

AGRICULTURAL DEVELOPMENTS IN AFGHANISTAN

VOLUME 1 ISSUE 3

APRIL 1992



Inside this issue : Focus on Fertilizer

Over the past 2 1/2 years ASSP/PSA has identified and taken on many of the constraints facing Afghan agriculture. In response to a shortage of agriculturalists familiar with the results of applied research on yield improving practices, we have trained extension agents in the use and benefits of modern cultivation practices. In order to facilitate transfer and adoption of this knowledge, we have demonstrated these new technology packages to farmers. After creating a demand for better agricultural practices, we are now working hard to make available the equipment and other inputs needed to improve agricultural production.

This month's newsletter focuses on fertilizer, an input whose time has come in Afghan agriculture. We present in this issue the case for fertilizer: its benefits in terms of increased wheat yields, the logic of adopting fertilizer use given the return to the farmer, and the strategy that ASSP/PSA is using to provide imported fertilizer for sale inside Afghanistan.

Our first article discusses the role of chemical fertilizers in unlocking wheat yield potential. For improved as well as the more traditional seed varieties found in Afghanistan under conditions of rainfed and irrigated cultivation, the grain production per unit of land area, or "yield", increase can be dramatic if essential quantities of nitrogen and phosphorus are made available.

We move from a discussion of the technical merits of fertilizer use on wheat to the question: Who is most likely to benefit from and use fertilizers? Based upon the most conservative assumptions regarding fertilizer impact and adoption, the market for near term adoption is identified along with the annual quantities of domestically produced and imported fertilizers that will be required by this group of farmers.

A comparison of the costs of importing fertilizer versus that of an equivalent amount of wheat demonstrates in simple financial terms the benefits of fertilizer imports. Recent changes in the value of the Afghani are illustrated because they make imports of agricultural inputs look even more favorable. Finally, we provide a glimpse of what is involved in moving large quantities of fertilizer and distributing it for sale inside Afghanistan.

ASSP/PSA is working on an additional fertilizer procurement in time for the fall wheat crop. We believe that making fertilizer available will result in the greatest increase in food production in Afghanistan. In the pages that follow we make our case and invite comment from others concerned with rebuilding Afghan agriculture.



Miles Toder
Deputy Chief of Party

Cover: Anxiously clutching the DAP upon which his family's harvest depends, this young man in Kandahar completes the final phase of the journey of DAP fertilizer from factory to field.

The Afghanistan Agriculture Sector Support Project/Private Sector Agribusiness (ASSP/PSA) is a development assistance program implemented by Development Alternatives, Inc. and funded by the Office of the United States Agency for International Development, Representative for Afghanistan.

ASSP/PSA focuses its efforts in two areas of Afghan agricultural development. It provides technical training for farmers in Afghanistan to increase food production and it gathers, analyzes and disseminates information about agricultural markets and production.

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CHEMICAL FERTILIZERS:

The Key for Improved Food Production

Wheat is the most important food crop grown in Afghanistan. Plant growth and grain yield depend upon the presence of 16 essential elements in the soil. To assure maximum growth and yield ALL the elements must be present in sufficient quantity and in an available form.

An annual wheat yield of four metric tons per hectare (116 seers per jerib) is considered to be a realistic target using improved seed varieties. The problem is that this yield removes from the each hectare approximately 85 kg of nitrogen(N), 43 kg of phosphorus (P_2O_3), and 26 kg of potassium (K_2O) each year. If the straw is removed from the field for livestock feed, as is the case in most of Afghanistan, even more nutrients are lost. Usually, the longer soils are cropped without the addition of farmyard manure or chemical fertilizers, the more deficient they will become. If nutrients are not replaced, production will eventually drop to zero.

Air and water provide necessary carbon, hydrogen and oxygen, but most plants need large quantities of nitrogen, phosphorus and potassium as well. Most soils have the other

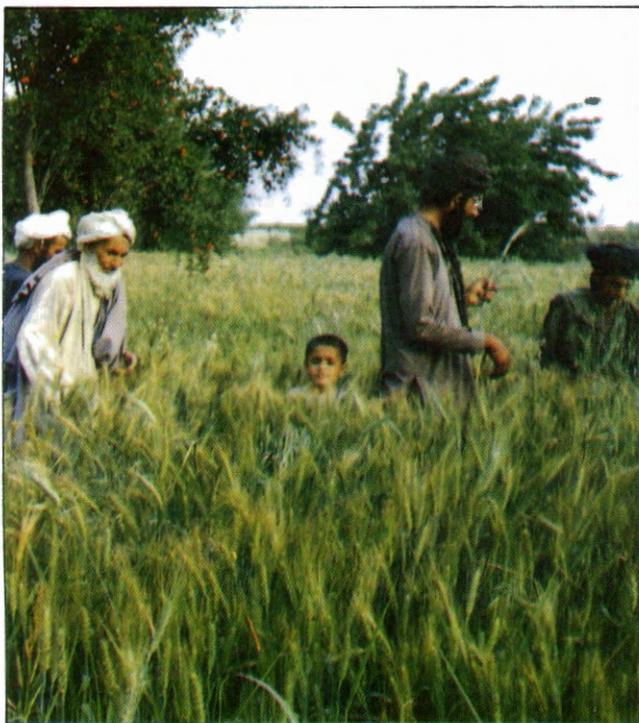
ten elements (calcium, magnesium, sulfur, zinc, copper, manganese, iron, molybdenum, boron and chlorine) in varying amounts in organic or inorganic form.

The amount and kinds of nutrients which need to be added to fields depend upon the species of crops grown and the length of time the soil has been cropped without the addition of fertilizers. Quantities of the major nutrients removed by a crop can vary from as little as 40 kg to as much as 285 kg nitrogen, 5 to 95 kg phosphorus, and 5 to 320 kg potassium per hectare.

The best way to estimate the fertility level of soils and the amount of a particular nutrient to be added is to take soil samples from each field. These samples are analyzed in a laboratory to determine which nutrients are deficient and what kinds and amounts of nutrients should be added to achieve specific crop yield goals.

If laboratory testing is not possible, as is the case in Afghanistan, then the recommendations of agriculturalists who are now or who have previously worked with soil fertility in Afghanistan serve as the best guide.

There is a consensus among these experts that a good wheat crop requires additions of nitrogen and phosphorus fertilizers. Irrigated wheat crops which produce higher yields than rainfed crops require correspondingly larger amounts of fertilizer. The recommended amount of additional nitrogen for irrigated wheat varies from 100 kg to 140 kg per hectare; the amount of additional phosphorus (P_2O_2) varies from 50 to 70 kg per hectare.



The wheat is as high as little boy's eye in Helmand, 1990.

Natural Versus Chemical Fertilizer

Nutrients in organic form, such as farmyard manures, are an excellent source of plant nutrients, but are usually difficult to obtain in the quantities needed. The major nutrient composition of farmyard manure is typically 0.5% nitrogen, 0.25% phosphorus (P_2O_2) and 0.5% potassium (K_2O). To supply all of the nitrogen and phosphorus required to fertilize just one hectare of irrigated wheat, 20 tons of farmyard manure are required. This assumes, probably unrealistically, that all the nutrients would be available during the first year.

CHEMICAL FERTILIZERS Continued ...

The most efficient way to add necessary nutrients to croplands is by chemical fertilizers. The most readily available source of nitrogen in Afghanistan is the chemical urea, produced from natural gas. By weight it is 46% nitrogen. One hectare of irrigated wheat can be fertilized by an application of 217 kg of urea - much more manageable than the 20 tons of manure of equivalent effectiveness.

Afghanistan currently is unable to exploit its mineral wealth and produce phosphate fertilizers. There are several sources of imported phosphorus, usually referred to as "black" or "gray" fertilizer, which contain varying amounts of phosphorus. Diammonium phosphate (DAP) contains 46% phosphorus, one of the highest percentages among alternative sources. This high concentration of phosphorus translates into lower shipping and handling costs, making DAP the best and most economical for the Afghan farmer. To

supply the 50 to 70 kg phosphorus needed to fertilize one hectare of irrigated wheat, 108 to 152 kg of DAP are required.

The Payoff

Applying proper amounts of phosphorus and nitrogen to wheat production results in a significant payoff. The fourth report, **Fertilizers**, of the Agricultural Survey of Afghanistan gives the results of countrywide trials in Afghanistan during 1976-77. The trials were conducted on different soil types, were assumed to be on irrigated land and included improved and local wheat seed varieties. When 175 kg of urea and 125 kg of DAP were used (103 kg nitrogen and 57 kg P₂O₅), yields increased from 34 to 108 percent. The average wheat yield increase from the applied fertilizer was 2,585 kg per hectare.

پهچې د اړوندو کسانو لپاره د ایالات متحده لخوا
USAID

مقایسه وخواص گندم های اصلاح شده با گندم های محلی



ASSP

۱. گندم های اصلاح شده مقابل امراض برخی مقاومت دارد.

۲. از کودهای کیمیاوی استفاده بیشتری نباید کرده نیست تواند.

۳. اگر گندم های محلی قبل از زمانه ضعیف داشته سبب چپ شدن میشود.

۴. نسبت به اگر گندم های اصلاح شده دیدیر تر میرسد.

۵. حاصل گندم های محلی کم است.

۶. در هجان با وجود نجات زیاد متعجب خوب پرست نیارده است.

۱. گندم های اصلاح شده مقابل امراض برخی مقاومت دارد.

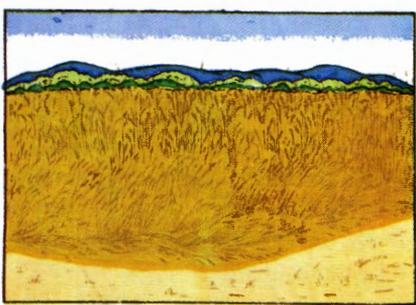
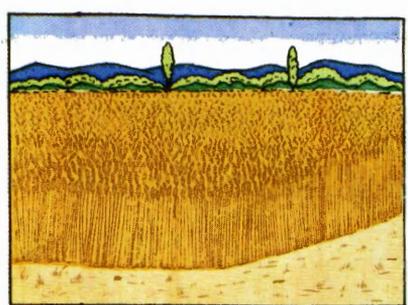
۲. از کودهای کیمیاوی استفاده بیشتری نباید.

۳. رساقه های قوی ثابته زیاد داشته به آسانی چینی شود.

۴. نسبت به اگر گندم های محلی زودتر میرسد.

۵. حاصل گندم های اصلاح شده زیاد میباشد.

۶. در هجان از حاصل خود رضی و خوشحال میباشد.




The expressions of these men reflect the impact of improved seed upon crop yield. This is one of the series of silk screen prints designed by DAI artist, Aminullah Baqizad.

THE MARKET FOR FERTILIZERS

Agricultural experts the world over agree that a combination of improved seed and chemical fertilizers results in greatly increased crop “yields” or production per unit of land area. Improved wheat production is the major agricultural concern in Afghanistan. If fertilizer holds the key to unlocking yield potential, two important questions must be answered: Does Afghanistan produce enough fertilizer for its own use? How much imported fertilizer may Afghan farmers be expected to use?

How Much Is Enough?

Dr. Ed Rice, consultant to ASSP/PSA and a cereals agronomist with USAID/Kabul in the early 1970's, conducted extensive field trials with nitrogen and phosphorus fertilizers in some of Afghanistan's rainfed and irrigated lands to determine optimal application rates and methods for obtaining maximum wheat yields.

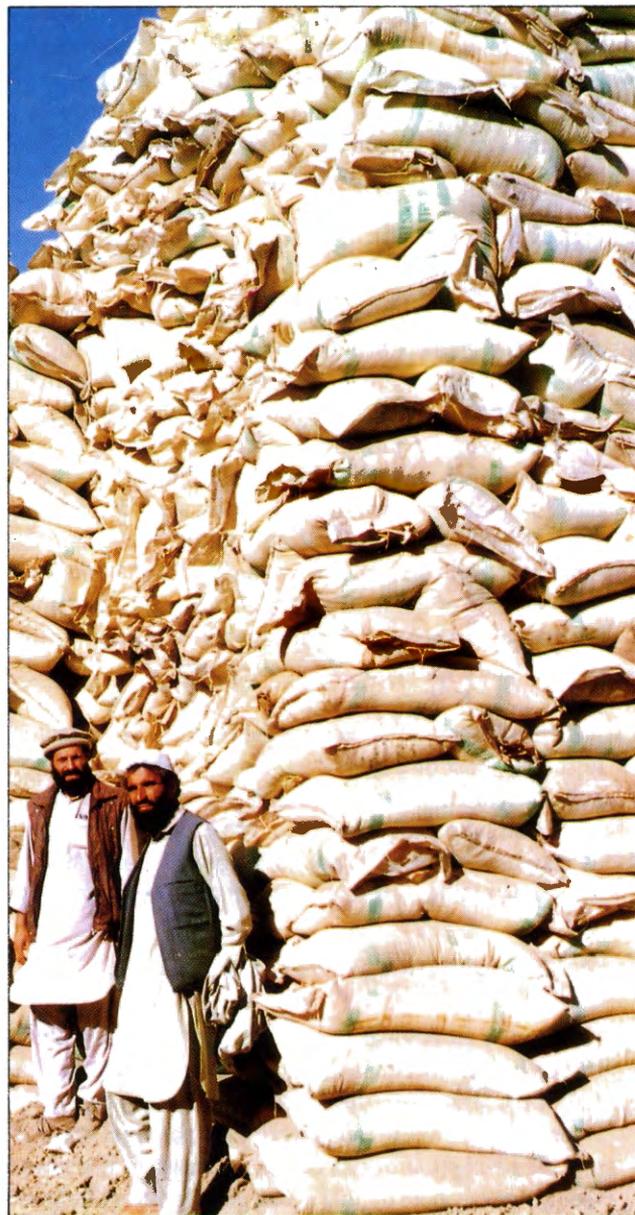
Dr. Rice reports that, although conditions vary widely across the countryside, as a general rule, phosphorus in the form of DAP applied at the rate of 125 kg per hectare on irrigated land and 70 kg on rainfed areas was necessary to achieve optimum yields. Approximately twice as much nitrogen-rich urea was required.

These figures when combined with the best estimates of the land areas under cultivation provide an upper limit to the Afghan farmers' possible demand for chemical fertilizers.

How Much Land Is Planted in Wheat?

Scientific methods for determining the elements necessary for plant growth are more advanced than they are for estimating the amounts of land under irrigated and rainfed wheat cultivation in Afghanistan in any given year. It is now possible to improve upon traditional estimates by using a combination of satellite imagery and conventional wisdom about how Afghan farmers use their land.

The pre-war Kabul government estimated in the early 1970s that throughout Afghanistan there were just under 1 million hectares of rainfed land and 1.3 million hectares of irrigated land under cultivation. These estimates were made using a combination of enumeration and field surveys from which totals were extrapolated.



DAP was piled in Wardak Province in 1989.

Today, with the help of satellite imagery taken between 1989 and 1991, ASSP/PSA estimates much higher figures. When adjusted to account for the difficulty of interpreting data and the need to discount estimates for roads, canals and other non-crop land uses, a reasonable, but educated, guess is that there are now about 1.9 million hectares of rainfed and 1.8 million hectares of irrigated land under cultivation.

THE MARKET FOR FERTILIZERS *Continued...*

Conventional wisdom suggests that 65% of all agricultural lands in Afghanistan are planted in wheat. That translates to 1.23 million hectares in rainfed areas and 1.2 in irrigated lands. If urea and DAP fertilizers are applied in all areas at the rates recommended for Afghanistan, there is a potential annual demand for 236,000 metric tons of DAP and 472,000 metric tons of urea.

Who Is Likely to Buy Imported Fertilizer?

Farmers most likely to demand fertilizer are those who will receive the greatest benefit from the addition of supplemental chemical fertilizer. An agricultural survey made in 1990 by the Swedish Committee for Afghanistan reports the percentage of farmers in each province who use a variety of improved wheat seed. Limiting the market to those farmers who are already familiar with using improved seed, alone or in combination with chemical fertilizers, reduces the potential market for DAP and urea to about 25% of the farming population. This adjustment results, conservatively, in a demand for 54,000 metric tons of DAP and 118,000 metric tons of urea.

Afghanistan has the capacity in the Mazar-i-Sharif factory to satisfy most of the nitrogen demand of those farmers most likely to use the recommended levels of urea. There is no local supply of phosphorus. If the lack of phosphorus as supplied by DAP is not to become a constraint for achieving optimum wheat yields, it must be imported.

What Determines DAP Adoption?

How much an Afghan farmer will pay for a potentially bigger harvest depends largely upon the difference between the cost of fertilizer and the selling price of his wheat. As elsewhere in the world, the potential for profit and the perception of risk drives the market. If a farmer sees his wheat yield double in one year, he most likely will want to buy enough fertilizer to repeat the harvest the next year. If there is a healthy profit between what he must pay for the fertilizer and the selling price of his wheat, his incentive to buy the fertilizer is increased.

Researchers have learned that farmers in developing countries like Afghanistan look for a return of 200% or more before adopting new technologies. A measure called a Value Cost Ratio (VCR) has been developed to assess the acceptability of a new technology based upon the minimum acceptable level of return. The VCR compares the

marginal value of the crop produced by the use of the new technology with the cost of that technology. The minimum desired ratio is 2:1, but experience shows that if a technology does not involve learning new skills or making large financial investments, a lesser profit may be acceptable.

The application of fertilizer is not a new practice in Afghanistan. The urea producing factory has made this type of fertilizer, which provides a good source of nitrogen, widely available for some years. Although DAP and the benefits of its use are relatively less known to the Afghan farmers, the greater impediment to its use is the increasingly large outlays of cash needed for purchase.

The value of the crop and the cost of fertilizer are determined by supply and demand. Figure 1. shows nominal wheat prices adjusted to the farm gate as reported by ASSP/PSA monitors from July 1990 through March 1992. Prices during the same period for DAP and urea are shown as well.

How Economical Is Imported Fertilizer?

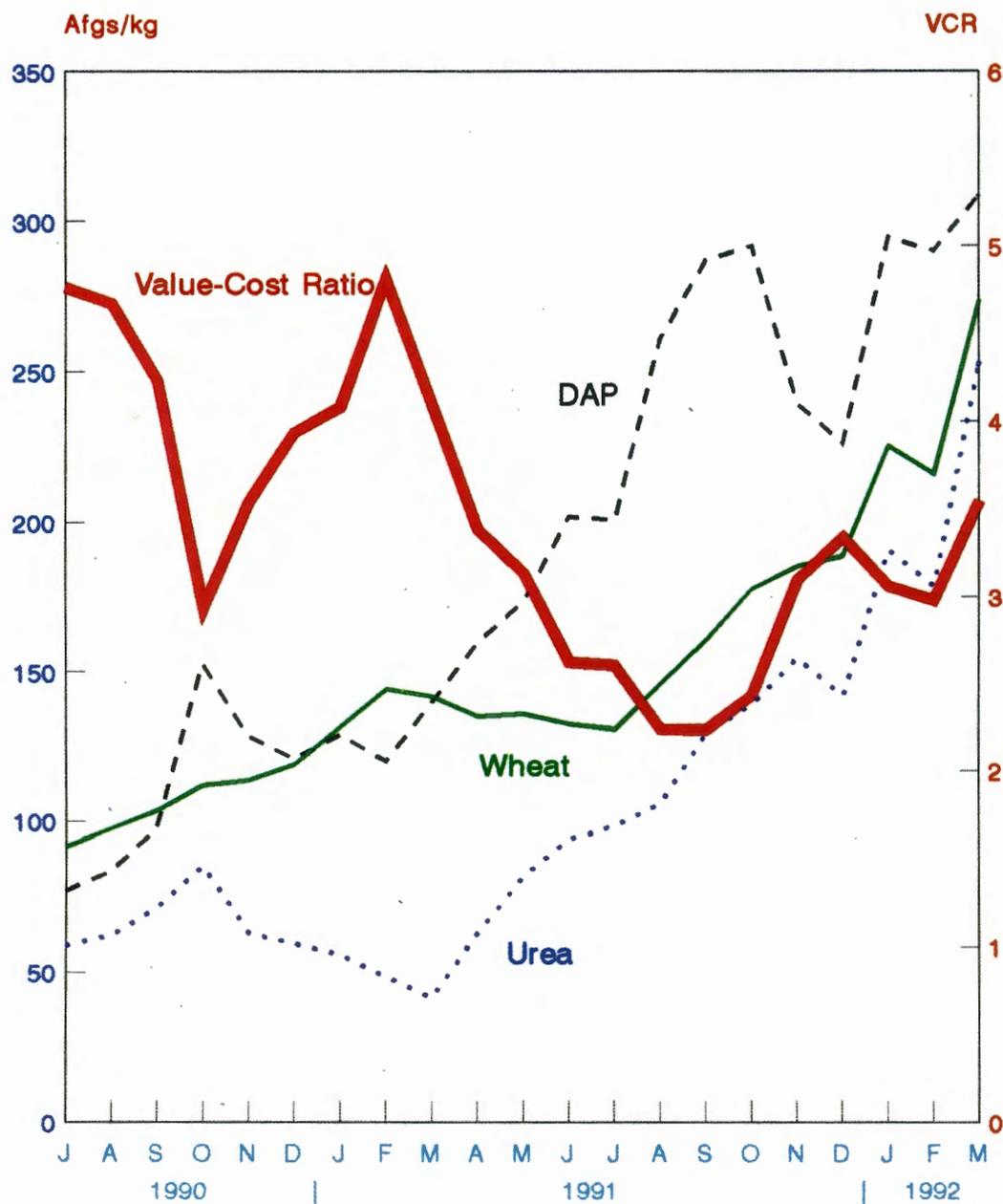
Constant price changes for wheat and DAP require a careful assessment of just how feasible it is for farmers, even those who might benefit most from the use of DAP, to adopt this innovation. Using the value-cost ratio as a measure of likelihood produces some encouraging results.

The ratio is calculated assuming that 1 kg of DAP results in 4 kg of additional wheat production, a relationship established through field trials and confirmed in actual on-farm use. When prices paid by the farmer for DAP and money received by the farmer for the sale of his wheat are considered, the resulting ratio of the increased value of the product to the cost of DAP use is expressed as the value-cost ratio illustrated in Figure 1.

While the VCR swings with the price fluctuations of both wheat and DAP, it is most sensitive to the price volatility of DAP. In no case does it drop below the critical 2:1 threshold. With the exception of a period from August - November 1991 when DAP prices escalated rapidly because of a sudden shortfall and demand exceeded supply, the VCR has remained and continues to be above 3:1. Abrupt swings in the ratio may give farmers the impression that DAP adoption is anything but a sure bet. Nevertheless, the fact that the ratio is so favorable and is headed up after the retreat of 1991, the suggestion is strong that the attitudes toward DAP adoption will be favorable.

Figure 1

Afghanistan Wheat and Fertilizer Prices: Impact on DAP Value-Cost Ratio



ASSP/PSA Information Unit
April 92 - DAPVCR2.ch3

THE CASE FOR IMPORTS

The case for chemical fertilizers is best made by examining the additional food produced by their proper use and application. The results are dramatic whether measured in terms of the amount of additional wheat produced, its value in terms of dollars, or the number of people who may be fed by it. The costs of importing DAP compare very favorably with the costs of importing wheat for human consumption.

As illustrated in Table 1, the impact is quite dramatic even in the most conservative situation - only those farmers who are reported to have used improved seed under irrigated conditions have access to the 54,000 metric tons of DAP.

With the addition of DAP at the recommended rates, the wheat yield on the 432,000 hectares worked by these farmers is increased by 25%. An additional 272,000 metric tons of grain are produced at a value of \$59 million. It is enough to feed 1.5 million Afghans for one year.

The cost of importing 54,000 metric tons of DAP to the Afghan/Pakistan border is \$330 or less per metric ton or an estimated total cost of \$17.8 million. (Table 2.) Using this base price Afghan farmers will have to pay about \$18 per

50 kg bag to their local distributor. This price is at the high end of the range paid in past years, but promises returns above a critical level of the 2:1 value cost ratio. The dramatic strengthening of the Afghan currency in the month of April makes it even more affordable. Some subsidy may still be necessary to encourage farmers to use DAP, if donor procurement and shipping requirements keep prices at this level.

By comparison, the cost of importing an equivalent amount of wheat is estimated at \$US 56 million, just over three times the cost of importing DAP. This figure is reached by adding the \$168/metric ton price FOB US Gulf and the \$38/metric ton shipping and handling cost from the US Gulf area to the Afghan border and multiplying the sum by 272,000 metric tons of grain.

These relatively simple financial calculations are only one part of the decision. Which approach or combination of approaches should be taken to provide food grain for Afghanistan requires analyses from an economic and social perspective as well. The import and sale of chemical fertilizers appear to be attractive.

Table - 1

ESTIMATED DAP RESPONSE AND IMPACT

Area planted (Hectares)	Average yield without DAP (MT/Ha)	DAP yield increase (%)	Expected yield (MT/Ha)	Wheat production due to DAP (MT)	Value of increased yield (US\$)	Food Requirement for one year (Persons)
432,000	2.5	25	3.13	272,000	59,600,000	1,500,000

Assumptions

1. Sufficient Urea available and applied
2. Application rates of 125 kg/ha
3. Improved seed
4. Irrigated
5. Value of grain established of US\$ 219/mt based upon March 1992 average retail prices and exchange rate of 1470 Afs/ US\$
6. Food requirements estimated at 180 kg/person/year

A Currency On The Way Up

The month of April 1992 witnessed changes in the value of the Afghani unlike anything seen in the past three years. 1991 began with the Afghani continuing its loss in value relative to the US dollar. (Figure 2) In December the rate of decline increased dramatically only to settle back to a more gradual erosion with the start of the new year.

In March, fueled by political events, the trend reversed with the sudden reversal in the fortunes of this much maligned

currency. April saw dramatic increases in the value of the Afghani as it fell from 1300 to a low of 353 Afghani to the US dollar. (Figure 3) Where it goes next is anyone's guess.

What this means for the agricultural sector is still unclear. In the immediate future the costs of buying imports, such as chemical fertilizers, look more attractive.

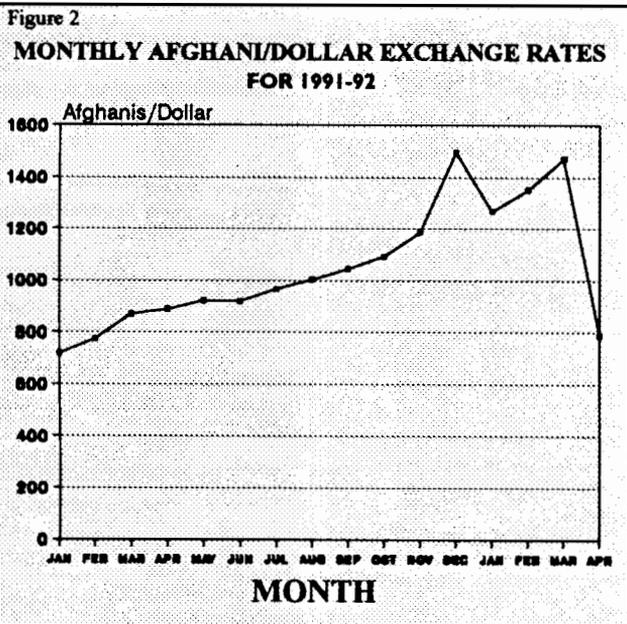
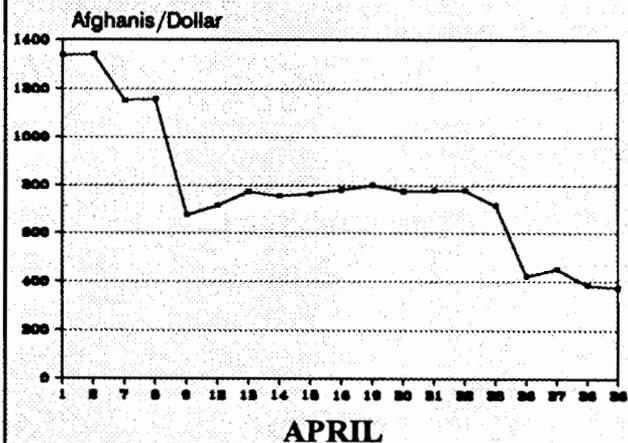


Figure 3

DAILY AFGHANI/DOLLAR EXCHANGE RATES FOR APRIL 1992



Month	Date	Daily exchange Rate AFG/\$
APRIL, 1992	01	1337.5
	02	1345.5
	07	1151.0
	08	1158.5
	09	675.8
	12	715.5
	13	772.6
	14	755.2
	15	763.4
	16	780.1
	19	799.7
	20	774.2
	21	777.9
	22	777.9
	23	715.0
	26	422.9
	27	451.4
	28	385.5
	29	375.2

DAI/ASSP Information Unit

Table - 2

PROVIDING 272,000 METRIC TONS OF WHEAT: TWO ALTERNATIVES

Cost of imported DAP US (\$)	Cost of equivalent imported wheat US (\$)
17,800,000	56,000,000

Assumptions

1. DAP cost at US\$ 330/Metric Ton
2. Wheat cost at US\$168/Metric Ton FOB US GULF plus \$US38/Metric Ton shipping and handling to Afghan border.

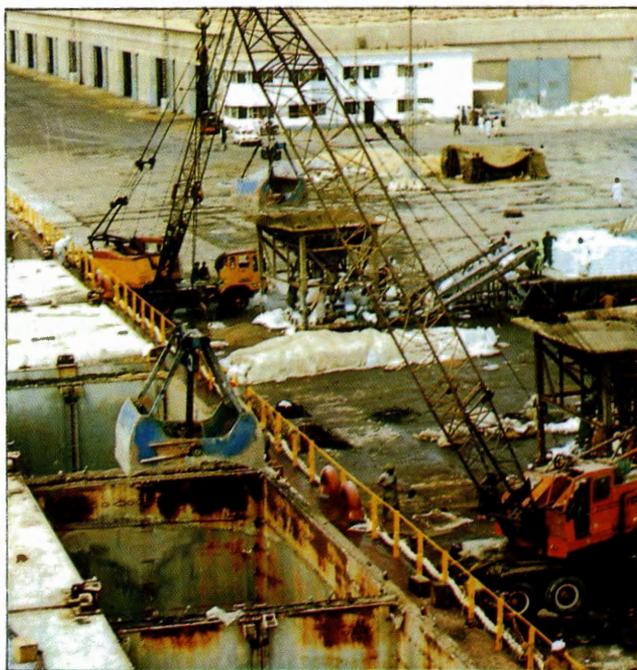
Moving Fertilizer from Factory to Field

DAI's efforts to deliver DAP to Afghanistan require careful planning and close coordination between the contractors for transport and distribution and the ASSP/PSA logistics unit.

In the first phase, 12,500 metric tons of DAP were purchased in the US with USAID funds and shipped in bulk aboard an ocean going barge to Karachi. At Port Qasim the fertilizer was unloaded and placed in 50 kg bags, specially labeled in English and Dari. The bags were tagged for identification and monitoring purposes.

The DAP was then transported across Pakistan to leased storage facilities in Chaman, Peshawar and Quetta. Great care was taken to make sure that the bags weighed within a narrow range of the 50 kg standard.

The final phase of the distribution plan is for trucks provided by the Afghan Fertilizer Group (AFG) to pick up the 160,000 bags of fertilizer marked for commercial sale and move them from the warehouses to the Afghan border. DAI expects to pay the shipping costs to the border and escort the shipment that far. At the border crossing the contractor will pay 300 Rupees per bag of DAP and assume full responsibility for the



Off-loading and bagging DAP at Port Qasim.

cargo. To carry out the shipping with the least possible amount of handling, which is time consuming, costly and potentially damaging to the bags, the same trucks will be used throughout the journey from warehouses to distribution sites in Afghanistan.

These complicated transportation arrangements are necessary to enable Afghanistan to receive large quantities of imported goods. Since hostilities began in 1979 Pakistan has stopped providing Afghanistan with a customs free "pipeline" from port to border. USAID and other donor agencies may transport goods duty free, but must guarantee the surety of shipments.

The price charged for DAP at the border has been set by DAI in consultation with AID/REP deliberately higher than the price of DAP in Pakistan to discourage "flowback" and yet still be economical for Afghan farmers. The in-country sales of DAP will be closely monitored by DAI extension agents to assure delivery to those areas targeted by ASSP/PSA and to enable the agents to give advice on the best methods and rates of application.



The trucks get under way from Karachi .

The Private Sector Takes Over

Beginning in early May 1992 about ten big trucks a day will be rolling into Afghanistan loaded with 50 kg bags of the phosphate fertilizer DAP. It is destined for use in agricultural areas specifically targeted by ASSP/PSA extension workers. Nasrullah Rehmat, representing the Afghan Fertilizer Group (AFG), estimates it will take between 40 and 50 days to move the 160,000 bags (8,000 metric tons) of DAP, provided by USAID and stored by DAI in warehouses in Quetta, Chaman and Peshawar near the Pakistan/Afghan border.

The pressure is on to move the DAP as quickly as possible to make available the phosphate fertilizer recommended for spring crops such as corn, rice, vegetables and fruits and to position the rest for the all important fall wheat crop. It may seem a bit early to start stockpiling, but in Afghanistan the unstable political and military situation dictates getting essential, non-perishable commodities in place while the "window of opportunity" is open.

Moving and marketing 8,000 metric tons of fertilizer is no small undertaking. ASSP staff will be working closely with AFG representatives this spring to monitor and to learn how better to do the job in the future. The AFG consortium shares the view of ASSP/PSA analysts that the best wheat yields this autumn will require as much as five to seven times the amount of DAP brought in this spring. The AFG is supporting this view by investing a substantial sum of money in the purchase of fertilizer.

The initial step being taken now by the AFG is reaching agreement with "transporters" from the areas targeted by ASSP/PSA to carry the DAP to those areas where it will be sold by members of AFG staff. Lining up the right "transporters" is important to assure safe and reliable delivery at a time of great change and uncertainty in the countryside.

June and July are usually months of little demand for fertilizer. The spring crops are in the ground and the fall planting is still several months away. Convincing farmers to buy ahead and store fertilizer for use in the autumn may not be so easy. One big hurdle is likely to be the lack of good storage spaces; many of them have been destroyed and not yet rebuilt.

An even bigger problem on the horizon is that to assure delivery of the large amounts of DAP needed for the autumn planting, orders must be placed before this first trial run of



It isn't all hard work in the warehouse.

marketing fertilizer through the consortium can be completed. Incomplete data must be the basis for the critical decisions which must be made in early summer.

While acknowledging these problems, Nasrullah Rehmat, president of the Rehmat Fruit Processing Co. with headquarters in Kabul and Karachi, warms to discussion of the challenge facing him. He sees an opportunity not just to strengthen the food import/export business which has been the Rehmat family interest for many years, but the chance to develop a new kind of agribusiness in Afghanistan.

He looks toward the placement of teams of trained agricultural workers in centers throughout the country and, through them, the sale and distribution of equipment, commodities and modern technology. The model is one of providing agricultural extension to farmers through the private sector. For Afghanistan to become self-sufficient in food supplies and, eventually, to produce surplus crops for export, Mr. Rehmat sees the need for aggressive private sector involvement.

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The trucks get smaller as the DAP gets closer to its destination.

Staff Artist Is Self-taught

Aminullah Baqizad, the artist who has created for ADT the set of five silk screened posters which are appearing in **Agricultural Developments in Afghanistan** and who has illustrated many DAI publications, is self-taught. An older brother gave him some instruction and he practiced by preparing illustrations for friends and faculty while he was a student.

Aminullah describes his talent and interest in drawing and

calligraphy as a hobby; his degree from Kabul University is in economics with special emphasis on statistics.

His desk at DAI is usually cluttered with sketches of things like bugs or blight infested plants, garlic cloves and apples. Recently he has been busy drawing illustrations for a new staff training manual covering high value horticulture crops.

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