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**Economics** Assignment 5
Group member name(s): 魏珈民、羅啟帆、李嘉芸、黃耀霆、林雋哲
Group member UID(s): b07303025, b07902047, b07303087, b08902136, b08901064

# ECON5107: Industrial Organization Assignment #5

## 1 Farmville: Our Strategy

- First, we observe that one should supply fertile over meadow, and meadow over rocky. However, in an extreme case where everyone supply high level land we will consider to supply low level land to raise the market-clearing price. For example, if everyone is supplying meadow, we may include 1 rocky land among our meadow supply to increase the overall profit.
- One Nash equilibrium of this game should be # of lands equals to # of farmers. Since when # of lands $<$ # of farmers, one have the incentive to increase supply of lands to increase profit. On the other hand, when # of lands $>$ # of farmers, one will not profit from increasing the number of lands.
- Observing this, if we can make credible commitment in the beginning of the round that we will throw all our lands to the supply, we may decrease the lands provide from others, increasing our profit.
- If upgrade is needed, upgrade meadow to fertile first, then consider rocky to meadow, finally consider creating a rocky land.
- Highest potential value for different lands is listed below. We will decide to buy or sell lands when we observed obvious over-priced (33% higher than optimistic value) or under-priced lands (33% lower than optimistic value) over round 2 to 10.
  - Optimistic value of rocky for time from round $t$ to 10:

$$\begin{cases} 15-(t-1), & t \le 5 \\ 10, & t=6 \text{ (upgrade 2 times)} \\ 7, & t=7 \text{ (upgrade 2 times)} \\ 4, & t=8 \text{ (upgrade 1/2 times)} \\ 2, & t=9 \text{ (upgrade 0/1 times)} \\ 1, & t=10 \text{ (upgrade 0 times)} \end{cases}$$

  - Optimistic value of meadow for time from round $t$ to 10::

$$\begin{cases} 23-2(t-1), & t \le 5 \\ 13, & t=6 \text{ (upgrade 1 time)} \\ 10, & t=7 \text{ (upgrade 1 time)} \\ 7, & t=8 \text{ (upgrade 1 time)} \\ 4, & t=9 \text{ (upgrade 0/1 time)} \\ 2, & t=10 \text{ (upgrade 0 time)} \end{cases}$$

  - Optimistic value of fertile for time from round $t$ to 10. Consider $t \ge 8$,

$$3(11-t)$$