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Introduction to the  
**The Groundwater Game**  
Gaming Simulations of  
Cooperation and Competition among  
South Asian Groundwater Irrigators

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### Game Objective:

To explore how the socio-economic dynamic of a village changes under different groundwater conditions

### How is the game played:

Pairs of players take up the role of a farm household in a paddy growing village. Each household represents a family that needs to be fed. You start the game with a household with working members and dependents, land and a cash balance. Each working member of the family entitles you to 1 Full Labour Unit (FLU) which you can use on your own field or hire out to other households at a wage rate you are free to negotiate. The initial cash balances are provided at a rate of Rs 10,000/ha of land owned. Some of the households also have a well; however, a well can be used for irrigation only if well owners buy energy in the form of Irri-toks from the Trader. Those who do not own wells can either buy a well from a trader or buy Irri-toks from well owners. The Trader will not sell Irri-toks to non-wellovers. At the end of every year, you have to provide to the Game Manager 600 kg of rice per family member—working or dependent—as survival ration. Failure to do so results in starvation deaths in the family.

As the head of this household, you have to decide on:

- [a] whether to plant *desi* (local) or High Yielding Variety of rice on each ha of your land;
- [b] how many bags of chemical fertilizer (NPK) to use on each ha; and
- [c] how many irrigations (Irri-toks) to use on each acre.

Table 1 provides the matrix showing how much rice you can get per ha under different combinations of seeds, NPK use and Irri-tok use.

Table 1 Response of rice yield/ha to variety, fertilizer and irrigation

| <i>Desi (Local) rice</i> |       |       |       |       | Hybrid (HYV) rice |       |       |       |       |
|--------------------------|-------|-------|-------|-------|-------------------|-------|-------|-------|-------|
|                          | 0 NPK | 1 NPK | 2 NPK | 3 NPK |                   | 0 NPK | 1 NPK | 2 NPK | 3 NPK |
| 0 Irri-tok               | 900   | 1300  | 1600  | 1700  | 0 Irri-tok        | 300   | 1500  | 2300  | 2900  |
| 1 Irri-tok               | 1200  | 1700  | 1900  | 2000  | 1 Irri-tok        | 1200  | 2800  | 3600  | 4200  |
| 2 Irri-tok               | 1450  | 1950  | 2000  | 2100  | 2 Irri-tok        | 2400  | 3600  | 4500  | 5200  |
| 3 Irri-tok               | 1600  | 2000  | 2050  | 2100  | 3 Irri-tok        | 3500  | 4200  | 5300  | 6000  |

Reflect on table 1 carefully to make good decisions. Also bear in mind the following two rules:

[1] You need to provide 1 Full Labour Unit (FLU) per ha if you plan rice yield of up to 3000 kg/ha; and 2 FLUs if you plan rice yield of more than 3000 kg/ha;

[2] The crop yields in table 1 are what you get in a 'drought' year. If the Game Manager announces 'rain', it is equivalent to the use of 1 Irri-tok. In other words, for hectares on which you use 0 Irri-toks, you harvest yields in the yellow-shaded row in a 'rainy' year, provided you can arrange a the necessary additional FLUs for yields higher than 3000 kg.

### Transactions

The Trader will sell HYV seeds, NPK, Irri-toks, Land (ha), wells and rice at pre-announced prices. The Trader will also buy rice at a pre-announced price. He will also hire surplus FLUs for construction work in the city at a preannounced wage rate.

The Trader will not sell FLUs which you must buy from other households. Similarly, the Trader will not sell Irri-toks to households without wells; you must buy Irri-toks from well-owning households.

Importantly, NPK tokens, HYV seed tokens, rice can be carried forward from one year to the next. However, you can not carry forward Irri-toks and FLUs from one year to the next. You must return unused FL and Irri-toks to the Game Manager at the end of each year.

### **Record of Transactions**

Since this is a learning game, all your decisions and transactions are important data which will be analysed and presented to you. Therefore, please complete the Household Record Sheet (HRS) clearly and carefully. Although you will be briefed on this at the start of the game, please study the HRS and the following protocol carefully.

### **Game Protocol**

In a typical year, we go through the following steps:

Step 1: Game Manager starts off a year by allocating FLUs that each household is entitled to.

Step 2: With this, you can plan your farming operations and start acquiring inputs you need from the Trader or other households. Once you have acquired all planned inputs, please complete your farm plan in the HRS, enter the transactions you have had with Trader and other Households, and arrange planned input tokens (FLUS, NPK, Irri-toks, HYV seeds if used on each ha of your land.

Step 3: At this stage, please invite the Game Manager to sign off on your plan and collect the used input tokens.

Step 4: The Game Manager announces the state of the monsoon by announcing "rain" or "draught". With this you have all the data you need to complete the HRS and compute the Actual Output of rice and your "Marketable Surplus". Please go to the Game Manager and collect your Marketable Surplus of rice which you can sell to the Trader for cash, or save it for the next year or settle your transactions with other households. Please do not forget to complete the networth table at the end of the HRS and record your end-of-the-year net worth on the common flip chart.

Step 5: when all households complete these steps, we are ready to move to the next year. Please return all unused FLUs and Irri-toks to the Game Manager.

**It is critical that we play the game fast because each year represents different groundwater conditions and our objective is to simulate the impact of different groundwater conditions on socio-economic dynamic of the village.**

### **Assessment of team performance**

Your team's performance in the game is assessed on two criteria:

Criterion 1: There should be no 'starvation death/s" in your household.

Criterion 2: % growth in your household's net worth over the game period. Net worth is a measure of the household's wealth valued at Trader's prices. The initial networth of all households is given in the Net-worth Chart.