This is a classic optimization problem.

I used a 3-step framework to solve the problem. To simplify the model, I disregarded other factors such as the cost of the tank, wind speed, the amount of water that is used at your home per day/month, the duration for which the rain is collected, to list a few. Otherwise the model could easily get very sophisticated by factoring these in, in which case that would perhaps require a commercial optimization solver software to come up with an optimal size of tank.

1. **Decisions**

What are my decisions? What are the quantities under my control?

I assumed that the only quantity under my control is : tank size

1. **Constraints**

What constraints do I face? What restrictions should I consider? These are constraints imposed by resource limitations or operations requirements. One major limitation is the client’s budget.

Constraints:

1. area of the tank’s site: - let’s assume the largest open area within the yard and suitable to install the tank is 30 by 18 metres which equals 540m2.
2. average volume of rain per year: - annual average rainfall in your neighbourhood is 464 mm / year, assumedly.

Therefore, assuming there is only 20% water loss, the maximum collectable amount of water is given by 0.8(540 \* 464) = 200 464litres.

If you live in a place where there is not much rain, you don’t want to install a tank too big and it only gets half full or even less all the time. You want to manage resources efficiently.

1. **Objective**

What is the goal, or the metric?

Answer: Collect as much water as possible

Maximize (Site area \* annual rainfall)

0.8(540 \* 464) = 200 448litres

**Conclusion**

A 200 500 litre tank is needed! I have also attached an excel sheet to help serve as a model for calculating the different tank sizes for different site areas as well as conditions (since the average rainfall and water loss for different regions would differ).