

Promotion of indigenous fruit trees through improved processing and marketing in Asia

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SUMMARY

Important issues were discussed recently on the promotion of underutilised indigenous fruit trees (UIFT) as these species can contribute substantially to the livelihood of local people because of their multipurpose uses and demand in local and national markets. This paper gives an overview of the current research and development work by the International Centre for Underutilised Crops (ICUC) on UIFT in Asia and highlights the constraints to commercialisation, potential market value of these species, and potential strategies for their development.

Keywords: Underutilised indigenous fruit trees (UIFT), non-timber forest products (NTFP), food and nutrition security, rural development.

INTRODUCTION

The term underutilised indigenous fruit trees refers to the trees bearing fruits that are not highly researched and generally ignored by the commercial sector. Little research has been carried out on these species and information documented about their basic biology, growing habits, management practices, processing and utilisation is scant and scattered. Research is often carried out by isolated groups with their findings restricted to academic journals, and dissemination of information to a wider audience is poor.

Nevertheless, UIFT are an important source of food and nutrition, and contribute to the income of rural and urban people through the marketing of their products. They are grown mainly in home gardens and small farms and resource poor people, particularly tribal people, also gather wild fruits from the forests and other non-cultivated areas for their multipurpose uses. Women often play a major role in the gathering of UIFT (Ruiz Pérez et al., 1997) and are frequently involved in decision making about the sale of the fruits and their products. The extra income from the fruits is more likely to be spent on education, nutrition and health, and controlled by the women who gain greater respect from their families and communities.

Fruit trees also play a vital role in crop diversification programmes and agroforestry systems. Their inclusion in production systems reduces the risks inherent to monocultures of staple food crops such as susceptibility to pests and diseases, soil nutrient depletion, price fluctuations, and reliance on a single crop for income. It has been reported in countries such as China, Nepal and the Philippines (Shakaya, 2002, Castillo, 2002), that farmer income from indigenous fruits is much higher than from traditional agricultural crops.

Recognising the importance of UIFT, ICUC was instrumental in establishing Underutilised Tropical Fruits in Asia Network (UTFANET) so that speedy research and development of UIFT could be achieved through collaborative efforts. ICUC was asked to implement the activities of this network and the achievements of UTFANET are highlighted in this paper.

WHY PROMOTE INDIGENOUS FRUIT TREES IN ASIA?

Asia has a diverse range of tropical fruit tree species, many of which are only known within the region. They are a valuable source of vitamins, minerals and antioxidants and make an important contribution to the diet of poor families. Fruit trees are a valuable family asset. In addition to their fruit, they are important sources of timber, fodder and fuel, and many have medicinal and industrial uses. Organised collection of these fruits and products from forest trees can create employment, particularly for the landless poor. The reason for this is that small scale food processing responds to local needs, builds on local knowledge and skills, and uses local resources. However, researchers, policy makers and commercial enterprises and the international community have just started to recognise their value because of the relation with non-timber forest products (NTFP).

Fruit trees provide environmental benefits by protecting the soil and generating leaf litter. This decreases the runoff from the soil surface, preventing erosion, maintaining a stable, moist surface and improving the physical properties of the soil. Tree roots can also loosen the topsoil by radial growth and improve the porosity in the subsoil (Sanchez and Leakey, 1997). Fruit trees, particularly UIFT, can establish on poor soils and improve the productivity of the soil. They are suited to marginal and waste lands, and can resist harsh conditions such as moisture stress and salinity. In addition, farmers can obtain a decent crop from trees growing in areas where other crops would not survive.

CONSTRAINTS FOR SUSTAINABLE PRODUCTION, PROCESSING AND MARKETING OF UIFT

Effective development and utilisation of UIFT requires the identification of the constraints and the implementation of actions to overcome these constraints. The constraints listed below have been identified through participatory research work and regional workshops implemented by various organisations on UIFT (Haq and Hoque, 2000, UTFANET, 2003), but refer mainly to practical issues relating to fruit tree development.

Lack of quality planting materials - Good quality planting materials provide farmers with better trees, tastier fruits and higher yields. Improved varieties may also be adapted to local climate, topography and farming systems providing specific benefits for farmers in different regions.

Lack of standardized propagation and production technology - Standardized propagation and production technology is important in the development of high quality products. This can be highlighted by using mangosteen as an example, the fruit of which is very desirable with some demand in the local, national and international markets (Dassanayake, 1996). However, because of production

constraints, demand exceeds supply. Mangosteen has a long maturation period, is slow growing and is susceptible to drought due to its shallow root system. A disorder referred to as 'Gamboge disease' leads to its poor marketability due to a yellowish exudate on the fruit skin and inside the fruit (Dassanayake, 1996). The presence of exudate has been linked to physical stress of the trees such as fertiliser deficiency or drought (Dassanayake, 1996). Research trials with fertigation methods are underway in Thailand and the Philippines (UTFANET) (Rondolo, 2002) and may have implications in the prevention of Gamboge disease through the improved growing conditions. Studies indicate that fruit yields are increased and the cost of fertiliser on a per hectare basis was reduced by almost 16% (Lertrat 2001).

Mangosteen is an apomictic species, usually propagated by seed. Traditional breeding methods are difficult and although progress has been made with vegetative propagation (UTFANET, 2003) it has thus far been slow. Multiplication methods and production technologies have not yet been fully developed for many UIFT.

Fruit ripening period - Narrow fruiting periods result in the simultaneous ripening of all fruits, causing an oversupply in the market and lowering of the prices, followed by a relative fruit scarcity with high prices. Tamarind for example, sometimes exhibits cyclic yields with a bumper harvest every 2-3 years (Jambulingam and Fernandes, 1986). Mangosteen also exhibits uneven and unreliable bearing (Dassanayake, 1996). This causes a particular problem for farmers as they often have to wait for traders before harvesting. Uneven and unreliable harvests can result in losses throughout the market chain. This also presents a problem for exporters as the supply of fruits is not continuous (Dassanayake, 1996).

Lack of information - Access to information is lacking throughout the production to consumption pathway. Areas of particular concern are:

- Production technology and propagation methods - propagation by seed is the most commonly used method throughout rural Asia; however grafted plants provide far better trees.
- Appropriate processing technologies – often small-scale processors are unaware of the technologies that may be appropriate to their needs, despite the fact that the technologies are being widely used elsewhere.
- Marketing information and economics – is essential in the successful commercialisation of fruit tree species.

The demand for information comes from a variety of groups and organisations including NGOs, CBOs, and from participatory research and survey reports carried out in countries in Asia including Bangladesh, India, Nepal, Pakistan, Philippines and Sri Lanka (UTFANET, 2003, Azam-Ali, unpublished). Farmers, small-scale entrepreneurs, businesses and research institutions have all expressed a need for access to current information on aspects of the production to consumption pathway (Haq and Hughes, 2002). Evidence of this is also reflected through participatory research and regional meetings in Africa (Haq and Atkinson 1999) and Latin America (UNICACH 1999). The particular challenge here is to develop information that can be effective in a country with high levels of illiteracy (Azami, 2002).

Lack of standardized processing and postharvest technologies - Processing and marketing strategies and consumer requirements are different. In addition, quality control standards and certification schemes for many UIFT are lacking, however such controls may improve the products available in the market (NRI, 2000). Better utilisation of these fruits can provide a number of opportunities to raise household income.

Local market structures poor or lacking - In the past, a large majority of the consumption of forest produce has taken place through non-market channels and subsistence use, which goes some way to explaining the poor marketing channels for UIFT. Marketing pathways remain poorly organized for these fruits in many countries throughout Asia and indeed globally. Lack of infrastructure and transport systems also lead to damaged fruits and high wastage. In Nepal, for example, annual fruit production is 46,492MT with over 55 different species under production; however 30-40% of the demand of the urban population is still met by imports due to the lack of roads to transport local produce (Shakaya, 2002).

Some small entrepreneurs do not have structured ideas about business practices, including how to market their produce, which is low quality (Haq 2000a) and fetches a low price (Vinning and Moody 1997). But the issues involved in capacity building that are sustained over time are not simply a matter of technical know-how. It is also about understanding the processes whereby change in farming and marketing practices occur, how people can feel they 'own' these changes and how they can be sustained in the long-term.

Lack of access to credit - The majority of small scale farmers and processors, especially women, face a variety of problems when seeking credit, including lack of information, high interest rates, lack of collateral, bureaucratic, and prejudice against women and small scale farmers and processors (Azami, 2002).

Lack of national policy - Although many farmers are interested in UIFT, the inclusion of such species in the national agricultural research programmes in developing countries is limited. According to Williams and Haq (2002), only eight developing countries worldwide have national programmes on underutilised species, including UIFT: four countries in Asia, with only India having a clear list of priority species.

EVOLUTION OF THE FRUITS FOR THE FUTURE PROGRAM

The Fruits for the Future is a global programme, established in 1995 with an overall goal to increase income generation, alleviate poverty and improve the livelihood of poor farmers through the promotion of UIFT. The programme started with the regional research network UTFANET and included the propagation, production and technology transfer of initially three species (jackfruit, pummelo and mangosteen) from a priority list of twelve. Later, a project on the collation and dissemination of information on the production, harvesting, processing, utilisation and marketing of UIFT was also developed. These projects follow the production-to-consumption approach as this is vital in the development of any new product and each step must be considered before promoting the production of a crop. In particular, the requirements of the consumer must be considered and the demand for the product

established. The Fruits for the Future programme includes the following stages to achieve its goal.

Production stage:

Diverse genetic variation exists in Asia for UIFT. ICUC, through its UTFANET project, is facilitating in the development of high quality planting materials for jackfruit, mangosteen and pummelo through farmers' participatory surveys and the evaluation, collection and characterisation of these species. Accessions were collected in nine countries (Bangladesh, India, Indonesia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam) and suitable mother stock identified for propagation and planting. Farmers' choices included characteristics for sweetness, juicy fruits, high yield, small stature and quality timber. In addition, characteristics including tolerance to drought and disease, and ability to withstand extreme temperatures and grow on marginal lands were maintained. Approximately, 1,100 accessions of jackfruit, 230 of mangosteen and 300 of pummelo have currently been collected, with further plants identified in the field (UTFANET, 2003). From those, approximately 130 jackfruit, 10 mangosteen and 40 pummelo have been selected for propagation trials (UTFANET, 2003). However, these characteristics cannot be adequately controlled or transferred to the offspring by seed propagation.

Vegetative propagation, including *in vitro* methods have been standardised for jackfruit, pummelo and mangosteen with some protocols already available (Azad 1999; Paudyal 1999; Haq 2002b). The advantages of vegetative propagation over seed propagation include the maintenance of the genetic material of the parental variety, shorter juvenile period, shorter in stature and many such trees do not exhibit undesirable morphological characters such as thorniness. Desirable characteristics may be enhanced in some varieties.

Dissemination of information and technology through hands-on training courses has been an ongoing in all UTFANET project countries for the propagation of jackfruit, mangosteen and pummelo (UTFANET, 2003).

Harvesting, post-harvesting and processing stage:

Traditional methods of fruit harvesting such as shaking the branches or using sticks to knock the fruits to the ground often result in heavy losses. Also, indigenous fruits are often picked either when immature or at an advanced stage of maturity where inherent physiological developments render them more susceptible to injury if subjected to rough handling during harvest and transportation (Wilson, 2002). In addition, packaging is often not appropriate for poor transport conditions resulting in heavy losses. While technology is available for commercially important species, it remains undeveloped for UIFT. Post-harvest losses occur at all stages of the marketing chain and observations indicate that they could be as high as 40-60% of the harvested crop (Wilson, 2002). It is important therefore to develop, adapt, and transfer technology that will minimise these losses.

Processing of fresh fruits immediately after harvesting may also reduce losses and transportation costs due to the lower space requirement. Various indigenous fruits are processed at different levels of sophistication. Fruits such as tamarind, jackfruit

and pummelo are processed in various forms for domestic consumption. Traditional methods of preservation have developed into cottage industries in some areas with produce sold in urban domestic markets. Some cottage industry operations also engage in supplying larger processing plants with semi-processed products. Processing of added-value products can also be lucrative as demonstrated by a Women's' group in Thailand. By making use of 'dropped' pummelo fruits, which can attract fruit flies to the orchard, and processing into candies, the group has managed to establish a stable business, expanding its membership from 7 to 45 women. The group earns a decent salary and has also started to train other local groups (Muang-Thong, 2002).

The promotion of commercially viable processing industries of indigenous fruits requires availability of raw materials, economic viability, marketability of products, availability of technology to meet processing and market requirements, necessary machinery and equipment, and adequate and easy access to necessary information and support services (including credit) (Wilson, 1998).

Marketing and commercialisation stage:

In West Bengal of India, very small numbers of indigenous fruits are consumed for domestic use by the farmers. A sample survey revealed that the marketed quantity of fruits by the farmer can vary between 85-95% (Chatterjee 2002). The farmers' profit on their fruits depends on whether they market the fruits themselves, or sell to an intermediary. There are several advantages of intermediaries: the farmers get their money in bulk and not in small quantities, cut down labour and transport costs, minimise theft of fruits from the tree, and reduce perishability during transport. The existence of intermediaries however, prevents price setting according to supply and demand. There is usually a high price gap between the farmer and the final consumer. In general, household's practise this form of selling in response to difficulties of cash flow and are therefore usually in a bad position to negotiate prices (Schreckenber, Degrande and Mbosso 2000). The intermediary may pay a fixed price and approach the farmer before harvesting, negotiate a price for the crop and then pay 50% in advance. The intermediary then takes responsibility for the crop and will dictate the harvesting time. This usually coincides with the time when the market price for the fruit is highest as opposed to the maturity index, leading to the sale of poor quality fruits (Winarno 2002). In addition to fruits, intermediaries may collect whole plants or plant parts of pharmacological importance either directly from the farmer or from the rural markets and take them to secondary markets for wholesale. The role of the intermediary is often very significant in assisting the farmers to market their produce.

Some farmers or community groups, however make the decision not to sell their produce to an intermediary, but to market their own products. The Ikalahan people are a forest dwelling community living in the northern mountains of the Philippines. After producing quality jams and jellies from locally gathered wild forest fruits, they decided to sell their products in local towns. Through a process of trial and error and with help from the local university and business school, the community has been successful in its endeavour and is producing and successfully marketing locally produced products (Rice, 2002). The Ikalahan people were lucky to enlist the help of others in their quest to sell their products and this has demonstrated that training and

education in business and development skills for rural communities would improve the earning potential of many indigenous fruit products.

POTENTIAL STRATEGIES AND ACTION PLANS

Strategy development for UIFT is limited due in part to lack of government support and also lack of information and documentation on the constraints mentioned above. Attention has been focused on the need to conserve and better use the botanical diversity in traditional agroecosystem and natural forest systems, but support at the national, regional and international level has been limited. The socio-economics and well-being of the farmers and communities need to be taken into account, and agricultural policy linked to forestry and export policy, which currently provides huge incentives for the local people to cut down indigenous species for veneer and timber production stimulated by the demand in the furniture industry (Williams and Haq 2002).

In conclusion, this report has highlighted the measures to overcome the constraints mentioned above through ICUC's project experience. These have been regularly discussed with the stakeholders and activities developed together to meet the challenges of UIFT commercialisation for rural income generation in Asia. The new and effective innovative techniques and approaches are developed, validated and disseminated through community participation and regional collaboration leading to economic growth, employment generation, poverty alleviation, environment protection and utilisation of biodiversity. The target species will be utilised to develop products in small and medium-scale fruit-based processing industries but the programme needs more support.

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