



NATURAL DEHYDRATION OF LEMONS

IDEASS GUATEMALA

Innovation for Development and South-South Cooperation

Introduction

By Nohora Elizabeth Hoyos

The lemon dehydration process developed in Guatemala involves the complete drying of lemons in direct sunlight, without adding any artificial or chemical substances, and using only the best agricultural practices, careful handling, and hygienic preparation and packing systems. This ensures pure and simple quality products, great with soups, meat dishes, salads, broths, tea and iced tea. Moreover, lemon is a nutritional fruit high in pectin and citric acid.

Natural dehydration or sun drying makes use of the natural elements and such weather conditions as sunshine, the heat of the day, and low relative humidity.

The cultivation, production, dehydration, processing and commercialisation of lemons represent a viable productive alternative in arid areas, and can help generate income for rural populations and make a positive contribution to the reduction of poverty.

The lemons are small and round measuring from 30 to 50 millimetres in diameter. The yellow-green peel is smooth and adheres closely to the endocarp; the pulp is tender and juicy with an enticing citric fragrance and an intensely acid taste. It originated



in Asia but has adapted well to Guatemala and can be cultivated in warm temperate climates.

For decades, people in eastern Guatemala dried 'limón criollo' or native lemon (*Citrus aurantifolia* L.), but it was the 'Cooperativa Integral de Producción El Limón R.L.' (COELMON), which, as of 1993, managed to develop and perfect the process by introducing technical innovations and extending the production chain.

National bodies such as the Ministry of Agriculture, the Gremial Non Traditional Products Exporters Association, the Economics Ministry, and the National Council for Science and Technology have funded research on lemon processing techniques and marketing.

COELMON is a member of the National Federation of Fruit Producers and the Gremial Rural Enterprises Association.

Work carried out by the cooperative on natural dehydration has been presented in important food fairs in Europe and the United States. Between 2001 and 2003, it was awarded important international prizes and recognitions, including a prize for rural productivity awarded by the World Bank.

Because of the high quality of dehydrated Guatemalan lemons, they are in demand in Saudi Arabia, Kuwait, Oman, Yemen, Qatar, Arab Emirates, Lebanon and the United States, both for home consumption and the food industry.

What problem does it solve?

Natural dehydrated lemons represent a sustainable environmental answer to the problem of generating income and work in semiarid and marginal zones, where it is hard to find other productive agricultural options.

The successful history of the COELMON cooperative started in the early 1990s, when the community of Marajuma, in the municipality of Morazán (Department of Progreso) went through an unprecedented economic crisis. Extreme poverty, malnutrition, lack of resources and unemployment affected the settlers so seriously that it was decided to find alternative forms of economic development. The proposal was to exploit the potential for producing lemons and tackle the price crisis by processing and commercialising lemons.

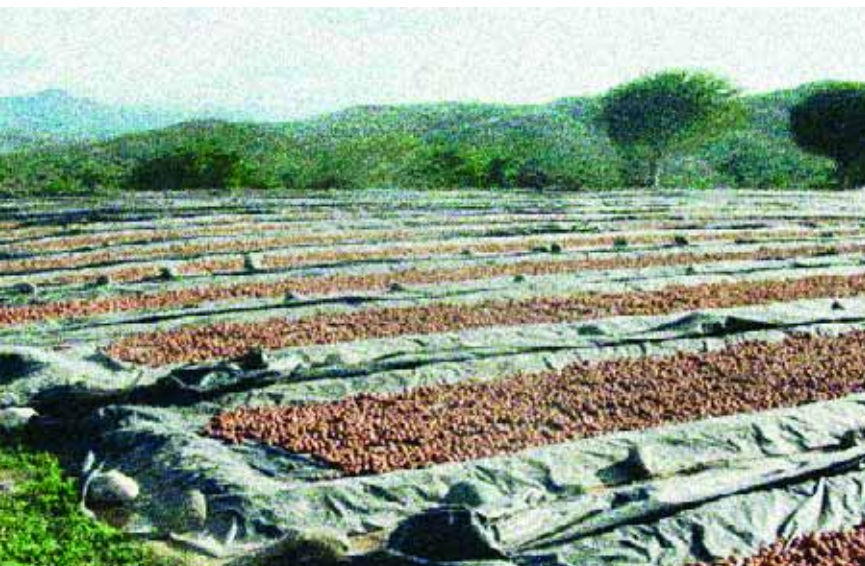
Lack of investment results in:

- High poverty levels
- Few job opportunities in rural areas
- Low income levels in semiarid zones
- Environment deterioration, due especially to deforestation and disappearance of thorn woods
- Surplus of fresh product in times of market saturation
- Weak community organisation
- Poorly developed agricultural production chains
- Limited market access

Positive aspects to be gained through the adoption of this process can be listed as follows.

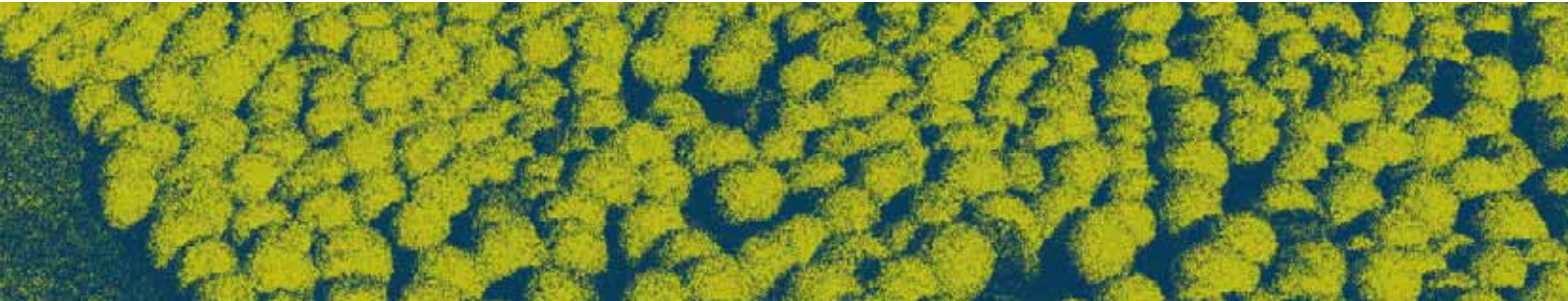
ENVIRONMENT

- Reforestation through planting of trees
- Establishment of fruit tree nurseries (grafting *Citrus Aurantifolia* L. on either *macrofilia* or *volkameriana* root stock).
- Non polluting drying process



ECONOMIC AND SOCIAL ASPECTS

- Generation of employment with no need for high levels of specialisation
- Strengthening of community organisation in terms of production
- Steady and seasonal work for producers, pickers and, transport workers, etc.



LOCAL DEVELOPMENT

- Exploitation of local resources
- Development of local workforce
- Extension of production chains from the local level upwards
- Prospects for increased productivity
- Technological innovation
- Gradual upgrading of product quality
- Standardisation of supply and improvement in producers' bargaining capacity
- Low cost locally available technical assistance

The experience of drying lemons in Guatemala demonstrates that, despite adverse natural conditions, lack of services and high poverty levels, quality production processes can be developed and directed at the international market.

The drying process has no negative effect on the environment, since the techniques used do not pollute and are based on locally developed experiences.

Equally environmentally friendly are the modern sun dehydrators which some producers use to speed up production, but which do not affect product quality (COELMON has already conducted several trials).

The process of producing, dehydrating and exporting lemons represents an innovative experience that has led to the introduction of suitable technology, larger production chains, promotion of exports, ecologically sustainable processes, and exploitation of local resources.



Experiences in Guatemala show that the dehydration process can be adopted by producer organisations in marginal rural zones, as long as there is plenty of sunshine and low relative humidity.

Ideally, temperatures should range between 28 and 40 degrees centigrade, which will help the drying process and prevent damage from humidity: rainfall should not exceed 500 millimetres a year.

The dried product does not require much investment in infrastructure and equipment, and can easily be replicated in economically disadvantaged parts of the world.

■ "THE DEHYDRATION PROCESS" in practice



The process is very simple but it requires constant control and supervision.

Dried lemons for export

- Ripe fruit is picked
 - Product purchased from members and non members
 - Product transported to store areas by the producers themselves
 - Delivery, inspection and weighing in drying fields
 - Product spread uniformly on raised earth beds (1.5 metres wide) covered with black plastic held in place by stones or other heavy objects at the sides
 - Lemons are sun dried on the black plastic for 3-4 months until 80-90% water is lost
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- Lemons are constantly turned and moved around to ensure homogenous drying; everyday, in the late evening, they are covered with the black plastic and, in the mornings, they are uncovered to expose them to direct sunlight
 - Constant inspection to verify the degree of dehydration; products with defects or in a bad state are rejected
 - Optimal conditions are reached when the lemons turn brown or black and have a slightly burnt look, when they are removed from the fields.
 - The product is placed in polypropylene sacks and taken to store rooms. Dehydration ratio is 10 to 1
 - Product is classified according to size and appearance. The lemons pass through a grid with set hole sizes
 - Once classified, product is weighed and placed in sacks for export.
 - OSacks are loaded into containers and taken to port for shipping.



LEMON ICE TEA

- Lemons that do not meet requirements in size and shape are used to obtain juice for iced tea.
- They are ground until grains are less than a millimetre in diameter
- The grains are packed into transparent plastic bags weighing approximately 25 pounds for storage
- The product is then submitted to a process which extracts and pasteurises the lemon essence
- The essence is mixed with pure water and sugar to obtain lemon ice tea
- It is then vacuum packed in labelled plastic bottles (250 millilitres, 500 millilitres, litre, __ gallon, and one gallon sizes)
- Product is distributed to supermarkets through the services of a transport company

LEMON TEA

- Lemon tea is made from ground lemon
- COELMON has established a strategic alliance with a specialised company for the production and commercialisation of the tea
- Product is processed and placed into two-gram tea bags which are packed into boxes of 25; the company is also responsible for distribution
- The product is sold under the registered COELMON trademark, owned by the cooperative.

Results

The main result that may be observed from this experience is a substantial improvement in the living standards of the producers and the local people in general.

Sale of the product has increased considerably, capacity for direct bargaining has improved, and production lines have been diversified.

In 2002, 5,000,000 kilos (2,272 tonnes) of fresh lemons were dehydrated, generating 150 steady jobs, directly benefiting 1,500 producers who have improved income by 400%.



Another positive effect has been price stability for fresh lemons in local markets.

Participation in the international fairs of Cologne, Paris and Chicago helped establish new contacts and improve prices for exported lemons, up from USD 50 to 95 per hundred kilos. Dried lemon is in high demand especially in Middle East countries such as Saudi Arabia, Yemen, Arab Emirates and Lebanon.

Initial investment was around USD 15,000 (1992), while the average value of exports in the last four years stands at USD 306,000 a year. Dehydrated lemons that have a deep black colour are exported to Arab countries and Europe, while orange-brown ones are marketed in the United States.

An important aspect to be pointed out is that the cooperative's fixed investments and operational costs have been financed through credit funds, profits, and, in small part, donations.

Products on offer include:

- Whole sun dried lemons, available in different sizes (Jumbo 40 mm., 30-40 mm., 20-30 mm., and Baby)
- Ground lemon
- Lemon ice tea
- Lemon tea

Lemons are a useful raw material for producers as they can be used in drinks, jams and even pharmaceutical products.



The process makes use of all the fruit, including rejects; trials are underway using earthworms in the production of organic fertiliser (lombricompost) to be used in nurseries and lemon plantations.

The following containers are used:

- Polypropylene sacks
- Plastic bags
- Tea in two-gram tea bags packed into boxes of 25.
- Iced teas in 250mm (mm), 500mm, litre, half gallon, and gallon plastic bottles.

THE MARKET IN NUMBERS

Value of exports of dehydrated lemons:

1999	USD 210,869
2000	USD 441,310
2001	USD 321,201
2002	USD 252,580

LEMON TEA

Locally, average sales come to 10,000 boxes a week at a price of USD 0.75 per box.

LEMON ICE TEA

Average sales come to two thousand litres a month.

Prices depend on size: gallon - USD 1.87; half gallon - USD 1.25; 32 oz. - USD 0.75

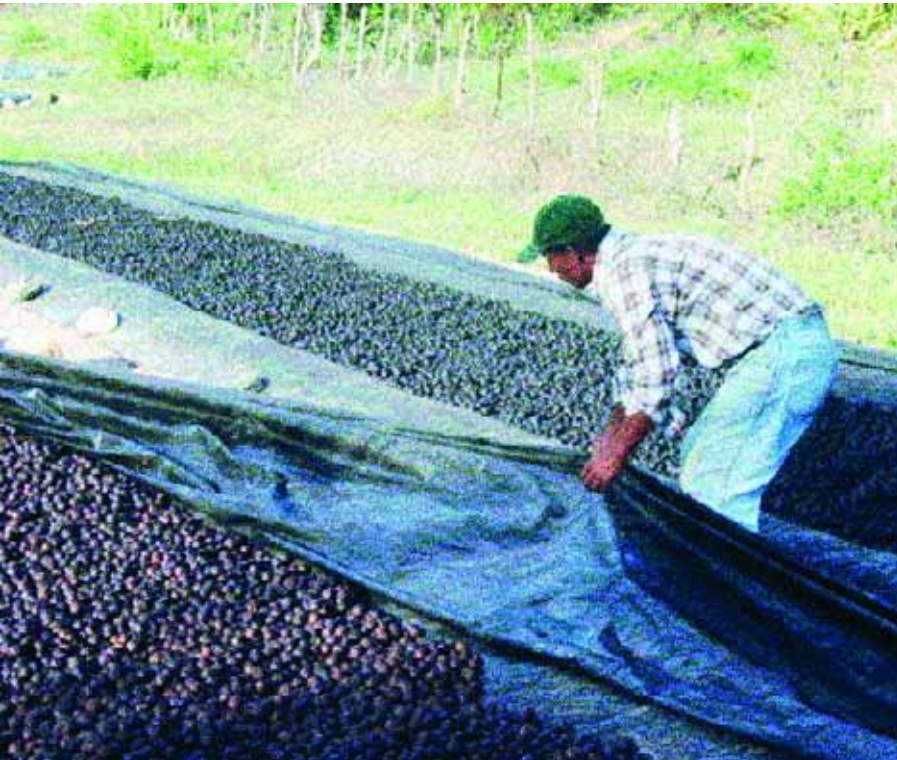
International interest

Adoption of the process internationally is a feasible and relatively simple operation, as long as markets are adequately located.

Many central American organisations have shown interest in developing the technology, since many countries and regions, such as El Salvador,

Honduras, Nicaragua and Southern Mexico, grow the product and have the right natural conditions.

COELMON has taken part in international fairs in Germany, France and the United States, to promote the cooperative's products and open new markets.



It has received numerous national and international recognitions, including:

- Finalist in the AGEXPRONT New Exporter of the Year Prize for 2000
- First place in the third Latin American and Caribbean Video Festival of Agricultural Industry 2001. IICA-PRODAR
- Productivity award Rural en Guatemala 2002. World Bank and the SOROS Foundation
- Award in Best Small and Medium-sized Export Enterprise 2002. World Bank, AGEXPRONT and the Council of Foundations
- Among the eight most successful companies to take part in an event on ways of improving capacity of rural enterprises, held in Lima, Peru in 2002. PRODAR, IICA and FAO
- Export excellence award 2002. Guatemalan Vice-presidency and Economics Ministry.

■ Adopting natural dehydration of lemons in other countries

The method utilised by the 'El Limón' cooperative is very simple and can be easily replicated by any farmers' organisation.

Minimum infrastructure requirements:

- Storage areas
- Storerooms
- Relatively extensive land for dehydration

Material requirements: black nylon on which to place and wrap the lemons during the dehydration process.

FACILITIES MUST INCLUDE:

- Electricity
- Telephone lines
- Practicable roads
- Finance and credit services
- Technical assistance and trained workforce
- Marketing services

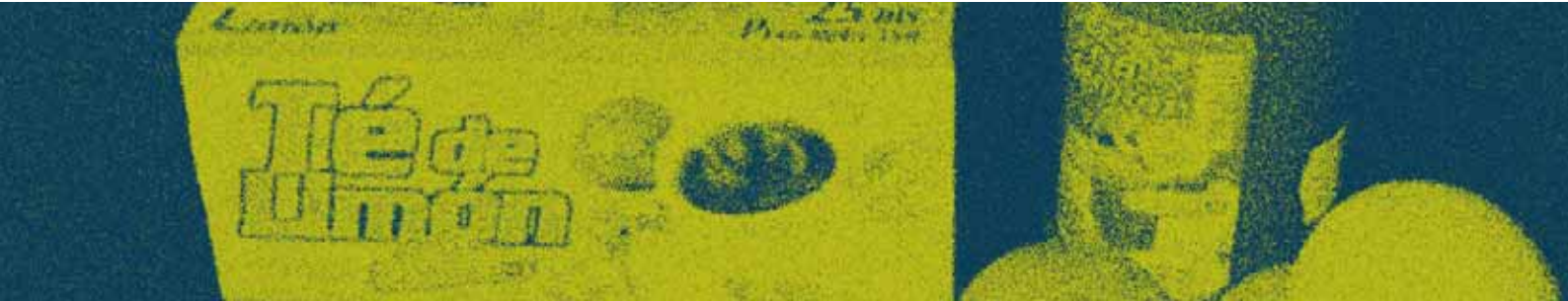
Furthermore, financial support, technical assistance and help in finding potential clients can be sought from private enterprises and non-government organisations.

Legal aspects to take into consideration:

- Environmental impact study
- Cooperative or company registration
- Licence and health registration
- Trademark registration
- Export company registration



Production costs for this system can vary according to country, so special analysis is needed in each case.



To learn more

More information on how to implement this system can be found at:

www.coelmon.com



Contacts

For further information and details on establishing permanent collaboration, please contact:

Nery Gonzalo Arriaza
Manager

Cooperativa Integral de Producción "El Limón R.L" (COELMON)

Aldea Marajuma, municipalities of Morazán, El Progreso, Guatemala

Telephone: (502) 206-5876
(502) 206-5616
Fax: (502) 206-5923

email: limon@coelmon.com

The IDEASS Programme – Innovation for Development and South-South Cooperation – is part of the international cooperation Initiative ART. IDEASS grew out of the major world summits in the 1990s and the Millennium General Assembly and it gives priority to cooperation between protagonists in the South, with the support of the industrialised countries.

The aim of IDEASS is to strengthen the effectiveness of local development processes through the increased use of innovations for human development. By means of south-south cooperation projects, it acts as a catalyst for the spread of social, economic and technological innovations that favour economic and social development at the local level. The innovations promoted may be products, technologies, or social, economic or cultural practices. For more information about the IDEASS Programme, please consult the website: www.ideassonline.org.

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Innovation for Development and South-South Cooperation



ART - Support for territorial and thematic networks of co-operation for human development - is an international co-operation initiative that brings together programmes and activities of several United Nations Agencies. ART promotes a new type of multilateralism in which the United Nations system works with governments to promote the active participation of local communities and social actors from the South and the North. ART shares the objectives of the Millennium Development Goals.

In the interested countries, ART promotes and supports national co-operation framework programmes for Governance and Local Development - ART GOLD. These Programs create an organized institutional context that allows the various national and international actors to contribute to a country's human development in co-ordinated and complementary ways. Participants include donor countries, United Nations agencies, regional governments, city and local governments, associations, universities, private sector organizations and non-governmental organizations.

It is in the framework of ART GOLD Programmes where IDEASS innovations are promoted and where cooperation projects are implemented for their transfer, whenever required by local actors.