

Green Revolution Simulation - Rule Sheet

Gameplay

Every team is a family growing wheat. Sell wheat to earn money with which to buy tools, seeds, fertilizer, etc. to grow more wheat the next year. New western seeds and technologies sound promising, but weather, crop prices, and other factors may affect your crop output. Keep track of your consumption and spending using the Household Score Sheet.

Win Condition

The family (team) with the most money and assets at the end of the game is the winner. Besides cash, assets include land, tubewells, and oxen. Seeds and fertilizer do not count. Assets are valued at their initial price (\$300 for land, \$1,000 per tubewell, \$1,000 per ox) no matter what price was paid for them.

Sequence of Play

Phase 1 - Start of Year (Pre-Harvest)

1. Weather and Wheat Price are declared.
2. (Year 2+ only) Fate draws Village and Family cards.
3. Fill in Weather, Wheat Price, # of Adults, # of Children, # of Acres, and Savings for the year.
4. Determine Total Household Consumption.

Phase 2 – Harvest Season

5. Calculate yield based on the Yield Performance Graph. In Year 1, all households only have LR seeds.
6. (Year 2+ only) If you do not have enough labour to work all of your land (two acres per adult), you must hire labour (\$200 per adult) or the land goes untended.
7. Subtract consumption amounts per household.
8. Sell your remaining wheat to the Market or to neighbours. You cannot store any wheat beyond what you need to feed the family.

Phase 3 – Planting and Tending Season

9. Conduct transactions with other households (labour or land) or with the Market (seeds, fertilizers, land, oxen, etc.) for the following year's crops.
10. Apply all fertilizers, seeds, and irrigation to land (which will bear fruit in next year's harvest).
11. Determine your balance/next year's savings (Total Income minus Total Costs).

Repeat all steps a total of 5 times, or as time permits.

Family

The Household Cards given to each team at the beginning of the simulation states how many adults and children each family starts with. The makeup of the family can change at the start of each year via the following events:

- A Family Fate card for a new child may be randomly drawn for each family.
- If a family exceeds 4 children, 1 existing child "grows up" to become an adult.
- After 5 years, one child will become an adult no matter how many children there are in a family.
- Family members can die if there is a food deficit.

Each child requires 5 bushels of wheat/year, including new children, while each adult needs 10 bushels of wheat/year. If a family needs more food than they grow, family members will die, starting with children. Any deficit will cause a death; however, the deficit must be more than the food consumption of a child to affect the next family member (i.e., a food deficit of 1-5 bushels will lead to the death of only one child, while the next family member is only affected with a deficit of 6 or more bushels). You may buy wheat for consumption from the Market or from neighbours during Harvest Season.

Fate

At the start of each year, Fate will determine the weather, wheat prices, village events, and family events.

The weather will randomly be rolled for from 1-5, with 1 representing the best weather for growing wheat and 5 the worse weather.

One (or none) of the following village events affecting every family equally will randomly be rolled for:

- 1: *A Relief Organization is working in your community.* (Oxen are half price this year)
- 2: *A Relief Organization is working in your community.* (Tubewells are half price this year)
- 3: *Sold Out!* (no HYC seeds are available this year)
- 4 - 6: No event card drawn.

One (or none) of the following family events for each family separately will randomly be rolled for:

- 1: *Pest Attack!* (Family loses half of the year's crop)
- 2 - 3: *New Baby!* (Add one child to the family)
- 4 - 6: No event card drawn.

Land

You may buy and sell land. Land costs from the bank are \$300 per acre. The price of land purchased between families is negotiable. Obtain a Land Card for each acre your household owns. There is a limited number of land plots available for sale.

Wheat Varieties

There are two types of wheat varieties to choose from, land races (LR) and the new high yield cultivars (HYC) of the Green Revolution. HYCs have a high yield potential, whereas LRs have strong yield stability.

If you use LRs, you hold back some of your previously harvested seed and do not need to purchase seed each year. If you choose to plant HYCs, then you must purchase the seed for \$40 per acre from the Market. A HYC card must be placed on a Land Card. Return HYC card(s) to the Market when collecting money at the end of the growing season.

Fertilizer

You must decide if you will apply fertilizer. You can apply fertilizer at three levels, coded by the index F ranging from 1 to 3. When F = 1 you apply 80 lbs of fertilizer per acre. For F = 2 you apply 40 lbs to the acre. For F = 3 you apply no fertilizer. The cost of fertilizer is \$1 per pound. Obtain a Fertilizer Card corresponding to the level of fertilizer you purchased and place it on top of your Land Card. Fertilizer must be reapplied every year.

Irrigation

You must decide whether you will irrigate. To be able to irrigate, you must install a tubewell. Each tubewell will cost \$1,000 to install and will pump enough water to irrigate 10 acres. After irrigation, use a weather index of 1 for next year's harvest season. Irrigation is more labour-intensive (see Labour section), requiring double the labour.

Yield

Yield will depend on the type of seeds you use (the native and more stable Land Races [LR] or the High Yield Cultivars [HYC] with more potential yields), the weather conditions, and the level of fertilizer inputs you apply to the crop. In place of a farmer's experience, study the Yield Performance Table, which describes the relative performance of the two wheat types as affected by weather and fertilizer input level.

Labour

Land Labour Requirements:

- 1 adult per 2 acres of unirrigated land
- 1 adult per 1 acre of irrigated land

You can sell and buy labour between families (not the Market). Wages are typically \$200 per growing season (negotiable between families). Only fully unoccupied adults (not tending land) can sell labour. For example, an adult working on 1 acre of unirrigated land is considered occupied (if not fully) and cannot sell labour. If labour is not provided for an acre of land, then it lies fallow and no crops are grown from it.

An ox can be bought for \$1,000 (and sold to other families for a negotiable price). An ox will reduce time for field labour by 50% for an adult. This will double the output of 1 adult. A family may have as many oxen as there are adults:

Land Labour Requirements with an Ox:

- 1 adult per 4 acres of unirrigated land
- 1 adult per 2 acres of irrigated land

Conducting Transactions

For the results of the simulation to be realistic, your transactions must be "real". In other words, when you decide to sell land, you must find a buyer. When you decide to buy something, you must have the budget for it. If you want to work for wages, you must find a willing employer.

Price List

Product	Price
Fertilizer	\$40 per level per acre
HYC Seeds	\$40 per acre
Tubewell	\$1,000 (irrigates 10 acres)
Ox	\$1,000 (one ox per adult per family)
Land	\$300 per acre