AFGRAIN
Afghanistan Regional Foodgrain Situation

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Afghanistan Affairs

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A joint venture by

Nathan Associates Inc.
Louis Berger International Inc.

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PREFACE

This report was prepared under Delivery Order No. 10 of the A.I.D. Afghanistan Studies Project (Contract No. 306-0205-C-00-9385), a joint venture between Nathan Associates Inc. and Louis Berger International Inc.

Analysis for this report was carried out during February 1990 by Drs. Edgar Ariza-Niño and John Newton, two Nathan Associates economists. Mr. Gerard Sequeira assisted in improving the user-friendliness of the spreadsheet program. The team benefited from the contributions of several reviewers, but especially Messrs. Robert R. Nathan, Ozzie Biaich, Harvey Lerner, and Robert Manly.

Drs. Phil Church and Curt Wolters of O/AID/Rep/Afghanistan in Islamabad originally conceived and designed the terms of reference for this assignment. Their inputs and feedback during the course of the implementation of this work order are appreciated. Special thanks are expressed to members of the Swedish Committee for Afghanistan, particularly the Director, Dr. Azam Gul, and two agricultural economists, Messrs. Tom Morrison and Lawrence Clark, for their willingness to share and discuss the results of the 1987 Agricultural Survey of Afghanistan.

EXECUTIVE SUMMARY

AFGRAIN is a Lotus 1-2-3 spreadsheet model of foodgrain production and consumption in Afghanistan. It was commissioned by the USAID Afghanistan representative as a tool to facilitate making assessments of foodgrain balances and needs on a province-by-province basis.

AFGRAIN integrates two major types of information: data on agricultural production and estimates of in-country population. Agricultural production is estimated province-by-province from the results of the 1987 Agricultural Survey of Afghanistan conducted by the Swedish Committee for Afghanistan. The survey provides averages of crop areas, yields, and production for a non-random sample of farmers in each province. These results are extrapolated on the basis of the reported proportion of farmers raising each crop, and the percentage of population engaged in farming.

To arrive at estimates of in-country population, projections based on the 1978 census are adjusted to reflect refugee populations residing in Pakistan and Iran. Numbers of refugees by province of origin in Afghanistan are available from the United Nations High Commissioner for Refugees (UNHCR).

Results from AFGRAIN, using the baseline data on grain production and population available in February 1990, are presented. Grain production in Afghanistan has declined drastically during the last decade. In many provinces grain production is still roughly sufficient to cover minimum nutritional requirements, estimated at 180 kilograms of grain per head per year. However, serious grain deficits occur in Kabul province and surrounding provinces, as well as in the provinces bordering on Pakistan. The grain deficit in Kabul region is estimated at nearly 400,000 tons. This deficit is being satisfied mainly by imports from the Soviet Union, shipments from northern provinces with surpluses, and food donations channelled through Pakistan.

The baseline data suffer from several deficiencies. For example, agricultural production estimates in some provinces are based on too few observations and have high variances, and could therefore be overly optimistic. Also, the number of refugees in Iran is likely an underestimate according to knowledgeable observers. The AFGRAIN model allows analysts to insert adjustments in the data to reflect their judgments. For example, three provinces in which production data were suspect were removed from the analysis to arrive at a more realistic baseline estimate of grain production of 190 kilograms per person for the country as a whole, with persistent deficits in the Kabul region and border provinces.

As more and better information becomes available, analysts are encouraged to update the current baseline data in AFGRAIN. For example, results from the 1989 Agricultural Survey of Afghanistan will become available later in 1990. Moreover, detailed population data will become available in the forthcoming publication by Thomas Eighmy, "The Population of Afghanistan, Inside and Out."

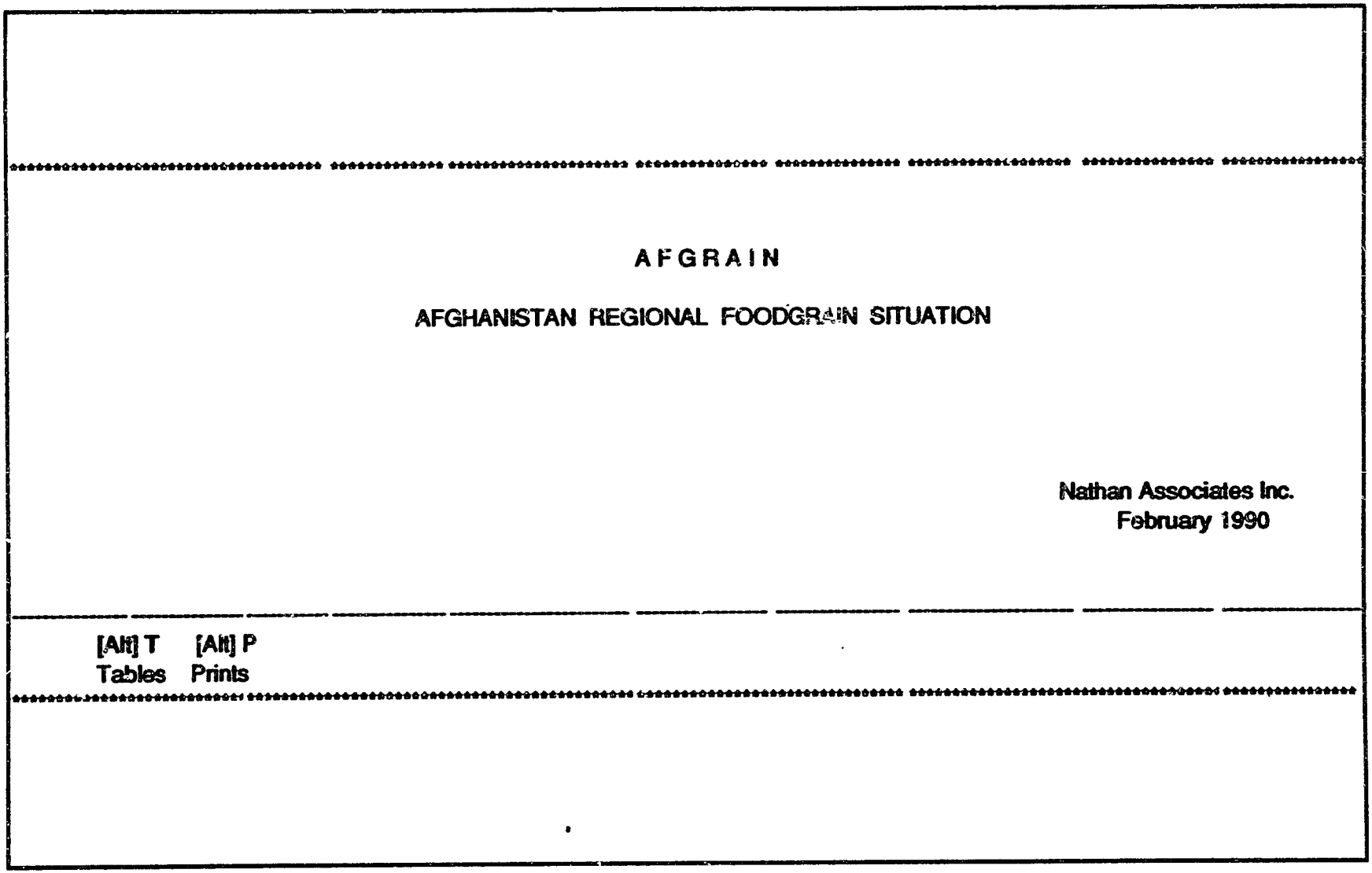
A diskette with the AFGRAIN Lotus spreadsheet program is available on request from Nathan Associates in Washington.

1. INTRODUCTION

This report accompanies a diskette containing a copy of a software program to assess Afghanistan's regional foodgrain needs. Attached to the report are sample tables generated by the AFGRAIN program, using default data values available to the design team. The program is designed to accommodate various types of changes that foodgrain analysts might want to make. AFGRAIN can be accessed by itself, or as part of the Macroeconomic Database Nathan Associates and Louis Berger have developed for USAID/ Afghanistan. Modifications and improvements can still be made, depending on the needs and reactions of the policy analysts who use the system. Comments on the shortcomings of the program are welcome. They should be addressed to either Phil Church or Curt Wolters, O/AID/Rep/Afghanistan in Islamabad.

AFGRAIN is a self-contained spreadsheet that can be operated using Lotus 1-2-3 in a standard microcomputer. Because Version 2.01 of the Lotus software cannot interconnect separate files, it is necessary to incorporate all the original data required, computation, and output tables into a single spreadsheet. It is therefore a fairly large program, which might take a few seconds to recalculate after every change. It requires 170,000 K of disk space, but it is not likely to pose problems of memory capacity in most microcomputers running Lotus 1-2-3.

Figure 1. Welcome Screen to AFGRAIN



2. ACCESSING TABLES

AFGRAIN distinguishes between input tables and output tables. The output tables, needed to present the results of the analysis, are of the most interest. A complete set of output and input tables is included in Appendix A. Tables 0 to 6 will be the ones needed most often, for they change every time a modification is made. Tables 7 to 10 are optional; they are needed only when the user wishes to explore the implications of shipping grain from one province to another, or from Pakistan to one or several provinces.

Front Screen

The screen contents that appear when the AFGRAIN program is loaded into Lotus 1-2-3 is a simple identification screen with two instructions at the bottom as shown in Figure 1.

At the bottom left of the front screen there is a note to press [Alt] T for tables. This takes the user to the table of contents with the list of AFGRAIN tables shown in Figure 2. This list contains the addresses in the spreadsheet where the user can find either the raw data provided with AFGRAIN or the output tables. For example, for each province data are based on the 1978 census, adjusted for 1989 by the United Nations High Commissioner for Refugees (UNHCR). Table 11 contains a list of the specific number of people for each province. To locate Table 11, a user presses [Alt] T 11 [Enter].

The second item at the bottom of the front screen is the note to press [Alt] P to print. It is a reminder that tables can be printed by pressing [Alt] P, followed by the number of the appropriate table. Again, Figure 3 shows the list of output and input tables. Tables 0 through 6 can be printed simultaneously by typing 66. Tables 7 to 10 can be printed by entering 77.

Figure 2. AFGRAIN. Afghanistan Foodgrain Situation

Output Tables

1: Foodgrain balance, by region
2: Percapita supply and prices
3: Population, by province
4: Population, by region
5: Foodgrain production, by province
6: Foodgrain balance, by province
7: Foodgrain shipments
8: Gains to shipping
9: Price differentials
10: Transport costs

0: General adjustments

99: Macro database

Input Tables

11: Population, by province
12: Refugees, by province
13: Rural population, by province
14: Farm household size, by province
15: Irrigated wheat production, farm data
16: Rainfed wheat production, farm data
17: Maize production, farm data
18: Rice production, farm data
19: Barley production, farm data
20: Transport costs between regions
21: Road distances, major cities
22: Foodgrain shipments
23: Renaming regions
24: Reassigning provinces to regions
25: Foodgrain production, direct entry

Figure 3. AFGRAIN. Printout selection

Output Tables

1: Foodgrain balance, by region
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3: Population, by province
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5: Foodgrain production, by province
6: Foodgrain balance, by province
7: Foodgrain shipments
8: Gains to shipping
9: Price differentials
10: Transport costs

0: General adjustments

66: Tables 0-6
77: Tables 7-10

Input Tables

11: Population, by province
12: Refugees, by province
13: Rural population, by province
14: Farm household size, by province
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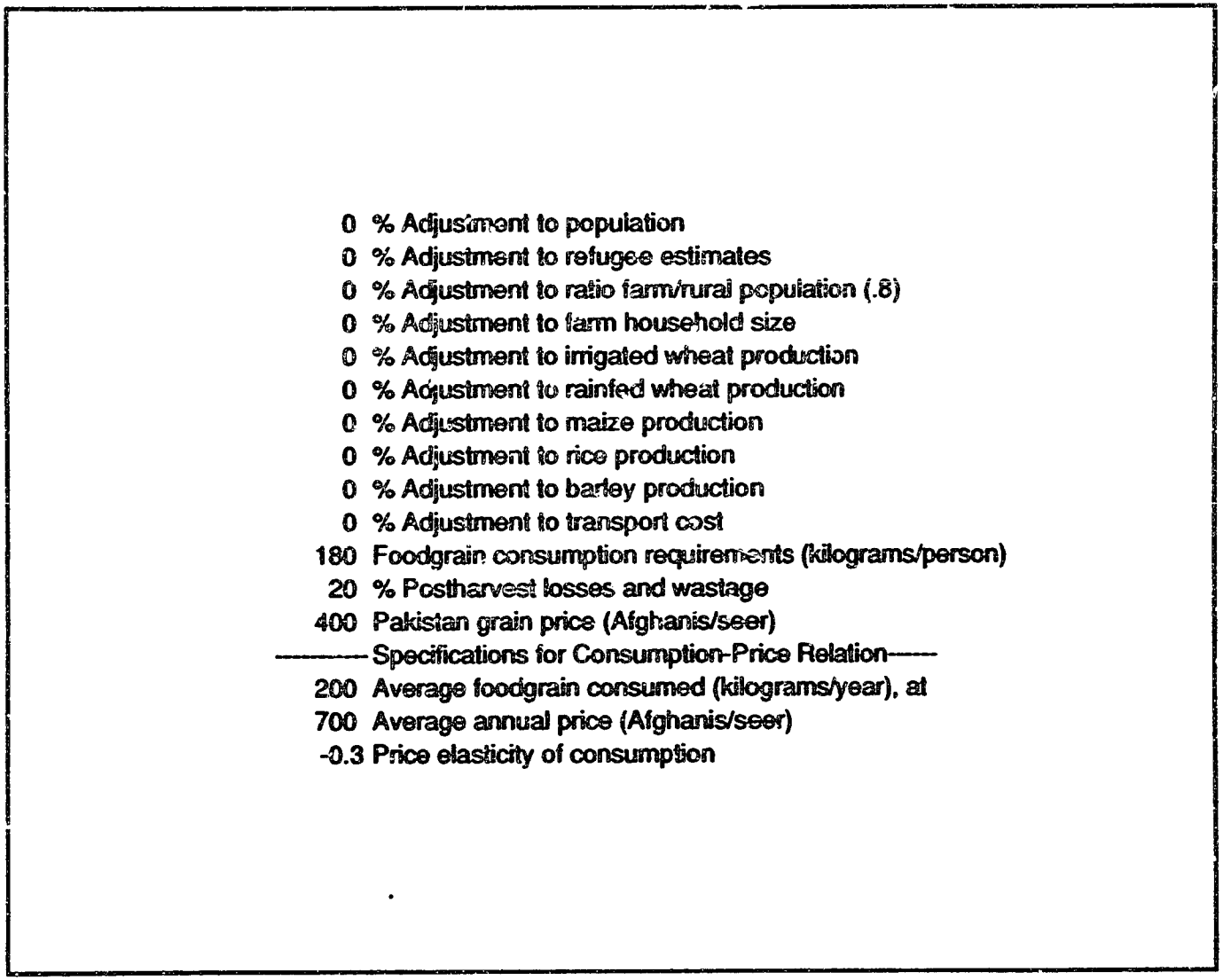
Figure 4. General Adjustments



Changing Data

Users can make two types of changes: general changes on an array of data, or changes in individual entries within an array. Because most of the changes anticipated are general, the page after the front screen is designed to facilitate those changes by allowing the user to enter them in the General Adjustments table, Table 0, in Column A, Rows 21 through 40. To change individual elements of the data requires going to the specific input table where those data were stored.

Output tables have been placed in sequential order downward from the front screen. This allows analysts to move back and forth between output tables using the [Page down] and [Page up] keys on the keyboard. As an alternative, users can press [Alt] T and enter the number of the desired table.

The front screen can be reached any time by pressing the [Home] key. The General Adjustments table (Figure 4) can be reached either by pressing the [Page down] key from the [Home] position, or by pressing [Alt] T 0 [Enter] from anywhere in the spreadsheet.

Following an explanation of General Adjustments (Figure 4), Output tables are discussed. Then each output table is reviewed and the origin of the data used in the analysis is explained.

General Adjustments (Table 0)

When Table 0 (Figure 4) is called, the screen content is designed to provide a control panel to make general adjustments to the original data. For example, if the user wants to adjust the population data downward by 10 percent, to allow for overcounting in the 1978 census, he or she can enter a -10 in cell A24. Similar percentage adjustments can be made in the population of refugees, estimates of household size, production of irrigated wheat, transport costs, and so on.

Table 0 (Figure 4) also includes entries for certain parameters that are entered only once, such as the foodgrain consumption requirement per person. Below the dashed line also appear three parameters needed to generate a hypothetical consumption function for a typical Afghan consumer: average consumption, average price, and price elasticity. Because it is not likely that such data are available by province or region, this information is requested only once, to apply to the entire country.

3. OUTPUT TABLES

Foodgrain Balance (Table 1)

Table 1 presents the usual foodgrain balance sheet for each region, including population, consumption requirements, gross and net production, and the surplus or deficit situation for each region and for the entire country. The numerical data in this table cannot be changed.

The names of regions that appear in AFGRAIN are the names assigned for the default foodgrain balance situation worked out here. The names can be changed elsewhere, but not in Table 1. A separate table (Table 23) has been provided precisely for that purpose. Once a change in the names of the regions is made in Table 23, it is reproduced automatically throughout the spreadsheet.

The assignment of particular provinces to specific regions is also arbitrary, and the analyst can define up to 10 regions and assign any province to any region; see Table 24, for example.

Cereal Supply and Prices (Table 2)

Table 2 is nearly the same as Table 1, but it includes the effect of both external food aid and internal movements of grain. It calculates production per capita by region, as well as available supply per capita after accounting for imports and interregional trade. In the initial situation, there is a default import of 250 kilotons of grain from the Soviet Union, 200 of which go to Kabul and 50 to Herat. This default can be changed, of course.

The last column in Table 2 introduces the anticipated local prices generated by the consumption function. Initially, this column indicates the prices that would prevail in each region in the absence of any interregional trade, but as an analyst interacts with AFGRAIN, the column adjusts to reflect the changes in prices expected from the changing supply and demand in each regional market. The last two are therefore of special interest in identifying the merits of potential flows of foodgrain from one region to another.

Population by Province (Table 3)

Tables 1 and 2 are regional summary tables of the results of analysis. The details behind the analysis are provided in subsequent tables. Thus, Table 3 presents the province-by-province data on population, refugees, and in-country population. Totals for Afghanistan are computed as well. The first column in Table 3 indicates the region to which each province has been assigned. The number corresponds to the regions specified in Tables 1 and 2. It is possible to reassign a province from one region to another. This can be done in Table 24. For example, to transfer Wardak province from the Kabul region (Region 1) to the Ghazni region (Region 2), users can type a number 2 on cell next to Wardak in Table 24, instead of the 1 now in place. All subsequent references to Wardak are then transferred to Region 2.

In-Country Population by Region (Table 4)

Table 4 summarizes the data on population, refugees, and in-country population on a regional basis, and it computes the relative incidence of displaced population as percent of the total population for the region.

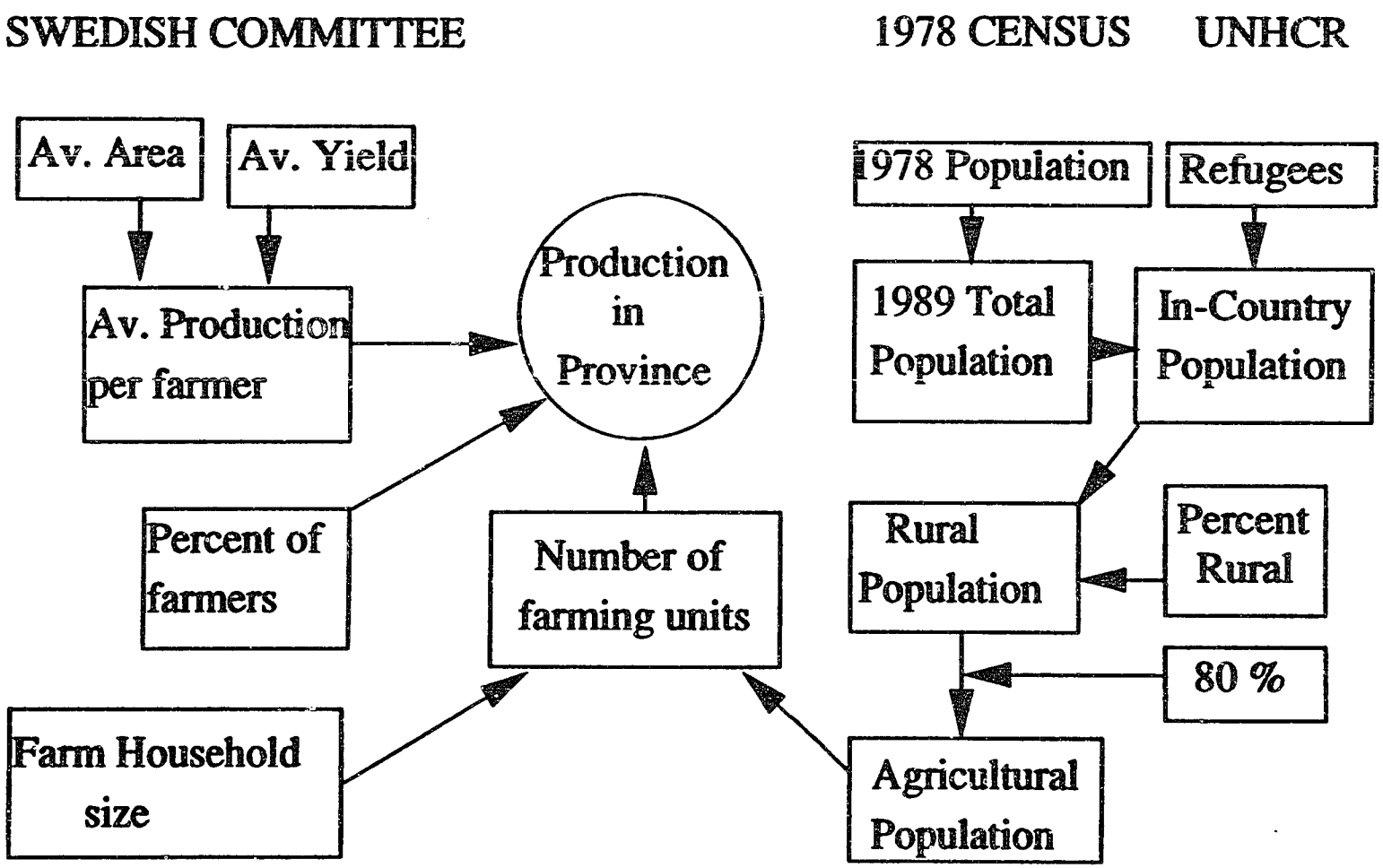
Foodgrain Production by Province (Table 5)

Table 5 provides results from computing production for the five main cereal grains considered in this analysis, namely, irrigated wheat, rainfed wheat, maize, rice, and barley. A total of all these grains is provided for each province in the last column under Cereal. Each one of these production estimates has been calculated on the basis of raw data for each product for each province. They are taken from the results of the large-scale Agricultural Survey of Afghanistan (ASA) carried out in 1987-88 by the Swedish Committee for Afghanistan (SCA) and available in the report *The Agricultural Survey of Afghanistan: Crops and Yields*, Volume I, published in August 1989 (SCA-ASA Report No. 3).

This survey, henceforth referred to as the Agricultural Survey, provides data on average area per farmer, average yield per jerib, average production per farmer, and percent of farmers growing the crop in 1987. These data should be complemented with estimates of rural and farming population. Such estimates are derived by using the percentages of rural population from the census data, but they can be adjusted otherwise at the discretion of the analyst. The Agricultural Survey also provides information by province on average household size for the farmers surveyed. This allows the number of farming units to be estimated from the agricultural population of the province.

The flowchart in Figure 5 shows the logical relationships between the different variables involved in calculating volumes of production of a given

Figure 5. Grain Production Estimation Flowchart



grain crop for each province. It makes explicit the linkages between Agricultural Survey data and demographic information available from other sources. The same pattern of computations is followed for each province and for each grain crop, namely, irrigated wheat, rainfed wheat, maize, rice, and barley.

Foodgrain Balance by Province (Table 6)

The foodgrain surplus or deficit balance is estimated for each province. A food requirement is computed based on in-country population assuming a minimum consumption of 180 kilograms per head. This value is compared to the net cereal production for that province, as it appears in Table 5. The difference is the amount of grain that would be needed to satisfy minimum consumption requirements, or the surplus above that minimum that might be available for extra consumption, storage, or shipping to other regions.

In adition, Table 6 computes the per capita net cereal production for each province. If it is larger than the 180-kilograms minimum, the province would be self-sufficient in grain; otherwise it is in deficit. In Afghanistan substantial diversity has existed among provinces in foodgrain balances. The Kabul region, for example, has suffered from a deficit, and it has depended on other regions to supplement its low grain production. The northern provinces have usually produced more than they needed to feed the local population.

Foodgrain Shipments (Table 7)

Table 7 is unusual, and it is also optional. It is a shipping matrix in which each cell indicates the number of kilotons shipped from the region named in the same row of Column B to the region named at the top of the same column in Row 5. This matrix at the outset consists largely of zeroes, indicating no shipment of foodgrains between regions.

There are two extra regions named in Column B, the USSR and Pakistan, as sources of foodgrain aid. The row for the USSR shows 200 kilotons of foodgrain being provided to Kabul region, and 50 kilotons to Herat region. These default assignments are based on figures often cited as official estimates by the Government of Afghanistan (GOA) of the quantity of food aid provided by the USSR. For Pakistan, a total of 80 kilotons are included to reflect the shipment of wheat from official sources to different provinces along the border.

Table 7 is also interactive. The analyst can move about the table and enter any given number of kilotons of grain to ship from one region to another. Of course, care must be taken not to take away from a region

more than it produces. An entry in any cell is reflected automatically in the supplies of the receiving and the originating regions. Such changes can be observed in Table 2, including changes in per capita availability and the new set of local prices in the two regions affected.

Gains to Shipping (Table 8)

Table 8 makes it easier for the analyst to decide which shipments are most advantageous. One possible criterion is to try to equalize relative per capita availability of cereals across regions, using the values of per capita supplies in Table 2. Another is to use the values in Table 8 of potential gains to be made shipping a seer of cereal from one region to another. Values in this matrix are obtained by subtracting the transport costs between the two regions from the differences in grain prices. Negative values indicate that shipping grain from the region of origin to the destination region would result in a loss.

Tables 7 and 8 overlap in such a way that it is possible to toggle back and forth between them with the [Page up] and [Page down] keys. This allows the analyst to identify a particularly profitable shipment in Table 8, place the cursor on it, and toggle back to Table 7 to enter the number of kilotons to ship.

The impact of making a shipment is twofold. It reduces the supply in the region of origin, and increases it at the destination. Local prices increase at the source and decrease at the destination. These shifts in supply and prices can be verified in Table 2. A duplicate of Table 2 has been placed in the spreadsheet directly above Table 7 to make it easy to decide how much larger or smaller a shipment should be. It is evident, also, that a shipment from any source to Kabul, for example, will automatically reduce the gains to be made from future shipments from all other regions. Conversely, the profitability of shipping to all other destinations from the region of origin will be lower.

Price Differentials (Table 9)

Profits from shipping are calculated from the price differentials given in Table 9 and the transport costs that appear in Table 10. In Table 9, each cell contains the result of subtracting the local price at the region of origin from the local price at the destination region. Regions of origin are listed downward at the left, in Column B. Destination regions are column headings. The main diagonal is, of course, filled with zeroes. There is also a negative symmetry, that is, values above the diagonal are the negative of those below the diagonal. A row of price differentials for Pakistan is also calculated on the basis of the Pakistan price entered in Table 0.

Transport Costs (Table 10)

Transport costs appear in Table 10. A default table of transport costs is provided with AFGRAIN for the default regional classification of provinces. Analysts using different regions should make certain to enter the new set of transport costs. The original internal transport costs are computed based on the road distances between major cities, assuming an arbitrary cost of 5 Afghanis per kilogram per 100 kilometers, or about $10/ton/100 kilometers. Figures on internal transport costs in Afghanistan are not available. The table of original transport costs is given in Table 20. Table 10 has the same values as Table 20, but these are adjusted by the percentage factor specified in Table 0.

In addition, a row of transport costs between Pakistan and each region in Afghanistan has been included in this table. For the most part, these costs reflect quotations obtained by various organizations from private transporters for deliveries inside Afghanistan, using the mountain routes under the control of mujahidiin. These costs are substantially higher than the assumed internal costs using the main paved roads now under the general control of the Kabul government.

4. INPUT TABLES

AFGRAIN users can modify any of the individual data elements used here in estimating the foodgrain situation in Afghanistan. The values provided here should be seen as default values to be replaced whenever better estimates or more up-to-date information is available. No special claim is made for the accuracy of the information stored in AFGRAIN, although every figure has some justification for being there. Explanations for each major data component follow.

Population (Table 11)

Table 11 reproduces the 1989 population estimates by province, prepared by UNHCR, Islamabad. These estimates were based on the 1978-79 census, extrapolated to 1989 assuming a rate of growth in the population of 2.2 percent. The projected population figures do not account for war-related deaths or internal displacement. Also, the original census figures are presented for comparison, even though they are not used in calculations. A nomad population of more than 2 million people was not included in the census, and no adjustment is made here. For all these reasons, the population figures must be considered relative and indicative, and AFGRAIN users are urged to enter better population figures that take these factors into account, when they are available.

The percent of rural population in each province in the 1978 census is also included to allow later estimates of rural population in 1989. Apart from Kabul province, Afghanistan is overwhelmingly rural, with more than 90 percent of population concentrated in rural areas. The average for the country is 85 percent.

Refugees (Table 12)

The UNHCR also maintains an updated estimate of the number of Afghan refugees in Pakistan. The most recent estimate totals 2.7 million, significantly lower than an earlier estimate of 3.2 in 1988. The lower estimate

might reflect adjustments for earlier double counting or voluntary repatriation since the last count. A breakdown by province of origin is provided by UNHCR. However, the sum of the provincial figures do not add up exactly to the total; the source of the discrepancy was not determined. The number of refugees in Iran is less well known. An estimate of 632,000 is adopted, taken from the Macro Database for Afghanistan. This figure is likely to be an underestimate, but an exact count for refugees in Iran is not available to the AFGRAIN design team. Thus a total of 3.3 million refugees must be subtracted from the 1989 population estimates to arrive at an estimate of in-country population. Figures on refugees are given in Table 12.

Rural and Farm Population (Table 13)

Table 13 computes the estimated in-country population for each province, after deducting the refugees. Rural population is estimated by using the 1978 census rates for each province. However, a distinction is made between rural and farming population because subsequent production data are based on agricultural population. No estimate of the proportion of rural people engaged in agriculture was available at the time AFGRAIN was being designed. Thus, an arbitrary rate of 80 percent has been used throughout. This rate is a critical link between the population and production data, and overall results on the foodgrain situation will be highly sensitive to it. AFGRAIN users are allowed and encouraged to do sensitivity analysis on this figure. Table 6 provides a cell in which analysts can specify the percent adjustment up or down. Note that the default values of 85 percent rural population and 80 percent farm/rural ratio represent a rate of 68 percent agricultural population for the whole country. The Swedish Committee uses a total agricultural population estimate of more than 11 million people, and it arrives at weighted national averages of yield, area, and production for each crop. This indicates a much higher proportion of agricultural to total population than the default value used in AFGRAIN.

Farm Production Data

Agricultural Survey of Afghanistan

The Agricultural Survey of 1987-88 supplies the most recent and complete data set on the agricultural sector in Afghanistan. AFGRAIN takes advantage of this wealth of data. In the survey, farmers both inside Afghanistan and in refugee camps in Pakistan were interviewed. AFGRAIN uses mainly results for farmers in Afghanistan, except in those few provinces where, for either security reasons or problems with the data, the Agricultural Survey has no in-country data. In those cases, the Agricultural Survey uses data reported by refugee farmers who had left in 1987, regarding their crops in 1986.

The Agricultural Survey obtained two basic sets of production information from farmers interviewed: their 1987 and 1978 production levels. Full statistical annexes for each province for both years are presented in the report *The Agricultural Survey of Afghanistan: Crops and Yields*, Volume II. For our purposes, only the 1987 figures are needed. The analysis in Volume I of the Agricultural Survey emphasizes the relative changes in production rather than the absolute figures. Yields in 1978, as recalled by farmers a decade later, appear higher than actual yields at that time. This bias in overestimating prewar production levels by farmers is understandable. An opposite bias might exist in understating current production in 1987, though neither yield nor average production per farmer suggests this is the case.

Farm Household Size (Table 14)

Nearly 10,000 farmers inside and outside Afghanistan were interviewed for the Agricultural Survey. Details about the relative family size, by province, are presented in Table 14. For the entire sample, average farm household size is 11 persons, but it ranges from a minimum of 8 persons in Zabul to a high of 16 in Paktia and Paktika. AFGRAIN users can change these family size values for any or all provinces by merely retyping the updated values in the corresponding cells.

Irrigated Wheat Production (Table 15)

Wheat is by far the principal crop in Afghanistan in terms of both area farmed and total production. Over three-quarters of the farmers in Afghanistan produce irrigated wheat. The average producer cultivates an average of 8.8 jeribs, from which an average yield of 51 seers, or 1,700 kilograms per hectare is obtained. Production averages 427 seers or 3 tons for a family of 11 persons, that is, 274 kilograms of gross production per farm family member. If a 20 percent postharvest loss and waste are assumed, the net production is 220 kilograms per farm person. Farm population is estimated at 68 percent of the total population and, of this figure, 78 percent of farm households grow irrigated wheat. This results in a net production of 116 kilograms per person.

AFGRAIN's computations use only the figures for average production per farmer and the percent of farmers who grow the crop. The figures on average area and yield per farm are presented for illustration, but they are not used in subsequent calculations. The area times the yield is equivalent to the average production per farm. This is not always the case, because the average of the product is not the same as the product of the averages. Moreover, averages for each province are computed from the survey data, but to compute national averages, the provincial values are weighed in proportion to the relative farming populations in 1978.

Rainfed Wheat (Table 16)

Rainfed wheat is sown primarily as a spring crop in March or April and harvested before September. It is mainly grown in the northeastern and northwestern zones (Jawzjan, Badakshan, Takhar, and Faryab); it is negligible in the rest of the country. Nevertheless, after winter wheat, it is the second most important cereal crop grown in Afghanistan. One-fourth to one-third of total wheat production normaily comes from rainfed cultivation. Table 16 provides province-by-province production coefficients for rainfed wheat. Table 5 gives provincial estimates of rainfed wheat production using the production data in Table 16 and the farming population data from earlier tables. The average producer of rainfed wheat plants 12 jeribs and obtains a yield of 25 seers per jerib, or 875 kilograms per hectare. Average production per producer is 320 seers, but only 18 percent of farmers interviewed in the Agricultural Survey in Afghanistan grew wheat in 1987.

Maize (Table 17)

Maize is a summer crop in Afghanistan, normally planted in June or July following the harvest of winter wheat. The crop is used for both animal fodder and grain for human consumption. In terms of tonnage, maize contributes only a small percent of the cereal supply. Table 17 provides data on farm production for maize, derived from the Agricultural Survey data.

Rice (Table 18)

Table 18 contains farm production data on rice for Afghanistan farmers cultivating the crop in 1987. Rice is a summer crop planted after irrigated wheat. Only about one in five farmers in Afghanistan grows rice. An average producer gets 405 seers out of an area of 6 jeribs; the average yield was estimated at 65 seers per jerib.

Barley (Table 19)

Barley is both irrigated and rainfed in soils and climates less favorable than those required by wheat, and it receives a minimum of fertilizer. In Afghanistan barley is grown exclusively for animal feed, mainly for horses and oxen. At 36 seers per jerib, yields for barley are higher than for rainfed wheat, but producers average a smaller area (5 jeribs), and only about one-third of all farmers cultivate barley. An average producer obtains a total of 156 seers. Barley, like maize, is included as a cereal crop despite its principal use as animal fodder, because in times of distress it can serve for human consumption and because it is a sturdier crop, less demanding of fertility.

Transport Costs (Table 20)

The AFGRAIN design team found no information on internal transport costs in Afghanistan between the major provincial centers. The team did obtain various quotes on transport from Pakistan to some of the provinces near the border, but the prices quoted vary widely. To Ghazni, for example, an August 1989 survey of NGOs and transporters obtained quotations ranging from 2,300 to 5,100 Rupees per metric ton, the average being 3,480 Rupees per metric ton, or about 560 Afghanis per seer at the February exchange rate of 23 Afghanis per Rupee. For Logar the rates ranged from 2,000 to 5,200 Rupees per metric ton, with an average of 3,041 Rupees per metric ton, equivalent to 490 Afghanis per seer. For Kabul city, a truckers association president quoted 30,000 Rupees per truck loaded with 5 tons, or 970 Afghanis per seer.

The variation among transport quotations results from a combination of factors. The main ones are seasonal changes in road conditions, changes in routing to reach a particular destination, extra payments and levies by various Mujahidiin area commanders for rights of passage, and risks from military activities in areas along the route. Most trucking into Afghanistan has to be broken down into stages. At the border, a truck load would normally be transferred to smaller trucks with permits to circulate in Mujahidiin territories. Depending on the partners involved, a particular transporter might offer different freight charges.

Table 20 provides a way for analysts to input more recent information on freight charges, both within regions in Afghanistan and between these regions and Pakistan. The entire matrix has been left unprotected to give AFGRAIN users full liberty to change this transport cost matrix. The difference between this input table for transport costs and Table 8, the output table, is that values in Table 8 reflect overall adjustments specified in cell A13 for the whole transport matrix. For example, a user can specify a 20 percent increase in all transport charges by merely typing 20 in cell A13 and leaving Table 20 intact.

Road Distances (Table 21)

Because of the absence of transport rates inside Afghanistan, AFGRAIN provides the road distances between the major towns in Afghanistan to arrive at a first approximation of freight costs. The distances were obtained from large-scale U.S. Department of Defense maps of Afghanistan. Almost all the cities of interest are located along the beltway, the paved road that nearly envelopes the country. The section of the beltway between Herat and Mazar-i-Sharif is not completed, however. Only a dirt track, barely passable in a four-wheel-drive vehicle, exists in that segment. Table 21 presents a matrix of the kilometer distances between major cities.

An arbitrary cost of 5 Afghanis/kilogram/100 kilometers (U.S. $10/metric ton/100 kilometers) was used in AFGRAIN to estimate internal transport costs between the default regions. A major city in each region was selected as a regional center from which to determine distances and transport costs. Analysts using a different classification of provinces to define regions will need to redefine regional centers and establish appropriate distances and freight costs among them.

The distance table is provided for information purposes only, and it is not directly linked to subsequent computations in AFGRAIN. Users must enter new transport charges in Table 20 directly. Distances in Table 21 are among major cities, so they will not change when regions are redefined. Table 21 has been protected to prevent users from changing it, believing mistakenly that transport costs will be changed accordingly. Transport cost must be changed in Table 20, the original transport cost matrix.

Redefining Regions

Renaming Regions (Table 23)

AFGRAIN provides the capability to redefine regions according to criteria appropriate to the needs of the analyst. Up to 10 separate regions can be specified. Each region can be assigned any number of provinces. Any arbitrary name can be given to a region, and it will be used through the remainder of the analysis. Redefining regions is a two-step process. First, they are renamed; second, the corresponding provinces are assigned to each region. To rename regions, the user accesses Table 23 in the List of Tables and inputs the name of each region in Column L of the table, Rows 49 through 55, in the spaces containing the current region names. Old region names are erased by typing blank spaces over them.

The default regions specified in AFGRAIN correspond to the regions defined in an earlier study of the foodgrain trade in Afghanistan, carried out in 1972 by Checchi and Company, entitled *Survey of Fertilizer Warehouse and Transport Requirements in Afghanistan.* Mr. Robert Manly, a Checci consultant, was the principal author of the report. The study was to be the basis for a proposed private sector fertilizer distribution system to be developed in conjunction with the Wakil Fertilizer project.

Mr. Manly uses the 325 minor civil divisions as defined by an earlier demographic study and incorporates population and cereal production for each of those divisions. Each division is assigned its geographical code corresponding to the province and hydrological region. At the time, only 28 provinces existed; Paktika had not become a separate region. Manly's use of hydrological regions appears particularly appropriate to reflect the conditions

of a mountainous country and to incorporate both geographic homogeneity and transport linkages.

Six hydrographic regions are identified in Manly's study. A major population center has been assigned as the center for each region. To facilitate interpretation of results, the name of the regional center is used in AFGRAIN instead of the original hydrological region. The original hydrological zones and centers are

Kabul Basin	Kabul
Ghazni Plateau	Ghazni
Sistan Basin	Kandahar
Hari Rud Basin	Herat
Murghab Slope	Maymana
Oxus Basin	Mazar-i-Sharif and Kunduz

The Oxus Basin is a vast area encompassing the northern provinces flowing into the Oxus (Amu Darya) River. Two distinct agricultural production regions are evident, one centered in Mazar-i-Sharif and another in Kunduz. For that reason, AFGRAIN has divided the original Oxus region into west and east centered in Mazar-i-Sharif and Kunduz, respectively. This separation is somewhat arbitrary and can be changed.

Reassigning Provinces (Table 24)

Provinces can be switched to any region merely by retyping the appropriate number for the new region next to the province name in Table 24, Columns I, K, and M. Table 24 can also be accessed by selecting Table 24 in the List of Tables after pressing [Alt] T. Any of the 29 entries, one for each cell, can be changed in any sequence. The cells in Columns I, K, and M have been left unprotected to permit changes, but the remainder of the table is protected to prevent accidental changes. After a province has been assigned to a region in Table 24, all subsequent analysis in AFGRAIN will reflect that change.

It should be reemphasized that redefining regions also requires respecifying transport costs among the new regions. For each region a commercial center must be selected to serve as a reference point in estimating transport costs to other regional centers.

5. BASELINE FOODGRAIN SITUATION

To illustrate the use of AFGRAIN, we have assessed the foodgrain situation in Afghanistan, using the default data in their original state. This exercise is not intended as a definitive statement of the foodgrain situation. Instead, it is offered as a first approximation of the data available to the AFGRAIN design team. Other analysts are encouraged to revise the input data in the light of more up-to-date information, other empirical data, or their own experience.

The 29 provinces in Afghanistan were organized into 7 regions according to their hydrological and agricultural characteristics, based on the original Manly report on cereal production and flows. The regions correspond to the categories described in the preceding section that defines regions. For ease of recall, each region is referred to by the name of the major town selected as its commercial center:

Town	Region
Kabul	Center for Kabul Basin region, Provinces: Kabul, Kapisa, Konar, Laghman, Logar, Nangarhar, Parwan, and Wardak.
Ghazni	Center for Ghazni Plateau region, Provinces: Ghazni, Paktia, Paktika.
Kandahar	Center for Sistan region, Provinces: Farah, Helmand, Kandahar, Nimroz, Uruzgan, Zabul.
Herat	Center for Hari Rud region, Provinces: Ghor, Herat.
Maymana	Center for Murghab Slope region, Provinces: Badghis, Faryab.

Mazar-i-Sharif	Center for Western Oxus region, Provinces: Balkh, Bamyan, Jawzjan, Samangan.
Kunduz	Center for Eastern Oxus region. Provinces: Badakshan, Baghlan, Kunduz, Takhar.

In-country population figures for each province were calculated using the 1989 estimates of population and refugee numbers, made available by the UNHCR in January 1990. UNHCR, in turn, bases its estimates on the 1978-79 census, plus extrapolation for growth. (See Tables 11 and 12.) UNHCR arrives at a total population estimate of 16.2 million people living inside and outside Afghanistan. The default number of refugees, 3.3 million, includes 2.6 million refugees in Pakistan and 600,000 in Iran. The figure for Iran is likely to be an underestimation, but no other recent breakdown by province is available. Several other estimates of refugee numbers are often cited that are usually higher than the ones used here. The lower number of refugees leads to an estimate of in-country population of 13 million people, generally higher than estimates from other sources.

Nearly one-third of the population is concentrated in the Kabul basin. There are 4.9 million people in the provinces included in this region. Twenty-three percent of the population has taken refuge outside the country, leaving only 3.8 million people living in the region, according to these estimates. Ghazni and Kandahar have the highest proportions of refugee population, each with nearly one-third of their people having left their home province. Northern provinces in the Maymana (Murghab) region and the Mazar-i-Sharif (western Oxus) region have the lowest proportion of refugee population. (See Table 4.)

On the basis of these statistics for the total population and for refugees for each province, AFGRAIN arrives at an estimate of the in-country population. This, in turn, is used to estimate rural population by province, using the percentages of rural population obtained from the 1978 census. It is likely that the proportion of rural population for many provinces has decreased during the war years. In Table 11, AFGRAIN users can change the percentage of rural population for any province. The lowest proportion of rural dwellers occurs in Kabul province, where only 30 percent live outside the city, whereas surrounding provinces such as Wardak, Kapisa, Konar, Logar, and Laghman are almost totally rural. For the country as a whole, 84.5 percent of the population is rural.

To arrive at an estimate of agricultural population, we have arbitrarily assumed that 80 percent of the rural population is engaged in farming. Better estimates of this critical coefficient are needed. Unfortunately, no alternative value for the agricultural population was found in the time available to develop AFGRAIN. Table 13 provides the estimates of rural and agricultural population for each province. According to these estimates, Afghanistan has

8.8 million people out of a total of 13 million engaged in agriculture, or about two out of every three persons.

In order to derive an estimate of farming units in a given province, AFGRAIN divides the agricultural population estimate by the average household size for that province, as determined from the Agricultural Survey. Table 14 presents those family sizes for farming units in the survey. For Afghanistan as a whole, the average is 11 persons per farm family. The smallest families are found in Ghazni, Zabul, and Herat provinces, with fewer than nine members, whereas the largest families are found in two provinces—Paktia and Paktika—with 16 members per family. These averages were obtained from farmers in Afghanistan as well as in refugee camps. There might be an upward bias to overstate the family size among refugee farmers. No correction has been made in the default values of AFGRAIN to adjust for this potential bias, in the interest of keeping the data as originally obtained.

Table 5 presents the estimates of production for each province for each major grain crop. Irrigated wheat is produced in all provinces, and rainfed wheat is produced in most provinces except thoses in the Kabul basin and the Ghazni plateau. Farm production data on average production per farmer, and the percentage of farmers in each province who grow each crop, are taken from the results of the Agricultural Survey. (For detailed farm data for each crop, see the statistical annexes in Volume 2 of Report No. 3 of that series.)

Wheat production for the entire country is estimated at 2.75 million tons, including 817 kilotons of rainfed wheat and 1.9 million tons of irrigated wheat. Thus, about 30 percent of all wheat is produced under rainfed conditions. Other foodgrains are produced in smaller amounts. Barley production is the second largest with 600 kilotons. Barley is included in this baseline foodgrain situation because under war conditions it is an edible grain, though traditionally it is only used for animal fodder. Badakshan and Takhar are the two largest producers of barley.

Rice production reaches 386 kilotons or about one-tenth of all cereal produced, most of it concentrated in three provinces—Baghlan, Kunduz, and Takhar. Maize production is even smaller; less than 200 kilotons are produced, according to these estimates, mainly in provinces in the center of the country.

Total foodgrain production for the country thus adds up to 3.9 million tons: 2.75 million tons of wheat, .6 million tons of barley, .4 million tons of rice, and .2 million tons of maize. Excluding barley and maize, the two crops used mainly as animal feed, total edible foodgrain gross production comes to 3.14 million tons.

How adequate is this production to the needs of the population living in the country? Table 6 offers a response to this question for each province. First, the gross production estimate for cereal is adjusted for losses following harvest. A 20-percent waste and postharvest loss is postulated here, in the absence of a more precise figure. This percentage is specified in Table 0 of AFGRAIN, and it can be modified by the user. A net production of 3.1 million tons is thus derived, including barley, maize, and rice.

Foodgrain requirements are calculated for each province on the basis of 180 kilograms of cereal per person and the estimate of in-country population for 1989. The 180-kilogram figure is widely used by FAO and others as the minimum cereal equivalent consumption required per person to maintain good health. For Afghanistan as a whole, a total of 2.3 million tons are thus required to provide the minimum consumption levels. On per capita terms, a national average of 242 kilograms of all grains are available for consumption, or 60 kilograms above the minimum requirements.

Unfortunately, different provinces in the country offer contrasting situations on the relation between requirements and net production. At one extreme is Kabul province, where 271 kilotons of foodgrains are needed to feed 1.5 million people; local production amounts to only 62 kilotons, thus leaving a deficit of 209 kilotons to be imported or brought in from other provinces. At the other extreme is Takhar, which has a comfortable margin above the minimum requirements: only 114 kilotons are needed, and net production is estimated at 449 kilotons, thus leaving 335 kilotons to move to other less fortunate provinces.

Among the provinces with the greatest deficits, that is, those with the lowest net production figures per head, are Kabul (41 kilograms), Wardak (63 kilograms), Zabul (60 kilograms), Nangarhar (71 kilograms), Parwan (74 kilograms), Paktia (84 kilograms), Paktika (87 kilograms), Ghor (99 kilograms), and Kapisa (108 kilograms). Also below the minimum requirement are Faryab (147 kilograms), Bamyan (152 kilograms), and Kandahar (172 kilograms).

The provinces with a surplus, that is, with net production estimates above 300 kilograms per head, include Takhar (711 kilograms), Baghlan (514 kilograms), Badakshan (504 kilograms), Kunduz (374 kilograms), Balkh (356 kilograms), Jawzjan (348 kilograms), and Uruzgan (322 kilograms).

Under current war conditions, however, it is not likely that regions with a deficit can be supplied regularly with grain from regions with a surplus. Interregional trade has been severely disrupted by the cutting off of traffic on the main roads, and truck transport using mountain paths becomes extremely expensive for long distances.

Looking at the surplus and deficit situation on a regional basis, it is possible to aggregate several provinces that, because of geographical proximity, will likely maintain some level of trade. Table 1 summarizes the

food balance situation by region. The Kabul basin is by far the region with the largest deficit, requiring 375 kilotons of grain to satisfy minimum requirements. The Murghab slope area, including Badghis and Faryab, also experiences a deficit according to these estimates based on the production parameters for 1987. In 1989 the production of these two provinces was reported to be drastically down as a result of the attack of the sunnpest, hence their deficit in 1990 will be even more acute.

On the other hand, the Eastern Oxus region, including Bandakshan, Takhar, Baghlan, and Kunduz, has substantial surpluses and it could be expected to supply part of the needs of the Kabul basin provinces under normal circumstances. However, given the constraints on truck traffic to the Kabul region, it is not likely that much trade is taking place. The Western Oxus region, comprising Balkh, Jawzjan, Bamyan, and Samagan, also appears to have a substantial margin above minimum consumption needs, on the order of a quarter of a million tons. The area around Kandahar, including Helmand, Nimroz, and Farah, also appears to enjoy a favorable margin of 100 kilotons above consumption needs.

Kabul province makes up a large part of its foodgrain deficit from imports from the Soviet Union, which are either airlifted or brought in by truck convoys. A modicum of trade flows from the northern provinces into Kabul, but it is intermittent at best. Finally there is wheat that comes in from Pakistan, either as food aid to the Mujahidiin parties and private voluntary organizations, or as commercial shipments by private traders to markets in and around Kabul. This helps to alleviate the deficit in that province.

Table 7 indicates shipments of grain into the different regions. The USSR is often cited as providing 250 kilotons of grain to Afghanistan, mainly to Kabul city itself, but shipments to Herat are also reported. In Table 7, shipments from the USSR have been arbitrarily assigned as 200 kilotons to Kabul and 50 to Herat. Moreover, official wheat shipments from Pakistan of about 80 kilotons were made in 1989. This was mostly USAID donations to the parties of the Afghan Interim Government, but it also included World Food Program wheat distributed through various nongovernment organizations. In Table 7, 50 kilotons are assumed to have been shipped to provinces in the Kabul region (not necessarily to Kabul province), whereas 10 kilotons were shipped to provinces in the Ghazni region, and 20 kilotons to provinces in the Kandahar region. These figures for Pakistan do not take into account volumes of grain taken into Afghanistan by private traders. When estimates of the volume of private shipments are made and their destinations known, they should be inserted into this table.

No interregional shipments of grain are entered in the default baseline situation of AFGRAIN. In part, this reflects the constraints on interregional trade, but it is also intended as an encouragement for analysts to try their hand at exploring the effects of potential deliveries from one region to another.

6. VERIFICATION

There is no easy way of testing the validity of the AFGRAIN analysis of foodgrain balances by province. Much depends on the reliability of the original data entered, both for the farm production parameters and for the demographic information for each province. There are no independent means of determining either population or grain production by province. AFGRAIN default production estimates are therefore subject to many questions about their absolute and relative levels.

If AFGRAIN's default results cannot be contrasted with the real values today, perhaps they can be contrasted with estimates made in the past. One possibility is to compare the evaluation of surpluses and deficits generated by AFGRAIN with similar assessments made by the foodgrain distribution study by Manly cited earlier.

We need to determine if the relative surpluses and deficits in AFGRAIN agree well with those generated by Manly. Such a test, if there is a good match, would lend credibility to AFGRAIN. However, if the foodgrain balance by province has little relationship with Manly's estimates, it should raise questions about the overall validity of the data or the methodology used in AFGRAIN. Discrepancies between the two foodgrain balances could also be attributed to actual changes in agricultural production or grain consumption since 1972, but a convincing explanation would need to be made for each case.

Manly's regions of surplus and deficit were defined in a manner different from AFGRAIN. Manly started by accepting that Afghanistan as a whole is self-sufficient in grains and that food consumption will be distributed evenly throughout the country. Foodgrain production and consumption were then taken as being equal. In the base year of 1968-69, a total 3,853 kilotons of foodgrain was produced when the population was 14.7 million. This implies an average consumption of 262 kilograms per head. Provinces with production above 262 kilograms per head are considered to have a surplus, and those with less have a deficit. (Manly's foodgrain includes barley and maize.) For each province, Manly's study provides an estimate of the magnitude of the surplus and deficit. Table 26 provides a

comparison of the surpluses generated by AFGRAIN and those reported by Manly in the 1972 study.

In general, a good match exists between the situations of surplus and deficit for each province from both analyses. Provinces with a surplus in AFGRAIN appear as such in Manly's study, and the same is true for regions experiencing a deficit. Figure 6 shows a scatter diagram for both sets of grain balances. In only a few cases does AFGRAIN estimate in 1989 a significant surplus when Manly reports a deficit, and vice versa. The more glaring discrepancies are

Ghazni:	AFGRAIN	+90	versus	Manly	-105
Takhar:	AFGRAIN	+335	versus	Manly	+37
Bandakshan:	AFGRAIN	+200	versus	Manly	+7
Baghlan:	AFGRAIN	+144	versus	Manly	-18
Faryab:	AFGRAIN	-24	versus	Manly	+96

It is not possible for the AFGRAIN design team to explain why such contrasting results might have occurred in these five provinces. In the case of Takhar, both analyses indicate a surplus, but whereas AFGRAIN indicates that it is +335 kilotons, Manly reports only +36.5 kilotons. The fact that Takhar, Bandakshan, and Baghlan are in the same region—Western Oxus Basin—indicates that there is something more than a random factor at play. The wide discrepancy does not necessarily indicate that AFGRAIN's data or methodology for these provinces are faulty; changes could have occurred in the provinces in the meantime.

Nevertheless, the correlations among the results for the other 24 provinces is remarkable, considering that the two estimates are separated by 20 years, 10 of them under war conditions. Figure 6 plots the surplus and deficit estimates for both studies to make the match visually apparent. Figure 7 shows the same data with a regression line linking the two estimates. The regression equation estimate to predict Manly's foodgrain balance is

$$\text{Manly's} = 1.43 + 1.56 * \text{AFGRAIN}.$$

Manley's grain balances are on average about 56 percent higher than those derived by AFGRAIN. The standard error for the regression coefficient (1.56) was only .185, which makes the *t*-value for the coefficient highly significant ($t = 8.4$). The *R* square coefficient was 0.757, indicating a highly significant relation between the two analyses, because three-quarters of the variation in Manly's study are explained in AFGRAIN. The correlation between the two surplus and deficit values is 0.87. The number of observations used in Figure

Figure 6. Foodgrain Balance by Province

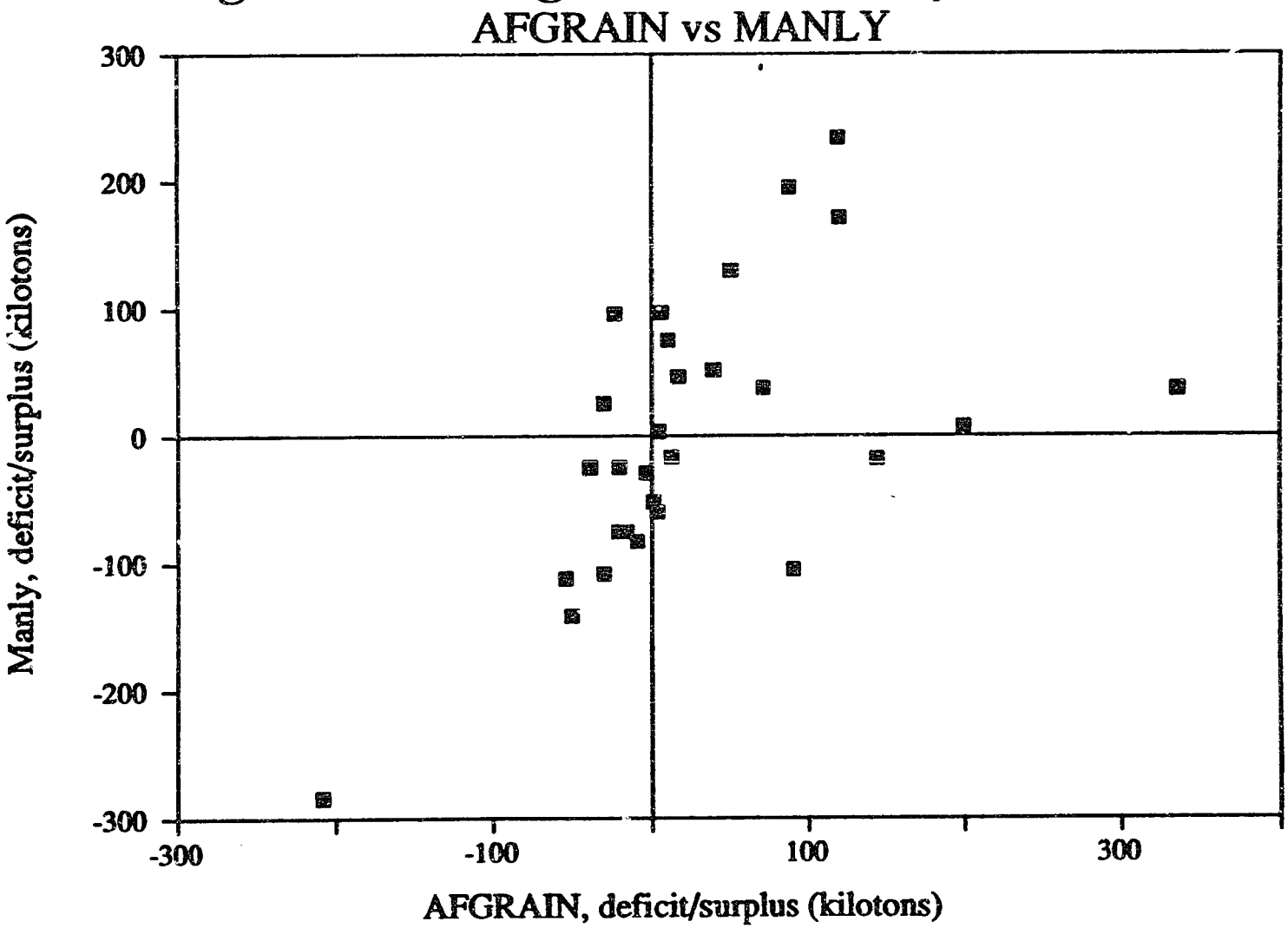
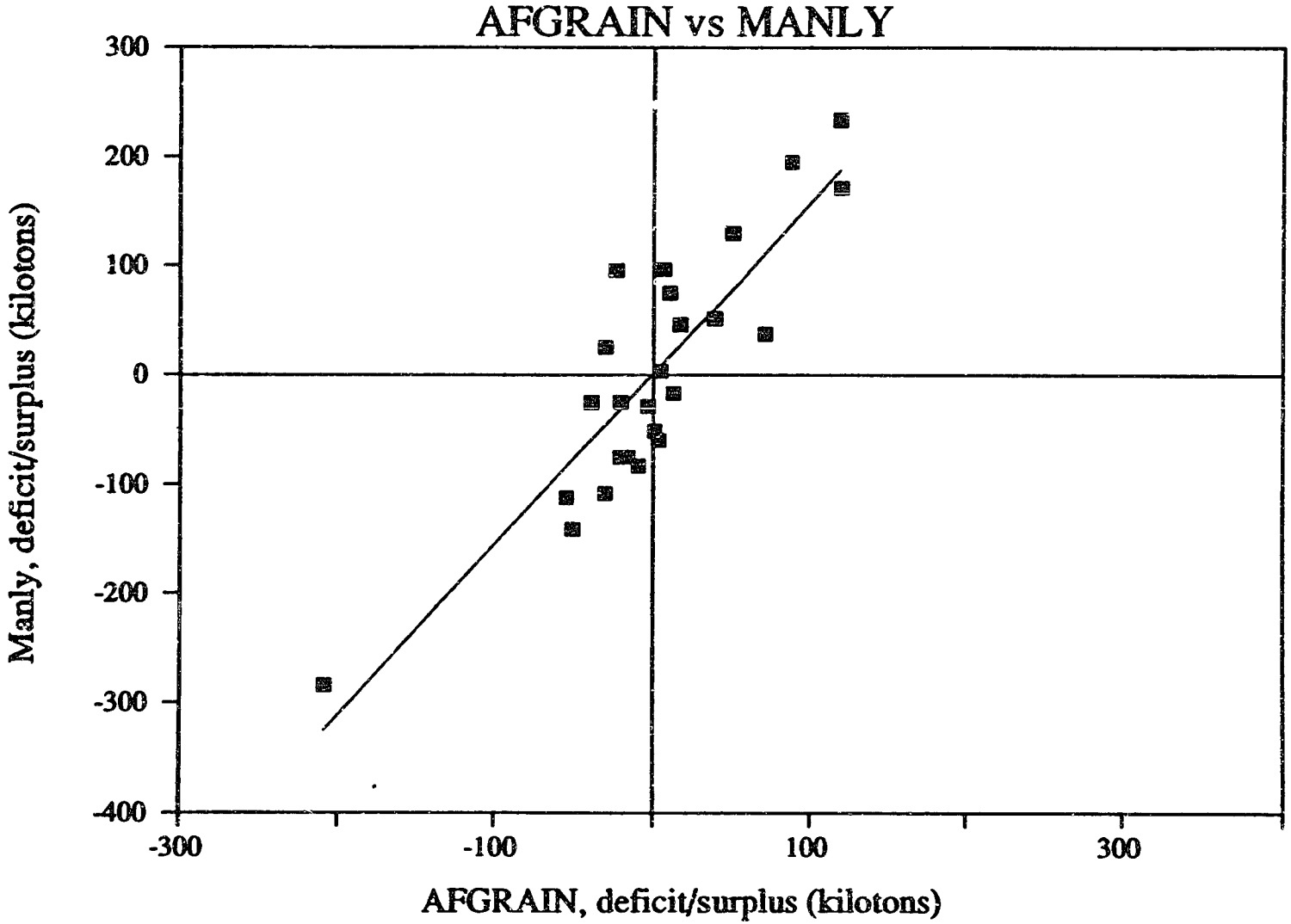


Figure 7. Foodgrain Balance by Province



3 is only 25. Four of the provinces were omitted as outliers: Takhar, Bandakshan, Baghlan, and Ghazni. Thus, only 23 degrees of freedom remain for statistical testing.

7. SIMULATIONS

AFGRAIN is designed to permit analysts to modify the original data entered and to carry out the implications of such changes in a quick and consistent manner. Changes can be made singly or in any combination at the same time.

As an example of the sort of adjustments possible, the design team introduced two changes suggested by the Agricultural Survey:

1. Barley production is used totally for animal fodder, not for human consumption, and should therefore be excluded from the foodgrain analysis.

2. Maize is also used largely as animal feed, but it is also consumed in fresh and grain form. It was suggested then that only one-half of the grain production be considered edible.

These two changes were inserted in Table 0, General Adjustments. In cell A10 a value of -50 was entered to indicate that 50 percent of maize production should be excluded. In cell A12 a value of -100 was entered to exclude the entire barley crop. That suffices to adjust the entire set of results from AFGRAIN to reflect the new specifications. A new set of tables, B-0 through B-6, is provided in Appendix B to show the difference that these changes made. In Table B-1 gross cereal production drops to 3.2 million tons from 3.9 million tons, and net production drops from 3.1 million tons to 2.6 million. Regional surpluses also drop considerably: the Kunduz region's surplus declines from 767 kilotons to 516 kilotons, and the Mazar-i-Sharif's surplus drops from 246 kilotons to 121 kilotons. For the country as a whole, the overall surplus drops from 798 kilotons to only 249 kilotons.

Table B-6 presents the same results but relates them to the population in each region. The national average grain availability drops to 199 kilograms per head, from the 242 kilograms in the AFGRAIN default situation. With the

contribution of the Soviet grain and shipments from Pakistan, the supply per person reaches 225 kilograms, compared with the previous one of 267 kilograms. Again, the biggest drops occur in Kunduz, where the decline is from 544 kilograms per head to 422 kilograms per head, and in Mazar-i-Sharif region, where the decline is from 300 kilograms per head to 239 kilograms per head. The Kabul basin does not appear to be affected at all by these changes. Net production per person drops from 81 kilograms to 76 kilograms per person. This, of course, reflects the minor importance of barley and maize in the foodgrain production in the provinces of the Kabul region.

Baseline Reassessment

A more realistic assessment of the foodgrain situation in Afghanistan than the one resulting from the baseline situation could be obtained if it were possible to adjust initial data and parameters to counteract apparent biases in the data. For example, in view of the disparity between the baseline estimates of cereal production in the northeastern provinces and those in Manly's study, it is worth examining how the baseline situation would differ if these outlier provinces were excluded from the analysis. In other words, we need to determine the significance of results from AFGRAIN for the great majority of provinces for which the two studies coincide in their relative estimates of surpluses and deficits of foodgrain. Three provinces in the Kunduz region are removed in the following analysis, namely Badakshan, Baghlan, and Takhar, the provinces with the largest surplus/deficit differences.

Table 25 in the AFGRAIN model provides a tool for inserting directly province-by-province estimates of cereal production, instead of estimating grain production endogenously on the basis of average area, yields, percentage of cultivators, and farming population. Initially the table is filled with zeros to indicate that no independent production estimates are being entered and therefore the values are to be computed internally. In order to remove a particular province from the analysis, it suffices to insert in the appropriate cells a value arbitrarily close to zero. For example, to exclude Badakshan wheat production one can enter values of 0.001 kilotons in the cells to the right of Badakshan under the columns for irrigated and rainfed wheat. Similar values can be entered for other grains and for the other two provinces.

In addition to removing cereal production from consideration, it is necessary to remove the population and refugee estimates for the same provinces. This is done by entering zeros in the appropriate cells of Table 3. Discounting these three outlier provinces, the in-country population of Afghanistan is reduced to 11.3 million, out of a total Afghan population of 14.3 million, the difference being the 3.0 million refugees.

Total cereal production declines to 2.7 million tons when production from Badakshan, Baghlan, and Takhar is omitted. Two million of this total correspond to irrigated and rainfed wheat, and the remaining .7 million consists of maize, rice, and barley in roughly equal amounts. See Table C-5 for a province-by-province breakdown of foodgrain production. After allowing for post-harvest losses, total net cereal production available for consumption is 2.15 million tons. Table C-6 relates the distribution by province of both cereal production and consumption. Average net production per person is now 190 kilograms, a figure that in our judgment is closer to the real situation than the earlier figure of 242 kilograms in the baseline situation.

On a regional basis the foodgrain situation remains critical in the provinces around Kabul, with only 81 kilograms of net production available per person, compared with 375 kilograms in Kunduz, and 300 kilograms in Mazar-i-Sharif (see Tables C-1 and C-2 in Appendix C). The total deficit in the Kabul region amounts to 375 kilotons. A small but significant deficit emerges in the Maymana region, an area afflicted by locust and sunnpest. Substantial surpluses seem to be available in two major regions, Mazar-i-Sharif with 246 kilotons and Kandahar with 100 kilotons. For the country as a whole (without the three outlier provinces), a net surplus of 118 kilotons exists, though the constraints on transport and trade make it nearly impossible for grain from surplus regions to flow into the Kabul area where it is most needed.

Appendix A

BASELINE FOODGRAIN SITUATION
USING
AFGRAIN's DEFAULT DATA

Table 1. Afghanistan
Regional Foodgrain Situation

Region/Center	Population in Country	Foodgrain Required	Cereal Production		Surplus/ (Deficit)
			Total	Net	
	(1000s)	kilotons	kilotons	kilotons	kilotons
1 Kabul	3,790	682	384	307	(375)
2 Ghazni	1,188	214	333	267	53
3 Kandahar	1,816	327	533	427	100
4 Herat	1,028	185	254	203	18
5 Maymana	969	174	204	163	(11)
6 Mazar-i-Sharif	2,045	368	768	614	246
7 Kunduz	2,133	384	1,439	1,151	767
8	0	0	0	0	0
9	0	0	0	0	0
**	0	0	0	0	0
AFGHANISTAN	12,969	2,334	3,915	3,132	798

Table 2. Afghanistan
Regional Foodgrain Situation

Region/Center	People (1000s)	Cereal Production		Cereal Supply		Local Price
		Net kilotons	Per head kilograms	Total kilotons	per head kilograms	Afghanis/ seer
1 Kabul	3,790	307	81	557	147	1,953
2 Ghazni	1,188	267	224	277	233	422
3 Kandahar	1,816	427	235	447	246	352
4 Herat	1,028	203	198	253	246	349
5 Maymana	969	163	168	163	168	1,246
6 Mazar-i-Sharif	2,045	624	300	614	300	180
7 Kunduz	2,133	1,151	540	1,151	540	26
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
AFGHANISTAN	12,969	3,132	242	3,462	267	

Table 3.
Population and Refugees, by Province and Region, 1989 Estimate

Region	Province	1989 Population (1000s)	----REFUGEES---- Total (1000s)	(percent)	In Country (1000s)
1	Kabul	1,708	204	12	1,503
1	Kapisa	430	8	2	422
1	Konar	311	173	55	138
1	Laghman	386	67	17	320
1	Logar	269	176	66	93
1	Nangarhar	927	425	46	502
1	Parwan	509	31	6	478
1	Wardak	358	23	6	334
2	Ghazni	804	13	2	791
2	Paktia	602	433	72	169
2	Paktika	305	77	25	228
3	Farah	384	209	55	175
3	Helmand	643	194	30	449
3	Kandahar	715	239	33	476
3	Nimroz	152	103	68	48
3	Uruzgan	543	48	9	494
3	Zabul	223	49	22	174
4	Ghor	420	40	10	380
4	Herat	841	193	23	648
5	Badghis	290	40	14	250
5	Faryab	724	6	1	719
6	Balkh	708	33	5	674
6	Bamyan	334	0	0	334
6	Jawzjan	732	18	3	713
6	Samangan	339	15	4	324
7	Badakshan	619	0	0	619
7	Baghlan	614	181	29	433
7	Kunduz	690	240	35	450
7	Takhar	646	15	2	631
AFGHANISTAN		16,224	3,255	20	12,969

Table 4.
Afghanistan Population, by Region

Region/Center	Population (1000s)	Refugees '89 (1000s)	Percent refugees	Population in Country (1000s)
1 Kabul	4,897	1,108	23	3,790
2 Ghazni	1,710	523	31	1,188
3 Kandahar	2,659	843	32	1,816
4 Herat	1,261	233	18	1,028
5 Maymana	1,015	46	4	969
6 Mazar-i-Sharif	2,112	67	3	2,045
7 Kunduz	2,569	436	17	2,133
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
AFGHANISTAN	16,224	3,255	20	12,969

Table 5.
Cereal Production, by Province and Region, 1989 Estimate

Region/ Province	Irrigated Wheat kilotons	Rainfed Wheat kilotons	Maize kilotons	Rice kilotons	Barley kilotons	Cereal Production kilotons
1 Kabul	77	0	0	0	0	77
1 Kapisa	54	1	0	0	3	57
1 Konar	13	0	15	2	5	35
1 Laghman	33	0	15	29	0	77
1 Logar	19	0	2	0	0	22
1 Nangarhar	39	6	0	0	0	45
1 Parwan	42	3	0	0	0	44
1 Wardak	23	0	0	2	1	26
2 Ghazni	227	5	50	0	8	291
2 Paktia	12	0	2	3	0	18
2 Paktika	15	0	7	0	2	25
3 Farah	62	1	18	2	3	87
3 Helmand	73	26	9	0	0	109
3 Kandahar	87	1	7	0	7	102
3 Nimroz	19	0	2	0	1	23
3 Uruzgan	114	23	22	21	19	199
3 Zabul	12	0	0	0	0	13
4 Ghor	37	5	3	0	3	47
4 Herat	129	11	1	27	39	207
5 Badghis	38	15	5	0	14	72
5 Faryab	27	76	0	0	29	132
6 Balkh	152	70	1	38	39	300
6 Bamyan	40	7	0	5	12	64
6 Jawzjan	40	174	9	0	87	310
6 Samangan	47	19	1	13	13	94
7 Badakshan	82	114	5	1	186	389
7 Baghlan	95	52	0	119	12	278
7 Kunduz	138	1	0	69	3	211
7 Takhar	189	207	3	54	108	561
AFGHANISTAN	1,936	817	179	386	597	3,915

Table 6.
Foodgrain Balance by Province

Region/ Province	Population in Country (1000s)	Foodgrain Required kilotons	Net Cereal Production kilotons	Net Production Per head kg/head	Surplus/ (Deficit) kilotons
1 Kabul	1,503	271	62	41	(209)
1 Kapisa	422	76	45	108	(30)
1 Konar	138	25	28	205	3
1 Laghman	320	58	62	193	4
1 Logar	93	17	17	188	1
1 Nangarhar	502	90	36	71	(55)
1 Parwan	478	86	36	74	(50)
1 Wardak	334	60	21	63	(39)
2 Ghazni	791	142	232	294	90
2 Paktia	169	30	14	84	(16)
2 Paktika	228	41	20	87	(21)
3 Farah	175	31	69	398	38
3 Helmand	449	81	87	193	6
3 Kandahar	476	86	82	172	(4)
3 Nimroz	48	9	19	384	10
3 Uruzgan	494	89	159	322	70
3 Zabul	174	31	10	60	(21)
4 Ghor	380	68	38	99	(31)
4 Herat	648	117	166	255	49
5 Badghis	250	45	57	230	12
5 Faryab	719	129	106	147	(24)
6 Balkh	674	121	240	356	119
6 Bamyan	334	60	51	152	(9)
6 Jawzjan	713	128	248	348	120
6 Samangan	324	58	75	232	17
7 Badakshan	619	111	311	504	200
7 Baghlan	433	78	222	514	144
7 Kunduz	450	81	169	374	88
7 Takhar	631	114	449	711	335
AFGHANISTAN	12,969	2,334	3,132	242	798

Table 7.
Foodgrain Shipments (kilotons)

Region/Center FROM \ TO >>>>>	1 Kabul	2 Ghazni	3 Kandahar	4 Herat	5 Maymana	6 Maza	7 Kunduz	8	9	10	TOTAL FROM
U.S.S.R.	200	0	0	50	0	0	0	0	0	0	250
PAKISTAN	50	10	20	0	0	0	0	0	0	0	80
1 Kabul	0	0	0	0	0	0	0	0	0	0	0
2 Ghazni	0	0	0	0	0	0	0	0	0	0	0
3 Kandahar	0	0	0	0	0	0	0	0	0	0	0
4 Herat	0	0	0	0	0	0	0	0	0	0	0
5 Maymana	0	0	0	0	0	0	0	0	0	0	0
6 Mazar-i-S	0	0	0	0	0	0	0	0	0	0	0
7 Kunduz	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
Total to	250	10	20	50	0	0	0	0	0	0	330

Notes: Table 22 is identical to Table 7.

Table 8.
Profits from Shipping Between Regions

Region/Center FROM \ TO >>>>>	1 Kabul	2 Ghazni	3 Kandahar	4 Herat	5 Maymana	6 Mazar-i-Shar	7 Kunduz	8	9	10	Region/Center
	Afghanis per seer				Afghanis per seer						
PAKISTAN	1,070	(542)	(248)	(1,051)	(154)	(1,220)	(1,374)	0	0	0	PAKISTAN
1 Kabul	0	(1,582)	(1,778)	(1,983)	(986)	(1,919)	(2,040)	0	0	0	1 Kabul
2 Ghazni	1,480	0	(196)	(401)	494	(439)	(560)	0	0	0	2 Ghazni
3 Kandahar	1,624	(56)	0	(204)	546	(651)	(616)	0	0	0	3 Kandahar
4 Herat	1,225	(255)	(198)	0	751	(447)	(704)	0	0	0	4 Herat
5 Maymana	428	(1,154)	(1,242)	(1,043)	0	(1,198)	(1,455)	0	0	0	5 Maymana
6 Mazar-i-S	1,625	43	(309)	(109)	934	0	(258)	0	0	0	6 Mazar-i-Sharif
7 Kunduz	1,814	232	36	(58)	985	52	0	0	0	0	7 Kunduz
8	0	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	0	10

Table 9.
Price Differentials between Regions

Region/Center FROM \ TO >>>>>	1 Kabul	2 Ghazni	3 Kandahar	4 Herat	5 Maymana	6 Mazar-i-Shar	7 Kunduz	8	9	10	Region/Center
	Afghanis per seer				Afghanis per seer						
PAKISTAN	1.553	22	(48)	(51)	846	(220)	(374)	0	0	0	PAKISTAN
1 Kabul	0	(1,531)	(1,601)	(1,604)	(707)	(1,772)	(1,927)	0	0	0	1 Kabul
2 Ghazni	1,531	0	(70)	(73)	824	(241)	(396)	0	0	0	2 Ghazni
3 Kandahar	1,601	70	0	(3)	894	(171)	(326)	0	0	0	3 Kandahar
4 Herat	1,604	73	3	0	897	(169)	(323)	0	0	0	4 Herat
5 Maymana	707	(824)	(894)	(897)	0	(1,066)	(1,220)	0	0	0	5 Maymana
6 Mazar-i-S	1,772	241	171	169	1,066	0	(155)	0	0	0	6 Mazar-i-Sharif
7 Kunduz	1,927	396	326	323	1,220	155	0	0	0	0	7 Kunduz
8	0	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	0	10

Table 10.
Transport Costs between Regions (Afghanis/seer)

Region/Center FROM \ TO >>>>>	1 Kabul	2 Ghazni	3 Kandahar	4 Herat	5 Maymana	6 Mazar-i-Sher	7 Kunduz	8	9	10	Region/Center
	Afghanis per seer				Afghanis per seer						
PAKISTAN	483	564	200	1,000	1,000	1,000	1,000	0	0	0	PAKISTAN
1 Kabul	0	51	177	379	279	147	113	0	0	0	1 Kabul
2 Ghazni	51	0	126	328	330	198	164	0	0	0	2 Ghazni
3 Kandahar	177	126	0	201	348	480	290	0	0	0	3 Kandahar
4 Herat	379	328	201	0	146	278	381	0	0	0	4 Herat
5 Maymana	279	330	348	146	0	132	235	0	0	0	5 Maymana
6 Mazar-i-S	147	198	480	278	132	0	103	0	0	0	6 Mazar-i-Sharif
7 Kunduz	113	164	290	381	235	103	0	0	0	0	7 Kunduz
8	0	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	0	10

Table 11.
Population by Province

Region	Province	UNHCR 1989 Population (1000s)	1978-79 CENSUS Total Population	1978-79 CENSUS Percent Rural
1	Kabul	1,708	1,373,572	30.8
1	Kapisa	430	345,775	99.6
1	Konar	311	250,132	99.2
1	Laghman	386	310,751	98.7
1	Logar	269	216,303	98.2
1	Nangarhar	927	745,986	92.4
1	Parwan	509	409,510	94.2
1	Wardak	358	287,605	99.3
2	Ghazni	804	646,623	95.3
2	Paktia	602	484,023	97.6
2	Paktika	305	245,229	99.4
3	Farah	384	308,907	94.1
3	Helmand	643	517,645	94.9
3	Kandahar	715	574,954	68.5
3	Nimroz	152	122,036	93.8
3	Uruzgan	543	436,418	98.5
3	Zabul	223	179,362	96.7
4	Ghor	420	337,992	99.1
4	Herat	841	676,422	77.7
5	Badghis	290	233,613	97.7
5	Faryab	724	582,705	90.6
6	Balkh	708	569,255	95.9
6	Bamyan	334	268,517	97.3
6	Jawzjan	732	588,609	90.7
6	Samangan	339	272,584	87.9
7	Badakshan	619	497,758	98.0
7	Baghlan	614	493,882	84.8
7	Kunduz	690	555,437	80.7
7	Takhar	646	519,752	90.8
AFGHANISTAN		16,224	13,051,357	85.0

Table 12.
Refugee Population

Region	Province	UNHCR Refugees Pakistan (1000s)	UNHCR Refugees Iran (1000s)	Total Refugees (1000s)
1	Kabul	204		204
1	Kapisa	8		8
1	Konar	173		173
1	Laghman	67		67
1	Logar	176		176
1	Nangarhar	425		425
1	Parwan	31		31
1	Wardak	23		23
2	Ghazni	13		13
2	Paktia	433		433
2	Paktika	77		77
3	Farah	9	200	209
3	Helmand	174	20	194
3	Kandahar	239		239
3	Nimroz	3	100	103
3	Uruzgan	8	40	48
3	Zabul	49		49
4	Ghor	0	40	40
4	Herat	1	192	193
5	Badghis	0	40	40
5	Faryab	6		6
6	Balkh	33		33
6	Bamyan	0		0
6	Jawzjan	18		18
6	Samangan	15		15
7	Badakshan	0		0
7	Baghlan	181		181
7	Kunduz	240		240
7	Takhar	15		15
AFGHANISTAN		2,623	632	3,255

Table 13.
Rural and Farm Population

0.80

Region	Province	In Country (1000s)	Rural Population (1000s)	Farming Population (1000s)
1	Kabul	1,503	463	370
1	Kapisa	422	420	336
1	Konar	138	137	110
1	Laghman	320	315	252
1	Logar	93	91	73
1	Nangarhar	502	464	371
1	Parwan	478	450	360
1	Wardak	334	332	266
2	Ghazni	791	754	603
2	Paktia	169	164	132
2	Paktika	228	226	181
3	Farah	175	164	131
3	Helmand	449	426	341
3	Kandahar	476	326	261
3	Nimroz	48	45	36
3	Uruzgan	494	487	390
3	Zabul	174	168	134
4	Ghor	380	376	301
4	Herat	648	504	403
5	Badghis	250	245	196
5	Faryab	719	651	521
6	Balkh	674	647	517
6	Bamyan	334	325	260
6	Jawzjan	713	647	518
6	Samangan	324	285	228
7	Badakshan	619	606	485
7	Baghlan	433	367	294
7	Kunduz	450	363	291
7	Takhar	631	573	459
AFGHANISTAN		12,969	11,023	8,819

Table 14.
Farm Household Size

Region	Province	Farm Household Size	SCA Survey number of farmers	Population in SCA Survey
1	Kabul	11.8	209	2,475
1	Kapisa	10.8	136	1,470
1	Konar	10.9	549	5,968
1	Laghman	10.2	471	4,795
1	Logar	12.0	313	3,743
1	Nangarhar	12.1	399	4,824
1	Parwan	10.4	322	3,342
1	Wardak	11.6	229	2,652
2	Ghazni	8.5	532	4,522
2	Paktia	16.1	537	8,667
2	Paktika	15.7	605	9,474
3	Farah	8.5	335	2,854
3	Helmand	11.1	394	4,354
3	Kandahar	9.8	528	5,185
3	Nimroz	10.7	12	128
3	Uruzgan	13.0	40	518
3	Zabul	7.9	626	4,927
4	Ghor	9.6	135	1,301
4	Herat	7.8	182	1,423
5	Badghis	10.8	42	454
5	Faryab	11.6	151	1,749
6	Balkh	12.0	443	5,294
6	Bamyan	9.7	432	4,190
6	Jawzjan	10.4	336	3,488
6	Samangan	12.2	125	1,528
7	Badakshan	10.8	39	421
7	Baghlan	10.1	568	5,708
7	Kunduz	10.5	781	8,216
7	Takhar	11.4	271	3,089
AFGHANISTAN		11.0	9,742	106,759

Table 15.
Farm Production Data for Irrigated Wheat

Region	Province	Average Area (jeribs)	Average Yield (seers)	Percent of Farmers	Production per farmer (seers)
1	Kabul	6.0	68	100	349
1	Kapisa	4.1	60	97	252
1	Konar	4.6	57	70	263
1	Laghman	3.8	52	99	189
1	Logar	7.6	58	101	440
1	Nangarhar	6.5	38	69	261
1	Parwan	3.3	69	74	230
1	Wardak	2.6	50	100	139
2	Ghazni	11.0	41	95	477
2	Paktia	5.9	45	75	268
2	Paktika	4.7	48	92	206
3	Farah	14.9	53	70	816
3	Helmand	10.6	62	59	567
3	Kandahar	13.8	45	75	620
3	Nimroz	34.6	40	58	1,384
3	Uruzgan	12.0	45	100	536
3	Zabul	4.8	56	36	278
4	Ghor	4.1	37	104	159
4	Herat	7.9	53	83	428
5	Badghis	9.3	42	76	389
5	Faryab	10.1	33	27	318
6	Balkh	25.5	48	43	1,158
6	Bamyan	4.6	42	98	213
6	Jawzjan	11.8	35	28	409
6	Samangan	16.9	34	63	568
7	Badakshan	5.0	67	77	337
7	Baghlan	10.6	44	95	485
7	Kunduz	11.3	68	90	782
7	Takhar	31.3	52	47	1,413
AFGHANISTAN		8.8	51	78	427

Table 16.
Farm Production Data for Rainfed Wheat

Region	Province	Average Area (Jeribs)	Average Yield (seers)	Percent of Farmers	Production per farmer (seers)
1	Kabul	0.0	0	0	0
1	Kapisa	9.0	30	1	270
1	Konar	2.4	28	5	68
1	Laghman	2.5	54	2	138
1	Logar	2.0	18	2	42
1	Nangarhar	6.4	29	14	190
1	Parwan	5.2	31	7	161
1	Wardak	0.0	0	0	0
2	Ghazni	7.4	17	8	118
2	Paktia	2.2	25	2	54
2	Paktika	4.3	19	3	85
3	Farah	12.0	31	2	360
3	Helmand	32.8	47	11	1,097
3	Kandahar	16.4	20	2	328
3	Nimroz				
3	Uruzgan	33.4	26	13	868
3	Zabul	14.5	23	1	340
4	Ghor	4.3	8	60	36
4	Herat	8.4	24	14	212
5	Badghis	13.4	18	50	240
5	Faryab	17.3	17	82	291
6	Balkh	33.8	25	25	910
6	Bamyan	6.2	20	31	126
6	Jawzjan	25.6	19	94	525
6	Samangan	24.5	13	45	323
7	Badakshan	25.5	22	64	561
7	Baghlan	36.1	34	20	1,247
7	Kunduz	8.5	31	2	261
7	Takhar	45.0	26	63	1,155
AFGHANISTAN		12.0	25	18	320

Table 17.
Farm Production Data for Maize

Region	Province	Average Area (jeribs)	Average Yield (seers)	Percent of Farmers	Production per farmer (seers)
1	Kabul	1.0	0	33	0
1	Kapisa	2.6	0	46	0
1	Konar	4.0	60	88	245
1	Laghman	2.7	49	56	150
1	Logar	1.9	49	53	94
1	Nangarhar	6.2	0	69	0
1	Parwan	2.7	0	64	0
1	Wardak	0.8	24	9	14
2	Ghazni	11.3	33	22	456
2	Paktia	2.4	54	52	82
2	Paktika	2.3	39	82	100
3	Farah	6.8	49	50	329
3	Helmand	3.8	49	22	193
3	Kandahar	4.6	31	25	144
3	Nimroz	7.0	28	50	196
3	Uruzgan	3.3	47	68	155
3	Zabul	1.9	0	6	0
4	Ghor	1.0	23	46	28
4	Herat	4.0	45	1	180
5	Badghis	4.6	38	21	177
5	Faryab	2.0	0	2	0
6	Balkh	6.2	33	3	159
6	Bamyan	2.5	0	5	0
6	Jawzjan	7.5	30	5	495
6	Samangan	2.9	35	7	101
7	Badakshan	5.2	25	13	128
7	Baghlan	2.0	17	2	25
7	Kunduz	4.3	0	9	0
7	Takhar	7.0	68	3	396
AFGHANISTAN		4.1	40	31	127

Table 18.
Farm Production Data for Rice

Region	Province	Average area (jeribs)	Average yield (seers)	Percent of Farmers	Production per farmer (seers)
1	Kabul				
1	Kapisa	2.7	0	13	0
1	Konar	3.4	60	16	190
1	Laghman	4.1	80	53	309
1	Logar				
1	Nangarhar	0.0	0	0	0
1	Parwan	2.0	0	6	0
1	Wardak	2.2	45	29	44
2	Ghazni				
2	Paktia	2.4	110	14	413
2	Paktika	1.3	47	4	47
3	Farah	6.9	39	11	207
3	Helmand				
3	Kandahar	3.0	45	0	134
3	Nimroz				
3	Uruzgan	8.1	49	25	393
3	Zabul	0.0	0	0	0
4	Ghor				
4	Herat	8.8	57	15	498
5	Badghis				
5	Faryab				
6	Balkh	22.6	83	6	2,075
6	Bamyan	3.2	55	14	172
6	Jawzjan				
6	Samangan				
7	Badakshan	2.0	75	3	150
7	Baghlan	13.3	65	67	860
7	Kunduz	12.2	70	64	550
7	Takhar	19.7	87	11	1,716
AFGHANISTAN		6.3	65	19	405

Table 19.
Farm Production Data for Barley

Region	Province	Average Area (jeribs)	Average Yield (seers)	Percent of Farmers	Production per farmer (seers)
1	Kabul				
1	Kapisa	1.2	42	24	48
1	Konar	2.7	44	57	111
1	Laghman	1.6	32	4	57
1	Logar	1.5	45	14	80
1	Nangarhar				
1	Parwan				
1	Wardak	1.1	39	19	48
2	Ghazni	1.9	30	29	56
2	Paktia	1.9	40	5	78
2	Paktika	1.8	38	36	79
3	Farah	6.4	38	13	235
3	Helmand				
3	Kandahar	5.7	33	20	186
3	Nimroz	6.7	36	25	243
3	Uruzgan	4.6	35	55	160
3	Zabul	1.4	53	5	73
4	Ghor	1.1	23	53	26
4	Herat	5.7	47	40	267
5	Badghis	6.2	30	57	188
5	Faryab	6.0	19	68	133
6	Balkh	9.0	29	53	239
6	Bamyan	2.7	46	57	112
6	Jawzjan	10.2	23	89	278
6	Samangan	9.0	19	59	175
7	Badakshan	20.9	35	80	738
7	Baghlan	12.1	27	18	324
7	Kunduz	5.6	37	9	195
7	Takhar	16.2	27	88	433
AFGHANISTAN		4.8	36	36	156

Table 20.
Original Transport Costs Matrix between Regions

Region/Center FROM \ TO >>>>>	1 Kabul	2 Ghazni	3 Kandahar	4 Herat	5 Maymana	6 Mazar-i-Sher	7 Kunduz	8	9	10	Region/Center
	Afghanis per seer				Afghanis per seer						
PAKISTAN	483	564	200	1,000	1,000	1,000	1,000	0	0	0	PAKISTAN
1 Kabul	0	51	177	379	279	147	113	0	0	0	1 Kabul
2 Ghazni	51	0	126	328	330	198	164	0	0	0	2 Ghazni
3 Kandahar	177	126	0	201	348	480	290	0	0	0	3 Kandahar
4 Herat	379	328	201	0	146	278	381	0	0	0	4 Herat
5 Maymana	279	330	348	146	0	132	235	0	0	0	5 Maymana
6 Mazar-i-S	147	198	480	278	132	0	103	0	0	0	6 Mazar-i-Sherif
7 Kunduz	113	164	290	381	235	103	0	0	0	0	7 Kunduz
8	0	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	0	10

Table 21.
Road Distances between Principal Cities (kilometers)

Region/Center FROM \ TO >>>>>	1 Kabul	2 Ghazni	3 Kandahar	4 Herat	5 Maymana	6 Mazar-i-S	7 Kunduz	8	9	10	Region/Center
1 Kabul	0	145	502	1,072	788	415	319	0	0	0	1 Kabul
2 Ghazni	145	0	357	927	933	560	464	0	0	0	2 Ghazni
3 Kandahar	502	357	0	570	984	1.357	821	0	0	0	3 Kandahar
4 Herat	1,072	927	570	0	414	787	1,079	0	0	0	4 Herat
5 Maymana	788	933	984	414	0	373	665	0	0	0	5 Maymana
6 Mazar-i-Sh	415	560	1,357	787	373	0	292	0	0	0	6 Mazar-i-S
7 Kunduz	319	464	821	1,079	665	292	0	0	0	0	7 Kunduz
8	0	0	0	0	0	0	0	0	0	0	8
9	0	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	0	10

Note: Default transport cost matrix computed at 5 Afghanis/kilograms/100 kilometers

Table 22.
Foodgrain Shipments (kilotons)

Region/Center FROM \ TO >>>>>	1 Kabul	2 Ghazni	3 Kandahar	4 Herat	5 Maymana	6 Maza	7 Kunduz	8	9	10	TOTAL FROM
U.S.S.R.	200	0	0	50	0	0	0	0	0	0	250
PAKISTAN	50	10	20	0	0	0	0	0	0	0	80
1 Kabul	0	0	0	0	0	0	0	0	0	0	0
2 Ghazni	0	0	0	0	0	0	0	0	0	0	0
3 Kandahar	0	0	0	0	0	0	0	0	0	0	0
4 Herat	0	0	0	0	0	0	0	0	0	0	0
5 Maymana	0	0	0	0	0	0	0	0	0	0	0
6 Mazar-i-S	0	0	0	0	0	0	0	0	0	0	0
7 Kunduz	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
Total to	250	10	20	50	0	0	0	0	0	0	330

Notes: Table 22 is identical to Table 7.

Table 23.
Renaming Regions

Region Number	Region Name
1	Kabul
2	Ghazni
3	Kandahar
4	Herat
5	Maymana
6	Mazar-i-Sharif
7	Kunduz
8	
9	
10	

Table 24.
Reassigning Provinces to Regions

Region	Province	Region	Province	Region	Province
1	Kabul	2	Paktika	5	Faryab
1	Kapisa	3	Farah	6	Balkh
1	Konar	3	Helmand	6	Bamyan
1	Laghman	3	Kandahar	6	Jawzjan
1	Logar	3	Nimroz	6	Samangan
1	Nangarhar	3	Uruzgan	7	Badakshan
1	Parwan	3	Zabul	7	Baghlan
1	Wardak	4	Ghor	7	Kunduz
2	Ghazni	4	Herat	7	Takhar
2	Paktia	5	Badghis		

Table 25.
1989 Cereal Production, by Province and Region, direct entry

Region/ Province	Irrigated Wheat kilotons	Rainfed Wheat kilotons	Maize kilotons	Rice kilotons	Barley kilotons	Cereal Production Total kilotons
1 Kabul	0	0	0	0	0	0
1 Kapisa	0	0	0	0	0	0
1 Konar	0	0	0	0	0	0
1 Laghman	0	0	0	0	0	0
1 Logar	0	0	0	0	0	0
1 Nangarhar	0	0	0	0	0	0
1 Parwan	0	0	0	0	0	0
1 Wardak	0	0	0	0	0	0
2 Ghazni	0	0	0	0	0	0
2 Paktia	0	0	0	0	0	0
2 Paktika	0	0	0	0	0	0
3 Farah	0	0	0	0	0	0
3 Helmand	0	0	0	0	0	0
3 Kandahar	0	0	0	0	0	0
3 Nimroz	0	0	0	0	0	0
3 Uruzgan	0	0	0	0	0	0
3 Zabul	0	0	0	0	0	0
4 Ghor	0	0	0	0	0	0
4 Herat	0	0	0	0	0	0
5 Badghis	0	0	0	0	0	0
5 Faryab	0	0	0	0	0	0
6 Balkh	0	0	0	0	0	0
6 Bamyan	0	0	0	0	0	0
6 Jawzjan	0	0	0	0	0	0
6 Samangan	0	0	0	0	0	0
7 Badakshan	0	0	0	0	0	0
7 Baghlan	0	0	0	0	0	0
7 Kunduz	0	0	0	0	0	0
7 Takhar	0	0	0	0	0	0
AFGHANISTAN	0	0	0	0	0	0

Appendix B

SIMULATION OUTPUT

Excluding 100 Percent of Barley and

Excluding 50 Percent of Maize

Table B-0.
General Adjustments

0	% Adjustment to population
0	% Adjustment to refugees estimates
0	% Adjustment to ratio farm/rural population (.8)
0	% Adjustment to farm household size
0	% Adjustment to irrigated wheat production
0	% Adjustment to rainfed wheat production
(50)	% Adjustment to maize production
0	% Adjustment to rice production
(100)	Adjustment to barley production
0	% Adjustment to transport cost
180	Foodgrain consumption requirements (kilograms/person)
20	% Postharvest losses and wastage
400	Pakistan grain price (Afghanis/seer)
-------Specifications for Consumption-Price Relation------	
200	Average foodgrain consumed (kilograms per year), at
700	Average anrual price (Afghanis/seer)
-0.3	Price elasticity of consumption

Table B-1. Afghanistan
Regional Foodgrain Situation

Region/Center	Population in Country (1000s)	Foodgrain Required kilotons	Cereal Production		Surplus/ (Deficit) kilotons
			Total kilotons	Net kilotons	
1 Kabul	3,790	682	358	287	(396)
2 Ghazni	1,188	214	293	234	20
3 Kandahar	1,816	327	473	378	51
4 Herat	1,028	185	210	168	(17)
5 Maymana	969	174	159	127	(47)
6 Mazar-i-Sha	2,045	368	611	489	121
7 Kunduz	2,133	384	1,125	900	516
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
AFGHANISTAN	12,969	2,334	3,229	2,583	249

Table B-2. Afghanistan
Regional Foodgrain Situation

Region/Center	In-Country Population (1000s)	Cereal Production		Cereal Supply	
		Net kilotons	kilograms per head	Total kilotons	kilograms per head
1 Kabul	3,790	287	76	537	142
2 Ghazni	1,188	234	197	244	206
3 Kandahar	1,816	378	208	398	219
4 Herat	1,028	168	164	218	212
5 Maymana	969	127	131	127	131
6 Mazar-i-Sha	2,045	489	239	489	239
7 Kunduz	2,133	900	422	900	422
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
AFGHANISTAN	12,969	2,583	199	2,913	225

Table 8-3.
Population and Refugees, by Province and Region, 1989 Estimate

Region	Province	1989 Population 1000s	REFUGEES (1000s)	REFUGEES (percent)	In Country 1000s
1	Kabul	1,708	204	12	1,503
1	Kapisa	430	8	2	422
1	Konar	311	173	55	138
1	Laghman	386	67	17	320
1	Logar	269	176	66	93
1	Nangarhar	927	425	46	502
1	Parwan	509	31	6	478
1	Wardak	358	23	6	334
2	Ghazni	804	13	2	791
2	Paktia	602	433	72	169
2	Paktika	305	77	25	228
3	Farah	384	209	55	175
3	Helmand	643	194	30	449
3	Kandahar	715	239	33	476
3	Nimroz	152	103	68	48
3	Uruzgan	543	48	9	494
3	Zabul	223	49	22	174
4	Ghor	420	40	10	380
4	Herat	841	193	23	648
5	Badghis	290	40	14	250
5	Faryab	724	6	1	719
6	Balkh	708	33	5	674
6	Bamyan	334	0	0	334
6	Jawzjan	732	18	3	713
6	Samangan	339	15	4	324
7	Badakshan	619	0	0	619
7	Baghlan	614	181	29	433
7	Kunduz	690	240	35	450
7	Takhar	646	15	2	631
AFGHANISTAN		16,224	3,255	20	12,969

Table B-4.
Afghanistan Population, by Region

Region/Center	Population in 1989 (1000s)	Refugees (1000s)	Percent refugees	In-Country Population (1000s)
1 Kabul	4,897	1,108	23	3,790
2 Ghazni	1,710	523	31	1,188
3 Kandahar	2,659	843	32	1,816
4 Herat	1,261	233	18	1,028
5 Maymana	1,015	46	4	969
6 Mazar-i-Sha	2,112	67	3	2,045
7 Kunduz	2,569	436	17	2,133
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
AFGHANISTAN	16,224	3,255	20	12,969

Table B-5.
Cereal Production, by Province and Region, 1969 Estimate

Region	Province	Irrigated Wheat kilotons	Rainfed Wheat kilotons	Maize kilotons	Rice kilotons	Barley kilotons	Total Cereals kilotons
1	Kabul	77	0	0	0	0	77
1	Kapisa	54	1	0	0	0	54
1	Konar	13	0	8	2	0	23
1	Laghman	33	0	7	29	0	69
1	Logar	19	0	1	0	0	20
1	Nangarhar	39	6	0	0	0	45
1	Parwan	42	3	0	0	0	44
1	Wardak	23	0	0	2	0	25
2	Ghazni	227	5	25	0	0	257
2	Paktia	12	0	1	3	0	16
2	Paktika	15	0	3	0	0	19
3	Farah	62	1	9	2	0	75
3	Helmand	73	26	5	0	0	104
3	Kandahar	87	1	3	0	0	92
3	Nimroz	19	0	1	0	0	21
3	Uruzgan	114	23	11	21	0	169
3	Zabul	12	0	0	0	0	12
4	Ghor	37	5	1	0	0	43
4	Herat	129	11	0	27	0	168
5	Badghis	38	15	2	0	0	56
5	Faryab	27	76	0	0	0	103
6	Balkh	152	70	1	38	0	261
6	Bamyan	40	7	0	5	0	51
6	Jauzjan	40	174	4	0	0	219
6	Samangan	47	19	0	13	0	80
7	Badakshan	82	114	3	1	0	200
7	Baghlan	95	52	0	119	0	266
7	Kunduz	138	1	0	69	0	207
7	Takhar	189	207	2	54	0	451
	AFGHANISTAN	1,936	817	89	386	0	3,229

Table B-6.
Foodgrain Balance by Province

Region	Province	In-Country Population (1000s)	Foodgrain Required kilotons	Net Cereal Production kilotons	Net Production Per Head kilograms	Surplus/ (Deficit) kilotons
1	Kabul	1,503	271	62	41	(209)
1	Kapisa	422	76	43	103	(32)
1	Konar	138	25	19	134	(6)
1	Laghman	320	58	55	174	(2)
1	Logar	93	17	16	175	(0)
1	Nangarhar	502	90	36	71	(55)
1	Parwan	470	86	36	76	(50)
1	Wardak	334	60	20	59	(40)
2	Ghazni	791	142	206	260	63
2	Paktia	169	30	13	77	(17)
2	Paktika	228	41	15	67	(26)
3	Farah	175	31	60	342	28
3	Helmand	449	81	83	185	2
3	Kandahar	476	86	74	155	(12)
3	Nimroz	48	9	17	340	8
3	Uruzgan	494	89	135	274	46
3	Zabul	174	31	10	58	(21)
4	Ghor	380	68	34	90	(34)
4	Herat	648	117	134	207	18
5	Badghis	250	45	45	178	(1)
5	Faryab	719	129	83	115	(47)
6	Balkh	674	121	209	309	87
6	Bamyan	334	60	41	123	(19)
6	Jawzjan	713	128	175	245	47
6	Samangan	324	58	64	197	6
7	Badakshan	619	111	160	259	49
7	Baghlan	433	78	213	491	135
7	Kunduz	450	81	166	368	85
7	Takhar	631	114	361	572	247
AFGHANISTAN		12,969	2,334	2,583	199	249

Appendix C

Baseline Situation Reassessment

Table C-1. Afghanistan
Regional Foodgrain Situation

Region/Center	Population in Country	Foodgrain Required	Cereal Production		Surplus/ (Deficit)
			Total	Net	
	(1000s)	kilotons	kilotons	kilotons	kilotons
1 Kabul	3,790	682	384	307	(375)
2 Ghazni	1,188	214	333	267	53
3 Kandahar	1,816	327	533	427	100
4 Herat	1,028	185	254	203	18
5 Maymana	969	174	204	163	(11)
6 Mazar-i-Sha	2,045	368	768	614	246
7 Kunduz	450	81	211	169	88
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
AFGHANISTAN	11,286	2,031	2,687	2,150	118

Table C-2. Afghanistan
Regional Foodgrain Situation

Region/Center	In-Country Population (1000s)	Cereal Production		Cereal Supply	
		Net kilotons	kilograms per head	Total kilotons	kilograms per head
1 Kabul	3,790	307	81	557	147
2 Ghazni	1,188	267	224	277	233
3 Kandahar	1,816	427	235	447	246
4 Herat	1,028	203	198	253	246
5 Maymana	969	163	168	163	168
6 Mazar-i-Sha	2,045	614	300	614	300
7 Kunduz	450	169	375	169	375
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
AFGHANISTAN	11,286	2,150	190	2,480	220

Table C-3.
Population and Refugees, by Province and Region, 1989 Estimate

Region	Province	1989 Population 1000s	REFUGEES (1000s)	REFUGEES (percent)	In Country 1000s
1	Kabul	1,708	204	12	1,503
1	Kapisa	430	8	2	422
1	Konar	311	173	55	138
1	Laghman	386	67	17	320
1	Logar	269	176	66	93
1	Nangarhar	927	425	46	502
1	Parwan	509	31	6	478
1	Wardak	358	23	6	334
2	Ghazni	804	13	2	791
2	Paktia	602	433	72	169
2	Paktika	305	77	25	228
3	Farah	384	209	55	175
3	Helmand	643	194	30	449
3	Kandahar	715	239	33	476
3	Nimroz	152	103	68	48
3	Uruzgan	543	48	9	494
3	Zabul	223	49	22	174
4	Ghor	420	40	10	380
4	Herat	841	193	23	648
5	Badghis	290	40	14	250
5	Faryab	724	6	1	719
6	Balkh	708	33	5	674
6	Bamyan	334	0	0	334
6	Jawzjan	732	18	3	713
6	Samangan	339	15	4	324
7	Badakshan	0	0	0	(0)
7	Baghlan	0	0	0	0
7	Kunduz	690	240	35	450
7	Takhar	0	0	0	0
AFGHANISTAN		14,345	3,060	21	11,286

Table C-4.
Afghanistan Population, by Region

Region/Center	Population in 1989 (1000s)	Refugees (1000s)	Percent refugees	In-Country Population (1000s)
1 Kabul	4,897	1,108	23	3,790
2 Ghazni	1,710	523	31	1,188
3 Kandahar	2,659	843	32	1,816
4 Herat	1,261	233	18	1,028
5 Maymana	1,015	46	4	969
6 Mazar-i-Sha	2,112	67	3	2,045
7 Kunduz	690	240	35	450
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
AFGHANISTAN	14,345	3,060	21	11,286

Table C-5.
Cereal Production, by Province and Region, 1989 Estimate

Region	Province	Irrigated Wheat kilotons	Rainfed Wheat kilotons	Maize kilotons	Rice kilotons	Barley kilotons	Total Cereals kilotons
1	Kabul	77	0	0	0	0	77
1	Kapisa	54	1	0	0	3	57
1	Konar	13	0	15	2	5	35
1	Laghman	33	0	15	29	0	77
1	Logar	19	0	2	0	0	22
1	Nangarhar	39	6	0	0	0	45
1	Parwan	42	3	0	0	0	44
1	Wardak	23	0	0	2	1	26
2	Ghazni	227	5	50	0	8	291
2	Paktia	12	0	2	3	0	18
2	Paktika	15	0	7	0	2	25
3	Farah	62	1	18	2	3	87
3	Helmand	73	26	9	0	0	109
3	Kandahar	87	1	7	0	7	102
3	Nimroz	19	0	2	0	1	23
3	Uruzgan	114	23	22	21	19	199
3	Zabul	12	0	0	0	0	13
4	Ghor	37	5	3	0	3	47
4	Herat	129	11	1	27	39	207
5	Badghis	38	15	5	0	14	72
5	Faryab	27	76	0	0	29	132
6	Balkh	152	70	1	38	39	300
6	Bamyan	40	7	0	5	12	64
6	Jawzjan	40	174	9	0	87	310
6	Samangan	47	19	1	13	13	94
7	Badakshan	(0)	(0)	(0)	(0)	(0)	0
7	Baghlan	0	0	0	0	0	0
7	Kunduz	138	1	0	69	3	211
7	Takhar	0	0	0	0	0	0
	AFGHANISTAN	1,570	445	170	212	290	2,687

Table C-6.
Foodgrain Balance by Province

Region	Province	In-Country Population (1000s)	Foodgrain Required kilotons	Net Cereal Production kilotons	Net Production Per Head kilograms	Surplus/ (Deficit) kilotons
1	Kabul	1,503	271	62	41	(209)
1	Kapisa	422	76	45	108	(30)
1	Konar	138	25	28	205	3
1	Laghman	320	58	62	193	4
1	Logar	93	17	17	188	1
1	Nangarhar	502	90	36	71	(55)
1	Parwan	478	86	36	74	(50)
1	Wardak	334	60	21	63	(39)
2	Ghazni	791	142	232	294	90
2	Paktia	169	30	14	84	(16)
2	Paktika	228	41	20	87	(21)
3	Farah	175	31	69	398	38
3	Helmand	449	81	87	193	6
3	Kandahar	476	86	82	172	(4)
3	Nimroz	48	9	19	384	10
3	Uruzgan	494	89	159	322	70
3	Zabul	174	31	10	60	(21)
4	Ghor	380	68	38	99	(31)
4	Herat	648	117	166	255	49
5	Badghis	250	45	57	230	12
5	Faryab	719	129	106	147	(24)
6	Balkh	674	121	240	356	119
6	Bamyan	334	60	51	152	(9)
6	Jowzjan	713	128	248	348	120
6	Samangan	324	58	75	232	17
7	Badakshan	(0)	(0)	0	(16)	0
7	Baghlan	0	0	0	ERR	0
7	Kunduz	450	81	169	374	88
7	Takhar	0	0	0	ERR	0
AFGHANISTAN		11,286	2,031	2,150	190	118

Appendix D

Comments on Draft Report

by John Newton

22 February 1990

To: Edgar Ariza-Niño

From: John Newton

Subject: Comments on Food Needs Draft

I've made a few marginal comments on your food needs report. As we've discussed before, I think the model has some very good points and allows an admirably detailed analysis of the Afghan foodgrain situation. I believe you should include some explanation or mention of the following points, however, for the benefit of those using the model or trying to understand its output.

1. With default data, the model projects a foodgrain surplus of approximately .8 million tons in a country with imports of approximately .4 million tons in wheat alone.

2. The model's default in-country population is approximately 1 million higher than the next-highest current adjusted estimate.

3. The refugee population estimate is approximately 1.5 million lower than usually accepted figures.

4. The figures on the percentage of rural population and the percentage of population engaged in farming are high by world standards, unsubstantiated with reliable data, and unadjusted for the effects of war.

5. The input for foodgrain consumption per capita (180 kilograms) is quite low in comparison to the usually accepted minimum wheat consumption level of 150 kilograms. An equivalent foodgrain level, based on Afghan production levels, would be 215 kilograms. The Manly study uses an even higher level, above 260 kilograms.

6. The interpretation of the Agricultural Survey production estimates included in the model is very different from the Agricultural Survey interpretation. In particular, various Agricultural Survey representatives have stated: (a) that the relative yields are the most reliable result of their survey, not the absolute yields; (b) that all yield levels--past and current--are likely to be exaggerated, as they are in

most surveys of farmers; (c) that neither the survey nor the yield levels are designed to measure total production, but that their own projections based on the data yield estimates in the range of 1.4 to 1.9 million tons of wheat for 1987; (d) that the demographic components of the survey are likely to be exaggerated.

7. The model's means of calculating grain production levels depends on a complex indirect calculation, using unavailable and unreliable data. In addition, the default values of these data are questionable and not verifiable. A simpler area-based approach to estimation, used by other analysts we've spoken to, is not an option in the model.

8. The model's output as it stands is essentially a circular calculation. Both production and consumption of foodgrain depend on population, with fixed coefficients among various intermediary variables. With the default coefficients, there is no way for the model to generate a deficit foodgrain situation in Afghanistan—that is, it does not generate conclusions in accord with observed reality. Of course, direct entry of production data is now possible with the model, a cumbersome but acceptable alternative to having realistic default values of production in the first place.

In summary, as we've discussed on prior occasions, the model's great advantage is that it allows users to change input values and requires that they specify certain assumptions. Its disadvantage is that the default data and functions are unrealistic and the grain production function is needlessly indirect and based on several unreliable and unavailable data.

If the above items are explained to readers of the draft report and prospective users of the model, I believe we'll have an easier presentation to the client.

Appendix E

Response to Comments on Draft Report

22 February 1990

To: John Newton

From: Edgar Ariza-Niño

Subject: Response to Comments on AFGRAIN

Your comments on the Afghanistan Regional Foodgrain Situation Assessment report are most welcome and appreciated. In keeping with your suggestion, I have set down some of the considerations that evolved in the course of developing AFGRAIN, as well as the choices made regarding data and methodology. I agree with many of your points regarding the deficiencies of the data currently available. Unfortunately, as explained below, often there are few alternatives to those data. In responding to your comments, I am keeping the same numerical references used in your memo.

1. The default foodgrain situation for Afghanistan that results from using the default data values cannot be defined in a single figure. There are 12 provinces that show a deficit and 17 that show a surplus. The surplus is heavily concentrated in a the few provinces in the northwest corner of Afghanistan (Takhar, Bandakshan, Baghlan). Most other provinces have only modest surpluses. The deficits are heavily concentrated in the provinces around the Kabul basin and in the provinces around the Murghab slope. Given the constraints to internal transport, it is not likely that surpluses generated in one region can be moved to the regions with a deficit. It therefore becomes necessary for regions with a deficit to be supplied from the outside, even though there might be regional surpluses in other parts of the country.

The surplus in AFGRAIN is defined as production above the minimum cereal equivalent requirement to maintain good health, or 180 kilograms per person. This is a minimum value. Under ordinary conditions people consume more than such a minimum level. Afghanistan in the past has produced more than such a minimum. In Manly's study for example, average consumption/ production in 1968-69 was 262 kilograms per head. AFGRAIN's per capita production amounts to 242 kilograms per head when barley and maize are included, and 199 kilograms per head when barley is completely excluded and only half of the maize is taken for human consumption. While 199 kilograms is higher than several other estimates, it is exceeded by the 210-215 kilograms estimate made by Dr. Farough in his forthcoming study.

2. The default in-country population is 13 million, derived from the UNHCR's 1989 estimate of population by province and their estimates of refugees outside Afghanistan. Unfortunately, I don't have other independent estimates of in-country population by province. Other analysts are of course urged to use better estimates whenever available. While improvements in the demographic data are possible, the purpose of the AFGRAIN exercise was to develop a framework for exploring alternative estimates for population, not

necessarily to develop those better demographic estimates. There are other people far more qualified than myself working on that very subject.

3. The default refugee population of 3.3 million is indeed lower than previous figures suggested. This figure merely adds the 2.6 million refugees in Pakistan that UNHCR reported on January 7, 1990, in a memo to you and the .632 million reported in Nathan Associates' Macro Database for Iran. I agree that the figure for Iran might be understated, but until I find something more solid on paper I have no way to assign additional refugee values by province. We should stress the need to come up with better data to arrive at more realistic values.

While the latest refugee figures are lower than before, several observers have pointed out that previous figures were probably inflated. Several factors would lead to overestimates of actual numbers: most refugee estimates are based on the number of food ration cards issued. However, some families might report more members than they actually have to obtain higher rations; camp commanders might increase the number of families living in a camp; some families might be recorded more than once; there are seasonal refugees who return to Afghanistan for part of the year; the register books are not kept up to date. I am therefore not certain that the most recent figures provided by UNHCR are necessarily an undercounting of the actual number of refugees.

4. "The figures on the percentage of rural population and the percentage of population engaged in farming are high by world standards." They are indeed, but I don't see why world standards should apply to Afghanistan in this regard. The figures for percent rural population are taken directly from the 1978 census, and for the country as a whole urban population only represent 15 percent. I agree that this percentage presumably increased as a result of the war. No adjustment has been made in this regard; any efforts to correct this would be welcome. It is unfortunate that under the scope of work of this assignment there was not opportunity to work out better demographic estimates of urban/rural population by province. I understand there are other specialists working on this subject.

The default ratio of farming-to-rural population, 80 percent, is a critical value I assigned rather arbitrarily to make it possible to estimate agricultural population. If there is any empirical estimate of this coefficient, it should be entered immediately. I don't know of any recent one, however. Moreover, the 80 percent value is probably on the low side: combined with the 85 percent estimate of rural population, it implies a rate of farming population of only 68 percent of total population. From the little I have learned about Afghanistan this ratio seems low, but it is only my opinion. Others with more experience in the country might be able to offer better estimates. The Swedish Committee uses an estimate of 11 million farming population for 23 provinces for 1978, out of a population of 13 million, which implies a ratio of 85 percent.

5. Concerning the minimum consumption requirement, assessments regarding the adequacy of food production levels are usually made using fairly accepted levels of cereal equivalent consumption, normally 180 kilograms per head. I repeat, this is a nutritionally based minimum level, not an average, not a maximum, not a recommeded diet. In most countries, including Afghanistan in the past, actual per capita consumption is above such levels. To fulfill such a consumption requirement UNHCR recommends providing refugees with 150 kilograms of wheat per head, supplemented with soybean meal, powdered milk, sugar, and cooking oil. Many other possible combination of foods can be used to fulfill the nutritional requirements. Wheat per se does not have any minimum consumption level. I don't really see how you arrive at a cereal consumption requirement of 215 kilograms. While desirable, most nutritionists would view this as too high a minimum requirement.

Manly's 262 kilograms per head is not based on any nutritional considerations; it is merely the average production per head for the base year 1968/69. He uses this value as a yardstick to identify surplus and deficit provinces, on the assumption that consumption should equalize across the country. I don't think Manly intended the 262 kilograms per head to be taken as a minimum consumption requirement.

6. The use of data from the Agricultural Survey has been amply discussed with the representatives of the Swedish Committee, particularly with those specialists working on the tabulation of the 1987 survey results. Theirs is the only set of farm production data available by province, as far as I know. There has been no other empirical survey of the agricultural sector in the past 2 decades, that I know of. I admit that their results suffer from several shortcomings, deriving from the special war circumstances in which the survey took place. In general, they stand by their 1987 farm production data as being reasonably accurate, though there are some specific cases where questions arise.

6-a. In their interpretation of the data, the Swedish Committee emphasizes the relative magnitudes of the drop in production from 1978 to 1987 as reported by the surveyed farmers in 1987. A large part of the apparent loss can be attributed to faulty recollection by farmers of what their yields and area were a decade before, before the war. A detailed analysis of why such a relative measure is likely to exaggerate the actual drop in farm production is found in the text of Nathan Associates' Macro Database, pp. 51-65 of Volume I. Readers are encouraged to examine this section. The basic point is that the reported yields for 1978 could not have been as large as farmers claimed.

6-b. The above does not invalidate farmers' responses about 1987 yields since that was the current or most recent year at the time of the survey. Farmers like everyone else recall recent experience much better than events a decade before. Yields reported for 1987 appear reasonable to me and I believe to most agronomists. The Swedish Committee itself considers the 1987 farm yield estimates reasonably accurate within 10 percent of actual

values. Since 1987 was a year of relatively good rains, yields might have been above average, but still within the normal range. AFGRAIN uses only the 1987 farm production data, and as far as I understand, the Agricultural Survey does not disavow these figures. This does not mean that these farm production figures are beyond improvement. In their more recent second farm survey, the Swedish Committee has introduced several modifications in their questionnaires and methodology to avoid some of the deficiencies in their 1987 study. When results of the 1989 survey become available later in 1990, they should be incorporated into AFGRAIN.

6-c. As far as I understand, the Swedish Committee has officially consistently avoided using their survey results to arrive at absolute estimates of production for wheat or other cereal products. I have not seen in their literature any absolute estimate of production (though I confess having read only a small portion of their published output). Other analysts, however, have used their estimates of relative decline in productivity, in combination with data for the last prewar year, 1978, to arrive at estimates of current foodgrain production. Nathan Associates' Macro Database (Table A-II-9) uses this approach, for example, and estimates 1986/87 wheat production of .93 million tons, a 65-percent drop from 1978, and for foodgrains a total of 1.5 million tons, a 64-percent fall from the 4.1 million tons in 1978. I believe these estimates are too low for the reason given above, namely, the relative drop in productivity is likely to be exaggerated. Moreover, the accuracy of agricultural statistics for 1978 is also subject to doubt since they were not based on any kind of nationwide survey. At least, the 1987 figures from the Agricultural Survey are based on a rather extensive field survey.

6-d. Household size for farmers in the Agricultural Survey was found to be about 11 persons per family, with little variation between farmers interviewed in Afghanistan and farmers in refugee camps. The Swedish Committee analysts are confident that these are reasonably accurate figures, despite the anticipated bias toward overstating family size among refugees. I don't know of any other estimates of farm family size to compare with those of the Swedish Committe, and I know little about family compositon in Afghanistan to make a judgement myself. Of course, alternative values are most welcome.

7. AFGRAIN's production estimates are derived from farm data from the Agricultural Survey and population data from other sources. The population data are, I admit, highly uncertain and incomplete in many cases. Unfortunately, I don't see an easy alternatives to avoid the linkage with population estimates. Of course, if there were independent means of determining area planted to each crop in each province, it would be preferable. Unfortunately, I don't know of any source of that information at the moment, except perhaps official statistics from the GOA. I do not know the analysts you mentioned as having that kind of information. It is to be hoped that with the coming project of using satellite imagery to determine cropping areas such a capability might be developed. However, given the usual lag between start-up and actual delivery of results for that kind of project, it might be some time before we have these figures in hand.

8. It is far from true that AFGRAIN does not generate deficits of foodgrain. At least 12 provinces are identified as having a deficit under the default conditions, and 15 have a deficit when barley and half of the maize are excluded as edible foodgrains. More provinces would show a deficit if the minimum consumption requirement were raised above 180 kilograms per head, as you suggest. The true test is whether AFGRAIN generates deficits when deficits are known to occur and surpluses when surpluses are known to occur. In that regard, AFGRAIN performs surprisingly well, when one compares the surplus and deficit regions with those generated by the Manly study. There is a very close correspondence between the levels of surplus and deficit predicted by AFGRAIN and those reported by Manly 20 years before. A correlation of 0.87 is found between the two studies for 25 provinces, after excluding 4 outlier provinces. Such strong association cannot be attributed purely to good luck; it lends credibility to the accuracy of the Agricultural Survey that this survey's predicted outcomes match previously known situations so well.

It should be stressed, however, that the purpose of this report is not to do a foodgrain assessment for Afghanistan. Rather it is to introduce a simple-to-use spreadsheet program, AFGRAIN, that will facilitate such assessment by analysts more familiar with the country and with access to up-to-date data. The default baseline situation is only a first approximation using the raw data values. Users are urged to incorporate their own information and judgements to arrive at better foodgrain balances.