MATH3202/7232 Operations Research & Mathematical Planning 2017

Week 3 – Blending Problem

A food manufacturer refines raw oils and blends them together. The raw oils come in two categories – vegetable oils, of which there are two types; and non-vegetable oils, of which there are three types.

The oils are refined on different production lines. In any month it is not possible to refine more than 200 tonnes of vegetable oil and more than 250 tonnes of non-vegetable oils. There is no loss of mass in the refining process and the cost of refining may be ignored.

There is a technological restriction on the "hardness" of the final product. In the units in which hardness is measured it must lie between 3 and 6. The hardness of a blended product is the weighted average of its components.

The hardness of the raw oils are:

Oil	Veg 1	Veg 2	Oil 1	Oil 2	Oil 3
Hardness	8.8	6.1	2.0	4.2	5.0

The raw oils may be purchased for immediate delivery (January) or bought on the futures market for delivery in subsequent months. Prices now and in future months are given by the following table:

Oil	**January**	**February**	**March**	**April**	**May**	**June**
Veg 1	$110	$130	$110	$120	$100	$90
Veg 2	$120	$130	$140	$110	$120	$100
Oil 1	$130	$110	$130	$120	$150	$140
Oil 2	$110	$90	$100	$120	$110	$80
Oil 3	$115	$115	$95	$125	$105	$135

It is possible to store up to 1000 tonnes of each raw oil for use later. The cost of storage is $5 per tonne per month.

The final product sells for $150 per tonne.

There are currently 500 tonnes of each raw oil in storage. What buying and manufacturing policy should the company pursue in order to maximise profit?