

A GUIDE TO A DATE TRANSFORMATION UNIT

1 - PRESENTATION

1-1 Nature of Activity

Dates can be used two ways :

- Dried , possible candying with date syrup and packaged for direct sales to the consumers as dried fruit. This is the most significant and the most traditional use.
- IFP (Intermediary Food Products) production for the food industry : date paste for confectionery date syrup (fructose, glucose) and liquid sugar (for manufacturing of syrup, wine, vinegar...), flour (basically for animal feed).

In both cases, removing insects and refrigerated storage can be used to spread out the manufacturing period (2 months harvest/5 months transformation).

Date trees can also be used to produce sap to make palm wine. In this case, the tree will not produce dates, so palm wine production and date production are incompatible.

1-2 Alternatives

* Finished Products :

- Valorization of dried fruit, the alternatives vary with presentation and packaging :
 - . presentation : in branches, bouquets, separated
 - . packaging : from 250 g to 10 kg (even 25 kg). For local markets, packaging in bags ; for export, either consumer packaging (in trays or cans), or in boxes or cases that importers will repackage themselves.
 - . possible supplementary valorization : stuffed or coated dates.
- Valorization of IFP : sugar syrup to make wine, vinegar, syrup, etc. ; flour made by processing the rejects from sorting.

* Raw Materials :

We attempt to have the best raw material / finished product relation :

- dry dates, low water content for flour,
- soft, semi-soft and/or small caliber dates for paste and syrup,
- large caliber dates for consumption as dried fruit.

* Technology:

This will vary with the finished product :

- Dried fruit : treatment and packaging as a 3-step process :
 - 1) Prewashing and elimination of insects (over a brief time period as they arrive from the farmer
 - 2) Standardizing of water content
 - > either by continuous drying in fast rhythmmed units with homogeneous quality of raw material.
 - > or through a series of humidification operations, light drying for smaller units.
 - 3) Packaging unit with two possibilities for packaging :
 - . arrangement by caliber with multi-packaging (fast rhythm)
 - . arrangement for packaging numerous calibers together (small units).

Between each of these steps, storage period of varying length allows processing time to be spread out for the most expensive workshops. Between workshops, the dates are cased, then uncased at the onset of the following workshop.

- Paste : crushing with a crusher drum.

- Syrup : submersion in hot water (counter-current) then purification on an ion exchanger.

1-3 Types of Possible Units

Two types of units will be considered :

Unit A : large capacity (3000 t/yr over 5 mos.). Large number of products but concentration on packaging of dried fruit.

Flexibility in packaging : depending on the market, packaging can go from consumer size (maximum capacity about 2500 t) to wholesale size (maximum capacity 6500 t).

Continuous automated line. Due to automation, unit A requires very homogeneous raw materials (especially in regard to the fruits' maturity).

Unit B : medium capacity (800 t/yr). Packaging of dried fruit and manufacturing of paste.

This less mechanized line can treat all of the raw materials received without rigorous homogeneity demands. Sorting, putting in to trays, taking out of trays, humidification, and drying can lead to a standardized finished product, but investment costs are high for the treatment line and the significant labour force.

In both cases, an effort will be made to lengthen the period of manufacturing by developing three levels of stock :

- raw materials stock after fumigation(up to three months),
- light drying stock after sorting and regulation of water content,
- finished products stock.

2 - TECHNICAL AND ECONOMIC GUIDE

2-1 Description of the Unit

2-1-1 Finished Products

LINE	A 3000 t/year	B 800 t/year
Product range	- dried dates - date paste	- dried dates - date paste
Types of packaging	- dried dates . carboard boxes with windows (250 g-1 kg) . plastic boxes (100 g to 1 kg) . filled carboard box (5 kg à 20 kg) . sacs et boîtes . bags and metallic boxes (20-25 kg) - date paste . sticks . polyethylene bags in metallic barrel	same as A
Production - daily - annual	max. 30 t/day 3000 t/yr	max. 15 t/day 800 t/yr

2-1-2 Technological Choices

OPERATIONS	TECHNOLOGICAL OPTIONS	SOLUTIONS	
		LINE A 3000 t/yr	LIGNE B 800 t/yr
Receiving	- Automated handling line - Manual line	Automated handling (truck unloading with telescopic conveyor)	Manual unloading, washing elevator with presorting belt Manual casing
Prewashing	- Wash by spraying - Wash by soaking	Wash by spraying	Wash by soaking
Fumigation	- Methyl bromide - Ethyl dichloride	Choose	Choose
Washing	- Destoning bath, then wash by spraying	Destoning then spraying	Same as A
Standardizing water content	- Continuous drying - Humidification/drying workshop	Continuous drying (with caramelizing)	Humidification/drying workshop
Sorting-grading	- Manual - Mechanized (band-sorting)	Mechanized	Manual (after storage)
Storage	- Storage after sorting (arranged by caliber)	Sorted products stored ; humidity adjusted before packaging in a humidifying chamber	Non-sorted products stored
Packaging	- Many single format lines - One multi-format line	Packaging by caliber. Many lines, single format boxes	Packaging by format. Sorting, calibration and packaging on one line
Paste production			
Pitting	In drums	In drums	In drums
Crushing	Crushing, refining, or extrusion, slicing	Crushing, refining	Extrusion, slicing
Packaging	in bags in sticks	In bags	In sticks

2-2 Economic Analysis

2-2-1 Investments

EQUIPMENT	LINE A FOB price US \$	LINE B FOB price US \$
Reception	\$ 120 000	\$ 90 000
Fumigation	building	building
Case cleaning	\$ 40 000	\$ 20 000
Treatment line	\$ 240 000	\$ 280 000
Packaging lines	\$ 450 000	\$ 90 000
Paste line	\$ 130 000	\$ 130 000
Total equipment (including handling equipment)	\$ 1 150 000	\$ 660 000
Industriell building Land	Unit : 6000 m2 Storage : 1000 m2 10 000 m2	Unit : 3000 m2 Storage : 900 m2 5000 m2
Other investments	Heater : 1 t/hr Compressed air : 340 Nm3/hr Dry air : 300 N m3/hr Electrical power : 1250 Kw Water : 3 m3/processed	Heater : 500 Kg/hr Compressed air : 100 Nm3/hr Dry air: 500 Kw Water : 3 m3/processed
Total investment	\$ 4,5 to \$ 8 million (local investment preponderant)	\$ 2 to \$ 2,5 million (local investment preponderant)

2-2-2 Functioning

	LINE A	LINE B
Labour :		
- Unskilled	37	40
- Skilled	10	10
Consumption (annual) :		
- raw materials (fresh dates)	2250 t/yr	700 t/yr
- energy	1 500 000 Kw/hr	500 000 Kw/hr
- packaging material (250g boxes, cartons of 200 boxes)	9 million boxes 90 000 cartons	2,8 million boxes 28 000 cartons
- water	9000 m3/yr	3000 m3/yr

3 - KEY FACTORS TO THIS PROJECT'S SUCCESS

3-1 Supply

The unit should be able to depend on agricultural supply which is consistent in quantity and quality. Markets should be agreed upon, with a harvesting calendar for the growers, directed by the unit if possible.

Equipment, like the cases, should be standardized.

Harvest plans should be based on the orchard, to obtain the greatest homogeneity possible in supply lots.

3-2 Technology and Equipment

The technology is not very sophisticated : few delicate stages.

The main difficulty concerns the management of buffer stock. Also pay special attention to the fumigation process : the toxicity is low, but highly corrosive ; therefore, placing the fumigation zone away from the rest of the unit is recommended.

3-3 Personnel

One qualified person to be the chief of the line or the workshop. Possible employment of unskilled female laborers (little physical effort involved) for all operations.

3-4 Quality Control

The regular tests are simple and classic :

- dry matter,
- sugar content,
- a few microbiological tests or insect counts.

On the other hand, considering the amount of intermediary storage, these tests must be conducted at different stages :

- products on arrival,
- after fumigation,
- before sorting,
- before packaging.

Verify elimination of fumigants on fruits.

3-5 Distribution and Commercialization

Nearly all of the products can be exported.

There are two possible (complementary) strategies : either sales in consumer packaging (wrapping is indispensable in this case) or bulk sales, simply labeled, for importers to repackage.

It is better to sell off all of the products from one season to the next. If not, cold storage will be necessary.

Before expedition, the boxes (especially those of low weight) require an external packaging (cardboard or boxes) before being put on pallets.

3-6 Financing

Significant working capital is necessary, or short term credit. This is because of the seasonal nature of the activity, and the varying size of stocks.

3-7 Other Specific Problems

Significant waste water (about 3 m³/t), which is heavy in suspensions and sugar : foresee at least a pool for this waste water.

The pits can be utilized in cattle feed (fine crushing) or fuel.

4 - INDUCED ACTIVITIES

- Reactivation of agricultural efforts, with valorization of products destined for markets with high added value.

. Possible packaging supply from the local market.

- This can lead to maintenance and transportation services.

Considerable seasonal employment of female laborers, well adapted to the rural context in developing countries.