Métodos de Apoio à Decisão – Assignment 2

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With the evolution of global warming, in 2027 it became possible to grow vineyards in the Antarctic. Your company has just bought 10 parcels with the following areas (see area.csv):

Parcel	Area (ha)
1	13
2	7
...	
10	10

You are considering three scenarios for the expected yield and revenue, each with probability 1/3. You are planning to plant some Portuguese wine varieties, so that you can increase the production of your wine brands W01, W02, ..., W07. You currently have no difficulties selling these brands, and the revenues per barrel are the following: (see revenue.csv):

	Revenue ($/barrel)		
Brand	Scenario 1	Scenario 2	Scenario 3
W01	12.39	10.61	10.19
W02	11.94	8.82	13.94
...			
W07	11.92	8.98	11.65

Due to the differences in the soil, solar exposition, ..., some parcels may be more appropriate for a given variety than other. The yield (in barrels/ha) in each of the varieties in each parcel, under each scenario, is the following (see yields.csv)::

	1	2	...	10
Scenario 1				
Alfrocheiro	1.20	1.07		1.40
Amaral	1.34	1.45		0.53
...				
Xara	0.55	1.40		1.38
Scenario 2				
...				

You currently have 10000$ available. The cost for planting depends on the variety; the cost per unit area is as follows (see cost.csv):

Variety	Cost ($/ha)
Alfrocheiro	11
Amaral	60
...	
Xara	10

Additionally, there is a fixed cost of 500$ for each variety planted on each parcel. Some of your wine brands require a minimum quantity of particular varieties. The minimum percentage of each variety per brand is the following (see composition.csv):

	W01	W02	...	W07
Alfrocheiro	0	0		0
Amaral	41	0		10
...				
Xara	0	0		0

For minimizing the risk, the department of marketing decided that for at least three brands the quantity produced must not be smaller that 5 barrels, no matter what scenario.

1. Write a mathematical optimization model for the problem of maximizing the revenue.
2. Solve your problem using a mixed-integer optimization solver, and report the solution obtained.
3. A friend can lend you 100$ for helping you expand your business, at a rate of 1% per year. Should you accept this offer?

Describe all the assumptions you have considered.

Note: *the deadline for handing the report is 13/APR. Your report should ideally have 4 pages. Each working group should hand a printed version and send an e-mail with the report and programs. For ecological reasons, please to not bind your report; just insert it in a transparent file folder.*