Hunger Crisis Simulation- Player Manual

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NOTE: the tkinter visualization is functional, but please use the textual visualization if the graphics do not work.

Objective: You are the President of a fictional country that is in the midst of a serious hunger crisis. Your goal: successfully manage your country for 30 years, ensuring that no more than 200,000 people die.

Along the way, you will be faced with various impediments such as natural disasters and periodic conflict. You must balance your budget between hunger initiatives and the military, as well as strategize over short-term or long-term initiatives.

The Real Wicked Problem:

- It is estimated that 815 million people in the world today suffer from varying levels of malnutrition
- 83 to 123 million more people will be hungry by the end of the pandemic
- Around 36 million people die of hunger each year, more than deaths from AIDS and malaria combined
- One child will die of hunger every 5 seconds
- The world wastes enough food every year to feed 2 billion additional people
- Although progress is good (there are 200 million less hungry people than there was 25 years ago), there is still much to be done

Population and food: There are four levels of population: normal, population with moderate malnutrition, population with severe malnutrition, and the deceased population.

Method by which the populations change:

1. Nobody from the normal population will move down a level unless there is a conflict that year
2. Each year, food supply will be applied to the severely malnourished population first. Those that can be fed will move up into the moderately malnourished population. Those that cannot be fed will die
3. If there is any leftover food, the remaining food supply will be applied to the moderately malnourished population. Those that can be fed will move up into the normal

population. Those that cannot be fed will move down into the severely malnourished population

4. No attempt will be made to feed the normal population. Any leftover food at this point is not decremented

Operators (Our Math + What they represent in real life)

NOTE:
f = food supply boost in a given year
n = number of boosts
y = years since first boost of this category

0. Cash Assist: Cash is given to locals so they can immediately buy food
   - Cost: $100,000
   - One-time food supply boost
   - The food supply will immediately increase by 40,000
   - **Background:**
     - Poverty is one of the leading causes of hunger and has a cyclic relationship with hunger. Poorer people often cannot afford adequate nutrition, and in turn hungrier people have a harder time being productive at work/school
     - Especially in the case of conflict, when food prices skyrocket, locals simply cannot afford food. Today in West Africa, food prices have risen 200% while incomes have sharply decreased.

1. GMO Research: GMO research helps increase crop productivity and proportionally increase food supply over time.
   - Cost: $1,000,000
   - Linear increase of food supply boost
   - f = 500 * n * y
   - **Background:**
     - Genetic engineering is expensive, but allows for a whole host of benefits. GMOs can be engineered to be more nutritious (ex. Golden Rice), withstand droughts and other natural disasters, and more
     - One study found that GMos reduced the use of pesticides by 37%, increased crop yields by 22%, and increased farmers profits by 68%

2. Better Food Storage: Better food storage allows for the food supply to increase by a constant amount over time.
   - Cost: $250,000
   - Constant food supply boost

- $f = 4000 * n$
- **Background:**
    - Food storage may sound deceptively unimportant, but around the world, many farmers lose half their entire harvest to this exact issue
    - In Africa, small-scale farmers lose 40% of their harvested food to pests, mold, and spoilage
    - Objects such as air-tight bags and silos can safely and securely store food

3. Farmer Education: teaches farmers about more effective agricultural practices
    - Cost: $250,000
    - Reciprocal function for modeling food supply boost
    - $f = 9000 * n / y$
    - **Background:**
        - Many NGOs such as WFP are investing heavily in farmer education
        - Teaching local farmers about effective agricultural practices can be a game changer
        - Nearly ⅔ of hungry people today are women, largely due to unequal treatment and gender inequality. Many NGOs are working to teach women how to farm and be self-sufficient
4. Land Restoration: Land Restoration allows for exponentially increased food supply over time.
    - Cost: $750,000
    - Exponential function for modeling food supply boost
    - $f = 10 * n * y^2$
    - **Background:**
        - Some NGOs are spending hundreds of millions of dollars on rehabilitating arable land.
        - One project by World Food Program USA increased South Sudan's farmable land by 27% in 2 years
5. Food Waste Awareness: causes the food supply to increase by a constant amount each year.
    - Cost: $50,000
    - Constant food supply boost
    - $f = 1000 * n$
    - **Background:**
        - Intentional food waste is a serious problem, especially in richer countries. The UN estimates ½ of all fruits and vegetables produced are wasted each year
        - Over 920 million tons of food are tossed out, also accounting for 10% of total greenhouse gas emissions
        - In the US, 30% of all food, worth 48 billion dollars, is thrown away
6. Do Nothing: A broke ruler is a useless ruler.

- Cost: $0
- The year will pass with no change in food supply

Special Events:

Budget (every four years starting in 2021)

- Every four years, the player is presented with a budget and has two options: add the money to the budget that can be used on fundable hunger-reduction initiatives or add the money to the military budget. The year does not increase if either of these budget options are chosen. The player will be able to choose another operator for that year to pass.
- If they choose Hunger Initiatives: $1,500,000 is given to the player to spend on operators.
- If they choose Military: $1,500,000 is given to the military to fight enemies during conflict events.

Conflict (every five years starting 2026)

- Every five years, there will be conflict with an enemy country who has a military budget generated by the formula round(1e6 * year since game began$^{0.5}$).
- If the opponent's military budget is greater than your military budget, you lose the war:
    - Your military budget becomes 0
    - 20% of the normal population will move to the severe malnutrition population
- If the opponent's military budget is equal to your military budget, you draw the war:
    - Your military budget becomes 0
    - 5% of the normal population will move to the severe malnutrition population
- If the opponent's military budget is less than your military budget, you win the war:
    - Your military budget becomes whatever it was before the war minus your opponent's military budget
    - 3% of the normal population will move to the severe malnutrition population

Natural Disasters (every seven years starting 2028)

- Every seven years, a natural disaster will occur and deplete your food.
    - Flood
        - The food supply becomes 70% of what it was before.
    - Wildfire
        - The food supply becomes 70% of what it was before.
    - Pests
        - The food supply becomes 60% of what it was before.
    - Hurricane

- The food supply becomes 40% of what it was before.

Positive Event (year 2032)

- A generous NGO will donate food for 5,000 people in your country!