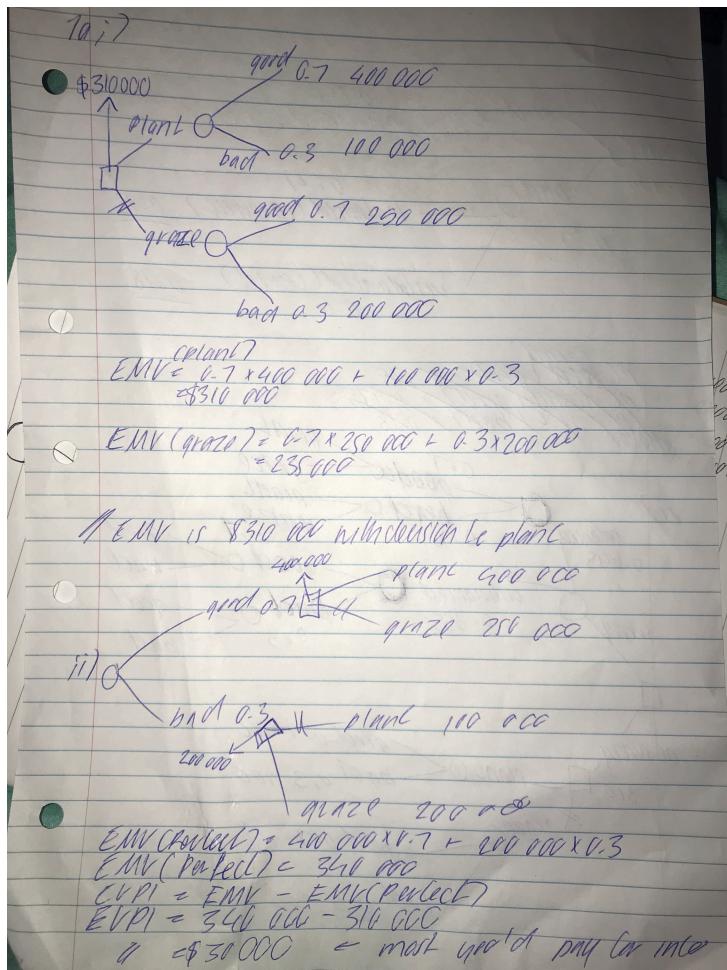


Q1

A)



B)

Let B mean balanced

Let G mean good soil

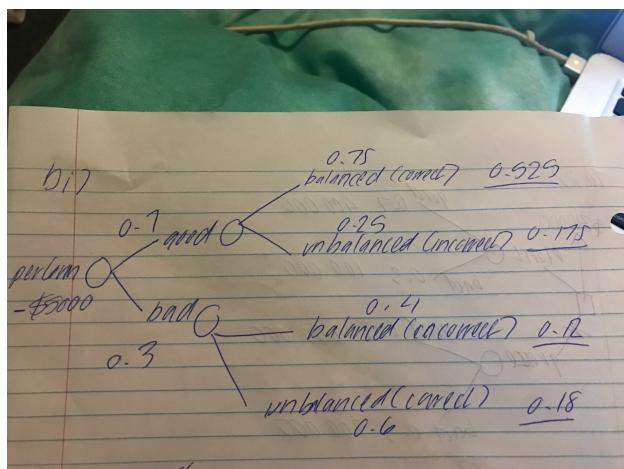
i)

$$P(B|G) = 0.75$$

$$P(B|G') = 0.4$$

$$P(B'|G) = 1 - 0.75 = 0.25$$

$$P(B'|G') = 1 - 0.4 = 0.6$$



ii)

$$P(G) = 0.7$$

$$P(G') = 0.3$$

$$P(B|G) = 0.75$$

$$P(B|G') = 0.4$$

$$P(B'|G) = 1 - 0.75 = 0.25$$

$$P(B'|G') = 1 - 0.4 = 0.6$$

$$P(G \cap B) = 0.7 * 0.75 = 0.525$$

$$P(G \cap B') = 0.7 * 0.25 = 0.175$$

$$P(G' \cap B) = 0.3 * 0.4 = 0.12$$

$$P(G' \cap B') = 0.3 * 0.6 = 0.18$$

$$P(B) = P(G \cap B) + P(G' \cap B) = 0.645$$

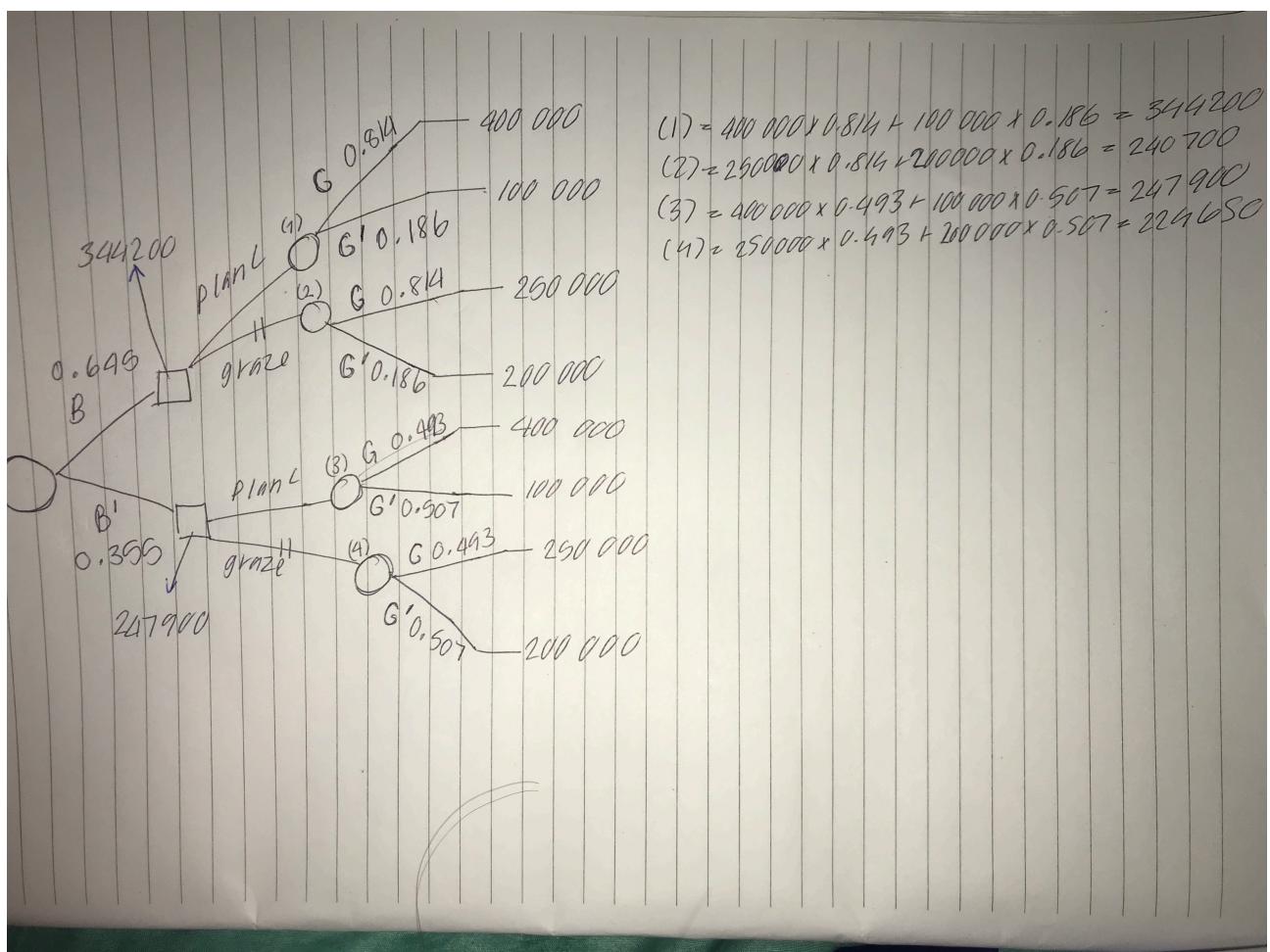
$$P(B') = 1 - 0.645 = 0.355$$

$$P(G|B) = 0.525 / 0.645 = 0.814$$

$$P(G'|B) = 0.12 / 0.645 = 0.186$$

$$P(G|B') = 0.175 / 0.355 = 0.493$$

$$P(G'|B') = 0.18 / 0.355 = 0.507$$



$$EMV(\text{Survey}) = ((344200) * 0.645) + ((247900) * 0.355)$$

$$\underline{EMV(\text{Survey})} = \$310013.5$$

iii)

$$EVSI = EMV(\text{survey}) - EMV$$

$$EVSI = 310013.5 - 310000$$

$$EVSI = \$13.5$$

$$ENGSI = EVSI - \text{cost}$$

$$ENGSI = 13.5 - 5000$$

$$\underline{ENGSI = -\$4986.5}$$

As the ENGSI is negative (-\$4986.5) we should not take the survey as the net gain is less than the net cost

Question 2

a)

Method of moment

$$n=100$$

$$\bar{x} = 4.8$$

$$E(X)$$

$$\bar{x} = 4.8$$

$$E(X) = 1/\hat{\theta}$$

$$\begin{aligned}\hat{\theta} &= 1/\bar{x} \\ &= 1/4.8 \\ &= 0.2083 = 5/24\end{aligned}$$

$$X \sim \text{Exp}(0.2083)$$

$$F(x) = 1 - e^{-(5/24)x} \text{ for } x \geq 0$$

b)

$$X \sim \text{Exp}(-\hat{\theta})$$

$$P(X < x) = 1 - e^{-(\hat{\theta}x)}$$

x	P(X < x) = 1 - e^{-(\hat{\theta}x)}	p(X < x)
0	$1 - e^{-(0.2083 \times 0)}$	0
2	$1 - e^{-(0.2083 \times 2)}$	0.341
4	$1 - e^{-(0.2083 \times 4)}$	0.565
6	$1 - e^{-(0.2083 \times 6)}$	0.713
8	$1 - e^{-(0.2083 \times 8)}$	0.811
10	$1 - e^{-(0.2083 \times 10)}$	0.875
12	$1 - e^{-(0.2083 \times 12)}$	0.918
∞	$1 - e^{-(0.2083 \times \infty)}$	1

c)

$$n=100$$

$$\bar{x} = 4.8$$

Time (a)	Time (b)	Mid	Frequency	Probability	Expected

Working:		(a+b)/2		p(X<b)-p(X<a)	probability*100
0	2	1	27	0.341	<u>34.1</u>
2	4	3	23	0.224	<u>22.4</u>
4	6	5	19	0.148	<u>14.8</u>
6	8	7	14	0.098	<u>9.8</u>
8	10	9	11	0.064	<u>6.4</u>
10	12	11	6	0.043	<u>4.3</u>
12	∞			0.082	<u>8.2</u>
			100	1	<u>100</u>

d)

x		0<X<3	2<X<5	4<X<7	6<X<9	8<X<10	10<X
Observed	f _i	27	23	19	14	11	6
Expected	e _i	34.1	22.4	14.8	9.8	6.4	12.5

12<X< ∞ is merged with 10<X<12 as e_i of 10<X<12 was 4.3 less than 5 (too small)

$$X^2 = ((27-34.1)^2/34.1) + ((23-22.4)^2/22.4) + ((19-14.8)^2/14.8) + ((14-9.8)^2/9.8) + ((11-6.4)^2/6.4) + ((6-12.5)^2/12.5)$$

$$X^2 = 11.1725$$

Degree of freedom:

V=K-1-NUMBER OF PARAMETER (θ)

$$=6-1-1$$

$$=4$$

$$X^4(0.05) = 9.488 \leftarrow \text{from chi square table}$$

$$X^2 > X^4(0.05)$$

$$11.0942 > 9.488$$

The observed value for X^2 is 11.0942. Because X^2 is greater than $X^4(0.05)$ (9.488) this indicates that there is evidence to doubt the exponential model.