Seabuckthorn-

Processing & Products Overview

GROWING Opportunities

Alphonsus Utioh, P. Eng.
Manager, Product and Process Development

Food Development Centre
A Member of Manitoba Agri-Health Network

Presented at ISA 2007 Conference, Quebec City, Canada
August 12–16, 2007

Seabuckthorn

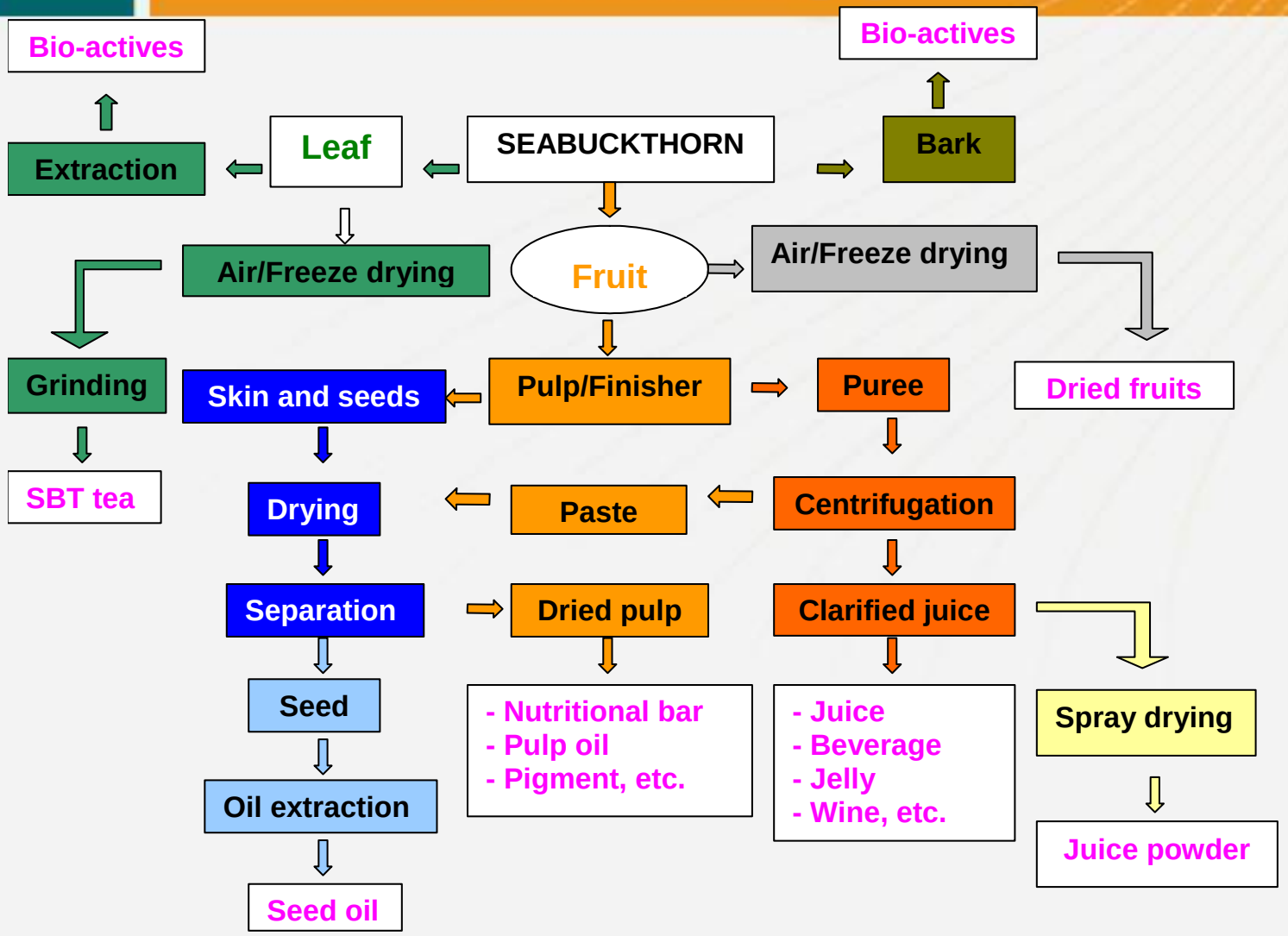
GROWING Opportunities

- Hardy, deciduous shrub native to China, Mongolia, Russia, and Eurasia
- Processed into a wide spectrum of products that fit the rapidly growing nutraceutical and health food markets
- Products are made from the berries, as well as the oil, leaves, and bark

Bark 	Pharmaceuticals Cosmetics		
Leaves 	Pharmaceuticals Cosmetics Tea Animal feeds		
Fruit 	**Oil**	Pharmaceuticals Drinks Food products Cosmetics Flavours/additives	
	Juice	Sports drinks Health drinks	
	Pulp	Juice	Food Beverages Brewery
		Oil	Pharmaceuticals Cosmetics
		Residues	Animal feeds
Seeds 	**Oil**	Pharmaceuticals Cosmetics	
	Residues	Animal feeds	

Seabuckthorn Processing

GROWING Opportunities



SBT Juice Extraction

GROWING Opportunities

Seabuckthorn Juice Products

GROWING Opportunities

Juice

Wine

Liquor

Jam

Samples of Christine Berger Gmbh Products

SBT Juice
Sibu International

SBT Beverages in Tetra Pak
Seabuckthorn Indage Ltd. India

SBT Juice Powder

Produced at FDC

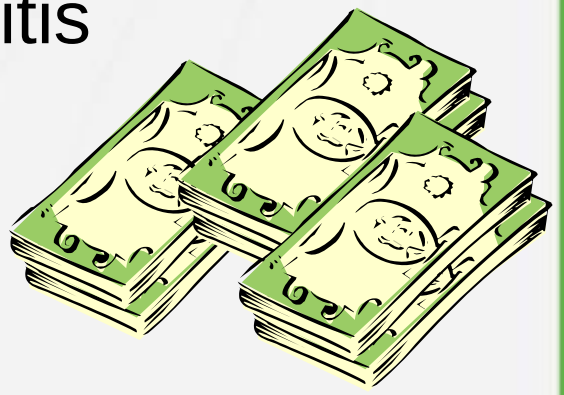
SBT Pulp and Seed Separation

GROWING Opportunities

Seabuckthorn Seed Oil

GROWINGOpportunities

- Important pharmacological functions include anti-inflammatory, anti-microbial, relieving of pain, and promoting regeneration of tissues
- Treat radiation damage, burns, scalds, duodenal ulcers, gastric ulcers, skin ulcers, and other skin damage
- EFA (linoleic and linolenic acid) relieves chronic eczema and dermatitis
- Seed oil price of $200/kg
- A high quality oil



Seabuckthorn Oil Content

GROWING Opportunities

Some oilseeds and % oil content

PALM KERNEL	SESAME	CANOLA	MUSTARD	LINSEED	COTTON SEED	SOYABEEN	PALM FRUIT
							
38 to 45%	50 to 56%	38 to 45%	38 to 45%	40 to 50%	18 to 22%	18 to 22%	20 to 22%

Seabuckthorn seed

8 to 12 %

Extraction Methods

GROWING Opportunities

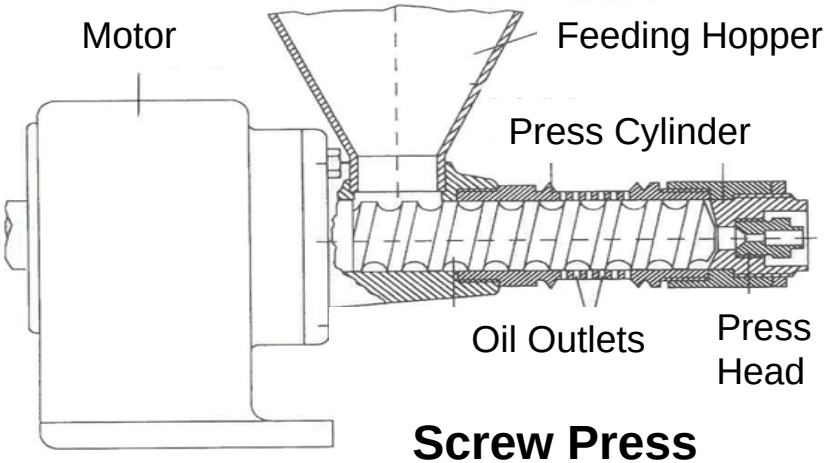
1. Mechanical expression
2. Solvent extraction
3. Supercritical fluid extraction

SBT Seeds

SBT Oil Extraction Contd.

GROWING Opportunities

- Cold Press Process
  - Expellers have rotating screw inside a horizontal cylinder
  - Screw forces the seeds through the cylinder gradually increasing the pressure
  - Oil escapes from the cylinder through small perforations
  - Temperature and pressure can be adjusted for efficient extraction and oil quality
  - Material preparation is important



Screw Press

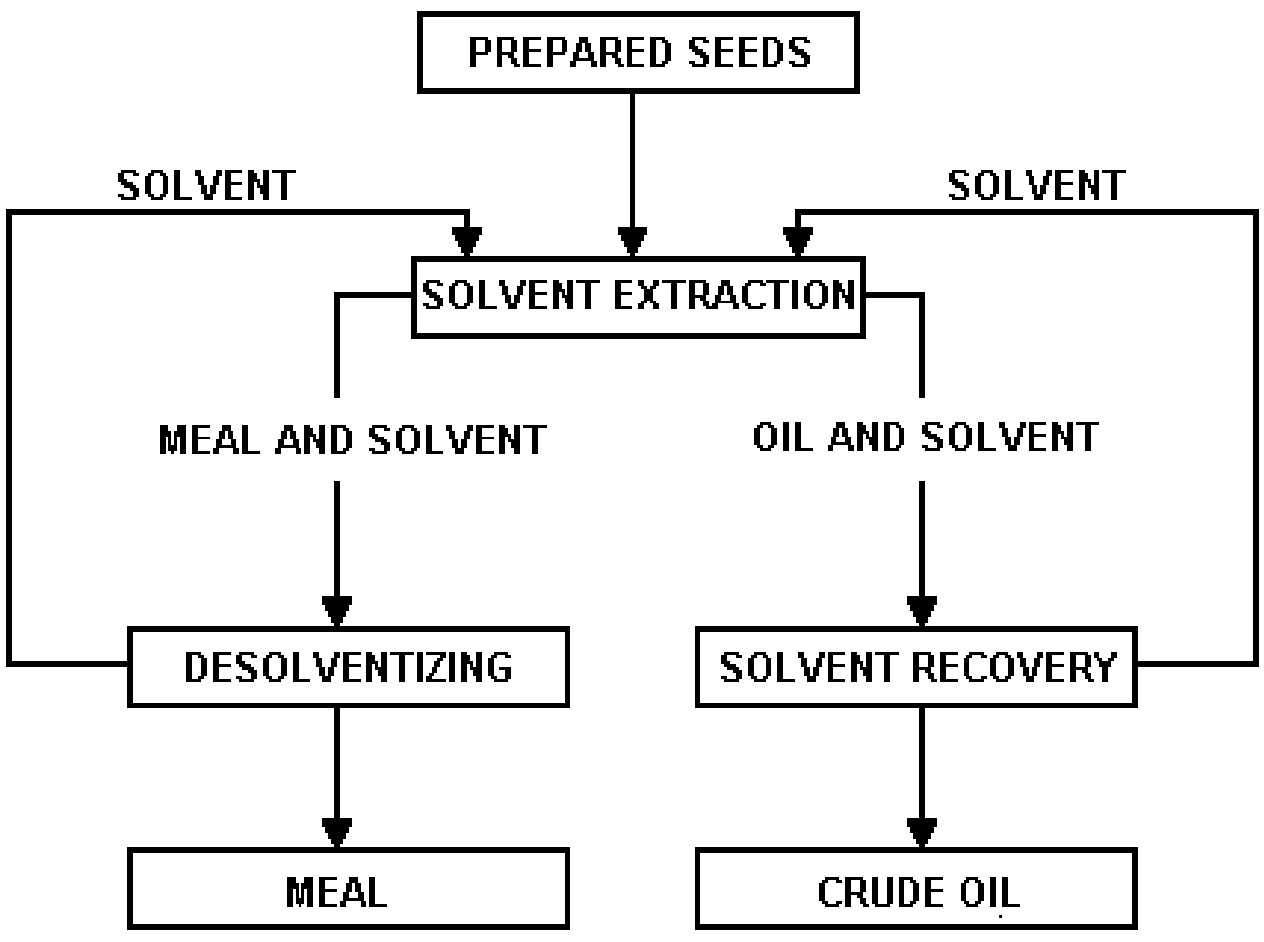
Solvent Extraction

GROWING Opportunities

- Seeds with low oil content (< 10%) are extracted using solvent extraction
- Recovering over 98% of the available oil in seeds
- Flakes are treated with a solvent that dissolves and washes out the oil
- Most solvents are dangerous to handle (explosive)
- High capital cost (economies of scale)

Solvent Extraction con't

GROWINGOpportunities



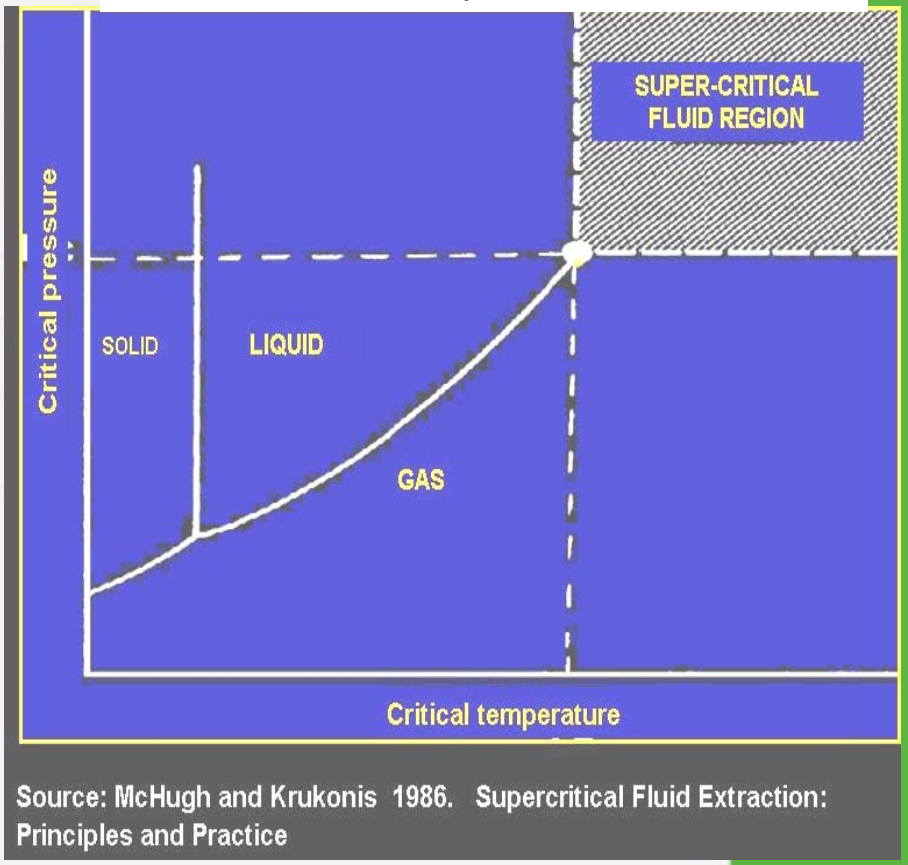
SBT Oil Extraction Contd.

GROWING Opportunities

Supercritical Fluid Extraction

- Unique separation process
- Uses properties of gas above its critical temperature and pressure for extraction:
  - high density for good solvent power
  - low viscosity and diffusivity for appreciable penetrating power
- Commonly used gas is carbon dioxide

Pressure-temperature diagram for a pure component



Source: McHugh and Krukonis 1986. Supercritical Fluid Extraction: Principles and Practice

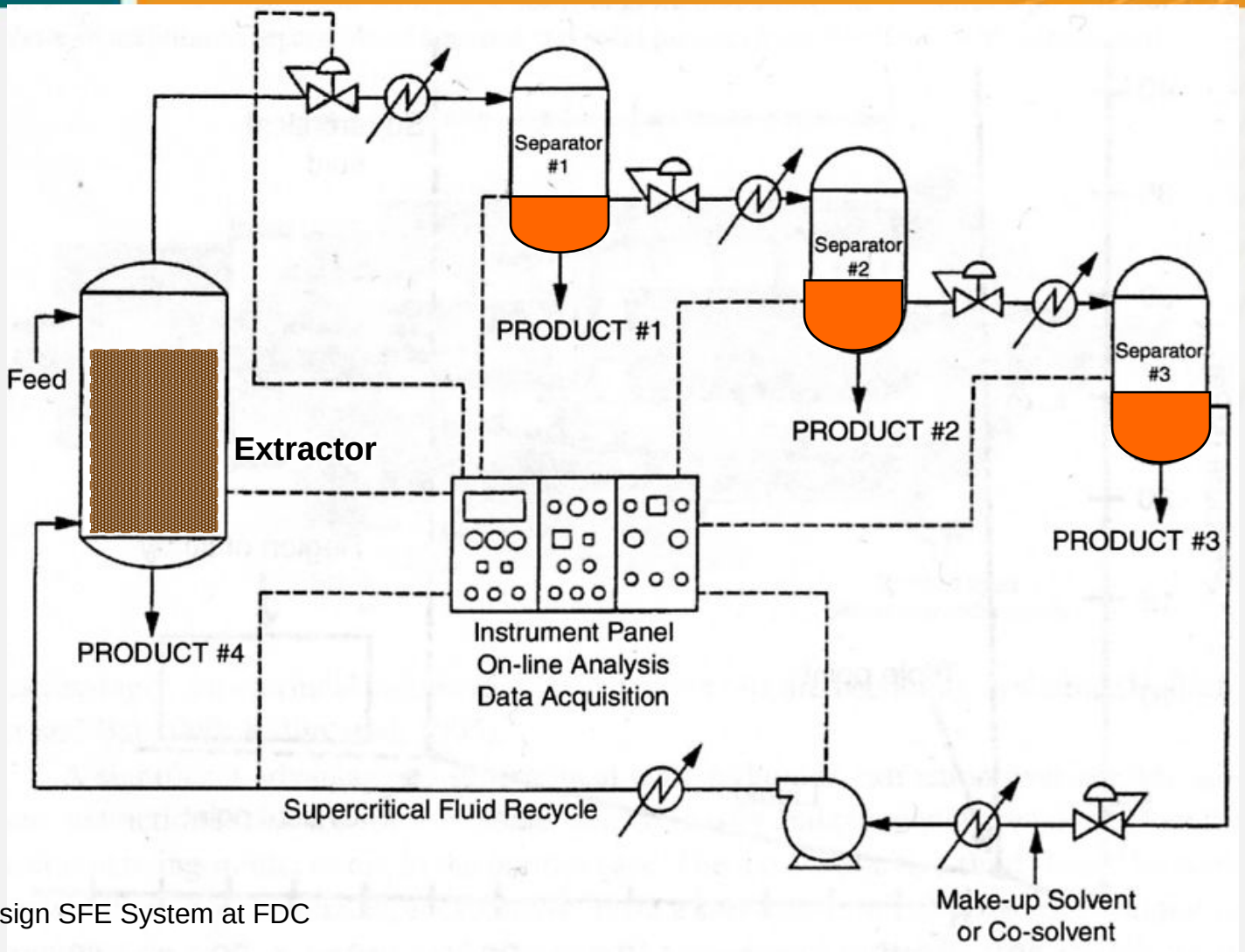
Advantages of CO_2

GROWING Opportunities

- Critical temperature is 31 °C. Extraction can be conducted at a temperature low enough to preserve the organoleptic properties of the extract
- Critical pressure at 73.8 bars. Easy to attain in a production facility
- Inert. No risk of reactions such as oxidation
- Safe. Non-explosive, non-flammable. Carbon dioxide is a harmless material with significant usage in beverages
- There is no residual CO_2 solvent in the extract, as is the case with the existing solvent extraction methods

Schematic Flow Diagram of SFE

GROWING Opportunities



Thar Design SFE System at FDC

Seabuckthorn Oil

GROWING Opportunities

Supercritical Omega 7

Steam Extracted

Drying of SBT Leaves

GROWINGOpportunities

- Two Basic Technologies:
  - Convection Air Drying
    - Most basic yet effective and commonly used in the industry
    - Equipment such as a tray dryer e,g. Proctor and Schwartz Dryer

Proctor & Schwartz Dryer

Drying of SBT Leaves Contd.

GROWINGOpportunities

- Freeze Drying
  - Freeze drying is the process of removing water from a product by sublimation
  - Freeze drying is an attractive option for drying of heat sensitive high-value products

Freeze Dryer at FDC

Equipment consist of:

-drying chamber with shelves

-Condenser to trap removed moisture

-Cooling system to supply refrigerant

-Vacuum system to facilitate drying

SBT Tea Product

GROWINGOpportunities

Tea Leaves

Tea Bar

Tea Soap

Summary

GROWING Opportunities

- Seabuckthorn could be called a superfruit because of its commercial value and its many health promoting properties
- The fruit can be processed for juice rich in vitamin C, and oils rich in fat soluble vitamins, sterols and essential fatty acids
- Seabuckthorn leaves can dried for tea formulations or as raw materials for bioactive components

Thank you!

Alphonsus Utioh, P. Eng.
Manager, Product and Process Development
Email: alphonsus.utioh@gov.mb.ca