XXX is an agrochemical company that produces and distributes worldwide. Currently, they are restructuring the production of one of their fertilizers, named YYY. To produce YYY efficiently, XXX uses the batch approach, in which a certain number of litres is produced at one time. This reduces setup costs and allows XXX to produce YYY at a competitive price. Unfortunately, YYY loses some of its properties with time. XXX produces YYY in batches of 20,000 litres, 30,000 litres and 40,000 litres. For simplicity, assume that in the coming three-month planning period, XXX will sell either 20,000 litres, 30,000 litres or 40,000 litres. More specifically, using historical data, XXX estimates that there is an equal probability of selling 20,000 litres, 30,000 litres or 40,000 litres.

The question XXX is facing is how many litres to produce of YYY in the next batch run. YYY sells for £10 per litre. Manufacturing costs amount to £5.50 per litre, and handling costs and warehousing costs are estimated to be £0.50 per litre. XXX allocates advertising costs to YYY at £1.50 for each litre that it produces. If YYY is not sold within three months, the fertilizer loses some of its properties. It can, however, be sold at a salvage value, estimated to be £5 per litre. Furthermore, XXX has guaranteed to its suppliers that there will always be an adequate supply of YYY. If XXX does run out, it has agreed to purchase a comparable fertilizer from a competitor at £12 per litre. No handling or warehousing costs are incurred on fertilizer provided by the competitor.

(a) Use a decision tree to identify the best decision for XXX.

(b) How sensitive is the optimal decision in part (a) to changes in the salvage value and demand probabilities?

(c) What is the most that XXX should pay for information regarding the level of demand?