makes use of a currently underutilised industrial by-product.

Activities:

Three methods of chip preparation will be compared. Traditional atmospheric deep-fat frying will be tested in Vietnam while vacuum frying and a modified de-oiling vacuum frying method will be tested in the CIRAD labs. The resulting chips will be analysed for their oil content, moisture content, colour, texture, total carotenoid content and sensory qualities.



Cashew apple chips (Photo: Max Reynes)