TROPICAL FRUIT NET

Your Global Partner in Tropical Fruit Development

Issue No. 8 | January 2007

TFNet - Linking People, Technology & Market

The use of urea in tropical fruits

CEO of TFNet, Dr. Izham Ahmad presenting a paper at the UREA Seminar 2006 in Kuala Lumpur.

In this issue...

Profile of Chairman of International Tropical Fruits Network *[page 2]*

The profitability of small-scale processing enterprises for underutilised tropical fruits *[page 4]*

International Tropical Fruits Network 3rd General Assembly in Guangzhou, China from 22 - 24 August 2006 *[page 15]*

ABSTRACT

Urea is one of the widely used nitrogen fertilizer on tropical fruits trees. It is mainly used as a basal fertilizer either singly or together with phosphorus or potassium sources and as a foliar spray to promote initial growth, maintain the plant's productive phase and sustain healthy plant growth. This paper reports on the use of urea in the Asia Pacific region both as a straight and foliar fertilizer and some other uses on common tropical fruit crops. Generally, recommendations for the use of urea vary according to the different agro-climate environments and the effectiveness of urea lies in its methods of application. The tricky balance between maintaining healthy vegetative growth and at the same time produce high yields, good quality fruit with longer shelf life, is an important aspect to consider in the utilization of urea.

[more on page 12]

Profile of Chairman

of International Tropical Fruits Network,
Dato' Dr. Zulkifli Idris

The past chairman of TFNet, also the former Secretary General, Ministry of Agriculture and Agro-based Industry, Malaysia, Tan Sri Abi Musa Asa'ari bin Mohamad Nor retired on September 11, 2006. This saw the appointment of Dato' Dr. Zulkifli Idris as the Ministry's new Secretary General and as the new Chairman for International Tropical Fruits Network.

Dato' Dr. Zulkifli obtained his Bachelor of Economics (Hons), from the University of Malaya in 1975. He pursued his Masters in Public and International Affair at the University of Pittsburg, USA in 1984. In 1995, Dato' Dr. Zulkifli obtained his Ph.D in Public Administration from the University of Southern California, USA.

Before assuming the post of the Secretary-General of the Malaysian Ministry of Agriculture and Agro-based Industy, Dato' Dr. Zulkifli has held important positions in the Malaysian Civil Service which include the following:

a. Deputy Secretary General, Ministry of Agriculture and Agro-Based Industry Malaysia
b. Deputy Secretary General, Ministry of Science, Technology and Innovation
c. Director, Conservation and Environmental Management Division, Ministry of Science, Technology and the Environment
d. Secretary Policy and Corporate Management Division, Ministry of Education, Malaysia
e. Deputy Director of INTAN, Financial Management, INTAN Bukit Kiara, Public Service Department, Malaysia
f. Principal Assistant Director, Ministry of International Trade and Industry
g. Programme Coordinator, Centre for International Relations and Diplomacy, National Institute of Public Administration (INTAN)
h. Senior Project Officer, Centre for Management Development, National Institute of Public Administration
i. Assistant Director, Multilateral Trade Relations, International Trade Division. Ministry of Trade and Industry
j. Assistant Director, Shipping and Freight Study Unit, International Trade Division. Ministry of Trade and Industry

We welcome Dato' Dr.Zulkifil Idris as the Chairman of TFNet, and we are confident that with his impressive work experience and commitment, he will guide the organization into one which is dynamic, relevant and fully committed to the development and improvement of the tropical fruit industry.

Welcome New Members

TFNet welcomes the following members :

Associate Members

- Selangor Fruit Valley, Malaysia
- South Africa Mango Association, South Africa

Ordinary Member

- Dr. Ahmad Kamal Abd. Lah

Note:
For those interested to contribute and participate in TFNet's activities, the membership application form is on page 19 of this newsletter.

Benefits as TFNet Members

- Sharing information, expertise and technologies;
- Participation in conferences and seminars;
- Market development and trade promotion;
- Participation in collaborative projects or studies;
- Assistance in implementation and harmonisation of international regulations; and
- Participation in human resource development programmes

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TFNet UPCOMING EVENTS

HANDS-ON SKILL ENHANCEMENT WORKSHOP AND FIELD VISIT TO FRUIT GROWING AREAS
Event Date : 13 – 19 August, 2007 and November, 2007
Venue : Sentra Pengembangan Agribisnes Terpadu (SPAT), Malang, East Java, Indonesia

This ongoing program involves a one day hands on workshop on vacuum fry technology for production of fruit chips and field visits to areas grown with lowland grapes, citrus, pineapple, starfruit, salak and organic agriculture.

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3rd MALAYSIA AGRO-BIO BUSINESS CONFERENCE
Event date : 12 -13 July, 2007
Venue : Matrade Exhibition and Convention Centre(MECC), Kuala Lumpur, Malaysia

The conference is aimed at providing an avenue for researchers, entrepreneurs, government agencies, commercial farmers and academicians to share views and experiences in the various activities related to agriculture and agrobased industries, with the objective of transforming the agricultural sector to one which is dynamic and competitive.

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INTERNATIONAL SEMINAR ON ECONOMICS AND MARKETING OF TROPICAL AND SUBTROPICAL FRUITS
Event Date : 16 – 18 July, 2007.
Venue : Putra World Trade Center, Kuala Lumpur, Malaysia
The 2 day seminar will highlight speakers from countries including Thailand, India, China, Indonesia, Philippnes, Vietnam, South Africa, New Zealand, Fiji, Sri Lanka and the USA who will share their knowledge and views on issues related to the economics and marketing of tropical fruits. The seminar aims to provide a forum for researchers, academicians, the private sector, farmers organizations, public sector and other stakeholders in the tropical fruit industry to interact and is also expected to encourage networking among those attending. A field visit to the Selangor Fruit Valley and Agricultural Heritage Park has been scheduled on July 18, 2007.

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TFNet BOARD OF TRUSTEES MEETING
Event Date : 19 July, 2007
Venue : Bunga Raya Room, Best Western Seri Pacific Hotel, Kuala Lumpur, Malaysia
This meeting is only for TFNet board members and invited observers only.

WORKSHOP ON PLANT VARIETY PROTECTION TESTING ON TROPICAL FRUITS IN ASIAN COUNTRIES
Event date : 14-16 August 2007
Venue : Hotel Singgahsana, Petaling Jaya, Malaysia
The workshop is part of the GTZ-TFNet collaboration on a study to gauge the Plant Variety Protection (PVP) testing of tropical fruits in Bangladesh, China, India, Indonesia, Malaysia, Philippines, Thailand and Vietnam. Only selected participants involved in PVP testing in their respective countries will be invited to attend this workshop which will be conducted by a consultant from Germany with support from TFNet.

OTHER RELATED EVENTS

BIO - ASIA 2007
The First International Trade Exhibition and Conference for Biotechnology to be held in Bangkok, Thailand provides the platform for biotechnology on its claim to be the gateway for a sustainable future.
BioAsia 2007 Thailand is being touted as the biggest gathering in the Asia Pacific region of scientists and academicians, businessmen and other experts involved in biotechnology covering various fields-from food, agriculture, health, environmental and industrial aspects.
Event date : 7-9 November 2007
Venue : Queen Sirikit National Convention Center, Bangkok, Thailand
For further information :
http://www.bioasia-2007.com/exhibition.html

ASIA FRUIT LOGISTICA
The original FRUIT LOGISTICA has been held in Berlin every year since 1993. Today it is the world`s leading exhibition and convention event for the marketing of fresh fruit and vegetables. Now it is bringing its expertise to Asia, one of the most dynamic and rapidly expanding markets in the world.
Together with the Asiafruit Congress - the Asian region`s only truly international conference event for the fresh produce sector - ASIA FRUIT LOGISTICA will offer unparalleled opportunities for you to find out what is happening in the rapidly changing world of fresh produce, make new business contacts and help you grow your business.
Event date : 5-7 September 2007
Venue: Queen Sirikit National Convention Center, Bangkok, Thailand
For further information :
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HAWAII TROPICAL FRUIT GROWERS 17th INTERNATIONAL TROPICAL FRUIT CONFERENCE
A conference for both fruit growers and the public, this event is held in Hilo and features scientific and marketing experts discussing all aspects of producing and bringing fruit to market. In addition, a nationally-known authority in the field is the keynote speaker.
Event date: 28-30 September 2007
Venue : Hilo, Hawaii, USA
Contact (808) 966-6444
or visit www.hawaiitropicalfruitgrowers.org..

4th INTERNATIONAL SYMPOSIUM ON TROPICAL AND SUBTROPICAL FRUITS
The Symposium will review current progress and explore potential application in the various research on tropical and subtropical fruits. The aims of the symposium are to facilitate discussion and exchange of technical and scientific information and to promote international cooperation amongst stakeholders who are involved in the development of the tropical and subtropical fruit industry.
Event date : 3-7 November 2008
Venue : Bogor Agricultural Unversity, Bogor, Indonesia
Contact: Prof. Dr. Roedhy Poerwanto
Tel: *62-251 326881 / 382201
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The profitability of small-scale processing enterprises for underutilised tropical fruits - a case study in Kandy and Kurunegala districts in Sri Lanka

Summary
If the choice is between investing in small-scale fruit processing enterprises or putting money in the bank, an upstart entrepreneur may find that investing in the enterprise is more profitable, despite the risks and potential long-term nature of the returns. Our case study shows that small-scale fruit processing enterprises are profitable if a number of factors are considered: operation throughout the year and flexibility to produce a range of products rather than too rigid specialisation. Since for many small-scale entrepreneurs the fruit processing enterprise is only a part of their livelihood strategy, and other benefits may arise from supporting these businesses, careful consideration needs to be given to a holistic approach.

Members of dried jackfruit producing self-help group at Mawatagama earn about LKR 27,000 a month from their enterprise.

Introduction
The International Centre for Underutilised Crops (ICUC) has been promoting the use of traditional tropical fruits since 1989. A recent South Asia regional project has been supporting small-scale entrepreneurs in Bangladesh, India, Nepal, Sri Lanka and Vietnam in the processing and marketing of lesser-known tropical fruit species (Abeyrathne and Jaenicke, forthcoming).

Sri Lanka has an ideal climate for the production of fruits from the moist tropical climate, such as jackfruit (Artocarpus heterophyllus), annonas (Annona sp.) and bael (Aegle marmelos). These and other species are primarily consumed fresh and their processing provides a great opportunity for agribusiness activities. Perishability and seasonality of fruits are some of the serious issues, which could be overcome by processing and value adding.

This case study appraises the profitability of two small enterprises of tropical fruit processing (Box 1). The first enterprise was set up by Practical Action-Intermediate Technology Development Group (ITDG) in order to pilot test a dried jackfruit producing group enterprise model, which consists of rural and urban poor at Kurunegala district. The second enterprise is a fruit drinks producing owner managed individual enterprise in Kandy district. It was set up as a result of training and other Business Development Support (BDS) by the International Centre for Underutilised Crops (ICUC) in 2004.

Background of the two enterprises

Dried jackfruit producing group enterprise
Eight poor women including several widows were invited by Practical Action ITDG-Sri Lanka to form a group enterprise with the financial assistance of Plan International in 2001. Now they are earning more than 50% of their annual income from the enterprise by annually producing about 1540 kg of dehydrated jackfruit which is sold through the label of REN (Rural Enterprise Network, a brand of ITDG). The enterprise has also created a good market for raw jackfruits locally by purchasing about 5,000 kg of raw kernels monthly during the peak season. The factory is located in Mawatagama, about 15 km from Kurunegala town and the enterprise operates only during the jackfruit seasons which in Kurunegala span from May to July and December to January. The initial capital outlay of this enterprise was LKR 1,152,000 (USD 11,520) and predicted life span is ten years.

Fruit drinks producing enterprise (Tharindu Fruit Products)
Mr Dhammika Perera, the owner of this enterprise is a pluralistic entrepreneur who perceived the opportunity for processing and marketing of underutilised tropical fruits in Kandy district of Sri Lanka. He started this enterprise in 2004 and now earns more than 50% of his monthly income from it. The enterprise provides employment for eight to ten labourers. It was also able to locally establish a new brand name "Tharindu" for a range of products including cordial, Ready To Serve (RTS) fruit drinks and fruit sorbet (frozen juice) in stick packets from a variety of underutilised fruit species, such as sugar apple, bael and mixed fruits. The factory is located in Dangolla, about 7 km from Kandy city, operating throughout the year. Mr Perera purchases about 2,500-3,000 kg of fresh fruits every month, providing income for farmers and five raw material suppliers in the area. The initial capital outlay of the enterprise was LKR 1,169,000 (USD 11,690) and the predicted life span is five years.

Time value of money and discounting the cash flows

A given sum of money has a different value depending upon when it occurs in time. The idea of time value of money is not directly concerned with inflation or deflation. It is assumed that neither exists and input and output price levels of these two enterprises are stable throughout time. Time value of money really concerns the fact that money can be invested in capital market so as to earn interest. Time vale of money is taken into account through discounting the predicted future cash flows in analysing these two investments by using discounted payback, Net Present Value (NPV) and Internal Rate of Return (IRR) methods (Lumby and Jones 2001). The discount rate (i.e. 7%) is decided considering the commercial banks' weighted average deposit interest rate in Sri Lanka. For 2004 and 2005 this was 5.3 and 6.2 respectively (Central Bank 2005). The interest from capital market is the capital market opportunity cost of physical investments in these two enterprises (Lumby and Jones 2001).

The jackfruit dehydration enterprise

This enterprise produces about 440 kg of dehydrated jackfruits during a peak month generating about LKR 48,500 of net cash inflow *(see Table 01)*. Five working months during the peak and low seasons generate net cash inflow of LKR 170,000 during the first year. Actual cash flow figures are used as much as possible while future cash flows are predicted for ten years incorporating the repair and maintenance cost, machinery replacement costs and scrap values of machinery and equipment for this analysis.

Table 01: Cash flow of an average month during the peak season of dried jackfruit producing enterprise

Cash inflow	Monthly production (kg)	Wholesale price (LKR/kg)	Amount (LKR)
Revenue	440	300	132,000
Total variable cost of production			83,452
Net cash inflow			48,548

1 USD = 113.23 LKR

When calculating the discounted payback period for the jackfruit enterprise which had to invest an initial capital outlay of LKR 1,152,000, the time needed was ten years which is equal to the life-span of the project. For any investor, this would be a very risky investment especially for limited-resource small-scale entrepreneurs unless they reduce the discounted payback period.

Rural Enterprise Network is marketing the group's products through its trusted and well-known REN label.

However the discounted payback method alone does not provide an appropriate picture about the desirability of the investment because it does not report the expected return over the whole life of an investment, since it disregards the investment's post-payback period cash flows (but in dried jack fruit producing enterprise, the discounted payback period and the life span of the project is equal). It used speed of return rather than rate of return as its criterion to describe a project's desirability. Thus the enterprise was also assessed by using Net Present Value (NPV) investment appraisal, which works on the simple, but fundamental principle that an investment is worthwhile undertaking if the money received is greater than the money put in (Box 2). In general terms, NPV of an investment is expressed as the "sum of its net discounted future cash flows", interpreted as the gain from the enterprise rather than investing the money on the capital market. Thus, investing LKR 1,152,000 into the dried jackfruit producing group enterprise produces LKR 188,143 more in present-value terms than investing it in the capital market. The decision rule is to accept a project if its NPV is equal or greater than zero (Lumby and Jones 2001).

The Internal Rate of Return (IRR) of an enterprise is the discount rate which, when applied to a project cash flow, produces a zero net present value (NPV). The IRR of the investment grouping the jackfruit enterprise is 9.86%. The decision criterion is to accept the projects only if IRR is greater than or equal to some predetermined cut-off rate, which is usually the market rate of interest (i.e. 7% for this study).

The fruit drinks enterprise

This enterprise generated net cash flow of LKR 52,600 during the month of August of the first year, which is more or less equal to an average full working month *(see Table 02)*. The enterprise generally operates throughout the year at full capacity, except during the first year where it operated at less capacity for seven months due to renovation activities, generating annual net cash flow of LKR 334,500.

Actual cash flow figures are used as much as possible while future cash flows are predicted for five years for this analysis as in the case of previous enterprise.

Table 02: Cash flow of month of August (more or less equal to an average month) of fruit drinks producing enterprise

Products and revenue	Monthly production (bottles / packets)	Wholesale price (LKR)	Revenue (LKR)
RTS	(190ml)	19,000	10 190,000
Cordial	(750 ml)	345	129 44,505
Sorbet	(45g)	16,000	1.5 24,000
Revenue			258,505
Total variable cost of production			204,250
Net cash inflow (expected)			54,255
Net cash inflow (actual)			52,600

1 USD = 113.23 LKR

The discounted payback period of the investment of LKR 1,169,000 on fruit drinks producing enterprise is only four years. The main reason for the shorter payback period is that this enterprise was in production year-round. The shorter the payback period, the smaller the risk for the investor.

Also using NPV as described above, we found that investing LKR 1,169,000 in the fruit drinks producing enterprise produces LKR 792,216 more, in present-value terms, than investing in the capital market.

The IRR of the enterprise is 25.9%

Summary of the profitability analysis of two of the investments on fruit processing

Location	Type of enterprise	Operation	Initial capital outlay (LKR)	First year net cash flow (LKR)	Profitability		
					NPV (LKR)	**IRR**	**Discounted Payback period**
Kurunegala	Dried jackfruit-group enterprise	Seasonal	1,152,000	170,000	188,143	9.86%	10 years
Kandy	Fruit drinks-individual enterprise	Year-round	1,169,000	334,500	792,216	25.9%	4 years

1 USD = 113.23 LKR

Whilst the fruit drinks enterprise poses the smaller risk for an investor, due to its shorter payback period, in terms of NPV and IRR both projects are acceptable, although the fruit drinks enterprise provides better returns.

As far as the deciding between these two small investment alternatives is concerned, deciding for the fruit drinks producing individual enterprise will produce greater addition to the shareholders'/ owners' wealth. The appraisal method in such circumstances is entirely unaffected by the fact that these two projects have different capital outlays and life-spans, but simply considers the difference in NPV. The fruit drinks enterprise NPV is LKR 604,073 higher than the dried jackfruit producing enterprise. Thus an entrepreneur will be advised to chose the fruit drinks enterprise. This decision is further supported by its smaller risk resulting from a comparatively short discounted payback period. However, it should be noted that this investment appraisal cannot give a definitive decision on whether to invest or not on any of these two fruit processing ventures, but can act as a decision guide only. The final investment decision will be based on a whole range of very diverse considerations (Lumby and Jones 2001).

Preparation of Ready To Serve wood apple drink in the small factory of "Tharindu" fruit products.

Discussion

Fruit drinks producing enterprises of this nature would qualify for commercial credit schemes due to comparatively higher IRR than the discount rate, higher NPV and short discounted payback period. In contrast, the dried jackfruit producing enterprise has relatively low NPV and subsequently a fairly long discounted payback period. It is thus a high risk operation for any lender. Therefore increasing the profitability of dried jackfruit producing enterprises of this nature is of importance.

Dried jackfruit producing group enterprise and fruit drinks producing owner managed enterprise are located in Kurunegala and Kandy districts of Sri Lanka respectively.

Each member of the dried jackfruit producing group enterprise earns about LKR 3,400 (USD34) during an average month as a combination of average monthly profit, labour wages and revenue from supplying raw jackfruits. This is, in general, more than 50% of their total average monthly income. Thus they belong to the 45 % of population in Sri Lanka who live on less than USD 2 a day (Central Bank Sri Lanka 2005). Thus, this enterprise alone does not provide sufficient income for its members. However they earn this income in only five months per year, which allows them to engage in other income generation activities during the remaining seven months. Other income sources are: income from small-scale farming activities, income from other small enterprises and labour wages in other farming and non farming enterprises. These income generating options are part of their livelihood strategies during the off season, which increases their average monthly income. Yet when interviewed, the members would rather prefer to expand the fruit processing business into the off season by including other dried fruits, such as pineapple, mango or banana, into the product range, which would increase the machine utilisation, profitability and annual income. At present, however, there is no market for these products which is the main impediment for extending the product range.

"Tharindu" fruit drinks products in a supermarket shelf

The cost of raw materials and labour are the highest variable cost components of both the enterprises in addition to high fixed costs. However the labour payment is an income for the members of dried jackfruit producing group enterprise as it uses the labour of its own members. This arrangement led to inefficient labour operation as the members are paid based on the number of hours they work. The inherent tendency of the members was to work more hours as the labour payments are made daily or weekly basis while the profit is shared at three or six months frequency. Introducing simple equipment for labour intensive operations (for example, automatic cutting machines) and a performance-based payment system could improve the labour efficiency. At the same time the initial large costs are prohibitive to small-scale operators which need to either form cooperatives, or explore possibilities for hiring or leasing the buildings and machinery instead of purchasing them. This could ultimately reduce the risk of the investment by reducing the discounted payback period.

Low efficiency of seasonal dried fruit enterprises of this nature does not necessarily imply that the promotion of such industries is not worthwhile. In the contrary they provide lots of other benefits such as creating employment at a fairly low investment (Tambunan 2005) and social strengthening through group activities. At the same time they require less sophisticated managerial skills than enterprises which operate at higher capacity.

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A new crop with potential?

Recent emphasis on new and underutilised crops has focussed on fruits with potential as fresh products with specific or nutritional chemical attributes that contribute significantly to human health and well being. However some fruit can be utilised for other properties contributing to human health. One such crop that has received attention in the USA and New Zealand in the last decade relies on extraction of a sweetening compound that can replace sugar in foods and beverages and thereby contribute to community health by reducing sugar intake and thus obesity. Obesity is considered a scourge of our time in many countries; obesity is clearly a result of many factors including excessive sugar in the diet.

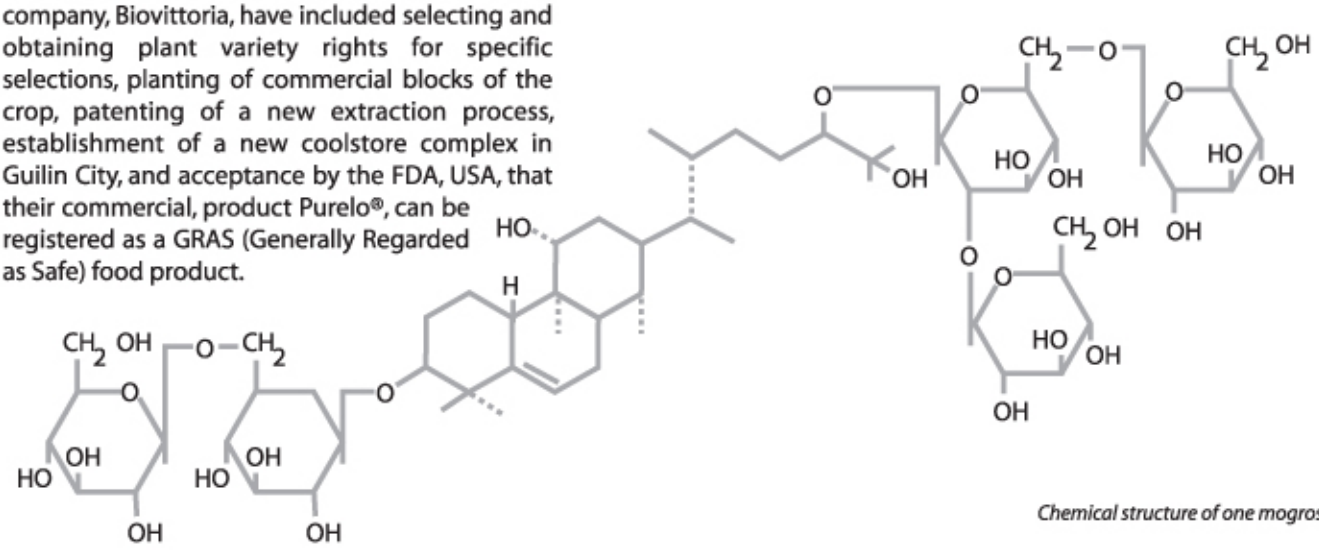
Flowering and young fruit.

Availability of a natural sweetening product that can replace sugar in a wide range of foods and beverages, and also has direct health conferring attributes, is possible through development of a traditional and underutilised fruit crop in China. Luo Han (Siraitia grosvenorii), a perennial vine from the cucumber family, is found predominantly in the mountains of Guanxi near Guilin, China (Anon, 2004). It has been cultivated locally for over 100 years, it has been used as a 'cooling' food and a traditional medicine for more than 300 years. A major attribute of this fruit is the presence of chemicals in the flesh, skin and seeds of the fruit that are very sweet and have a distinctive taste; they are called mogrosides and are triterpene glycosides.

Workers in the plantation.

A number of companies make products based on extracts from Luo Han fruit including the Youngfu Pharmaceutical Factory in Yongfu County, Guilin, and Procter and Gamble (PG). PG took out a patent for extracting mogrosides in 1995; the patent states that, while Luo Han Guo was very sweet, it had too many interfering aromas, which rendered it useless for general application, so PG developed a process for the removal of the interfering aromas. Recent developments in a joint commercial arrangement between a Chinese group, Bio-GFS, and a New Zealand company, Biovittoria, have included selecting and obtaining plant variety rights for specific selections, planting of commercial blocks of the crop, patenting of a new extraction process, establishment of a new coolstore complex in Guilin City, and acceptance by the FDA, USA, that their commercial, product Purelo®, can be registered as a GRAS (Generally Regarded as Safe) food product.

Fruits ready for harvest.



Chemical structure of one mogroside.

A number of companies make products based on extracts from Luo Han fruit including the Youngfu Pharmaceutical Factory in Yongfu County, Guilin, and Procter and Gamble (PG). PG took out a patent for extracting mogrosides in 1995; the patent states that, while Luo Han Guo was very sweet, it had too many interfering aromas, which rendered it useless for general application, so PG developed a process for the removal of the interfering aromas. Recent developments in a joint commercial arrangement between a Chinese group, Bio-GFS, and a New Zealand company, Biovittoria, have included selecting and obtaining plant variety rights for specific selections, planting of commercial blocks of the crop, patenting of a new extraction process, establishment of a new coolstore complex in Guilin City, and acceptance by the FDA, USA, that their commercial, product Purelo®, can be registered as a GRAS (Generally Regarded as Safe) food product.

Harvested fruit.

Purelo® is a naturally produced fruit concentrate that is non-caloric and is 300 times sweeter than sugar. It is a highly stable chemical, soluble in water and alcohol, and is said to have broad applications in natural medicine, food, beverage, confectionary and personal health care products. It is recommended that Purelo® be used as a sweetening agent for beverages, yogurt, caramel and hard candies, chewing gum, mouthwash as muffins (Anon, 2004).

Thus Luo Han is a recently crop, that while used locally in the past, had not been commercialised. New selections, and utilisation of patented technology, together with imaginative collaboration between companies in China and New Zealand, herald the possibility of a crop being developed for production a processed product and not a fresh fruit. There must be other fruit or vegetable crops with similar potential.

Anonymous, 2004. A brief history of Luo Han fruit (Luo Han Guo). http://www.biovittoria.com/Live/biovittoria-1-24.php

View of plantation.

Processing plant.

Close-up of harvested fruit.

Commercial salak (Zalacca edulis) grower demonstrating the vegetative propagation of the plant in Lumajang, East Java during a study visit organised by TFNet in September 2006.

Local zalacca varieties

Delegates from TFNet 3rd General Assembly visiting the litchi germplasm centre at the Institute of Fruit Tree Research, Guangdong Academy of Agricultural Sciences.

TFNet CEO, Dr. Izham Ahmad presenting a paper at the Chinese Tropical Fruits Seminar in Guanzhou, China on 25 August 2006.

Delegates attending TFNet 3rd General Assembly

TFNet CEO, Dr. Izham Ahmad expaining to country representatives and UPOV officials the TFNet / GTZ study on Plant Variety Protection testing of tropical fruits in Asian countries on 16 November 2006

Workers packing starfruit in a starfruit rehabilitation programme at Blitar, East Java during a study visit organised by TFNet in September 2006

TFNet CEO, Dr. Izham Ahmad delivering a paper at the National Fruit Seminar in Guangzhou, China on 25 August 2007

Participants attending the National Fruit Seminar in Guangzhou, China on 25 August 2007

Opening of TFNet 3rd General Assembly by Prof. Dr. Lu Fuhe of the Guangdong Academy of Agricultural Sciences in Guangzhou, China on 22 August 2007

The Use of Urea in Tropical Fruits

Introduction

Urea is the major fertilizer traded in international commerce. In the near future, it is expected to account for more than 50 % of the total nitrogen fertilizers in world trade. When compared to other dry fertilizers, urea has captured more than 65 % of the world trade.

With more than 46 % nitrogen, urea has the highest nutrient concentration among commercially available solid nitrogen fertilizers. Nitrogen from the urea source is made available in the ammonium or nitrate form to the plants by soil microbial reaction. Since urea is hygroscopic and easily breaks down, application is more efficient if it is incorporated or washed down into the root zone. To ensure efficient use of nitrogen in urea and to minimize ammonia emissions, urea should be incorporated into the soil, preferably be spread when rain is forecasted or washed into the soil by irrigation. Urea should not be applied during the hottest part of the day, after liming or spread on top of organic manure. On alkaline soils (pH > 7.5), urea should be incorporated into the soil immediately after spreading.

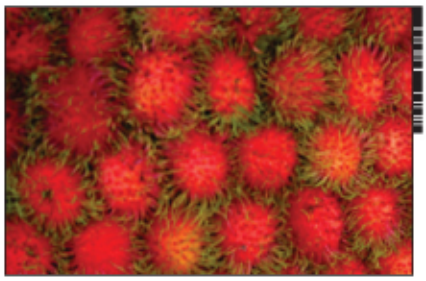
In Asia, urea is commonly used for paddy, corn, leafy vegetables and other short term cash crops. Besides this, urea is also used for more permanent tree crops like oil palm and fruit trees. In tree crops, urea is used as part of a basal mixture or as a straight fertilizer. It is also used as a foliar spray and as a component in fertigation. The main reason why urea is popularly used is the high N content and it is cheaply and readily available.

Urea on Tropical Fruits

On tropical fruits, urea is normally used as a basal fertilizer and as a foliar spray.
Some of the popular tropical fruit types, which incorporate urea as part of the fertilizer programs, include pineapple, mango, avocado, rambutan, guava, citrus and papaya. Besides being used as a fertilizer in fruit trees, urea is also used as a defoliant, a hormonal mix, and as a shoot regenerator.

Use of Urea as a straight fertilizer

The use of urea as basal fertilizers is mainly for initial or vegetative growth of fruit trees like avocados, durian, soursop, guava, rose apple, banana, papaya, mango and rambutan. Normal application is as a mixture together with phosphate and potassium sources (superphosphate and muriate of potash, respectively).



In many mango-growing countries, urea is recommended as an important N source in their fertilizer programs.

In the general fertilizer guide on mango growing in Pakistan, 2 – 3 kg of urea together with potassium sulphate have been recommended as a basal application before flowering (December to January). This is followed by, after fruit setting, 2 – 3 kg of urea in two equal doses for the months of March and April.

In the Indian technical guide on mango, for the areas around Andhra Pradesh, 170 g urea, 110 g superphosphate and 115 g muriate of potash per plant per year from the first to the tenth year are recommended. After the tenth year, 1.7 kg, 1.1 kg and 1.15 kg respectively of these fertilizers per plant per year are applied in two equal split doses (June – July and October). Foliar spray of 3 % urea is recommended before flowering in sandy areas.

In the Philippines Techno-Guide for mango, urea is recommended for vegetative growth for the initial 4 years. Urea is recommended at rates of 100 g / plant for the first year, 200 g for the second and third years and 400 g for the fourth. In this case, urea is applied together with organic matter or manure usually in split applications. (HVCC Techno-guide for Mango in the Philippines, 2001)

Similarly, urea is recommended in the mango growing areas of Sri Lanka. The applications of NPK in the wet zones are, for the first 2 years, 115g urea, 230g rock phosphate and 105g MOP per tree, with annual increments of 60g 115g and 55g respectively until bearing. A total of 215g urea, 325 rock phosphate and 190g of muriate of potash are applied to bearing trees. After several years the maximum recommended dose per tree is 870g urea, 1295g rock phosphate and 1515g of MOP. For the dry and intermediate zones, young trees are recommended annual amounts of 160g urea until bearing. Recommendations for bearing trees are 235g with incremental annual amounts of 180g per tree until the maximum of 945g urea.

Urea is also commonly used in the growing of citrus

In the Philippines fertilizer recommendation for citrus, one-month-old transplanted plants are given 200 grams of urea/tree/year for the first 3 years. Application is split during the onset and before the end of the rainy seasons (Department of Agriculture, Philippiines, 2002). Urea is also used to promote initial vegetative growth in seasonal tropical fruit trees that take some time to bear as in the case of Mangosteen which bears between 6 – 8 years.

In the fertilization program of young mangosteen in the Philippines, two equal dosages of 300 – 500 g 14:14:14: or 12:24:12 are applied together with 200 – 300 g urea. Urea is applied by incorporating in a shallow furrow around each tree. The first dosage is applied at the start of the rainy season, while the second dosage is at the end of the rainy season.

For pineapple, in most cases, urea is sprayed, however, it can also used as a basal fertilizer. Fertilizer trials on pineapples in Kenya showed that a total of 471 kg/ha in 4 equal applications during the first year was beneficial, whereas no advantage was apparent from added potassium and phosphorus.

In Malaysia, some studies have been done on the utilization of broadcasted urea on the main commercial tropical fruit crops, which are starfruit, papaya and banana.

In an eight-year study on starfruit (carambola), to evaluate urea based fertilizer mixtures together with ammonium sulphate (AS) based mixture, and a standard commonly used compound fertilizer, it was concluded that urea based or ammonium sulphate based fertilizer mixtures were better than the compound ones in terms of yield and plant girth size. Use of urea-based fertilizer also resulted in higher N foliar value (Aziz B and Balasubramaniam P. 2001)

In another urea based experiment on papaya in Malaysia, treatments ranging from different levels and sources of N, from small granular urea-based mixture (SGU), large granular urea-based mixture (LGU), large granular urea-based mixture incorporated into the soil (LGUi), ammonium sulphate-based mixture (AS), and a compound fertilizer were used.

The study, carried out for a period of 16 months, showed that generally all treatments were similar in the expression of total plant heights at 240 g N / tree. The girth size also were consistent to plant height where increased N showed increase size, however, SGU and incorporated LGU based fertilizers resulted in bigger girth sizes.

As far yields were concerned, generally, there was an increase in yield with increases in N. Plants treated with the compound fertilizer produced higher yields than the other N fertilizer types. Urea-based and ammonium-based fertilizer did not exhibit comparable yields as the compound fertilizer, however, the incorporated urea-based fertilizers did show yield increases at the same level of N.

In another comparative study on banana in Malaysia where fertigated and broadcasted N sources were applied to two different planting densities. The sources of N were urea, potassium nitrate and NPK compound. It was reported that urea, when used as an N source in fertigation was not as effective as broadcasted urea. However, urea when broadcasted was equally effective to broadcasted potassium nitrate and compound NPK This was apparent when urea fertigated plants produced bunch weights of between 16 – 24 kg., while bunches weighing 25 – 34 kg., were obtained by plants broadcasted with urea (Zabedah and Zaharah, 1998).

The use of urea in fertigation also resulted in lower leaf N-content (2.4 – 2.7 %) and a reduction of subsequent banana crops. Higher plant density (2200 plants/ha) also significantly reduced yield .

Urea as foliar spray on tropical fruits

There have been numerous studies on the effect of urea as a foliar spray on tropical fruit crops. Urea is applied as a foliar spray either separately, or together with other chemicals to improve fruit quality, as well as promote flowering and vegetative growth.

In a study done on mango (cv Langra) in India, orthophosphoric acid (0.5 %) was sprayed along with and without 2 percent urea in the months of September, November or March as well as in all the three months. It was reported that there was an improvement of fruit set in the sprayed treatments, which was high after March sprays. It was concluded that the urea given along with phosphorus improved the utilization of phosphorus in the fruits by providing a better balance of nutrients (Eswara and Majmudar 1983).

In another study on the effect of foliar spray of low biuret urea on induction of flowering in mango in Pakistan, it was reported that the sprays were effective and showed increased fruit bud differentiation, which was indicated from advanced flowering and increased number of fruits/yield in treated over control. Two percent spray of low biuret urea was found more effective to increase flowering (Faqir, Mohammad and Aslam 1999).

Urea is commonly utilized as a spray in the growing of pineapples, where nitrogen is essential to the increase in fruit size and total yield.

In Malaysia, it has been reported that for total fertilizer use in tropical fruits, nitrogen use was highest in banana at 5729, 5369 and 7670 tons followed by pineapples at 2164, 2272 and 2340 tons for the years 2000, 2001 and 2002 respectively. The amounts are significantly large compared to only 24 tons used in starfruit, 424 tons on watermelon, 81 tons in papaya and 1928 tons on durian in 2002. (FAO Corporate Document Repositor 2004). Even though the report did not indicate the exact nitrogen, for pineapples, urea is being extensively used.

In Malaysia, it is common practice to foliar spray pineapples with a mixture of urea (4 %) together with hydrated lime and copper sulphate for pineapples grown on peat soils. The hydrated lime and copper sulphate alleviate the problem of acidity and copper deficiency that are prevalent in tropical peat soil. Spraying is done twice, once 2 month after planting and second spray is 6 months after planting.

In pineapples, 4 % urea is applied to harvested plants to initiate growth of aerial shoots which are used as planting materials. The plants are left for 3 months to harvest the shoots for the purpose of replanting.

Studies on urea sprays on pineapples in other countries have also reported beneficial effects of urea on crop yield.

Studies in Puerto Rica on the fertilizing of pineapples have indicated that maximum yields have been achieved by urea sprays at the rate of 151 kg/ha.

Similarly, in a study done In Queensland, Australia, total yield of pineapple mother plants and ratoons was increased 8 % by urea at the application rate of 13.3 litres per 1,000 plants.

In the pineapple growing areas of Hawaii, Nitrogen, as urea or urea-ammonium nitrate, iron and zinc are commonly applied after planting, by using a boom spray truck or with the irrigation water. The urea, iron and zinc solution is applied every 10 days to 2 weeks beginning about 3 months after planting until fruiting is initiated.

Other uses of urea on tropical fruits

In some tropical fruits, urea is used as a defoliant to later promote more vegetative growth, thus increasing yield.

In a study done in Australia on guava, it was reported that a 25 % urea spray plus wetting agent applied to 15-month-old guava seedlings of the variety GA9-EX39, produced a three-fold increase in yield over untreated trees at 22 months of age. In addition, the harvesting period was shortened from 15 weeks for control trees to four weeks for sprayed trees. Mean yields also increased for sprayed trees at 27.93 t/ha compared to 8.73 t/ha for unsprayed trees. Fruit size was also not affected in the sprayed plants. The report confirms that the use of urea as a defoliant spray permits early cropping of young, densely planted orchards which results in faster economic returns. (Chapman, Saranah and Paxton, 1998).

Conclusion

It is apparent that urea as a nitrogen source is important in the fertilisation programs of tropical fruit trees. However, too much nitrogen will make the fruit keep poorly, while too little of it can cause trouble at budding and may reduce size and yield. Thus, emphasis has to be given to the mode of application. There has to be a balance whether it is applied directly into the soil or applied as a foliar spray since there is ample evidence that suggests that urea assists in the foliar uptake of other nutrients.

The incorporation of urea in the soil in basal applications is more effective as it prevents losses of N, but this will depend on labour availability. Another alternative is to irrigate the plants after urea is being broadcasted.

Splitting N applications between soil and foliar applications will actually reduce total N inputs, where reducing the requirements for soil applied N provides growers with an economic and environmental benefit.

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International Tropical Fruits Network 3rd General Assembly in Guangzhou, China from 22 - 24 August 2006

International Tropical Fruits Network (TFNet) Third General Assembly was held in Guangzhou, People's Republic of China from 22 – 24 August 2006. It was attended by a total of 32 delegates and observers from 9 countries namely; China, Fiji, India, Indonesia, Malaysia, New Zealand, South Africa, Vietnam and Israel.

The GA was declared open by the Honourable Professor Luo Fuhe, President of the Guangdong Academy of Agricultural Sciences. In his officiating speech Professor Luo Fuhe welcomed all delegates and thanked TFNet for hosting the General Assembly in China. He also mentioned that with Guangdong province as the third largest in terms of agricultural production in China is an appropriate place to have a meeting and he expressed his hope that the GA will be beneficial in charting the future plans for TFNet in improving the tropical and subtropical fruit industry.

The GA was chaired by the Secretary General of the Ministry of Agriculture and Agro-based Industry, Malaysia, Tan Sri Abi Musa Asa'ari bin Mohamed Nor.

After the appointment of Dr. Yi Ganjun and Mr Poasa Nauluvula from China and Fiji respectively as Vice chairpersons, the CEO of TFNet, Dr. Izham Ahmad proceeded with a progress report on the activities of TFNet from 2003 to 2005. The report covered TFNets' past activities, ongoing activities and projects that were in the pipeline. Besides this, the future direction for TFNet was also presented. After the presentation of the report, there were interactions from among members of the meeting regarding the future direction of TFNet, of which a special sub-committee comprising Prof. Dr. Errol Hewett, Dr. Sisir Mitra, Mr. Chan Seng Kit and Dr. Izham Ahmad, was appointed to look into this issue.

The meeting continued with a detailed discussion on the amendments of the TFNet constitution. Details on the amendments are as on page 20.

The meeting session also saw the presentation of four papers as follows:

a. Technical Assistance for a 3-year joint collaborative project on post harvest, handling and processing fruits in Syrian Arab Republic by Mr. Chua Piak Chwee, Project Officer, TFNet
b. TFNet – SPAT cooperation in developing the Tropical Fruit Processing Industry by Mr. Yacob Ahmad, Technical Officer, TFNet.
c. Marketing of Tropical Fruits – a global perspective by Mr. Ricky Yong, President of Malaysia Fruit Exporters Association.
d. The status of litchi, pineapple and banana in China by Dr. Yi Ganjun, Director, Institute of Fruit Tree Research , Guangdong Academy of Agricultural Sciences.

On the following day, delegates of the General Assembly participated in a study visit to:

a. Institute of Fruit Tree Research, Guangdong Academy of Agricultural Sciences (GAAS)
b. Baiyun Modern Agricultural Experimental Station
c. Commercial Banana Plantation, Zhongsan
d. Zhuhai Modern Agricultural Exhibition Centre.

Dragon Fruit Cultivation in Malaysia

White flesh variety.

Introduction

Dragon fruit or pitaya (Hylocereus sp) is a relatively new fruit crop in Malaysia. The fruit, which has been long cultivated in Vietnam and Thailand is slowly gaining popularity with increasing demand. The estimated area grown with pitaya or local name 'buah naga' is about 300 hectares, mainly concentrated in the States of Johor, Perak, Negeri Sembilan, Pahang, Pulau Pinang and Sabah.

Red flesh variety.

Varieties of Dragon Fruit

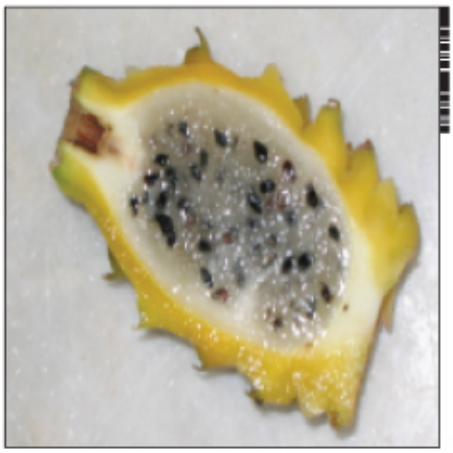
The three varieties of dragon fruits grown in Malaysia are those with white (Hylocereus undatus), red (Hylocereus polyhizus) and yellow skin (Selenicereus megalenthus) types. Commercially only the white flesh and red flesh varieties are planted. Currently the latter is more popular due to its attractive color and the local consumer's penchant for fruits which are sweet and less insipid.

Dragon fruits are externally red or pinkish in color, round to oval in shape, which weighs between 300 – 500 g., with fruit length ranging from 10 – 15 cm Its taste can be described as light sour to sweet. The yellow variety is smaller in size, weighs between 100 – 150 g and is sweeter, compared to the other two varieties.

The flesh of all the varieties contains numerous tiny black edible seeds.

Nutrient content and uses

Dragon fruit is rich in minerals and vitamins. Reports have shown that the fruit is beneficial for the gastro-intestinal and circulatory system. It has also been reported that it can alleviate conditions related to hypertension and toxins in the blood. The red variety is reported to contain high levels of antioxidants, which are beneficial for general well being and good health.



Yellow skin variety.

Planting

This cactus-like epiphytic plant has succulent stems and need support to grow and branch out. A stake or support for four plants are required during planting The suitable soils are those that are not waterlogged, well-aerated and contains high amounts of organic matter.

In Malaysia, dragon fruit is normally grown by cuttings, which are obtained from reliable plant suppliers. The cuttings of 15 – 30 cm length have to be disease free and preferable rooted in polybags. Four cuttings are planted around a stake or support. The distances between the stakes are 2 X 3 meters, which total 1,600 stakes per hectare, supporting 5,000 plants.

Removing excess young shoots from mainstem.

Commonly, the stakes are made of cement with dimensions of 10 cm X 10 cm with an above ground height of about 2.0 meters. Square or round frames to support the point of branching of the plants can be shaped from wood, wires, old tires, poly pipes or welded iron parts.

Pruning

As in other fruit types, pruning in dragon fruit is essential to balance the overall shape of the plant, encourage the growth of productive branches, remove diseased branches and ensure reasonable aeration to reduce the risk of diseases.

Fertilization

Organic fertilizers are important during establishment and early growth of the dragon fruit plant. Each planting hole requires between 3 – 4 kg of organic fertilizers before planting, of which subsequently, 2 – 3 kg are required at three month intervals after planting. A phosphate source (CIRP) at 20 g per hole is also a recommended practice. Compound fertilizers such as NPK 15:15:15 and 13:13:21 are also applied in 3 split applications a year at the rate of 3 – 6 kg/year.

Assisted pollination

The dragon fruit plant flowers after eight months to one year after planting. The flowers bloom at night, therefore pollination occurs during these hours. Fruit setting commences 4 to 6 weeks after floral emergence.

Some commercial growers carry out assisted pollination where, collected pollen are applied during the floral receptive stage (at night) between 8.00 to 10.00 pm. There have been reports that confirm that assisted pollinated fruits are of better size and quality.

Collecting pollen from flower.

Intercropping

Intercropping with pineapple, aloe vera, banana, herbs and vegetables are sometimes carried out by the growers during the initial establishment of the dragon fruit farms. This is to maximize utilization of land, control the weeds and as a source of revenue.

Crop husbandry

There has to be cautionary measures taken when using herbicides, since the nature of the stems or branches of dragon fruit plants are prone to injury at the slight contact with these chemicals.

Pest and diseases control

The most serious diseases that need attention are those related to bacterial and fungal attacks. Stem and collar rot caused by *Xanthomonas campestris, Phomopsis sp* and *Dothirella sp*. Chemical use for prevention and control is imperative. Cultural control like burning of pruned diseased parts and the use of non-diseased planting materials should also take precedence.

Pollen ready for pollination.

Costing

In Malaysia, the estimated cost of establishment of one hectare of dragon fruit plants is between RM 30,000 to RM 40,000 per hectare. Planting materials take up 35 % of the total cost. Other costs are land preparation, fertilizers, stakes and support frame, pesticides and labour.

Non assisted pollinated (left) and pollinated fruits (right).

Harvesting and production

Dragon fruit is productive all year round with peak yields in April and September. In the second year of planting yields can range from 2 to 8 tons / hectare, up to the time of full maturity yields up to 20 tons / hectare are attainable.

Fruits are graded according to size as such :

i. Grade AA – 500 – 800 g / fruit
ii. Grade A – 350 – 450 g / fruit
iii. Grade B – 250 - 350 g / fruit
iv. Grade C – below 250 g / fruit

By products of dragon fruit

The dragon fruit is best eaten fresh, however it can also be processed into cordials, jams and wine. The red variety has potential as a natural food coloring, while young shoots are edible if cooked and dried flowers can be made into tea.

The dragon fruit has the potential of developing into a lucrative fruit, however, there needs to be a concerted effort to gauge its market prospects, alleviate major diseases of the plant, achieve optimum yields and develop other by-products.

Tea made from dried flowers.

Extracted from an article by:
Dr. Zainudin Hj. Meon
Horticulture Research Center
MARDI, MALAYSIA
Email: zmeon@mardi.my

Skinning jackfruit for sale on a mobile cart in Jakarta, Indonesia.

Neatly arranged mangoes at the Warorot market, Chiangmai, Thailand.

** Photos by Yacob Ahmad*

TFNET ORDER FORM

Yes, I would like to purchase the selected item(s) as below : *(Please tick ✓)*

ITEM	PRICE
Proceedings	
☐ International Technical & Trade Seminar on Tropical & Subtropical Fruits (1st, 2002)	USD 30
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Box 334, UPM Post Office, 43400 Serdang, Selangor, Malaysia
Tel : (603) 8941 6589 / 8941 6590 Fax : (603) 8941 6591
E-mail : info@itfnet.org
Website : http://www.itfnet.org

MEMBERSHIP APPLICATION FORM

I / We wish to apply the membership ofTFNet as :

Choose Membership Category :

- Country [ ]
- Associate [ ]
- Ordinary [ ]

Name of Government / Organization / Individual _____

Correspondence Address _____

City _____ Postcode _____

State/Province _____

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Payment Enclosed : **USD** _____

Authorised Signature : _____

Name :

Designation :

Date :

Membership Fees (effective from 24 August 2006)

- Country Membership dues : USD 5,000 for one calendar year (for government only);
- Associate Membership dues : USD 500 for one calendar year; and
- Ordinary Membership dues : USD 50 for one calendar year

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Amendments to the constitution with reference to the Third General Assembly held in China on 22 - 24 August 2006

Proposal 1: Amendment to Article 6 (i) Ordinary Members
Present Clause:
"Ordinary" membership is open to all member countries of the FAO who are signatories to the Agreement on the Establishment of the International Tropical Fruits Network or who have acceded to the said Agreement.
Ordinary members shall have voting rights in the General Assembly"

Approved Amendment:
"Country" membership is open to all member countries of the FAO who are signatories to the Agreement on the Establishment of the International Tropical Fruits Network or who have acceded to the said Agreement.
Country members shall have voting rights in the General Assembly"

Proposal 2: Amendment to Article 6 (ii) Associate Members
Present Clause:
"Associate membership is open to any international or regional organisation, institute, association, individual and any entity in both the public and private sectors that can contribute positively to the objectives of TFNet.
Associate members shall have no voting rights in the General Assembly."

Approved Amendment:
"Associate membership is open to any international, regional or national organisation, institute, association, cooperative or business entity in both the public and private sectors that can contribute positively to the objectives and operations of TFNet.
Associate members shall have voting rights in the General Assembly."

Proposal 3: Amendment to Article 6 (iii) Honorary Members
Present Clause:"Honorary membership is open to any non-profit organisation or entity which can contribute positively to the objectives and operations of TFNet.Honorary members shall have no voting rights in the General Assembly."

Approved Amendment:"Ordinary membership is open to any individual or non-profit organisation that can contribute positively to the objectives and operations of TFNet.
Ordinary members shall have no voting rights in the General Assembly."

Proposal 4: Membership Fees
Approved Amendment:
- Associate Members : "Annual membership fees be USD500.00"
- Ordinary Members : "Annual membership fees be USD50.00"

Proposal 5: Amendments to Article 9.1 (a) Board of Trustees
Approved Amendment:

"The Board shall comprise 13 members who shall consist of:
i. The CEO who shall be an ex-officio member
ii. Seven (7) Representatives from among the Country Members. In the event there is insufficient Country Members, then Associate Members can be elected to the Board.
iii. Two (2) representatives from among the Associate Members.
iv. Two experts from among the members to represent the various disciplines in the tropical fruit industry; and
v. A Representative from the Food and Agriculture Organisation (FAO) of the United Nations."

ELECTION OF THE MEMBERS OF THE BOARD OF TRUSTEES
9. The amendments to the constitution take effect immediately. A period of 3 months had been agreed for members to decide on their status. The general assembly agreed that since the Board of Trustees (BOT) cannot be formed because of these new changes, the PMC be continued until the BOT can be formed. Seven (7) members can be confirmed as members of the PMC 2006 - 2009, as below

a. Representative from Malaysia
b. Representative from PR China
c. Representative from Republic of Fiji
d. CEO of TFNet
e. Representative from FAO
f. Dr. Errol Hewett (Technical Expert)
g. Dr. Sisir Mitra (Technical Expert)

The GA agreed to give the mandate to the CEO of TFNet to appoint the new members of the BOT based on the amended constitution. The appointments will be circulated to all members for their information.