CHAPTER 4:   THE SUMERIAN GAME

Background

The idea of constructing a computer model of the ancient Sumerian civilization and using it for teaching basic economics came from Bruse Moncreiff of IBM, who in turn was inspired by Rousseau and Dewey, a paper by Richard L. Meier entitled "Teaching through Participation in Micro-simulations of Social Organization," by the parlor game of Monopoly, and by other experiences with simulation and gaming. The term "simulated environment" was coined by him.[1]

The immediate reason for the choice of the Sumerians was "to protest against the growing tendency in school curricula to ignore the pre-Greek civilizations, in spite of the growing weight of scholarly evidence as to the important role which this prehistory and early history should play in our understanding of the processes by which our society has come to be what it is. Childe and others have identified the development of settled farming - the domestication of food plants and animals - as a necessary forerunner of urban, civilized, social organization. This transformation first occurred in lasting form in the river valleys of Mesopotamia, Egypt, and India. It is ironic that as scholarship was discovering the importance of understanding this technological, economic and social revolution, school authorities were dropping the topic from the social studies curriculum." (10)

The Game

Introduction.-- Preliminary to the programed play of the Sumerian Game there is an introductory lecture. The delivery of the lecture is made utilizing a tape recorder driving a conventional slide projector. During this introduction the student learns that he will play the role as ruler of a city-state in the ancient land of Sumer about 3500 B. C. This introductory presentation takes approximately 20 minutes.

Initial Play.-- At the conclusion of this orientation, brief instructions and the initial economic conditions are typed out for the child at the terminal controlled by the computer. He then assumes the role of Luduga I, priest-ruler of Lagash, and is

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[1]The instructional version of the game was written by Mrs. Mabel Addis, a fourth grade teacher at the Katonah Elementary School. William McKay of IBM programed the game for the computer.

presented with his first problematic situation: "We have harvested 5,000 bushels of grain to take care of 500 people. How much of this grain shall be set aside for the next season's planting, and how much will be stored in the warehouse? The remainder will be given to the people to eat." [1]

The child makes decisions and enters his answers at the computer terminal. The computer immediately returns a progress report, including the harvest reaped from the seed grain set aside for planting, a word index as to the standard of living, and a report on his inventory. This kind of problem is repeated throughout the first phase of the game, each harvest representing six months in the life of the ruler. A complicating figure affects the second planting. The ruler must take into account the increasing population. Eventually he is faced with the problem of expansion, which entails the acquisition of new land and irrigation. At intervals the ruler is presented with technological innovations and disasters which will alter his decisions.

The rule of the first Luduga is devoted to the solution of problems pertaining to an agricultural economy. In the second phase of the game, the child as Luduga II is given the opportunity to apply his surplus grain to the development of crafts. In the third and final stage he is introduced to trade and the more complex problems which confront a changing economy. The rate and trend of development are dependent upon the wisdom of the child's decisions.

Details of the Seasonal Play

The first messages introduce the student to the proper use of the terminal and give him an idea as to what his game objectives should be. Following the introduction, the student receives a first Seasonal Population and Harvest Report (FIGURE 1). The reports provide facts about population, acres of land for planting grain, number of farm workers, grain recently harvested, and grain remaining in inventory from previous harvests. The last part of the report asks the student to allocate his resources (grain harvested plus grain in inventory) among three requirements: (1) food for the people, (2) seed for next season's planting, (3) inventory for future needs. Such seasonal reports (a typical seasonal report is shown in FIGURE 2) with their related allocation decisions comprise the basis of play of the entire game.

The passage of time is signified by successive reportings. Good play is signified by a growing population and increasing harvests; poor play, by a decreasing population and/or a decreasing harvest.

The method of computing a change in population from one report to the next is illustrated in FIGURE 3 which shows that the "best" amount of grain to use for food is 18 bushels per person. The formulas used to compute the harvest are displayed in TABLE 1. These formulas do not show the effects of disasters or other temporary variations in harvest. Also, the numbers which appear in the formulas to not remain fixed through a complete play of the game; for example, the formula for the harvest, $H = 4S$, (Item 1) becomes $H = 5S$ after the use of fertilizer in farming is introduced.

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[1] A sample Sumerian Game printout is given in Appendix F.

In the text of a typical seasonal report, the comment, "The quantity of food the people received last season was _____" is modified to read "far too little," "too little," "satisfactory," "too much," or "far too much," depending upon the amount of grain allocated for food. The rules for insertion of the ratings - far too little, etc. - are shown in TABLE 2.

Random Disasters.--Immediately following the seasonal report, there occasionally occur other brief reports of events which alter conditions in the city-state. The most persistent happenings are natural disasters - floods and fires which kill people and ruin harvests. These natural disasters point up the need for maintaining a well-stocked inventory. The occasion and severity of the disasters are both determined by an Operation Research method known as the Monte Carlo method. Here use is made of a sequence of numbers, each sequence being computed as needed with the statistical property referred to as "randomness" (each of the possible values are equally likely to be picked, each selection is a statistically independent one). A computation for generating a sequence of "pseudo-random" numbers is shown in TABLE 3; they are termed "pseudo-random" because they are reproducible rather than obtainable by pure chance. A single computation generates a single number of the sequence.

The flowchart in FIGURE 4 shows a procedure for determining whether or not a disaster should occur, and if one is to occur then with what severity? The procedure, repeated a number of times will show disasters occurring 5/16 of the time overall. The severity of a disaster is reflected in the magnitude of a reduction in the harvest. The reduction may be 10%, 20%, 30%, or 40% and these percentages are chosen 9/16 of the time, 4/16 of the time, 2/16 of the time and 1/16 of the time, respectively.

Grain Rotting.--Another report frequently following the seasonal report, has to do with the rotting of grain left in inventory. The comment, "Sir: I am sorry to report that _____bushels of grain have rotted or been eaten by rats this past season," is given to the student if the amount of rotted grain is not zero. The calculation of the amount is given in TABLE 4.

Innovation Reporting.-- The economic condition of the city-state may improve in two ways: (1) through good management of the basic grain allocation, (2) by accepting with some good judgment a sequence of innovations presented in special end-of-season reports. Improvements of the second kind show themselves dramatically - a harvest productivity parameter is increased by 25%, the rate of rotting is cut by 50%, or perhaps the number of farmers required per acre of land is reduced by 50%. Progress through the game can be measured in terms of the number of special reports gone over by the students. Normally, a

strict sequence is followed for the special reports; no report can be given until some specific predecessor has been given. Some of the reports are not offered to the student until after the student has exhibited some "good" judgment; e.g. he has fed his people satisfactorily for two consecutive seasons. As each of the reports is given (the student is often required to respond to questions during the reporting), any variable of a collection of state-of-the-nation variables may have its value altered. Such alterations invariably show themselves in subsequest population and harvest reports.

A description of all the state-of-the-nation variables used in the Sumerian Game is included in TABLE V. Variables are shown in two groups, the first containing variables for which values are maintained as of the current time of play, as of the time one season ago, two seasons ago and three seasons ago. This brief "history" is maintained as the source of information for making judgments as to the "goodness" of play. The second group of variables are for current play-time only.

Three Parts - Three Rulers.--The Sumerian Game is played in three successive parts, the sequence of parts corresponding with the reign of three successive rulers: Luduga I, II and III. In addition to contributing to the story line of the game, this organization of the game makes plausible the resetting of the state-of-the-nation variables. That is, no matter how a student has directed the city-state through his reign as Luduga I or II (he may, for example, have increased his population by 20% or decreased it by 30%), he would start his play in the role of Luduga II or III with a standard set of values for the state-of-the-nation variables. The story line explanation is that a period of time elapses after the time of completion of one part before the start of the next.

Revision of Game

After the experience of having some thirty pupils play the game and take the tests and of listening to consultants, it was decided to make extensive revisions during the summer of 1966.

Mrs. Addis made an amplification and clarification of the objectives and facts, generalizations, and concepts implied in the scripts of the three rulers. Each concept was extended to show how it was incorporated in the game. The next step was a revision of the parameters with a view to making them more realistic. The script of the first ruler, Luduga I, was rewritten. The number of plays made by the student was reduced to thirty with the messages condensed to reduce the repetitious nature of the economic reports. Visuals, formerly used as motivational and illustrative devices, were improved to contribute directly to learning. Graphs and charts were included to enhance and review the explanation of economic concepts. These concepts were spelled out further by the introduction of mid-season court bulletins. Since the earlier approach relied heavily upon the printed word as a means of communicating with the student, a diversification in the range of learning in-put was introduced by the use of the tape recorder. In a series of problem-solving situations the ruler was given the opportunity to listen to a tape which recorded the simulated discussion of a cabinet of advisors. At the conclusion of each tape he was redirected to the printed word of the terminal to record his decisions. The introduction of an audio court news bulletin also relieved the reading routine and added interest to the play.

The form of the game representing the reign of the second ruler was changed completely in format. Reduced in length to ten plays, the lengthy procedure involved in the plant, harvest, storage decision making was eliminated. These calculations were assumed by the computer, thereby leaving the student free to concentrate on the major problem of allocating manpower. Justification for this revision lay in the assumption that the

successful conclusion by the student of the first segment of the game would indicate a certain degree of mastery of the allocation of resources problem.

The script for the first segment of the Sumerian Game has been reprogramed by Jimmer Leonard, graduate student in the Social Relations Department at the Johns Hopkins University, in Autocoder for use on an IBM 1401 computer at the University. The program is now being transmitted for demonstration purposes to terminals located at the BOCES Research Center in Yorktown Heights, New York.

Alternate plans have been drawn up for a revision of the third segment of the game. The first would retain the earlier format of Luduga III, requiring the student to manipulate the decisions of grain and labor allocation as well as introducing the new problematic situations of trade, colonization, and war. The primary purpose for retaining the decision-making elements of the first two rulers in the third would be for reinforcement and review. The second version would employ the abbreviated economic report of the second ruler with the computer doing the mathematical calculations, and the student would confront problem solving situations arising from a more complex society. New visuals and audio tape materials have been introduced into this third and last segment of the game.

Economic Principles in the Sumerian Game

The Sumerian Game play is not derived from a systematic economic theory, but rather the principles and guides to action exemplified in the game are those thought by the authors to be inherent in the situation and at the same time recognized by authorities in the field[1] as reputable principles of economics.

Following is a list of the economic principles in the original version of the game. Each principle is followed by a statement telling how the student was expected to learn it.

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[1]Consultants for this game have included Vaughn Crawford, Asst. Curator, Ancient Near East, Metropolitan Museum of Art, New York City; George Dawson, Head of the Social Studies Division, School of Education, New York University; and Martin Anderson, Associate Professor of Business, Columbia University Graduate School of Business.

Luduga I

I. In a centrally directed economy the ruler determines what is to be produced.

   Luduga makes all the decisions pertaining to planting and craft establishment.

II. Since human wants are greater than the resources available to satisfy these wants, societies must find ways of allocating their resources efficiently.

   From the initial play of the game on, the student has to face the problem of how to allocate his grain.

III. Efficient allocation of resources benefits society; inefficient allocation reduces the total wealth of a community.

   If too little grain is saved for planting, Luduga's people starve to death; the loss of people is a serious loss of an important factory of production -- labor.

IV. Savings and investment are necessary if society is to enjoy consumption in the future. A certain amount of current consumption must be sacrificed if we want to consume in the future.

   If Luduga saves too little grain, the next year's harvest may not be enough to feed his people.

V. The economic system attempts to find the proper balance between consumption, savings, and investment.

   There is one best ratio wherein Luduga sets aside a certain amount of grain for planting, a certain amount for inventory, and a certain amount for consumption.

VI. A knowledge of economic facts and principles can help us to make predictions, but these predictions can be upset by uncontrolled variables.

   If the student masters the proper ratio in the game, his predictions can still go awry because of random disasters.

VII. Economic growth is necessary if the standard of living is to increase. An economy is growing when there is an increase in real per capita output.

   Luduga must increase his grain output to meet his growing population.

VIII. The real cost of anything is what we must sacrifice to get it.

> The cost of Luduga's clay pots is the amount of grain lost
> by the fact that labor was taken from the fields to make pots.

IX. Improvements in productivity can lead to economic growth and greater national wealth.

> Technological innovations enable Luduga to increase his
> output. This, in turn, permits him to devote a smaller
> percentage of his total resources to the production of
> necessities.

X. As more labor and capital are used by a producer on a piece of land, a point is reached where his return becomes less in proportion to the amount of labor and capital used.

> If Luduga continues to increase his planting figure on the
> same number of acres, his harvest will eventually decrease.

XI. When the optimum yield on a given acreage has been reached, and the population continues to increase, it is necessary to cultivate more land.

> As population grows, Luduga is given the opportunity to in-
> crease his acreage.

XII. Climate, seasons, and natural resources affect how a man provides for his basic needs.

> It was possible for Luduga I to harvest much more grain than
> he planted and thus make farming the primary occupation be-
> cause of the natural conditions which existed in Sumer.

XIII. Disasters require a redistribution of resources.

> When Luduga is faced with a disaster to his harvest or
> people, it often necessitates a re-allocation of resources.

XIV. The effects of disasters can be alleviated by savings.

> Luduga frequently overcomes the effects of disaster
> by using the savings in his Inventory.

Luduga II

I. An increase in production in one sector of an economy may release factors of production for service in other sectors.

> An increase in farming production releases labor for service
> in crafts in all three rulers, but especially in Luduga II.

II. Specialization tends to increase efficiency.

    Luduga is told this when he begins to set up crafts.

III. The real cost of anything is what we must sacrifice to get it.

    Sending too many men to get timber reduced the grain harvest. The real cost of the timber was the lost grain.

IV. Technological improvements increase productivity.

    Crop rotation, the adoption of the plow, the potter's wheel, and the wheel all increase productivity in their related areas.

V. When we successively apply equal amounts of one or two factors of production to the remaining factor or factors and find that an added application yields a smaller increase in production than the application immediately preceding, we have the Law of Diminishing Returns.

    In Luduga II the watering of the barley, and the existence of too many basket makers illustrate this law.

Luduga III

I. Social capital is a necessary element of any economy, and must often precede broadly-based economic development.

    In the Sumerian Game social capital covers such things as schools, canals, roads, and other projects which do not usually result in profit.

II. Trade for desired commodities is preferable to raiding because:

    a. The high element of risk in raiding makes it costly. Luduga loses his raiding parties on several expeditions.

    b. Trading opens up markets for surplus projects. Luduga trades surplus grain for timber and metal.

III. Since water is essential to an agrarian economy, it is imperative that irrigation canals be maintained and improved.

    Luduga copes with the problem of silt removal, keeps canal guards, and builds a new dam and system of irrigation ditches.

IV. A commodity is used for exchange when there is a demand for it in the market, when it provides a better rate of exchange, or when there is a surplus of it at home.

    Luduga uses grain in his early trade transactions because of these reasons.

V. When a ruler has a choice of commodities to be placed
    in trade, whenever possible he should choose the one

    a. of which he has the greatest surplus.

    b. for which there is the greatest demand.

    c. for which there is the best rate of exchange.

    Luduga faces a choice among grain, wool or cotton,
    where wool is preferred.

VI. When an invention increases the output of a product
     beyond the demands of home consumption, it is possible
     to put that product into trade.

     The invention of a loom enables Luduga to use his
     surplus wool for trade.

VII. Although a part of the cost of a product goes to the
      middleman, this is compensation for performance of valuable
      services and contributes to the efficiency of resource
      allocation.

      Luduga uses the middleman at Mari because it saves
      travel time and eliminates the risk of travel in
      the dangerous hill country.

VIII. A country may profitably specialize if it has a greater
       advantage in producing one commodity than in producing
       another.

       Luduga produces barley and buys cotton because it is
       more to his advantage to raise the grain which feeds
       his people and gives him buying power.

IX. To keep the morale of his people high, it is advisable for
     a ruler to introduce into crafts and trade luxury items as
     well as necessities.

     Luduga trades for precious stones for the adornment
     of his temple.

X. Increased government production, as for war materials,
    takes resources away from civilian goods.

    Luduga faces the decision of transf.. ring men from
    his fields and crafts to meet the increasing demand
    for war materials.

IX. Every economy should attempt to conserve its natural resources.

     Luduga protects his natural resources with the construction
     of an intricate system of canals and dams.

The concepts outlined under Luduga's I and II are repeated for reinforce-
ment in Part III.

TABLE 1. FORMULAS RELATING HARVEST TO SEED PLANTED, LAND CULTIVATED AND NUMBER OF FARMERS

Symbol Definition:

Let H = the number of bushels in the harvest

S = the number of bushels of seed planted

L = the number of acres of land cultivated

W = the number of workers on the farm lands

Formulas:

1. If too much seed has not been planted

$$S \leq 6 L$$

and if there are enough farmers

$$W \geq L/4$$

then

$$H = 4S$$

2. If too much seed has not been planted

$$S \leq 6 L$$

but there are too few farmers

$$W < L/4$$

then

$$H = (4 W/L) \ 4S$$

3. If too much seed has been planted

$$S > 6 L$$

and if there are enough farmers

$$W \geq L/4$$

then

$$H = 24 L$$

4. If too much seed has been planted

$$S > 6 L$$

and there are too few farmers

$$W < L/4$$

then

$$H = 96 W$$

TABLE 2. MESSAGE INSERTS

Let the comment "The quantity of food the people received last season was_____"
have a variable insertion, to be specified below:

Let X = food per person in one season (see Figure 1); then

If $X < 9$ the insert is "far too little."

If $9 \leq X \leq 15$ the insert is "too little."

If $15 < X < 21$ the insert is "satisfactory."

If $21 \leq X < 27$ the insert is "too much."

If $27 \leq X$ the insert is "far too much."

TABLE 3. PSUEDO-RANDOM-NUMBER GENERATICN

Let R = the current value of the random number, $0 < R < 1$ then compute:

$$R_1 = 2^{35}R$$ an integer with a 35-bit binary representation.

$$R_2 = 1220703125 \, R_1$$ an integer with a 70-bit binary representation.

$$R_3 = R_2 \text{MOD } 2^{35}$$ an integer less than 2^{35} with a 35-bit binary representation.

$$R = R_3/2^{35}$$ a number less than 1 with a 35-bit binary representation.

The MOD 2^{35} notation above means to take the remainder of R_2 after subtracting away all positive multiples of 2^{35}. This is conveniently done on a binary computer with 35-bit registers simply by forming the 70-bit product and then dropping the leading 35 bits.

TABLE 4. THE GRAIN ROTTING COMPUTATIONS

Let I_0 = grain put into inventory this past season

I_1 = grain put into inventory one season back

I_2 = grain put into inventory two seasons back

I_3 = grain put into inventory three seasons back

ΔI = the change in inventory due to rotting

There are four rates of rotting. The applicable rate is determined by other factors, e.g. the extent of the use of clay pots, rather than baskets, for the storage of grain.

$$(1) \quad \Delta I = .1\,I_0 + .25I_1 + .75I_2 + I_3$$

$$(2) \quad \Delta I = .75I_2 + I_3$$

$$(3) \quad \Delta I = I_3$$

$$(4) \quad \Delta I = .5I_3$$

TABLE 5. STATE-OF-THE-NATION VARIABLES

FOUR TIME PERIODS

The first group of variables have values maintained as of 4 distinct points in time (simulated play time). They are the current seasonal report time, seasonal report time 1 season ago, seasonal report time 2 seasons ago and seasonal report time 3 seasons ago.

P	-	the population
F	-	the amount of grain allocated for food
H	-	the amount of the harvest
S	-	the amount of seed planted
L	-	the number of acres of land under cultivation
W	-	the number of workers in farming
I_0	-	the amount of grain in inventory zero seasons old
I_1	-	the amount of grain in inventory one season old
I_2	-	the amount of grain in inventory two seasons old
I_3	-	the amount of grain in inventory three seasons old

CURRENT PLAY TIME ONLY

Values of the following group of variables are maintained only for the current-play time.

R_0	-	the normal rate of return - harvest to seed planted
R_1	-	the maximum ratio of seed planted to land cultivated for normal harvests
R_3	-	the minimum ratio of farm workers to land cultivated for normal harvests
R_4	-	the ratio of farm workers to total population
Y	-	the number of seasons played

Initial Economic Report Made to the New Ruler of Lagash by his Humble Steward:

Total population now	500
Total farm land under cultivation, acres	600
Total grain in inventory, bushels	900
one season old	900
two seasons old	0
three seasons old	0
Total grain just harvested, bushels	13000
Total resources, harvest and inventory	22000

You must now decide how to use your resources.

How many bushels of grain do you wish to feed your people?

....

How many bushels of grain do you want planted for the next crop?

....

This means that........bushels must be placed in storage. Is this all

right? Do you wish to (1) let your decisions stand, or (2) revise them?

....

Resulting inventory   ....

The steward will execute the royal commands and return in 6 months.

FIGURE 1. THE INITIAL SEASONAL REPORT

Economic report of the ruler's steward for the fall season in the year 14 of Luduga 1.

Population at previous report   514

Change in population   12

Total population now   526

The quantity of food the people received last season was satisfactory.

Harvest last season   15829

Harvest this season   15829

Previous inventory   2620

Change in inventory   -456

Present inventory   2164

Total resources, harvest + inventory   17993

You must now decide how to use your resources.

How many bushels of grain do you wish to feed your people?

9500

How many bushels of grain do you want planted for the next crop?

4500

This means that 1829 bushels must be placed in storage. Is this all

right? Do you wish to (1) let your decisions stand, or (2) revise them?

1

Resulting inventory   3993

The steward will execute the royal commands and return in 6 months.

FIGURE 2. A TYPICAL SEASONAL REPORT
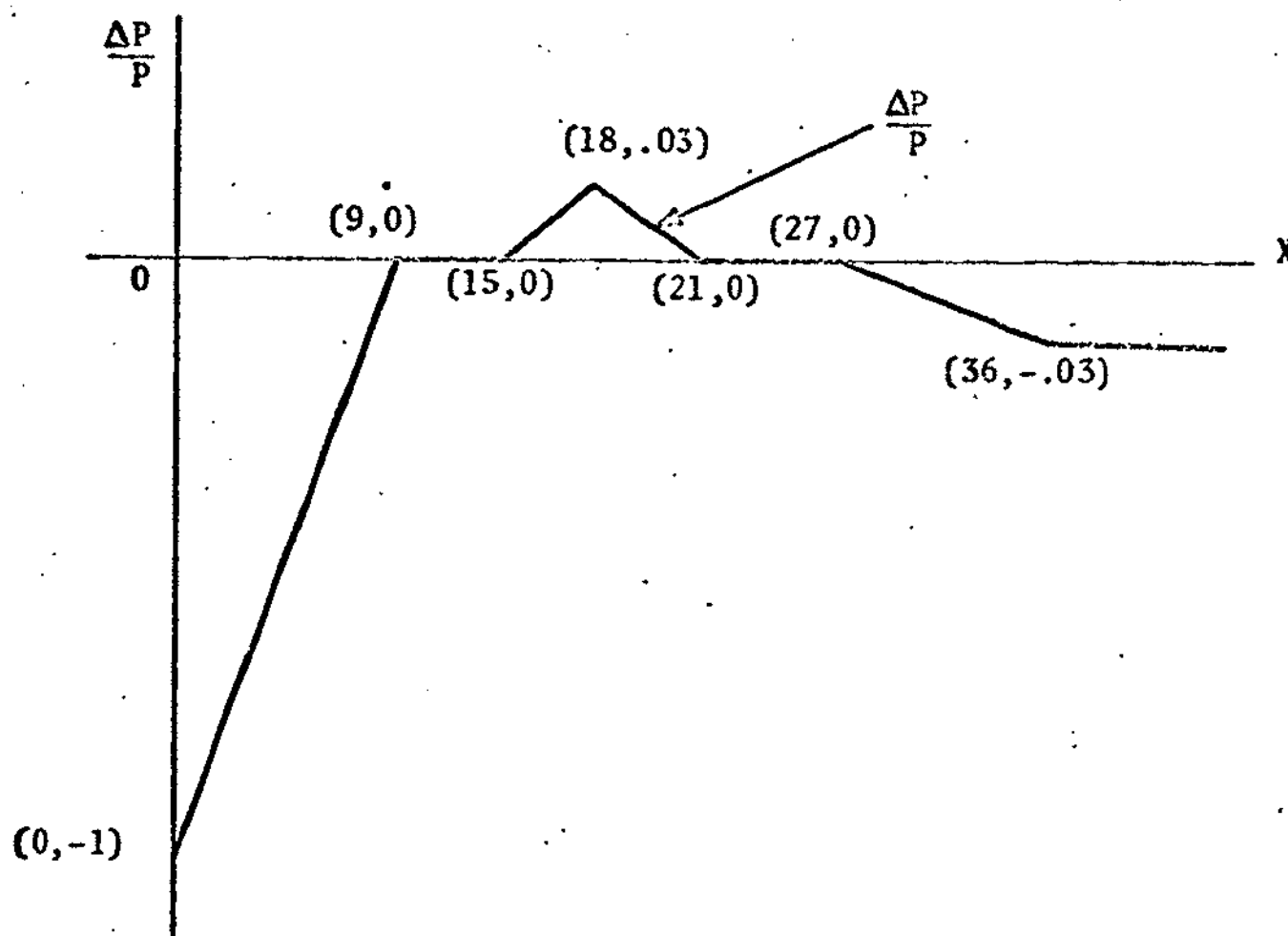
Let P = the population

ΔP = the change in population over one season

F = the number of bushels of grain set aside as food for one season

X = food per person in one season

then $X = F/P$

and the ratio $\Delta P/P$ is given in the graph below:

Example: If $P = 600$ and $F = 10,200$

then $X = 17$; $\Delta P/P = .02$

and $\Delta P = 12$

The next population figure would then be 612.

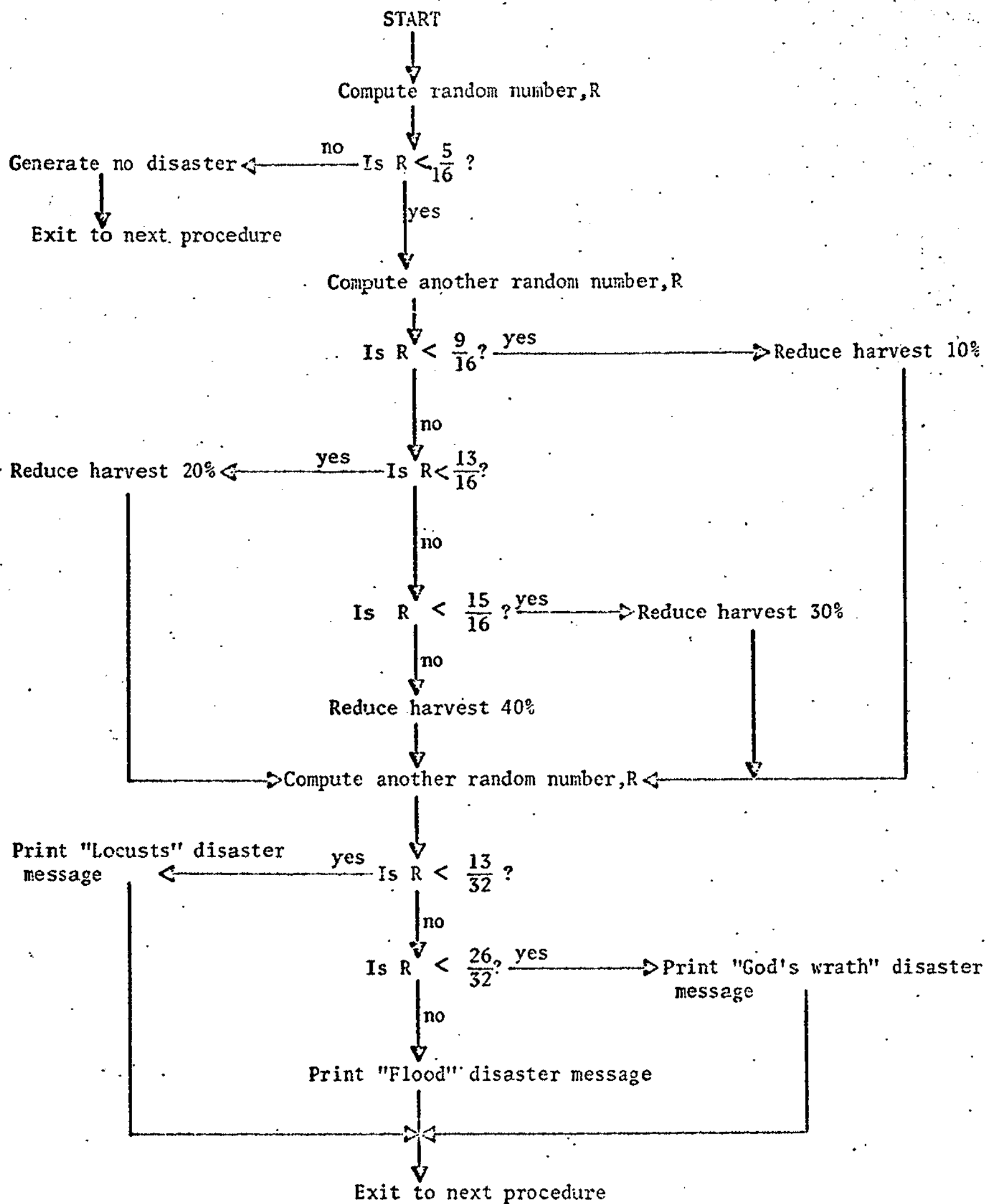FIGURE 3. GRAPH RELATING POPULATION CHANGE TO FOOD CONSUMPTION

START

Compute random number, R

Generate no disaster ←———— no ————— Is $R < \frac{5}{16}$?

Exit to next procedure

↓ yes

Compute another random number, R

Is $R < \frac{9}{16}$? —— yes ——————————→ Reduce harvest 10%

↓ no

Reduce harvest 20% ←——— yes ——— Is $R < \frac{13}{16}$?

↓ no

Is $R < \frac{15}{16}$? —— yes ——→ Reduce harvest 30%

↓ no

Reduce harvest 40%

→ Compute another random number, R ←

Print "Locusts" disaster message ←——— yes ——— Is $R < \frac{13}{32}$?

↓ no

Is $R < \frac{26}{32}$? —— yes ——→ Print "God's wrath" disaster message

↓ no

Print "Flood" disaster message

Exit to next procedure

FIGURE 4. NATURAL DISASTER GENERATION PROCEDURE

APPENDIX F: SAMPLE SECTION OF SUMERIAN GAME PRINTOUT

run 100
Suilxr is running.
Slide 1, hit CR.

   Hello! Before we begin, will you please type your name, first na
first, then your last name, and then press the Return key.
scott mclaughlin
   Now, SCOTT, you are ready to operate the Sumerian Economic
Model.

   Imagine that you have just been made Ruler of Lagash, a City-State
of Sumer, in the year 3500 B. C. Twice yearly your Royal Steward,
Urbaba, will report to you the economic condition of the kingdom.
Guided by these reports, you will decide the use of your grain and
other resources, trying to keep your population stable and well fed.
Between reports, your court advisor will come to you with news of your
kingdom.
   The Steward will use the typewriter to report and ask for your
decisions. When the "Proceed" light comes on, type your answer in
figures and press "Return". (If you make a mistake, press "Cancel"
instead and try again). Good luck!

Initial Economic Report made to the New Ruler of Lagash by his Humble
Steward:

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Total population now                             500
Total farm land under cultivation, acres        600
Total grain in inventory, bushels                900
     one season old                              900
     two seasons old                               0
     three seasons old                             0
Total grain just harvested, bushels            13000

Total resources, harvest + inventory           13900

You must now decide how to use your resources.

How many bushels of grain do you wish to FEED your people?
1000
How many bushels of grain do you want PLANTED for the next crop?
2000
This means that 10000 bushels must be placed in storage.  Is this all
right?  Do you wish to 1-let your decisions stand or 2-revise them?
2
How many bushels of grain do you wish to FEED your people?
2500
How many bushels of grain do you want PLANTED for the next crop?
9000
This means that 1500 bushels must be placed in storage.  Is this all
right?  Do you wish to 1-let your decisions stand or 2-revise them?
2
How many bushels of grain do you wish to FEED your people?
2600
How many bushels of grain do you want PLANTED for the next crop?
9999
This means that 401 bushels must be placed in storage.  Is this all
right?  Do you wish to 1-let your decisions stand or 2-revise them?
1
Resulting inventory                             1301

The steward will execute the royal commands and return in 6 months.


Sir, your people don't have enough food to eat and there are 1301
bushels in storage.  Shall we not distribute it to them?  How much?

500
Sir, I am sorry to report that 140 bushels of grain have rotted or
been eaten by rats this past season.

----------------------------------------------------------------------

Economic Report of the Ruler's Steward for the SPRING Season in the
year 1 of Luduga I.


Population at previous report                    500
Change in population                            -155
Total population now                             345

The quantity of food the people received last season was far too little.

Harvest last season                            13000
Harvest this season                            14393

Previous inventory                              1301
Change in inventory                             -640
Present inventory                                661
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You must now decide how to use your resources.

How many bushels of grain do you wish to FEED your people?
300

3500
How many bushels of grain do you want PLANTED for the next crop?
10000
This means that 893 bushels must be placed in storage. Is this all
right? Do you wish to 1-let your decisions stand or 2-revise them?
1
Resulting inventory   1554

The steward will execute the royal commands and return in 6 months.

Sir, your population has decreased -31% while the size of your farm
has not changed.

Should I ask the steward to change the number of acres of land under
cultivation? 1-yes or 2-no.
1
You will have 413 acres under cultivation compared to 600 in the past.

Sir, I am sorry to report that 405 bushels of grain have rotted or
been eaten by rats this past season.

Economic Report of the Ruler's Steward for the FALL Season in the
year 1 of Luduga I.

Population at previous report   345
Change in population   0
Total population now   345

The quantity of food the people received last season was too little.

Harvest last season   14393
Harvest this season   9824

Previous inventory   1554
Change in inventory   -405
Present inventory   1149

Total resources, harvest + inventory   10973

You must now decide how to use your resources.

How many bushels of grain do you wish to FEED your people?
3600
How many bushels of grain do you want PLANTED for the next crop?
9000
Please sir you dont have that much available
How many bushels of grain do you wish to FEED your people?
3600
How many bushels of grain do you want PLANTED for the next crop?
7000
This means that 776 bushels must be removed from storage. Is this all
right? Do you wish to 1-let your decisions stand or 2-revise them?

The steward will execute the royal commands and return in 6 months.

Remember, Luduga, any big change in population will affect your harvest because most of your people are farmers.

Luduga, I fear that the people have angered our god, Ningirsa. He alone could have sent that fire across the fields to destroy half of your crops. This is a very serious loss. I trust that you can cover it from your inventory.

Sir, I am sorry to report that 39 bushels of grain have rotted or been eaten by rats this past season.

Economic Report of the Ruler's Steward for the FALL Season in the year 2 of Luduga I.

Population at previous report	334
Change in population	0
Total population now	334

The quantity of food the people received last season was too little.

Harvest last season	2381
Harvest this season	5659
Previous inventory	153
Change in inventory	-39
Present inventory	114

Total resources, harvest + inventory   5773

You must now decide how to use your resources.

How many bushels of grain do you wish to FEED your people?
4500
How many bushels of grain do you want PLANTED for the next crop?
1300
Please sir you dont have that much available
How many bushels of grain do you wish to FEED your people?
4500
How many bushels of grain do you want PLANTED for the next crop?
1000
This means that 159 bushels must be placed in storage. Is this all right? Do you wish to 1-let your decisions stand or 2-revise them?
1
Resulting inventory   273

The steward will execute the royal commands and return in 6 months.

Luduga, I am seeking more information. If you want your population to increase, should you 1-feed them more grain 2-feed them less grain?
1
Yes, Luduga, you must feed the people more grain.

Sir, I am sorry to report that 101 bushels of grain have rotted or been eaten by rats this past season.

Economic Report of the Ruler's Steward for the SPRING Season in the year 3 of Luduga I.

Population at previous report   334
Change in population   0
Total population now   334

The quantity of food the people received last season was too little.

Harvest last season   .   5659
Harvest this season   3812

Previous inventory   273
Change in inventory   -101
Present inventory

                                      172

Total resources, harvest + inventory   3984

You must now decide how to use your resources.

How many bushels of grain do you wish to FEED your people?
3000
How many bushels of grain do you want PLANTED for the next crop?

 300
This means that 512 bushels must be placed in storage. Is this all right? Do you wish to 1-let your decisions stand or 2-revise them?
2
5
How many bushels of grain do you wish to FEED your people?
3009
How many bushels of grain do you want PLANTED for the next crop?
3 003
Please retype the number.
3003
Please sir you dont have that much available
How many bushels of grain do you wish to FEED your people?
3000
How many bushels of grain do you want PLANTED for the next crop?
458
5This means that 354 bushels must be placed in storage. Is this all right? Do you wish to 1-let your decisions stand or 2-revise them?
2
How many bushels of grain do you wish to FEED your people?
3000
How many bushels of grain do you want PLANTED for the next crop?
700
This means that 112 bushels must be placed in storage. Is this all right? Do you wish to 1-let your decisions stand or 2-revise them?
1
Resulting inventory   284

The steward will execute the royal commands and return in 6 months.

Ne-sag's family became ill with a fever while cutting reeds in the marsh lands. I am sorry to report that he and four grown sons have died. Fortunately the disease did not spread, but any loss of farmers is not to be taken lightly.

Sir, I am sorry to report that 75 bushels of grain have rotted or been eaten by rats this past season.

Economic Report of the Ruler's Steward for the FALL Season in the year 3 of Luduga I.

Population at previous report   334
Change in population   -5
Total population now   329

The quantity of food the people received last season was far too little.

Harvest last season   3812
Harvest this season   2537

Previous inventory   284
Change in inventory   -75
Present inventory   209

                                     Total resources, harvest + inven
    2746   y   r

You must now decide how to use your resources.

How many bushels of grain do you wish to FEED your people?
2000
How many bushels of grain do you want PLANTED for the next crop?
1200
Please sir you dont have that much available
How many bushels of grain do you wish to FEED your people?

1000
How many bushels of grain do you want PLANTED for the next crop?
1500
This means that 37 bushels must be placed in storage. Is this all right? Do you wish to 1-let your decisions stand or 2-revise them?
1
Resulting inventory   246

The steward will execute the royal commands and return in 6 months.

I lean heavily upon your wisdom, Luduga, but I am also here to help you. Tell me, if your population is increasing, would you expect the quantity of grain fed to your people to 1-increase 2-decrease?
1
Of course it should increase. Forgive me if my questions seem simple. It is my duty to urge you to see the relationships among the items in your Steward's reports.

Sir, your people don't have enough food to eat and there are 246 bushels in storage. Shall we not distribute it to them? How much?
120
A plague of locusts came upon our fields yesterday. Fortunately it was not as severe as it has been in the past.

Sir, I am sorry to report that 26 bushels of grain have rotted or been eaten by rats this past season.