PN-ACC-181

Georgia, Armenia, and Azerbaijan: An Assessment and a Strategy to Develop Agricultural Input Markets in the Caucasus

Submitted to

The United States Agency for International Development

Grant No. EE-WN17-97-22112-KG13

by

The International Fertilizer Development Center

February 1998

Table of Contents

List of Appendices

Acknowledgments

The International Fertilizer Development Center (IFDC) acknowledges the support and encouragement of the United States Agency for International Development (USAID) in affording an opportunity to make a contribution to agricultural development in the Caucasus and to American foreign policy in the region.

Charles Uphaus, Norm Sheldon, Marcus Winter, Paula Feeney, Caryle Cammisa, Gerry Donneley, Debra Mosel, Faraj Huseinbeyov, and Elchin Kuliyev were singularly outstanding in making logistical arrangements which allowed the assessment team to work in an efficient and timely manner.

IFDC recognizes with particular gratitude the contributions of the citizens of Georgia, Armenia, and Azerbaijan who guided the assessment team and offered their insights and knowledge about developing a prosperous agricultural economy in the Caucasus.

Preface

This report on agricultural input markets in the Republics of Georgia, Armenia, and Azerbaijan is based on an assessment conducted by the International Fertilizer Development Center (IFDC) in September-November 1997. The IFDC team was comprised of Thomas P. Thompson, Team Leader; Balu L. Bumb, Policy Economist; Donald R. Waggoner, Fertilizer Production Specialist; Channing Sieben, Input Marketing Specialist; and Thomas E. Bayley, Transportation and Distribution Specialist.

The assessment focused on fertilizers, seeds, crop protection chemicals, agricultural machinery, and credit. The assessment began on September 30 in Georgia, October 17 in Azerbaijan, and October 27 in Armenia. The field work was completed on November 3, when a debriefing was held with the USAID Regional Office in Yerevan.

The assessment and strategy presented and discussed in this document are intended to provide USAID with observations and recommendations that may be used to develop a network of private agricultural input dealers in the Caucasus. The strategy is in part based on the experiences of IFDC in conducting similar work on behalf of USAID in Albania and Bangladesh where private input markets are prosperous and flourishing.

Abbreviations and Acronyms

Organizations

ACDI/VOCA	Agricultural Cooperative Development International/ Volunteers in Overseas Cooperative Assistance
ACB	Agricultural Cooperative Bank
ADRA	Adventist Development and Relief Agency
AED	Academy for Educational Development
APB	Agroprombank
ATG	Armenian Technology Group
CARE	Cooperative for Assistance and Relief Everywhere
CIS	Commonwealth of Independent States
CLAU	Caucasus Logistics Advisory Unit
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECU	European Currency Unit
EF	Eurasian Foundation
EU	European Union
FSU	Former Soviet Union
GFU	Georgia Farmers' Union
GOA	Government of Armenia
GOAZ	Government of Azerbaijan
GTZ	German Agency for Technical Cooperation
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
MOA	Ministry of Agriculture
MWO	MidWest Oilseeds
NGO	Nongovernment Organization
SEED	Seed Enterprise Enhancement and Development Project
TACIS	Technical Assistance for Commonwealth of Independent States
TRACECA	Transport Corridor for Europe, Caucasus, and Central Asia
UMCOR	United Methodist Committee on Relief
U.S.A.	United States of America
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WFP	World Food Program
WV	World Vision

Abbreviations and Acronyms (continued)

Fertilizers

AN	ammonium nitrate
DAP	diammonium phosphate
HNO_3	nitric acid
K	potassium
K_2O	potash, expressed as potassium oxide
MAP	monoammonium phosphate
MOP	muriate of potash
N	nitrogen
P	phosphorus
P_2O_5	phosphate, expressed as phosphorus pentoxide
SSP	single superphosphate
TSP	triple superphosphate
15-15-15	blended N, P_2O_5, K_2O

Units of Measurement and Miscellaneous

C	centigrade
CPC	crop protection chemical
f.o.b.	free on board
gal	gallon
GDP	gross domestic product
h	hour
ha	hectare
hp	horsepower
HYV	high yielding variety
kg	kilogram
km	kilometer
mm	millimeter
mt	metric ton
mtpd	metric tons per day
mtph	metric tons per hour
mtpy	metric tons per year
ROP	run of pile
US $	United States dollar
VAT	value-added tax

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Introduction

Agriculture is an important component of the national economies of Georgia, Armenia, and Azerbaijan; as shown in **Table 1** it represents 70%, 46%, and 36% of gross domestic products, respectively. Each of the three countries comprising the Caucasus has unique circumstances and shares problems that resulted from the collapse of the Soviet Union. Their common problems include disruption of trade, shortages of all agricultural inputs, limited opportunities for marketing agricultural production, limited opportunities to earn foreign exchange through agricultural means, and declining yields to name but a few. The collapse of state farms and cooperatives and the redistribution of the land to employees created a situation where people with limited knowledge of agriculture received land, thus the concept of "farmer" is not entirely appropriate to the region and is misleading. "People with land" is a more appropriate and instructive concept.

Table 1. A Comparison of Agricultural Indicators Among Georgia, Armenia, and Azerbaijan

Characteristic	Georgia	Armenia	Azerbaijan
	(ha)		
Total area	6,970,000	2,980,000	8,660,000
Total land area	6,900,000	2,974,000	8,610,000
Arable land	804,000	495,000	1,549,800
Permanent crops	278,800	86,000	230,000
Pasture	2,021,300	804,000	2,600,000
Forest, woodland, and other	3,803,200	1,590,000	4,230,200
Irrigated area (estimated)	466,000	305,000	1,401,000
Percent of work force in agriculture	42	25	35
Percent of gross domestic product (GDP) in agriculture (1993/94)	70.0	46.0	36.0

Sources: World Bank, "Agriculture and Food Sector Reviews," 1996; and Internet websites for Georgia, Armenia, and Azerbaijan.

These problems should not be construed to mean that agriculture in the Caucasus is not worthy of the United States Agency for International Development (USAID) technical assistance or that potential is severely limited.

After independence from the Soviet Union in 1991, all countries in the Caucasus experienced disruption and reduced economic activity caused by the collapse of the command economy structures and trade linkages, macroeconomic instability, foreign exchange shortages, political turmoil, war between Armenia and Azerbaijan, and civil war in Georgia. Even during this difficult and transitional period (1991-95), the agricultural sector remained productive, continued to produce significant but reduced output, and became a major contributor to gross domestic product (GDP). During 1993-94, the share of agriculture in GDP increased to 70% in Georgia, 46% in Armenia, and 36% in Azerbaijan. Although, after 1994-95, recovery in other sectors of the national economy naturally reduced the share of agriculture in GDP, agriculture continues to play a critical role in generating income, employment, and foreign exchange earnings and supplying food and fiber to the population of the Caucasus. About one-third of the population is directly employed in the agricultural sector and agriculture contributes one-fourth to one-third of GDP. Wheat, maize, grapes, potatoes, cotton, tobacco, tea, and fruits and vegetables are dominant crops. Livestock, especially sheep and goats, is also an important activity. During the Soviet era, the region was a major source of wine, fruit, and vegetables (fresh and processed) to the Soviet Union.

Georgia

Georgia is largely an agricultural based economy with a population of 5.4 million. Currently, agriculture contributes over one-third of GDP and employment and has a potential to become an important source of foreign exchange earnings. During the Soviet era, Georgia was a net exporter of agricultural commodities. The ratio of exports to imports averaged 1.7. With the disintegration of the Soviet Union and command economy, Georgia became food insecure and a net importer of agricultural commodities including bread, milk, sugar, and oils. In 1996 net agricultural imports amounted to US $195 million. Georgia also received food aid from the European Union (EU) and the United States of America (U.S.A.). Self-sufficiency in bread and related products dropped from 67% in 1990 to 35% in 1993 and crop production was only 33% of the 1987 level. However, after 1994, agricultural production increased appreciably, although it remains below that of the Soviet

period. Grain production increased from 257,000 mt in 1994 to 420,000 mt in 1996 and the value of agricultural produce was estimated to be US $1,102 million.

Currently, the agricultural sector is passing through *transition* from the command economy to the market-based economy where traditional organizational structures and systems have collapsed or become dysfunctional, but new organizations and institutions have not emerged. Moreover, disintegration of the Soviet Union has disrupted trade linkages with former Soviet Republics and input and output supply systems are in disarray.

Georgia has a total land area of 69,000 km^2 (6.9 million ha). Of this, 3.1 million ha (43%) is agricultural land and 3.8 million ha is covered by forests and others. Of the agricultural land, 26% is arable land, 9% is under perennial/orchards, and 65% under pastures and fallow. Wheat and maize are major food crops, and tea and grapes (for wine) are important industrial crops.

Georgia has good soils and agroclimatic conditions suitable for wheat, maize, tea, grapes, potatoes, oilseeds, and fruits and vegetables. Despite good agroecological conditions, crop yields are low averaging about 1.4 mt/ha for grains. Major factors responsible for low crop yields are: lack of improved seed, low or no use of fertilizers and crop protection chemicals (CPCs), inadequate and inappropriate availability of machinery, and above all, lack of farming skills. A transition from state farms to private farms has not been adequately accompanied by training and education of new landowners about decisionmaking, farm management, and agronomic practices. The lack of input and output markets also discourages farmers from adopting yield-enhancing technologies because increased crop output cannot be sold at a profitable price and leads to waste of fruits and vegetables.

With the adoption of appropriate technologies and development of supporting institutions and marketing infrastructures, Georgia can achieve self-sufficiency in grain and become a net exporter of other agricultural commodities. Fruits and vegetables, tea, and wine offer strong potential for exports. One can justifiably ask the question: Does Georgia have a comparative advantage in producing agricultural crops, especially wheat and maize? To answer this question, comprehensive data are needed on farm budgets, input-output prices, and crop responses to modern technologies. However, such data are not available because data collection systems are not fully developed, and experimental stations have not conducted demonstrations since the disintegration of the Soviet Union. Hence this question has to be answered by data available from other sources having similar conditions.

Demonstrations conducted by Agricultural Cooperative Development International/ Volunteers in Overseas Cooperative Assistance (ACDI/VOCA) in Georgia indicate that with improved seeds, adequate and timely application of fertilizers and CPCs, and proper agronomic practices, grain (maize and wheat) yields can be easily increased by 100%-200%. Evidence from several countries including Albania and Poland suggests that at low levels of fertilizers, 1 mt/ha of nutrients from mineral fertilizer use can increase grain yield by 10-15 mt/ha. Assuming conservatively that 1 mt of fertilizer nutrients yields 10 mt of additional grain and the cost of fertilizers and other associated inputs is about 5 mt grain-equivalent, application of one additional mt of fertilizer nutrients and associated inputs generate a net social benefit of 5 mt of grain-equivalent. In 1996, 1 mt of fertilizer nutrient cost on average 2 mt of grain (maize and wheat) in the world market. Thus, an investment of 2 mt grain-equivalent in modern technologies using improved seeds, fertilizers, and other inputs generates a net social benefit of 250%. This evidence is consistent with observations made by some enterprising farmers in the Caucasus that if assured of timely and adequate supply of inputs, credit, and markets for the produce, profits of 100%-200% are possible. This is likely also the case for Armenia and Azerbaijan because these countries are endowed with similar agroecological conditions and are at the same low level of input use and technology adoption. It is obvious from these calculations that the Caucasus have a strong comparative advantage in grain production and can achieve food security by increasing domestic production of wheat and maize in a cost effective way.

Armenia

Unlike Georgia, Armenia was a net importer of food products including grain, meat, dairy products, and sugar but a net exporter of wine, brandy, and fruit and vegetables (fresh and processed). The disintegration of the Soviet Union severely affected Armenia because over 95% of food imports were from other republics of the Soviet Union. During the 1991-93 period, the war with Azerbaijan over Nagorno-Karabakh and civil war in Georgia nearly isolated the country from the rest of the world and reduced food supplies and domestic production drastically. These hardships and political difficulties forced the Government of Armenia to develop a program, called Target-Oriented Comprehensive Food Production Program, to achieve food self-sufficiency by 2005 by creating an enabling policy environment and devoting more resources to agriculture. As a result, Armenia transferred all land from state farms to private owners by 1993, removed subsidies on most inputs and outputs, withdrew from state procurement of grain and bread, and privatized state-owned enterprises.

Despite these efforts and political difficulties, it must be stressed that Armenia cannot, and should not, attempt to achieve 100% self-sufficiency in food because its resource endowment does not justify that goal.

Nevertheless, Armenian agriculture has considerable scope for growth and development for three reasons. First, soils and agroecological conditions are suitable and about 80% of the arable land is irrigated, although irrigation systems need rehabilitation. Second, crop yields based on traditional practices are low; most crop yields are about 50%-60% of realizable potential. With the adoption of modern technologies based on improved seeds, mineral fertilizers, and other associated inputs, grain yields can be increased from the existing 1.5 mt/ha to 2.5-3.5 mt/ha. Third, it is economically more beneficial to import fertilizers and other inputs to produce grain domestically rather than importing grain. Social and economic returns on such investment are very high, as shown above for Georgia.

With the collapse of the industries based on imported raw materials and energy during the post-Soviet era, agriculture has become an important sector of the national economy. Agriculture contributes over one-third of GDP and employment, compared with 18% before independence. In 1993 agriculture contributed 46% to GDP. By revitalizing traditional exports and promoting cost effective import substitution, agriculture can contribute to foreign exchange savings and balance of payments. Most importantly, a revitalized agriculture can make a critical contribution to food security, not food self-sufficiency, for the people of Armenia.

Currently Armenian agriculture is suffering from the same type of problems as agriculture in other transitional economies of Eurasia and Eastern Europe, that is, problems associated with the transition from Soviet command agriculture to market-based agriculture: disrupted trade linkages, foreign exchange shortages, dysfunctional organizational structures, lack of credit, extension and research support, fragmented landholdings, unskilled and inexperienced farming population, and undeveloped input and output markets, to mention only a few. The transition to a well-functioning and efficient agriculture based on market economy is daunting and requires investments in skills, infrastructures, institutions, and organizations.

Armenia has a total land area of 29,740 km^2 (3 million ha) and a population of 3.7 million. About half of the land area is suitable for cultivation and grazing — 495,000 ha arable land, 86,000 ha under perennial crops, and the remaining land under meadows and pastures. Grains, potatoes,

grapes, vegetables, and forage are important crops. With the disruption of trade linkages limiting exports of wine and vegetables to the former Soviet Union (FSU) and blockade during the war, the area under grain crops increased significantly — from 138,000 ha in 1990 to 208,000 ha in 1993. This increase was partly compensated by decreased area under grapes and forage and was induced by demand for wheat for breadmaking. Some farmers have also cleared vineyards and orchards to grow wheat because there was no market for grapes and other fruits.

In 1993 Armenia imported 505,000 mt of cereals (including food aid). This was only 40% of that imported during the late 1980s. In the same year, domestic production was 300,000 mt of grain. Although the old import levels were unrealistically high because of waste in both consumption and processing due to subsidies and parastatal management, the 1993 import level underestimates the potential grain requirement because high prices (resulting from subsidy removal, price liberalization, and supply shortages) and low incomes forced people to reduce food consumption. As a result, consumption and production of meat decreased by over 50% during the 1988-93 period. With growth in population and as the economy recovers, incomes rise, and prices decrease (due to improved efficiency in domestic production and marketing and integration with global and regional economies), demand for meat and other food products will increase. Thus, by 2005 Armenia may need about 1.2-1.4 million mt of grain. With improved technologies and farming systems, Armenia should be able to increase grain production from 340,000 mt in 1996 to 700,000 mt of grain by 2005. The remaining 500,000-700,000 mt of grain demand will have to be satisfied by imports. Although Armenia cannot become self-sufficient in grain production, it has scope for increasing grain production significantly and economically.

As recently as 1986, livestock accounted for 55% of the value of primary agricultural production. Currently, that figure is about 31%. In the late 1980s livestock used 80% of the land and provided employment for 75% of the agricultural labor force. The provision of animal feed for auction in Armenia would promote dealer development and, more importantly, make a significant contribution to Armenia reclaiming a comparative regional advantage in livestock production and associated products. USAID had a successful experience using animal feed to create and develop private input dealers in Romania in 1994.

Azerbaijan

The agricultural sector in Azerbaijan is experiencing the same *transition* as in other Caucasus countries and Eurasia. It is moving from the Soviet-type command and state-owned agriculture to market-based private agriculture, albeit very slowly. Unlike Georgia and Armenia, where land has been transferred from state farms to private farms, land privatization in Azerbaijan has been completed only in a few regions, and cotton prices and procurement remain state-controlled. Nevertheless, agriculture plays an important role in the national economy, second only to the oil and gas industry, and currently (1996) accounts for about one-fourth of GDP and one-third of employment. Another important difference between Azerbaijan and other countries in the Caucasus is that Azerbaijan has vast reserves of oil and natural gas in the Caspian sea. Although these reserves provide Azerbaijan an important source of income and foreign exchange, agriculture should not be neglected because it is an important source of food security, income and employment in rural areas, and foreign exchange earnings through agricultural exports (cotton and fruits) and import substitution (grains).

Azerbaijan has a land area of 86,100 km^2 (8.6 million ha) and population of 7.7 million. Over one-half of the total land is agricultural land devoted to annual crops (1.6 million ha), permanent crops (230,000 ha), and meadows, pastures, and long fallow (2.6 million ha). The main crops grown are grain, cotton, fruit and vegetables, tobacco, tea, and forage crops. By value, grapes, cotton, and tobacco are dominant crops. As in the other Caucasus countries, production of all crops and agricultural activities declined after 1991. For example, production of grain and cotton decreased from 1,414,000 mt and 543, 000 mt in 1990 to 921,000 mt and 274,000 mt in 1995, respectively. In addition to the usual disruption and dislocation caused by the collapse of the Soviet Union and the command economy, the war with Armenia also contributed to a general decline in economic activity including crop production. After the end of war and upon restoration of political stability in the country, agriculture and other sectors of the economy are showing signs of recovery. Between 1995 and 1997, grain production increased by 17%. It should be noted that in the future, the area under grain crops may increase proportionately more than that under other crops for three reasons. First, during the Soviet era, many farmers were forced to grow grapes for wine production even though grape growing was not a part of traditional agriculture for wine export to the Soviet Union. Second, because farmers have "freedom of farming," they are replacing grape cultivation with the cultivation of grain and other crops. Third, grain prices are liberalized and many private flour mills and bakeries

have emerged and have created demand for wheat and other grain and made wheat cultivation profitable. The gradual reduction in dependence on food aid will continue to create incentives for grain production in the country.

The agricultural sector in Azerbaijan is facing the same constraints as in Georgia and Armenia: dysfunctional input and output markets, lack of credit and extension support, nonavailability of improved seeds, fertilizers, and CPCs, inadequate and unsuitable supply of traction power, and lack of management and agronomic skills with new landowners and cultivators. The removal of these constraints can make Azeri agriculture more productive and viable to make its genuine contribution to food security, income and employment in rural areas, and foreign exchange earnings and balance of payments support.

In 1996 Azerbaijan produced 1 million mt of grain including 750,000 mt of wheat. To fulfill the domestic requirements of bread and bread-related products, the country needs about 2 million mtpy of wheat. To reduce dependence on imports, domestic production of wheat should be more than doubled. With adequate and timely supply of improved seed, fertilizers, and other inputs, wheat production can be easily doubled because currently the use of these inputs is minimal and wheat yields are low (averaging about 1.5 mt/ha).

Without increased use of modern inputs including improved seeds and mineral fertilizers, agricultural production cannot be revitalized, and without well-functioning and properly integrated input markets, the use of modern inputs cannot be increased.

Regional Integration

Each country in the Caucasus has some comparative advantage such that reciprocal benefits of agricultural trade are possible. Some possibilities are described in **Table 2**.

Table 2. Agricultural Trade Possibilities Between Caucasus Countries

Exporter	Importer		
	Armenia	Azerbaijan	Georgia
Armenia	—	Apricots, fruits, vegetables, wine, brandy, meat, dairy products	Apricots, fruit, vegetables, wine, brandy, meat, dairy products
Azerbaijan	Rice, fresh and processed vegetables and fruit (especially fresh tangerines and persimmons), paddle fish	—	Vegetables and rice, fruit (especially tangerines and persimmons), paddle fish, natural gas
Georgia	Ammonium nitrate (AN), fruit saplings, sunflower and soybean products, tea, potato, lumber, sugar, nuts, wine, fresh and processed fruit and vegetables, blended fertilizers distributed from Poti	AN, fruit saplings, sunflower and soybean products, tea, potato, lumber, sugar, nuts, wine, blended fertilizers distributed from Poti	—

These potential trade relations would serve the interests of regional integration based on agricultural inputs and products. In some cases these areas represent opportunities for small and medium enterprise development. The regional agribusiness center recommended in this assessment would serve as a regional resource to develop trade relationships and foster business contacts and relationships.

Although there are numerous opportunities for beneficial development work in the Caucasus, the area of interest here is an assessment of agricultural input markets and means of establishing a private input dealer network in the region. If agriculture in the region is to change and develop at all, private input dealers are a basic, undeniable, and absolutely critical requirement because it is very unlikely that parastatals will return as viable private enterprises to provide the region with agricultural inputs.

Following the summaries of the assessments, the next major section offers a strategy for the creation of a private input dealer network in the Caucasus, followed by major recommendations to achieve that goal. Appendices I-IV present the detailed assessments on production of fertilizers in Georgia and Azerbaijan, agricultural and economic policies, agricultural input marketing in the Caucasus, and transportation and distribution, respectively. Appendix V lists the persons and organizations who assisted in the assessment.

Summary of Assessments

Agricultural Input Markets

The agricultural input markets in the Caucasus are fragmented, ad hoc, unpredictable, and totally inadequate. The complete absence of any type of input marketing system or market information system is characteristic of each country.

The collapse of the centrally planned economies has resulted in virtual destruction of the input distribution system. In all three countries, parastatals responsible for distributing fertilizers and CPCs are involved in minimal distribution of inputs. However, most, while nominally privatized, are dysfunctional and in a state of disarray. Although parastatals have ceased to function, private companies have not yet developed to perform the marketing and distribution functions so essential to the development and sustenance of competitive markets. Thus, neither state-owned enterprises nor private companies are distributing inputs. As a result, inputs are often sold on the roadside during the cropping season. These ad hoc and unpredictable input sales are performed by some enterprising individuals on an opportunistic basis throughout the region.

Fertilizer use in the region during the past 6 years has been limited and the soils are being mined of nutrients. Severely limited amounts of AN have been used, but sources of P and K nutrients are simply not available. The nitrogen facility at Rustavi, Georgia, can supply 350,000 mtpy of product to the region but export to earn foreign exchange has a high priority. In many areas visited by the assessment team, absolutely no fertilizer products were available at any price. Agriculture in the Caucasus is simply not sustainable without the availability and use of mineral fertilizers. The situation is similar for other inputs including seed, CPCs, and machinery.

Seed is saved by farmers throughout the region and the genetic integrity of that seed diminishes annually. There are modest and limited efforts by government and partially private farmer parastatals to multiply improved seed, but the distribution and sales channels are fragmented and weak. A notable exception is in Georgia where ACDI/VOCA is supporting a seed program in the private sector.

There are also various efforts by partially private parastatals to procure and sell CPCs, but again channels for distribution and sales are weak, fragmented, and void of business structure. The ability of farmers to use CPCs, even if available, is limited by knowledge, poor or no application equipment, and high CPC prices relative to prices received for agricultural products.

The use of agricultural machinery is constrained by the age of equipment and lack of spare parts. So extreme is the problem that most operations are done by hand with only occasional opportunities to hire or rent machinery for specific operations. Furthermore, in most cases, farm size is too small for large machinery which was previously used on state farms and cooperatives.

Seasonal credit is available from banks and/or nongovernment organizations (NGOs) in some geographical areas of each country and new programs are being developed, but lack of inputs for purchase, especially fertilizer, does not promote demand for seasonal credit. Thus, synergy between seasonal credit and input use has considerable scope for development in the region.

It is highly unlikely that the restructured parastatals in each country will develop into strong, reliable, and profitable suppliers of agricultural inputs. Therefore, an alternative should be identified and developed. The alternative offered in this report is to create a network of private input dealers in each country of the Caucasus.

Fertilizer Production

Historically, fertilizer has been produced in the Caucasus region in the following three plants:

- Sumgait superphosphate plant near Baku, Azerbaijan.
- Nitrogen plant at Rustavi, Georgia, which is currently owned by the Rustavi Joint Stock Company Chemical Enterprises.
- Vanadzor Chemical Company nitrogen plant at Vanadzor, Armenia.

Other fertilizer materials, including potash, were imported from Russia. The Vanadzor plant which formerly produced ammonia, nitric acid, ammonium nitrate, and urea has been closed since 1988 as the result of a severe earthquake that damaged the plant facilities.

Sumgait Superphosphate Plant

The plant is located on the Caspian Sea in a large industrial area near Baku. Design capacity of the plant is about 1.2 million mtpy of granular single superphosphate (SSP) (19% P_2O_5). The plant, which is in very poor mechanical condition, has been shut down during all of 1997 and most of 1994, 1995, and 1996, due to lack of raw materials and no market for the low-analysis product.

It is not likely that the plant will ever resume commercial operation since the granular SSP produced at Sumgait from shipped-in raw materials cannot compete economically with high-analysis fertilizers such as diammonium phosphate (DAP), monoammonium phosphate (MAP), and triple superphosphate (TSP), which are produced in Russia and other Black Sea countries and are predominant in the world market.

Rustavi Nitrogen Fertilizer Plant

The plant is designed to produce ammonia, nitric acid, ammonium nitrate, and ammonium sulfate as byproduct from a caprolactam plant. Production during recent years has been severely limited due to shortage of natural gas, the major raw material. A major portion of the AN product must be exported to generate hard currency for natural gas purchases from Russia. Actual production for selected years is shown in **Table 3**.

Table 3. AN Production at Rustavi, 1987-1997

	1987	1988	1989	1995	1996	1997
Ammonia production (mt) (Design: 412,000 mtpy)	272,400	267,200	261,800	63,400	93,200	78,100
Percent of design production	66	65	61	16	23	25
HNO_3 production (mt), 100% (Design: 379,000 mtpy)	289,300	297,700	292,200	94,000	155,200	129,200
Percent of design production	76	78	77	25	41	46
AN production (mt) (Design: 396,000 mtpy)	363,000	373,200	371,300	118,200	195,300	166,000
Percent of design production	92	94	94	30	49	56

Note: Data for 1997 are for January 1 through September 30.

The plant is in fair mechanical condition and should be capable of producing up to 350,000 mtpy of AN if adequate supplies of natural gas are available. However, due to the out-dated technology used, mechanical condition, and relatively short remaining life of the plants, significant capital investments cannot be justified.

Overall Conclusions

The overall conclusions are as follows:

1. Future production of the Sumgait Superphosphate Plant is limited.
2. The Rustavi Nitrogen Fertilizer Plant can supply up to 350,000 mtpy of AN (33.5% nitrogen [N]) if natural gas is available.
3. Training and study tours are recommended for the management personnel of the Rustavi fertilizer plant to expose them to what are considered normal conditions (management, operations, and maintenance) in similar plants operated in a free market economy. Training and study tours are recommended if production at Sumgart is resumed.

Policy Environment

The macro- and microeconomic policies of the national governments are generally conducive to the development of input markets. All three countries have a reasonable degree of stability in exchange rate, and foreign exchange is freely traded in local markets. All input and output prices are liberalized and determined by the market. There are no subsidies on any input. On the negative side, although interest rates are determined by the market, shortage of funds and an underdeveloped banking sector and financial market make interest rates very high; in some areas farmers are required to pay as high as 96% per year. Consequently, there is limited borrowing for input purchases. Inadequate credit and high interest rates act as a severe constraint on input use and dealer development. Underdeveloped land markets are another constraint, because fragmented landholdings require consolidation for viable farming. But limited land registration and titling make it difficult to buy or sell land.

During the central planning period, because the state was the producer of goods and services, few regulatory frameworks were developed and implemented. However, because the state is no longer the producer of goods and services, it has to assume the responsibility of protecting the interest of farmers and consumers from unscrupulous traders and producers. In all three countries, limited mechanisms exist for quality control, standards, and measures. The absence of regulatory frameworks may become a major problem in developing dealer networks. Also, because the size of the fertilizer market is small, measures are needed to ensure that state monopolies are not replaced by private monopolies.

In Azerbaijan and Georgia, there is effectively no extension service. There is an emergent extension service in Armenia supported by the United States Department of Agriculture (USDA). Many farmers have little knowledge of modern technologies. As the use of modern inputs is knowledge-intensive, appropriate and adequate arrangements for extension and farmer education will be essential to promote input use and dealer development. Although extension and education are public goods and have been traditionally provided by the ministries of agriculture, in many countries including the United States, there is a growing trend towards using private dealers to provide extension advice to farmers, whereas extension services can focus on training dealers in high-level

scientific knowledge by acting as a bridge between research institutes and dealer networks. A constructive balance between public sector agencies and private dealers should be maintained in developing systems for technology delivery.

Transportation and Distribution

The ability of the transportation sector in the Caucasus to support a private dealer network of agricultural inputs is proportional to the demand that is placed on the system in a defined time period. In 1996 and 1997 the low usage of inputs relates primarily to the problem of the financial resources of the growers. The distributors interviewed in 1997 expressed few if any delays due to transport.

Fertilizer, the major agricultural input in terms of volume and weight, places the heaviest demand on the transport sector to move material from factories and seaports to dealer distribution points. Seed, crop protection chemicals, and equipment are normally less vulnerable than fertilizer to the capacity of transport.

As indicated in the report, the current level of fertilizer use is very low as compared to the years of 1988-89, The regional fertilizer consumption in 1996 is reported as roughly 27,400 nutrient mt as compared to 446,000 nutrient mt reported in 1989. A rough conversion of nutrient mt to product mt, an average product mt with 30% in nutrient value, indicates the need to physically move 91,300 mt to supply the current usage, or 1,487,000 mt metric to supply the 1989 reported usage due to the historical usage 35% N ammonium nitrate and 20% available P_2O_5 single superphosphate. Higher analysis fertilizers such as 46% N urea, 46% available P_2O_5 triple superphosphate, 18%N, 46% available P_2O_5 diammonium phosphate, and 60% K_2O potash will reduce the physical mt movement to 1,115,000 mt and save transportation costs.

The supply of fertilizers requires importing phosphate and potassium materials, but the ammonium nitrate and ammonium sulfate production capacity at Rustavi in eastern Georgia could supply a large portion of regional nitrogen needs. Importation of phosphates and potash can be achieved by a combination of (1) marine vessels at seaports on the Black and Caspian Seas and (2)

rail and highway shipments from the neighboring countries of Russia, Turkey, and Iran. These options reduce reliance on any one transport sector or port. As fertilizer use increases, the ability to move up to 900,000 mt of fertilizer to the market place will require some upgrading of the rail and highway transport sector.

The condition of the railways causes trains to move at slower than normal speeds and creates delays in equipment availability. Transport Corridor for Europe, Caucasus, and Central Asia (TRACECA) has already implemented corrective programs to improve tracks, bridges, and rolling stock with a project budget of 5,000,000 European Currency Units (ECU). The extensive regional rail system reaches rural areas and the improvements already in progress appear sufficient to improve the equipment and management systems to meet fertilizer demand as it grows over the next 4 to 5 years.

Road transport from railheads, factories, and seaports means short hauls on local roads with truck transport to reach nearby distribution points. It is true that the road surfaces need maintenance, but at the time of the observations, the inter-city roads were fair to good. Roads to villages and farms appeared to require a more intensive effort to repair surfaces, but were not impassable, and are not deemed a major deterrent to fertilizer distribution.

While not a factor of transport, the reported capacity to store fertilizer materials as well as other agricultural inputs is so very large, 900,000 mt, that it permits maintenance of a supply cushion and mitigates reliance on the transport sector.

In view of the improvements that are in progress at seaports, on railways, with highways, plus the expectation of a gradual increase in demand for inputs as growers can afford to buy and use them, the transport sector is judged to be adequate to support the establishment of a private dealer network to supply a growing need for agricultural inputs.

Development of Agricultural Input Markets in the Caucasus

A Strategy

This strategy for development of agricultural input markets in the Caucasus is based on the major observations, findings, and recommendations that are presented in this report. This strategy is further based on the experiences of USAID in input market development in Albania and Bangladesh. A period of at least 4 years is required to realize the goals articulated in this strategy.

The agricultural input market in the Caucasus is ad hoc, fragmented, unorganized, sporadic, and nebulous to the extent that it is characterized here as an "event" whose recurrence is unpredictable. The organization of a system of input supply by the private sector is of paramount importance and singularly critical to agricultural development in the region. It is here that a strategy with options and alternatives is outlined for consideration by USAID.

Geographical Areas

The effort to build and develop a private market for agricultural inputs is defined and bounded by the availability of credit, especially for small farmers to purchase inputs. This requirement defines regions in Georgia, Armenia, and Azerbaijan where time, resources, and efforts of USAID may be directed (**Figures 1-3**). These regions are also *a priori* defined by several other variables, but credit is of major importance. The geographical regions suggested here are also characterized by agricultural production histories which are commendable; the existence of nascent agroprocessing facilities; limited but expanding output markets; private land holding with a land market likely to develop; rail and road infrastructure for sale of outputs and receipt of inputs; and very importantly, nascent entrepreneurial activity which deserves support.

Figure 1. Administrative Boundary and Major Cities of Armenia

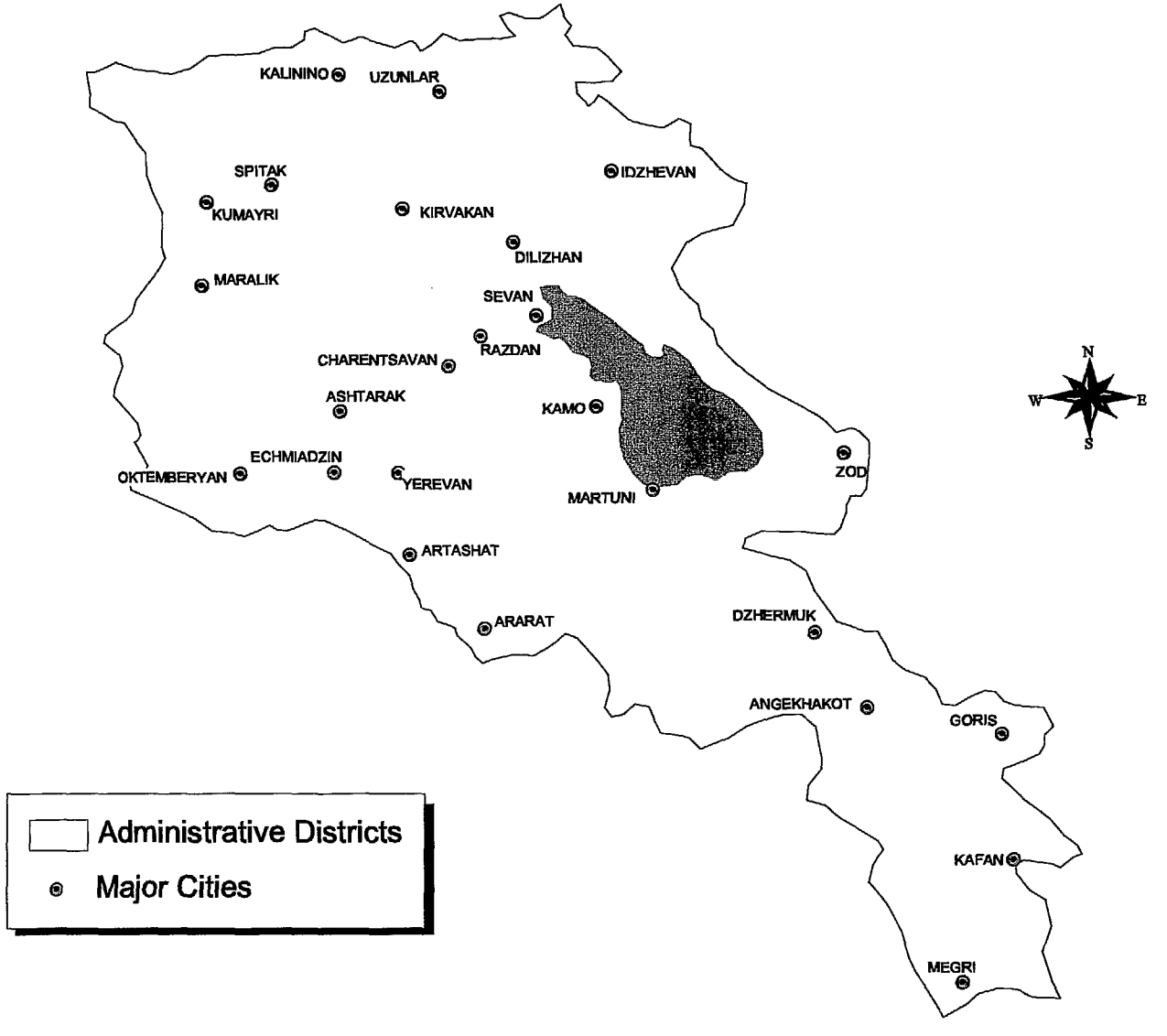

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Figure 2. Administrative Districts and Major Cities of Georgia

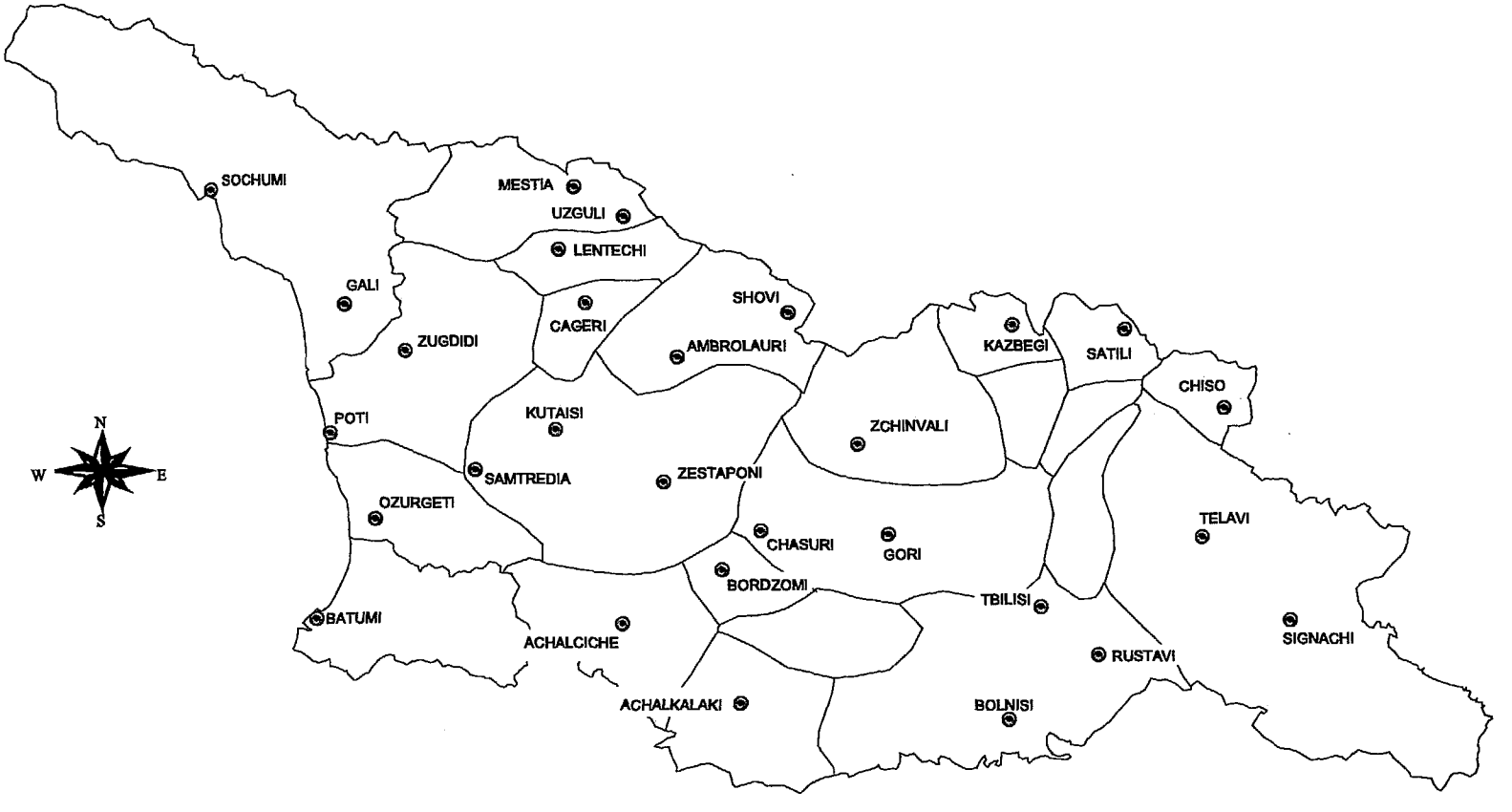
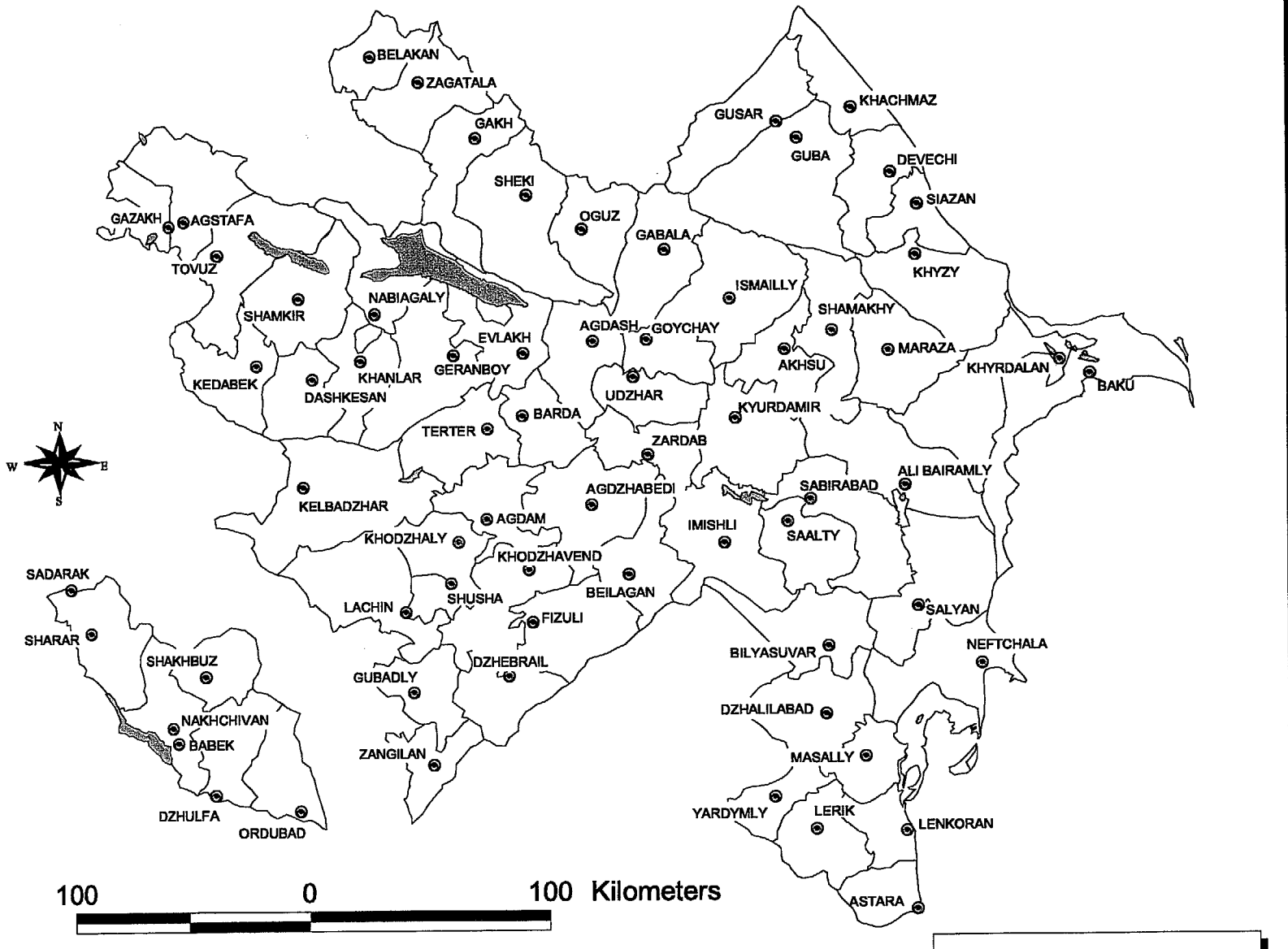


Figure 3. Administrative Districts and Major Cities of Azerbaijan



In Georgia the credit programs of ACDI/VOCA define the regions where such a project may be implemented. These regions include Gori, Kutaisi, and Telavi. In Armenia, the credit programs of the Cooperative Bank, the International Fund for Agricultural Development, various NGOs, and the Shirakinvestbank are available to small farmers to purchase inputs. The regions of interest for such a project are the Ararat Valley, Lori, Armavir, and Shirak-Mavir in northwest Armenia. In Azerbaijan, the credit programs of the World Bank and ACDI/VOCA define the regions where private input dealers may be created and developed. These areas include Ugra, Saylan, Massali, Lenkorn, Quba, Imisli, Zakatala, and Ganja. This restriction greatly increases the probability that the product will be sold to farmers who have access to credit in the targeted geographical area.

Identification of Potential Dealers

Based on the prior experiences of USAID in private dealer development, some initial, basic, and fundamental work is required to identify serious entrepreneurs whose social reputations for integrity and honesty are known and appreciated in the regions chosen for project work. There are two means to accomplish this initial step. The first is to use a reputational method through discussion with other project representatives and NGOs to determine suitable candidates for entry into the private agri-input business. The second means is to use mass media to call for meetings of those interested in such business activity. The second method is preferable. It is market driven; it avoids any omission of potential candidates; it avoids barriers to entry; and it utilizes the mass media to inform and educate not only dealers but all actors in the potential market.

Following the formation of a pool of prospective and aspirant dealers, a measure of attrition and self-selection may be expected. Each candidate should be evaluated in regard to ability to purchase, transport, store, distribute, and sell inputs. This information may be obtained through interviews and should be verified by on-site evaluation. With this process completed, the next step is to determine what inputs should be imported and auctioned or sold to the aspirant dealers as a catalyst for the development of a private network. Auctioning inputs provides an immediate opportunity to introduce concepts of market economics, competition, credit, and pricing, while providing profit opportunities for dealers to build equity.

Fertilizer as a Catalyst

Fertilizer is suggested as an input to be sold to aspirant dealers. There are several reasons for this choice rather than other inputs. Fertilizer is preferable because CPCs are more technologically sophisticated, require licensing and training, and are subject to legalities; thus, the process of introduction is more cumbersome and complex. Perhaps the most basic justification for the auction of fertilizer rather than CPCs for dealer development is that there must first be a viable crop to protect. Thus, a phasing sequence would be first, fertilizer, followed very closely by improved seed, then CPCs. In Georgia and Armenia CPCs of high quality are available through consignment arrangements or at least supply arrangements and business relationships with firms including Ciba-Geigy, Bayer, Zeneca, and Rhone-Poulenc. No such relationships or arrangements were observed in Azerbaijan. It is expected that increased fertilizer use and improved yields would promote a greater interest among farmers to use available CPCs. Furthermore, there has been virtually no use of P and K fertilizers during the past 5 years in the Caucasus. Thus, one may be certain that P and K nutrients are being mined in the region. A compound fertilizer such as 15-15-15 would help correct this problem. Using fertilizer as a catalyst, at least two product options for dealer development are apparent.

A first option is to use "straight" fertilizer products such as urea, TSP, and muriate of potash (MOP) to stimulate dealer development and a second option is the use of a blended product, such as 15-15-15, which is widely available. These two options may be combined for a vision of development of the input market in the Caucasus. The assessment team is unanimous that current production of AN in Georgia and possible resumption of production of SSP in Azerbaijan for use in local areas surrounding the plant should be anticipated and used as part of a development strategy in the long term.

As a second option, the sale of AN and 15-15-15 would serve the region and dealer development well. The blended product could be used as a basal application and the AN as a topdressing. These imports would be the basis of dealer development and the resumption of the use of P and K nutrients and reverse nutrient mining in the region. The farmers, with whom the assessment team met in three countries, are familiar with these products and indeed many were aware of the use and agronomic value of blended products during the Soviet era. These products may be

used initially with a longer term vision of a blending and bagging facility at the port of Poti in Georgia, which is well connected by road and rail to Armenia and Azerbaijan.

Fertilizer Products for Public Auction

It is recommended that USAID offer fertilizer products through public auctions similar to the process that was used in Albania in 1991/92. Public auction has two distinct advantages compared to outright concessional pricing. An auction introduces immediately the concept of competition, attracts those with entrepreneurial and risk-taking characteristics, and is the single most effective means to quickly establish a network of input dealers. An auction also provides a basis for gathering entrepreneurs who are interested in distribution and marketing of similar products and aids in the development of a trade association. The experience of USAID in creating a network of input dealers demonstrated that technical assistance with fertilizer as a commodity greatly enhances the efficiency and rapidity of creating private input markets.

The public auction of fertilizer is also recommended because the funds required for purchases at world prices greatly exceed the maximum allowable loans of existing credit programs. Furthermore, the required collateral to secure credit is often 200% of the amount loaned and this also greatly exceeds the financial ability of those who may have an interest in becoming an input dealer. The value of the AN shown in **Table 4** is estimated at about US $2,700,000 and the 15-15-15 (N, P_2O_5, and K) approximately US $5,300,000. Such amounts are clearly beyond the current ability of all credit programs in the Caucasus. An auction will serve as an immediate means to quickly begin an input dealer network and link that network to the global fertilizer market when funds realized from fertilizer sales are used to purchase subsequent supplies at world prices. Furthermore, a public auction allows supply and demand to establish market prices for fertilizer products.

Based on the experience of dealer development in Albania and subject to auction floor prices, the aspirant dealers are expected to pay between 35% and 45% below the landed world price of AN and 15-15-15. Thus, approximately between US $4,400,000 and US $5,200,000 may be recovered from auction sales. These funds may be used as: (1) seed money to develop a project credit fund for fertilizer procurement at world prices for dealer development and administered by an input project

or (2) a counterpart fund in Georgia and Armenia for the support of agricultural development projects and mutually agreed by USAID and the respective government, as was the case in Albania.

A tentative estimate of the quantities of AN and 15-15-15 required to begin the process of dealer development through public auctions in the Caucasus is shown in **Table 4**.

Table 4. Recommended Fertilizers, Quantities, and Values to be Offered at Public Auction

Product	Armenia	Azerbaijan	Georgia	Total
	(mt)			
AN	3,000	5,000	10,000	18,000
15-15-15	4,000	7,500	15,000	26,500
Total	7,000	12,500	25,000	44,500
	('000 $)			
AN	450	750	1,500	2,700
15-15-15	800	1,500	3,000	5,300
Total	1,250	2,250	4,500	8,000

The rationale for these quantities for auction is premised on several factors, namely:

- The initial program would be in regions where credit is available.
- The response to nitrogen is being limited by P and K deficiency.
- There should be sufficient tonnage to minimize sea freights.
- There should be sufficient auction lots to create competition among entrepreneurs.
- That maximum lot size should be 100 tons in Georgia and Azerbaijan and 50 tons in Armenia.
- That maximum lot sizes for 15-15-15 should be half the size of AN lots to limit the value of each lot.
- It is estimated that the value of each lot bid will be approximately $6,000 in Georgia and Azerbaijan and $3,500 in Armenia, based on bids equivalent to 60% of border prices.
- The maximum value of lots is constrained by credit availability and collateral.
- The quantities and lot sizes recommended will provide for 400 lots in Georgia and 200 and 220 lots in Azerbaijan and Armenia, respectively.

- The total quantities recommended provide a 100% increase in nutrients over the best estimates of 1997 consumption.

Assuming that two auctions were held in each country, the minimum lot numbers for adequate competition in the auctions would be about one-half the quantities shown in Table 4. An alternative therefore exists to reduce the fertilizer commodity assistance recommended for all three countries although this would probably result in a more limited development pace of private sector dealer networks. Another alternative would be to limit the recommended program to Georgia, or Georgia and Azerbaijan in the first instance.

The rationale for auctioning AN in Georgia, where domestic production is available from Rustavi is summarized by the following points:

- The Rustavi factory is exporting most of its production to obtain foreign exchange for the purchase of natural gas and only limited quantities of AN are available for the domestic market. These limited sales set the domestic price levels but the absence of a marketing system precludes factory interest in developing these sales.
- Dealers will bid at a discount below ex-factory prices and sell at retail prices similar to those established for AN from Rustavi, enabling them to maximize profits and build asset value for future purchases.
- The small quantities of Rustavi factory AN sales will be increased by the demonstrable ability of private dealers to purchase and market product from the auctions. In addition some dealers may win bids for 15-15-15 but not AN and may buy quantities of AN from Rustavi to improve their sales of 15-15-15 by having both products available.
- Sales will demonstrate to factory management that there is an available regional market for AN and AS. This will be a first step in reducing export sales. Regional sales revenue can be used to purchase foreign exchange for natural gas.
- If an exception can be made and non-U.S. AN supplied for auctions, it can be sourced from Rustavi at a lower price (approximately $100/mt) than the landed cost of U.S. source material while providing the Rustavi factory with a source of foreign exchange.

USAID may consider a second auction with one-half of these quantities to ensure that "new input dealers" have sufficient funds to procure products at prevailing international prices in the future. However, if a first auction is sufficient in establishing a nascent input network, a second auction would be unnecessary. A decision in this regard will be based on monitoring and evaluation. A monitoring procedure as used in Albania will be used to "track" the fertilizers from port to auction to sale and final disposition and use.

The value of fertilizer auction as a development catalyst lies in creating a shared common experience for private sector dealers. This can then be turned with advantage into the development of a trade association which consolidates the market network that becomes the driving force for technological change. The perception of unity of action gives confidence for individual dealers to take risks and advance their business interests into new areas needed for farmer development. The participatory communication process afforded by regular association meetings and democratic process, plus association imposed business ethics are integral advantages of this approach to development assistance.

Alternative Approaches

It is doubtful in transitional economies whether alternative approaches to stimulate competitive private sector participation in agri-inputs supply can be achieved. For example, technical assistance can be provided to assist entrepreneurs to develop business plans for the purpose of obtaining credit but without substantial collateral individuals will still be unable to obtain adequate credit funds. If credit funds were guaranteed, by for example USAID, and collateral requirements relaxed, dealers would also need to be immediately trained in international fertilizer procurement, a process with many pitfalls for the uninitiated, and they would be unable to quickly increase their asset value due to the normally low profit margins on fertilizer.

In Albania, efforts to secure World Bank credit funds for financing agri-inputs procurement and distribution have been unsuccessful but in 1998 substantial funds from the Bank have been made available to the dealer trade association members for agribusiness investments in processing and marketing of agricultural products. Additionally, because of excellent credit repayment performance, trade association members have obtained trade credit from international fertilizer suppliers. The

World Bank credit program for agriculture in the Caucasus is limited to small loans which are insufficient for the procurement and distribution credit needs of potential agri-input dealers. The auction approach is therefore recommended.

Auction of Animal Feed

Because of the importance of livestock in Armenia, USAID may consider the auction of animal feed as an additional catalyst to development of private input dealers. The assessment team bases this recommendation on the importance of livestock in Armenia compared to Georgia and Azerbaijan. As recently as 1986, livestock accounted for 55% of the value of primary agricultural production. Currently, that figure is about 31%. In the late 1980s livestock used 80% of the land and provided employment for 75% of the agricultural labor force. The provision of animal feed for auction in Armenia would promote dealer development and, more importantly, make a significant contribution to Armenia reclaiming a comparative regional advantage in livestock production and associated products. USAID had a successful experience using animal feed to create and develop private input dealers in Romania in 1994.

Dealer Development

Once entrepreneurs have been identified and guided through auctions and initial retail sales of fertilizers, there are several other skills that are required to sustain private dealers. These needs involve training and education in several areas: accounting, marketing, management, international procurement, and agricultural education. These areas should be the subjects of domestic and international study tours and training.

A successful auction of fertilizer and subsequent sales by new input dealers will establish small retail businesses to serve farmers. These businesses will require guidance, support, and monitoring over an extended period. Depending on talent, initiative, and circumstance, some businesses will develop and prosper ahead of others. For this reason, a uniform recommendation on sequencing products to be sold by dealers should depend on individual development, ability, and market demand. The establishment of a monitoring mechanism to identify opportunities for dealers to elaborate the range of inputs offered for sale is a means to introduce seed, machinery, and CPCs in the market. Monitoring is also a means to identify opportunities to integrate services such as machinery rental and

repair into the agricultural sector. Based on this reasoning, bi-monthly meetings of new dealers created by the project are absolutely necessary and indispensable to identify opportunities for and promote interest in elaborating the line of products sold by input dealers. The project would cultivate interest and demand for inputs through demonstrations and media.

A general and theoretical sequence for the introduction of inputs for sale by dealers would be fertilizer, then seed, followed by CPCs and then machinery and related services as possible. One should bear in mind that inputs are not introduced in a dealer network but rather to individual dealers who comprise a network.

Following the experiences of IFDC in Albania, those promising entrepreneurs supported by USAID in the development of small and medium enterprise should be exposed to market opportunities to sell additional inputs such as seed, CPCs, and small-scale machinery and implements. It is further expected that agro-processing interests will evolve from these activities, as occurred as a natural evolution in Albania and Bangladesh.

To realize these goals, it is recommended that USAID view any eventual project as three country projects with coordination from Tbilisi, Georgia. To organize a project as singularly regional, given the views of the Technical Assistance for Commonwealth of Independent States (TACIS), the German Agency for Technical Cooperation (GTZ), EU, and others, whom the assessment team met, would present logistical and organizational obstacles, which would be self-imposed and counter productive.

For this first alternative, a minimum 3-year project concept is envisaged with 5 resident consultants; a COP in Tbilisi with a crop production specialist and an agribusiness specialist; and agribusiness country leaders in Azerbaijan and Armenia. All of these resident consultants, except the COP, would have host country counterparts. In addition a local staff of 50 would be necessary in Georgia and 12 in each of the other countries. Approximately 60 person months of short-term consultant time is also envisaged.

The approximate cost of the technical assistance would be $11.0 million, excluding the commodity assistance of $8.0 million. Halving the fertilizer commodity assistance and restricting the areas of operation within the three countries would reduce the technical assistance $1.0 to $1.5 million over the 3 years.

A second alternative would be to restrict the proposed project to Georgia initially, with the recommended full amount of commodity assistance. It is estimated that only two resident consultants would be required and local staff could be reduced to 40. The approximate cost for technical assistance over three years is estimated at $4.9 million. Following the firm establishment of a dealer network in Georgia, the process of developing such a network could begin in Azerbaijan followed by Armenia, where an auction of animal feed may be considered. This approach has the advantage of providing valuable lessons and experiences in the Caucasus that would beneficially guide efforts to create and develop private input dealers in the entire region.

A third alternative could involve both Georgia and Azerbaijan initially. In this case the technical assistance cost over 3 years would be approximately $7.75 million.

Linkages With Other Projects

The successful implementation of a project on developing agricultural input markets in the Caucasus will require linkages with current and potential projects. Some of the projects from which this project can benefit include ACDI/VOCA seed and credit projects, the World Bank credit and land registration projects, and the EU food security and agricultural sector reform projects. The nature and scope of such linkages are described in each Caucasus country. Naturally, other opportunities for beneficial linkages would appear during project activity and would be pursued.

Georgia

ACDI/VOCA is currently developing the seed sector in Georgia. This project focuses on research, development, and dissemination of high quality seeds for maize, wheat, potato, and sunflower. Obviously, without good quality seeds, farmers cannot benefit fully from the use of mineral

fertilizers and without fertilizers, farmers cannot realize the yield potential of improved seeds. This complementarity between seed and fertilizers should be fully exploited by developing close collaboration with ACDI/VOCA. Another ACDI/VOCA project likely to have fruitful linkages with this proposed project involves credit. By using the monetized funds of the U.S. food aid, ACDI/VOCA is developing credit unions in the eastern and western regions of Georgia and making loans for agricultural purposes. The availability of funds from these sources can help the dealers purchase agricultural inputs and provide the necessary liquidity for establishing agribusiness ventures.

The EU is also developing credit by using funds available from monetization of food aid. The World Bank has a credit project to assist small enterprises and the rural sector. Both projects are involved in developing credit unions in rural areas to support agricultural development. Linkages with these projects will complement the proposed project by relaxing credit constraints in the development of agricultural input markets.

Armenia

Several donors and NGOs are currently active in Armenia. The Armenian Technology Group (ATG), United Methodist Committee on Relief (UMCOR), EU, and Eurasian Foundation (EF) are particularly notable. ATG is involved in developing high quality improved seeds for wheat and other crops. UMCOR has a small credit program for agribusiness dealers, and the EU is supporting the development of the Cooperative Bank and credit unions. These developments in the seed and credit sectors have obvious complementarities with dealer development for agricultural inputs. By working in close collaboration with these agencies, return to investment in this project can be maximized because these projects assist in removing the credit and seed constraint on the use of mineral fertilizers. The Japanese grant for fertilizer imports through trade credit can also be used effectively in developing fertilizer markets. USDA is also active in Armenia in developing an extension service and output markets.

Azerbaijan

ACDI/VOCA is currently developing the seed and credit sectors in Azerbaijan, and GTZ is working with farmers on training and farmer education. The World Bank is implementing a land privatization project that focuses on the privatization and registration of land in six regions. Once the

process of privatization and land registration is complete, the project provides funds for lending to farmers for short- and medium-term investments. The EU food security program is also involved in developing credit unions in rural areas. Because the availability of funds from these projects can have beneficial impact on dealer development, linkages with these projects should be fully exploited during the implementation of this proposed project.

Major Recommendations

Introduction

Given the importance of agriculture in the Caucasus as detailed earlier, the creation of a network of private input dealers is essential for the region to realize its production potential. Thus, several recommendations are offered in that regard.

The following recommendations are based upon and derived from the assessments of input markets, policy, fertilizer production, and transportation and distribution (Appendices I-IV). Each recommendation is intended to support the creation and development of private agricultural input dealers.

The recommendations are in two broad categories — those that are specific project activities and those related to government policies, programs, and procedures. Recommendations of the latter type would be presented for implementation through meetings on policy dialogue and submission of position papers, economic analyses, policy workshops, and active policy engagement through meetings with particular ministries and organizations. This strategy was employed successfully in USAID projects on agricultural inputs in Albania and Bangladesh.

Development of Agricultural Input Dealers and Agribusiness

All recommendations should be components of a project in the Caucasus.

1. Public auctions of fertilizers and animal feed as an immediate catalyst for development of input dealers with simultaneous fertilizer use demonstrations in strategic locations.
2. Development of agricultural education opportunities for farmers in all areas of agricultural production, farm management, and especially fertilizer use.
3. Development of training and study tour opportunities for new input dealers in business planning, marketing, accounting, international procurement, and management.
4. Development of education, training, and study tour opportunities for bankers, agricultural authorities, and government officials in the areas of policy, international banking procedures, training in business, agricultural studies, marketing, and accounting.

5. Development of national and regional agricultural market information systems with data bases including but not limited to crops, cropped areas, input use, input prices, output prices, marketing opportunities, procurement, and regional agribusiness contacts and opportunities.
6. Creation of opportunities for those engaged in agribusiness in the Caucasus to meet on a regular basis, exchange ideas and information, and develop business-trade relationships through a regional agribusiness development center located in Tbilisi.

Fertilizer Production

Regional—It is recommended that programs undertaken to develop agricultural input supply systems in the Caucasus region be based on high-analysis fertilizers from imports and regional production from the plants at Sumgait and Rustavi.

The following training programs and study tours are recommended for personnel of the Rustavi fertilizer company as project activities.

1. Acquainting the upper level management about how similar companies are managed and operated in a free market economy.
2. Exposing the production and maintenance managers to what are considered normal conditions in similar plants.
3. Establishing acceptable environmental and safety standards.
4. As part of a project, quality control and standards should be developed and implemented for fertilizer products.

Sumgait Superphosphate Plant — Significant capital investment in the plant is not recommended because of the need to import raw materials, poor mechanical condition, low-analysis product, short remaining plant life, and poor location in relation to the market. Detailed technical and economic analyses of the facility are recommended.

Rustavi Nitrogen Plant—The planned capital investments to increase ammonia production for exporting should not be made. Priority should be given to normalizing the existing facilities. The efforts to obtain a stable natural gas supply to the plant should be continued. With an adequate natural

gas supply, the plant can produce about 350,000 mtpy of AN for regional use. Any available capital should be used to upgrade the mechanical, operating, and safety conditions of the plant.

Appendix I
Fertilizer Production

Azerbaijan

Sumgait Superphosphate Plant

The Sumgait superphosphate plant is located on the Caspian Sea in a large industrial area near Baku. There are two sulfuric acid plants with a combined design capacity of 670,000 mtpy of sulfuric acid (100% basis) and two SSP units designed to produce a total of about 1.2 million mtpy of granular SSP.

Although run-of-pile (ROP) SSP is produced as an intermediate, the final product is all granular SSP. There are no bagging facilities, and all product leaves the plant as bulk either by rail or truck.

Most of the sulfuric acid is used to produce SSP. Some is sold for other industrial uses and some is converted to oleum for the caprolactam plant at Rustavi in Georgia. Small quantities are used to produce aluminum sulfate (alum). Pertinent data are shown in **Table I-1**.

Table I-1. Pertinent Data for the Two Sulfuric Acid Units at Sumgait

	Design Capacity	Basic Process	Year Built	Current Condition
	(mtpy)			
Unit 1	440,000	Polish	1974	Poor (being liquidated)
Unit 2	230,000	Russian contact	1984	Fair (is operable)

Sulfur used as a raw material for producing sulfuric acid is received as either solid or molten by rail from Russia (Volga).

The Unit 1 sulfuric acid plant was renovated in 1993. However, the renovation was not successful; the plant is no longer operable and is currently being liquidated.

The Unit 2 sulfuric acid plant is a contact plant of Russian design. It was built starting in 1984 and began operation in 1988. The plant was last operated in June 1997. The plant has only been operated 9 years but appears to be much older due to the deteriorated mechanical condition. Most likely this is the result of the following.

- Lack of adequate capital to properly maintain the plant.
- Inability of the plant management to judge the relative condition of the plant due to lack of exposure to what are considered as normal conditions in similar plants.

The plant was not operating during the visit and observations could not be made of the impact on the environment. However, the plant design includes environmental safeguards that should be adequate if properly operated.

The plant is not being operated due to lack of funds to procure sulfur and no market for granular SSP.

SSP Facilities — The SSP facilities at Sumgait consist of two units (six lines) to produce ROP-SSP, storage capacity for 24 days' curing of ROP-SSP and two units (eight lines) to produce granular SSP from the cured ROP-SSP. **Table I-2** shows pertinent data for these units.

Table I-2. Pertinent Data on SSP Facilities at Sumgait

	Number of Lines	Capacity per Line	Basic Process	Year Built	Current Condition
		(mtph)			
ROP-SSP					
Unit 1	4	40	Russian Rotating Den	1963	Poor
Unit 2	2	40	Russian Rotating Den	1984	Poor
Granular SSP					
Unit 1	4	20	Russian Rotary Drum	1963	Poor
Unit 2	4	40	Russian Rotary Drum	1984	Poor

Phosphate rock for producing SSP is imported from Russia (Kola) as beneficiated concentrate. No further grinding is required. The sulfuric acid, which requires imported sulfur, is produced internally.

Rock and sulfuric acid are reacted in a mixer and discharged into a rotary den. The reaction mass is continuously discharged from the den into a shed for 24 days' curing. Hold-up time in the den is about 1 h.

Following curing, the ROP-SSP is granulated in standard granulation facilities consisting of a drum granulator, rotary dryer, screening, oversize crushing, recycle system, and product cooler. Storage capacity for bulk granular SSP is only 1,000 mt. The SSP produced at Sumgait averages about 19% P_2O_5.

Average annual production for years 1987-89 was about 1.15 million mt. The plant has been shut down for all of 1997 due to lack of funds to purchase sulfur and phosphate rock and no market for the SSP. Reported production of granular SSP for the years 1991-96 is given in the **Table I-3**.

Table I-3. SSP Production at Sumgait, 1991-1996

	1991	1992	1993	1994	1995	1996
	(mt)					
SSP production	225,000	368,000	110,000	9,500	8,500	2,000

The mechanical condition of the plant is very poor. Further, rapid deterioration/corrosion is progressing while the plant is shut down.

The SSP units were not operating during the visit. However, based on remaining conditions, adequate attention has not been paid to control of pollutants. The entire plant area including all structural steel and piping is coated with SSP dust, which is contributing to continuing corrosion.

Safety conditions in the plant are much below acceptable standards. Open electrical wires and connections are in evidence throughout the plants. Stairways and platforms are rusted and corroded to the extent that they are not safe to use.

As with the sulfuric acid plant, the most likely reasons for the poor condition are lack of funds for proper maintenance and lack of knowledge of what are considered as normal conditions in similar plants.

Evidently the plant at Sumgait was built without regard for economic benefits. Raw materials for the plant must be shipped from Russia, and the low-analysis product must be shipped long distances to the use areas. Costs of production were not available and, if they were, would not be meaningful because of the very low production rates with constant fixed costs.

An obvious conclusion is that granular SSP (19% P_2O_5) produced at Sumgait from shipped-in raw materials cannot compete economically with high-analysis fertilizers such as DAP, MAP, and TSP, which are produced in Russia and other Black Sea countries and are predominant in the world market.

Detailed financial analyses would be necessary to determine the feasibility of producing limited quantities of SSP at Sumgait and marketing it in areas near to the plant where excessive freight costs for the low-analysis product would not be a disadvantage. Further, the current transport, storage, and handling infrastructure in the region is not adequate for bulk shipments. Therefore, installation of bagging and bag handling facilities at the plant would be required.

Conclusions — Based on observations about the Sumgait Superphosphate Plant, the following conclusions are offered.

1. The mechanical condition of the plant is poor except for the sulfuric acid unit, which is in fair condition.
2. The main product, SSP, is no longer considered a major fertilizer product due to the high transport and handling costs related to the low nutrient content, i.e., 19% P_2O_5.
3. Fertilizer products from the plants, which are based on imported raw materials, cannot compete on a sustained basis in international markets.

4. Safety standards/conditions in the plant are poor.
5. Although the plant was not operating during the visit, it is apparent based on remaining conditions that the plant designs do not incorporate reasonable environmental standards.
6. Plant management is not aware of what are considered as normal operating standards and on-stream efficiencies for plants of this type.

Georgia

Rustavi Nitrogen Fertilizer Plant

The nitrogen plant in Georgia and the Rustavi Joint Stock Company Chemical Enterprises are located at Rustavi, which is near Tbilisi. There are two ammonia plants each with a design capacity of 206,000 mtpy, a nitric acid plant designed to produce 379,000 mtpy (100% nitric acid basis) and a prilled AN plant with a capacity of 396,000 mtpy of AN product.

Ammonium sulfate is produced as a byproduct from a caprolactam plant, which is not operating because there is no foreign exchange to buy raw materials. Natural gas to produce ammonia is bought from Russia, and currently production at the plant is severely limited due to lack of foreign exchange to buy natural gas.

Some ammonia is sold for industrial use, but most is used internally to produce nitric acid and AN (prilled). Some AN is sold in the Caucasus countries. However, most is exported to earn foreign exchange to buy natural gas. Data on the ammonia units at Rustavi are shown in **Table I-4.**

Table I-4. Pertinent Data for the Two Identical Ammonia Units at Rustavi

Design Capacity (per unit)	Basic Process	Year Built	Current Condition
625 mtpd	Natural gas reforming, reciprocating compressors, high-pressure synthesis, Russian design	1985	Fair

The plants were built in 1985. However, the process is 1950 vintage, which is no longer used except in rare cases for very small plants. Energy consumption in these type plants is 20%-25% higher

than in modern centrifugal compressor plants. This is of critical importance considering the limited availability of natural gas. In order to improve energy efficiency (about 7% improvement), a prism-type unit was installed in 1990 to recover hydrogen from the synthesis loop purge gas.

During the visit, the ammonia plants were in the process of being commissioned following a 1-month outage because of no natural gas. For the year 1997 through September, the average ammonia production has been about 25% of design. Ammonia production for selected years is shown in **Table I-5**.

Table I-5. Ammonia Production at Rustavi, 1987-1997

	1987	1988	1989	1995	1996	1997
Ammonia production (mt)	272,400	267,200	261,800	63,400	93,200	78,100
Percent of design production	66	65	63	15	23	25

Note: 1997 data are for January 1 through September 30.

Plants of this type that are properly designed and operated normally produce at rates exceeding 95% of design. As seen in the above table, the Rustavi plants produced at only about 65% of the design rate when they were relatively new.

The current mechanical condition of the plants is fair compared with similar plants in other countries. Operating personnel stated that the plants can probably be operated at about 70% of design provided natural gas is available and catalysts are in good condition. This is doubtful considering past records and the current plant condition.

In spite of this, company management is actively promoting a project to renovate the plants to increase ammonia production up to the design rate of 1,200 mtpd. After satisfying internal requirements, about 550 mtpd would be available for export. The ammonia would be exported through the port at Poti, about 370 km from Rustavi. In order to accomplish this, about 210 new rail cars would be required in addition to a new ammonia tank and terminal at the port.

The total cost of the project has been estimated as about US $20 million. It appears that this estimate is too low based on the scope of the planned project. Further, ammonia produced in the type

plants at Rustavi from purchased natural gas cannot compete on a long-term basis in international markets with ammonia produced in large, modern plants with low-cost natural gas.

Rather than pursuing a project that is highly unlikely to materialize, the company should devote its efforts to securing a stable natural gas supply for maximizing production of AN.

The plant was not operating during the visits. However, the operating personnel reported that the actual capacity of the plant — 100% HNO_3 basis — is about 950 mtpd versus design of 1,150 mtpd (379,000 mtpy) (**Table I-6**). Russian technology used in the plant incorporates a tail gas conversion unit for reduction of nitrogen oxides plus a tail-gas power recovery turbine on the air compressor.

Table I-6. Pertinent Data for the Nitric Acid (HNO_3) Unit at Rustavi

Design Capacity (mtpd)	Basic Process	Year Built	Current Condition
1,150 (100% HNO_3 basis)	Russian	1972	Fair

Product nitric acid at a concentration of 58%-59% is upgraded to AN. The raw material is ammonia produced in the plant complex. The major limitation to production is ammonia availability.

Based on visual observations, the plant appears to be in fair mechanical condition considering that it was built in 1972. However, the operating personnel reported that on-stream time averages 20-25 days per month because of problems with the compressor, absorber column, and weak acid wash system. If the installed environmental control systems operate properly, environmental conditions in the plant should be good. As with other units in the complex, plant safety conditions are poor, particularly with respect to electrical systems and heat insulation for personnel protection.

Actual production of nitric acid (100% HNO_3 basis) for selected years is given in **Table I-7**.

Table I-7. HNO_3 Production at Rustavi, 1987-1997

	1987	1988	1989	1995	1996	1997
HNO_3 production (mt), 100%	289,300	297,700	292,200	94,000	155,200	129,200
Percent of design production	76	78	77	25	41	46

Note: 1997 data are for January 1 through September 30.

With adequate supply of ammonia, the plant should be capable of producing sufficient nitric acid for upgrading to about 350,000 mtpy of AN. Basic descriptive data for the prilled AN unit at Rustavi are shown in **Table I-8**.

Table I-8. Pertinent Data for the Prilled AN Unit at Rustavi

Design Capacity	Basic Process	Year Built	Current Condition
(mtpy)			
396,000 (1,200 mtpd)	Russian, high-density prills	1972	Fair

As with the other units at the complex, the AN unit was not operating during the visit. Operating personnel reported that the plant is capable of producing up to 350,000 mtpy if adequate supplies of ammonia and nitric acid were available. The plant process is typical consisting of a neutralization section (two trains) for reacting ammonia and nitric acid, air-swept evaporators (three units), melt pumps, and a high-density prill tower with fluidized bed cooler in the bottom. Product from the prill tower at about 40°C is coated with an olefin compound and sent to bulk storage. Product AN is shipped from the plant in 50-kg bags or bulk bags ranging from 0.5- to 1.5-mt capacity.

Production of AN for selected years is given in **Table I-9**.

Table I-9. AN Production at Rustavi, 1987-1997

	1987	1988	1989	1995	1996	1997
AN production (mt)	363,000	373,200	371,300	118,200	195,300	166,000
Percent of design production	92	94	94	30	49	56

Note: Data for 1997 are for January 1 through September 30.

Although no product was on hand, the plant should be capable of producing a good product with acceptable storage qualities.

Based on visual observations, the mechanical condition of the plant was judged as fair considering the age of the plant and the corrosive nature of AN. Also, environmental conditions in the plant during operation should be acceptable provided that the installed pollution control equipment is properly operated.

Careful consideration was given in the design to preventing development of explosive conditions with the AN solutions and melt. However, other safety conditions in the plant are poor, particularly with respect to electrical systems and heat insulation.

Conclusions — Based on observations about the Rustavi Nitrogen Plant, the following conclusions are offered.

1. The mechanical condition of the plants is only fair, and it appears that management is not aware of what is the normal standard for plants of this type.
2. The basic designs and processes are, for the most part, types that are no longer used. Products from the plants, especially ammonia, cannot compete on a sustained basis in international markets.
3. Plant management is not aware of what are considered as normal operating standards and on-stream efficiencies for plants of this type.
4. Safety standards/conditions in the plants are poor.

5. Although the plants were not operating during the visit, it appears that the plant designs have considered reasonable environmental standards.
6. Due to the technology used, mechanical condition and relatively short remaining life of the plants, significant capital investments cannot be justified.

Regional Overview

Existing Supply

In the past, supply of fertilizer nutrients to the Caucasus region has been primarily from the following sources:

- Nitrogen — Ammonium nitrate from the plant at Rustavi, Georgia, plus limited quantities of byproduct ammonium sulfate from the caprolactam plant at Rustavi.
- Phosphate — Bulk SSP (granular) from the Sumgait plant near Baku.
- Potassium — Imported from Russia in the form of MOP.

In recent years the SSP plant at Sumgait, Azerbaijan, has essentially discontinued production due to lack of raw materials and a market for the low-analysis SSP product. Further, production of AN of Rustavi has been seriously curtailed by lack of natural gas for producing ammonia. The caprolactam plant is not operating because of no funds for procuring raw materials and, thus, byproduct ammonium sulfate is not available. As a result, agriculture in the region is suffering from inadequate use of fertilizers.

If sufficient natural gas was available, the nitrogen plant at Rustavi could produce about 350,000 mtpy of AN. Until such time that natural gas is available, it will be necessary to use alternative sources of supply.

Previously, there was a nitrogen plant in Vanadzor, Armenia. The plant has not been operated since the late 1980s after a severe earthquake. Recent reports indicate that the plant equipment still exists and the plant may be privatized and returned to production. This probably will not materialize

due to the age of the plant, which was first built in 1957, and equipment deterioration during the prolonged shutdown following the earthquake.

It has been rumored (not substantiated by the team) that construction of a large, modern ammonia/urea plant is being considered at Baku utilizing the natural gas presumed to become available in the area. However, this possibility is highly unlikely because of the costs involved in shipping the large volumes of products to an international port such as Poti in Georgia.

To correct the imbalanced use of fertilizer in the Caucasus, blended granular fertilizer materials could be produced using low cost blending materials. Formulated mixtures of varying nutrient content can be tailored to specific needs of soils and crops. The equipment for a basic 50-mtph bulk output and 30-mtph of bagged product can be port delivered for an estimated US $100,000. The in-country delivery and erection cost would be additional. An estimated cost for 15-15-15 blend is given in **Table I-10**.

Table I-10. An Estimated Cost of 15-15-15 Granular Blend

Material	Analysis	kg/mt	Material Cost per mt (US $)	Cost in Formula (US $)
Diammonium Phosphate	18-46-0	326	240	78.24
Muriate of Potash	0-0-60	250	150	37.50
Ammonium Nitrate	33.5-0-0	272	140	38.08
Filler		152	15	2.28
Total Materials		1,000		156.10
20% Other Costs				31.22
Total Cost				187.32

As the agricultural market becomes more sophisticated and growers perceive the value of crop-specific fertilizers, a local blender will have a decided marketing advantage in product offering and price. This is an excellent opportunity for small- to medium-size business development.

Additionally, the blender can add micronutrients as required by specific crops based on soil tests which give greater flexibility and efficiency in the nutrition program for crops.

Based on the foregoing assessment, the following overall conclusions are offered:

1. Future commercial operation of the Sumgait Superphosphate Plant is limited and the phosphate nutrient requirement for the region should be imported.
2. The Rustavi Nitrogen Plant can supply up to 350,000 mtpy of AN (33.5% N) if natural gas is available.
3. Training and study tours are recommended for management personnel of the Rustavi fertilizer factory to expose them to what are considered normal conditions in management, operations, and maintenance in similar plants in a market economy. Training and study tours are recommended if production at Sumgait is resumed.

Appendix II

Policy Environment

Regional Overview

The macro- and microeconomic policies of the national governments are generally conducive to the development of input markets. All three countries have a reasonable degree of stability in exchange rate, and foreign exchange is freely traded in local markets. All input and output prices are liberalized and determined by the market. There are no subsidies on any input. On the negative side, although interest rates are also determined by the market, shortage of funds and an underdeveloped banking sector and financial market make interest rates very high; in some areas farmers are required to pay as high as 96% per year. Consequently, there is limited borrowing for input purchases. Inadequate credit and high interest rates act as a severe constraint on input use and dealer development. Underdeveloped land markets are another constraint because fragmented landholdings require consolidation for viable farming. But limited land registration and titling make it difficult to buy or sell land.

During the central planning period, because the state was the producer of goods and services, few regulatory frameworks were developed and implemented. However, as the state is no longer the producer of goods and services, it has to assume the responsibility of protecting the interest of farmers and consumers from unscrupulous traders and producers. In all three countries, limited mechanisms exist for quality control, standards, and measures. The absence of regulatory frameworks may become a major problem in developing dealer networks. Also, because the size of the fertilizer market is small, measures are needed to ensure that state monopolies are not replaced by private monopolies.

In Azerbaijan and Georgia, there is effectively no extension service. There is an emergent extension service in Armenia supported by USDA. Many farmers have little knowledge of modern technologies. As the use of modern inputs is knowledge-intensive, appropriate and adequate arrangements for extension and farmer education will be essential to promote input use and dealer

development. Although extension and education are public goods and have been traditionally provided by the ministries of agriculture, in many countries including the United States, there is a growing trend towards using private dealers to provide extension advice to farmers. The private dealers as described in the strategy would be supported in assuming that role in the Caucasus. As in Albania, private dealers have the incentive and motivation to provide extension advice as a requirements of customer service and business development.

Country Perspectives

Matrix A briefly summarizes the various policy recommendations for agricultural input markets in the Caucasus.

Armenia

Macroeconomic Policy — In contrast to Azerbaijan and Georgia, Armenia achieved exchange rate stability rather late. Since May 1997, the exchange rate has been reasonably stable (around 480-500 drams/US $). Forex bureaus or authorized dealers sell foreign exchange in the open market. Thus, availability of foreign exchange is not a constraint on imports of fertilizers and CPCs, provided enterprises have adequate funds to buy foreign exchange.

Pricing Policy — Prices for inputs and outputs are market determined. There are no tariffs on import of fertilizers. Although currently there is a 20% VAT on the sale of fertilizers, the Government of Armenia (GOA) has decided to remove VAT on fertilizers effective January 1, 1998. However, a 30% tax on profits of business enterprises is a severe constraint on the development of dealer networks. To avoid this tax, small enterprises use barter trade rather than cash sales. For example, one dealer in the Shirak region sells fertilizers in exchange for wheat and grain for a milling operation and swine farm and uses wheat flour in a bakery. To encourage the development of dealer networks, this tax should be reduced, if not eliminated, on enterprises involved in input distribution.

Matrix A— Recommendations for a Conducive Policy Environment for Agricultural Input Markets in the Caucasus Region

Policy	Armenia	Azerbaijan	Georgia
Overall Status of Ag-Input Markets	Ad hoc, fragmented, and underdeveloped.	Ad hoc, fragmented, and underdeveloped.	Ad hoc, fragmented, and underdeveloped.
Policy Environment			
Macroeconomic Policy	Exchange rate should be stabilized over long term.	Exchange rate should be kept stable.	Stability in exchange rate should be sustained.
Pricing Policy	All input and output prices are market determined. However, a 30% profit tax on dealers and traders acts as a disincentive to develop input dealer networks. This tax should be reduced, if not eliminated.	All input and output prices are market determined except for cotton. Cotton prices should also be liberalized.	All input and output prices are market determined but custom duty and VAT on non-Commonwealth of Independent States (CIS) imports make inputs expensive. Both custom duty and VAT should be eliminated on all farm inputs.
Credit Policy	a. Availability of funds at affordable interest rates should be made available to farmers in rural areas. b. Dealers and processing units should be promoted as financial intermediaries. c. Agricultural Cooperative Bank should open branches in rural areas.	a. Availability of funds at affordable interest rates should be made available to farmers in rural areas. b. Dealers and financial intermediaries should be promoted. c. Agroprom Bank should be revitalized and consolidated to enhance lending to farmers.	a. Availability of funds at affordable interest rates should be made available to farmers in rural areas. b. Dealers and financial intermediaries should be promoted. c. Banking networks should be developed in rural areas.
Organizational Policy	a. Armfertility and Agroservice should be fully privatized. b. Private dealers should be provided training and technical assistance in agribusiness skills.	a. Fertilizer factory (SSP plant) should be privatized and reoriented to develop marketing networks. b. Private dealers should be provided training and technical assistance in agribusiness skills.	a. Fertilizer factory (AN plant) should be privatized and reoriented to develop marketing plans and networks. b. Agroservice should be privatized. c. Private dealers should be provided training and technical assistance in agribusiness skills.
Land Policy	Land registration and titling should be accelerated to promote the development of land market and consolidation of land holdings.	Privatization of land ownership should be accelerated.	Land titling and privatization of state-owned land should be encouraged.

Credit Policy — Because the banking sector and financial markets are underdeveloped, credit is generally not available in rural areas. Despite the involvement of several NGOs, including the UMCOR, the Cooperative for Assistance and Relief Everywhere (CARE), World Vision (WV), ACDI/VOCA, and Save the Children, in distributing credit, the lack of funds and financial intermediaries result in high interest rates of 6% to 8%/month. To improve the supply of credit to farmers, two new banks have been established. The Agricultural Cooperative Bank (ACB) was established in 1995 and started operations in 1996 with a grant of US $2 million from the European Union. The bank provides small loans (US $100-$500) for short terms (6-10 months) for the purchase of inputs. The bank has regional unions in the Armavir, Shirak, and Ararat regions. These regional unions consist of 25-32 village associations having over 4,000 private farmers as members. A farmer should be a member of the village association to qualify for borrowing from ACB. The World Bank/International Fund for Agricultural Development (IFAD) funded project is expected to provide US $8-$10 million for loanable funds to ACB. With these funds, ACB will increase the maximum size of loans to US $1,000 per member borrower and will provide funds for medium- and long-term investments. Unlike other commercial banks, this bank accepts land as collateral with an interest rate of 36%/year.

Shirakinvestbank, located in Gyumri, is a private bank involved in agricultural and agribusiness lending in the Shirak region. Like ACB, this bank also lends money for short-term activities and accepts land as a collateral. In addition to the private contribution to share capital, the bank also receives funds from CARE, USDA, and EU for further lending to farmers. As a result, lending rates are only 15%/year, compared with 70%-80% charged by commercial banks. Thus, although limited, credit programs are available for farmers to purchase inputs.

Land Policy — Armenia was the first country in the Caucasus to redistribute land; the process was conducted by village councils by land type and family size with the village retaining approximately 20% of the land area. Land was categorized as good, medium, and poor soil; each family received one, two, or three "units" of each type of land, depending on the size of the family. Some families opted for farm machinery rather than land. Land parcels were awarded by lottery for

each type of soil and about 320,000 persons received property. The result is severe fragmentation, non-contiguous parcels, and individuals who are now "farmers" have little agricultural experience.

Land registration was delayed because of a 3-year moratorium on sale or transfer. The moratorium has ended but cadastral registration is only beginning. The Ministry of Agriculture (MOA) reported that 101,000 land titles will be issued by the end of 1997, approximately 30% of the estimated 320,000 that will be needed to complete the process. There are some signs of a land market emerging, but land valuation is not established and little land is sold because of high fees for changing ownership.

Regulatory Framework — Quality control measures and anti-trust laws are inadequate and implemented poorly. Such measures are necessary to prevent private input monopolies from replacing state monopolies. Laws to ensure the quality of agricultural inputs should be developed and implemented.

Organizational Policy — Armfertility and Armagroservice are semi-private joint stock holding companies responsible for agricultural inputs. Armfertility is an old parastatal responsible for distributing fertilizers and CPCs and Armagroservice is responsible for providing agricultural machinery services. Both organizations have been privatized under donor conditionalities of EU and the World Bank but very little private sector culture has penetrated these organizations. Both organizations used to have regional offices, and some have been fully privatized and others are semi-privatized. In both organizations, GOA still controls 34% of ownership.

Armfertility, although semi-private, has adequate staff and technical knowledge about the fertilizer business but will need technical and training support to develop marketing skills and business acumen. In the short to medium term, this organization could be fully privatized and strengthened to act as a major importer and trader of fertilizers and CPCs. This organization could serve as a "stepping stone" in building an integrated dealer network in Armenia.

Azerbaijan

Macroeconomic Policy — Azerbaijan has achieved stability in exchange rates for over a year. The current exchange rate averages about 3,900 manat/US $. Foreign exchange is traded in the open market and easily available. Thus, foreign exchange availability is unlikely to be a major constraint on fertilizer imports and dealer development. There are no taxes on imports or domestic sale of fertilizers.

Pricing Policy — There are no controls on prices of inputs, nor subsidies on fertilizers and other agricultural inputs. Prices for most crops, except some strategic commodities, such as cotton, are market determined. Because cotton is a major export crop, the state has a monopoly on cultivation and sale. However, all the cotton processing factories are believed to have been privatized. The prices of all food grains and bread are fully liberalized.

Credit Policy — Availability of funds in rural areas is a major constraint on input use and supply. All commercial banks are located in cities or large towns and generally do not lend to the agricultural sector, mainly because agriculture is considered highly risky and land is not accepted as a collateral. However, some commercial banks accept cotton and tobacco (export commodities) as collateral for seasonal and short-term loans.

Agroprombank (APB) is the only bank which lends to agriculture and has branches in all 67 regions, but it is nearly bankrupt due to poor loan recovery and loan defaults. Because this bank has branches in rural areas, the World Bank financial sector reform program has recommended revitalization so that it can be used as an agent to channel funds to rural areas. Of course, the bank should consolidate operations into a limited number of regional offices and improve performance. The World Bank recommended that once the bank becomes viable, it should be privatized. APB is the only bank that was allowed to remain in the state sector in the short to medium term. The bank has submitted a strategy paper to the World Bank for consolidation and revitalization of operations.

The World Bank and European Union are providing funds to APB for further lending to farmers. Currently, the bank charges 25%/year interest on loans. Most loans are short term and land

is not accepted as collateral because all land is not registered. Only in one region, namely, Massali, is land fully privatized. In six areas, the World Bank has initiated a pilot project that assists in privatization and registration of land and makes funds available to private farmers through a credit union and APB. Some farmers have opened accounts with APB but do not deposit money, because they do not fully trust banks since many have failed in the past.

Land Policy — Azerbaijan is the last of the three countries to privatize the agricultural sector. With the direct assistance of the World Bank, technically and financially, privatization of collective and state farms is proceeding rapidly. Land and other assets are being distributed pro-rata by each enterprise to former members, and no arable land or machinery will remain with the state. World Bank demonstration farms assisted with this process, including the registration of land in individual names. Each region is proceeding with land redistribution, and the Massali region has completed privatization. The process in Quba, Salyan, and Uqar is 40%-60% complete, and 100% privatization in all demonstration regions is planned by the end of 1998. Several other regions are at various stages of meeting the national goal of full privatization of agricultural land.

An effort is being made to accommodate extended family groups and groups of individuals who wish to cooperate to form larger farms. Small garden plots are also being provided, and they are private gardens not farms. The Desert Steppe, which extends about 50-150 km north, west, and south of Baku, suggests limited agricultural potential. Unfortunately, this area is that most often seen by consultants and visitors. Beyond that arid zone, the agricultural potential in valleys is considerable and more representative of the country.

In general, much more equipment was observed in operation in Azerbaijan than in Armenia or Georgia. This is probably due to two factors. First, the privatization program is encouraging farms of a scale that is more closely matched to equipment size. Second, delivery of farm machinery through the state system was fairly constant until 1994 when it collapsed. This would indicate that the machinery inventory may be of more current vintage than for the other countries.

Regulatory Framework — Quality control measures and anti-trust laws are inadequate and implemented poorly. Such measures are necessary to prevent private input monopolies from replacing state monopolies. Laws to ensure the quality of agricultural inputs should be developed and implemented.

Organizational Policy — The old parastatal, Agrochemistry, responsible for distributing fertilizers and CPCs, has been privatized, but has not developed marketing and distribution networks. From a policy point of view, there are no restrictions on the entry into or exit from input marketing and distribution. However, private sector traders and dealers need extensive training and technical assistance in developing marketing infrastructures and skills.

Extension Support — Under the centrally planned system, as the collectives and state farms received instructions from the planning authorities about the application of seed, fertilizers, and CPCs, there was little need for extension services. However, now with so many small farmers without adequate training and experience in farming, adequate arrangements for research and extension are essential. The establishment of a network of input dealers would provide a basis for private sector extension activity.

Georgia

Macroeconomic Policy — Georgia has achieved a reasonable degree of stability in exchange rates, and foreign exchange is freely tradeable in the open market. Hence, availability of foreign exchange will not be a major constraint. However, fiscal policy of imposing a custom duty and VAT on fertilizer imports from non-CIS countries is a major constraint on the development of input markets and the use of fertilizers and other inputs. Currently, importers must pay 12.5% custom duty and 20% VAT on fertilizers imported from non-CIS countries. In addition, there are other 2%-3% taxes in the form of transportation levies and other charges. Thus, these taxes raise the price of fertilizers by 35%. In order to encourage fertilizer use and promote fair and free trade, these discriminatory and prohibitively high taxes should be eliminated.

Pricing Policy — All input and output prices are market determined and the state has withdrawn fully from price controls and monopoly arrangements. There are no subsidies on bread or inputs. Thus, pricing policy is fairly conducive to the development of agricultural input markets.

Credit Policy — As is the case in Armenia and Azerbaijan, lack of credit at a reasonable interest rate is a major constraint on the use of fertilizers and other inputs. Commercial banks are mostly concentrated in cities and large towns and do not lend much to agriculture because of inherent risk and uncertainty and land is not taken as a collateral. Interest rates are also high, reaching 96%/year in some areas including Telavi in eastern Georgia. The concept of commodity as a collateral is not common with commercial banks. The World Bank/IFAD and ACDI/VOCA have started developing credit unions or associations. ACDI/VOCA is using funds available from monetization of food aid from the United States. Through these projects, farmers have to become members of a credit association and can receive short-term loans at an interest rate of 24%/year. No funds are available for medium- and long-term agricultural investments. Only a few large farmers have borrowed from the ACDI/VOCA credit union in Gori. CARE is also implementing a credit project providing short-term loans to small farmers. These loans range between US $500 and $800 per customer. European Union-TACIS has initiated a credit program for farmers and business dealers. Despite these programs, availability of credit remains a major constraint. Even a 24% interest rate, charged by credit unions funded by EU and others, is not low enough to attract many borrowers. By developing financial infrastructures and increasing the supply of funds and ensuring proper accountability and management, the interest rate should be lowered to more affordable levels.

Regulatory Framework — Quality control measures and anti-trust laws are inadequate and implemented poorly. Such measures are necessary to prevent private input monopolies from replacing state monopolies. Laws to ensure the quality of agricultural inputs should be developed and implemented.

Organizational Policy — The old parastatal called *Saksoplnakopiereba* has been converted into a joint stock company called Sakagroservice and plans are being finalized for privatization. The company distributes fertilizers and CPCs and has offices in the regions. Although its size has been

reduced considerably, the company has basic physical, scientific, and institutional infrastructures and can be converted, with adequate training and technical assistance, into a large scale importer and wholesaler. Its current management is also enthusiastic about having the company privatized, so it can be restructured and become a private entity. It would be desirable to accelerate the privatization process so it can become a viable business enterprise in a competitive environment.

Land Policy — Privatization of land involved an initial distribution of about 1.25 ha per adult. According to a report from the Ministry of Agriculture (MOA), 870,000 ha of land was privatized as of September 1997. Based on the average distribution this would mean that there are now some 696,000 landholders. Additionally, it was noted that up to 480,000 ha had been leased to farmers. Thus, approximately 45% of the 3,000,000 ha of agricultural land is being farmed privately. These numbers do not reflect "free" pasturage of unleased land or land which is being cropped marginally. National statistics are not obtainable on patterns of land use. The MOA reported that a National Agricultural Information Center and four regional centers are in the initial stages of organizing. However, at this time the MOA is not equipped to collect information.

It should be noted that much of the leased land is controlled locally where short-term leases are offered. It was observed and verified in one case in the Telavi region that individuals who had local influence and some outside sources of funds were consolidating large holdings. Local farmers stated that they are unwilling to bid on the land without long-term leases. The mayor of Telavi reported that individuals are much more productive than cooperatives in operating leased land. He planned to award more leased land that was under city control. A few individuals who have access to money from other sources are beginning to negotiate for larger land parcels.

There are voluntary associations who share machinery and cultivate crops, but the general pattern is essentially "gardening" with surpluses bartered in the market. This makes it virtually impossible to track productivity because transactions are not recorded.

There is little structure to private sector marketing of basic agricultural inputs. The former parastatal organizations totally collapsed in recent years as trading ties with the FSU were severed,

credit evaporated, military conflicts arose in several autonomous and disputed regions, and domestic political disruption ensued. Although the Parliament and Ministry of Agriculture are drafting new legislation rapidly and initiating privatization of state input and distribution parastatals, these efforts appear to be very much in response to conditionalities imposed for continuing funds from major donor programs, particularly TACIS.

It should be mentioned that the small landholders do not consider themselves farmers. They understand themselves to be peasants, and a "farmer" is one who rents or leases land. As former state employees, their occupations included accountants, drivers, janitors, mechanics, and secretaries. Many know little about agriculture, have heard stories of misapplied chemicals, and tried donated seeds that were not adapted locally. There is a grassroots feeling that mineral fertilizers, CPCs, and improved varieties are dangerous — that organic and homegrown produce is safer. Crop rotation is a foreign concept. The trained agronomists from the old system are shunned. In short, there is a fundamental need for basic agronomic education and information.

Extension Policy — For the same reasons as in Armenia and Azerbaijan, Georgia has no agricultural extension service, and the Ministry of Agriculture has no extension department. As many small-scale farmers are learning about farming, extension support and adult agricultural education will be essential to promote environmentally sound use of modern inputs and the development of input markets. Without proper knowledge and training about the use of CPCs, farmers may use herbicides in place of pesticides, as happened in the Kutaisi region. Extension services should be provided by the private sector through a network of input dealers.

Appendix III

Agricultural Input Markets

Armenia

Fertilizer

Fertilizer use is virtually nil with the exception of limited quantities of AN from Georgia and Russia. Most farmers have no idea about nutrient needs of soils or basic soil structure, although soil maps from the Soviet era are available. According to the Armenian Extension Service, there is an annual need for the following amounts of nutrients in the country: N — 70,000 mt; P_2O_5 — 45,000 mt; K_2O — 25,000 mt. Of the soils under cultivation, 70% are deficient in P and 23% are deficient in K. For the past 6 years no significant amounts of fertilizer have been applied.

Recent estimates from the World Bank of fertilizer needs are very similar and suggest that between 140,000 and 170,000 mt of nutrients is needed in Armenian agriculture. This means that in physical weight 450,000 to 550,000 mt of fertilizer products is needed. Although fertilizer use statistics are sparse and unreliable, it appears that less than 0.5 kg of fertilizer was used on cereal crops in 1997. The severe problem of a short and imbalanced supply of fertilizers demonstrates a need to create and develop an input network of dealers so that supplies are timely, routine, and predictable. In the absence of such a private network, the poor situation will deteriorate further. Because there is no domestic production of fertilizer in Armenia, all products must be imported.

A visit was made to Yerevan Berriutyum, an open stock holding company, which is 66% held by individuals and 34% held by the former parastatal under the MOA. The company imported 300 mt of AN product in 1997, only 120 mt was distributed. Rustavi offered the following terms: cash f.o.b. plant — US $110/mt; credit (6 months) — US $130/mt. The manager estimated that, after freight and delivery costs, a profit of 7% was realized. It was also reported that many customers paid by barter and that more cash sales would be helpful. No license is required to sell fertilizer products in Armenia. The limited nature of business is characteristic of the state of marketing inputs in the Caucasus. This example shows the inability of a partially private parastatal to procure and distribute

fertilizers and further makes a case for the creation and development of a network of private input dealers as described in the strategy section of this assessment.

The team visited Council Co. Ltd., Hatzik village, which is near Gyumri, where an estimated 20 mt of AN from Russia was stored. In discussions the owner said that he had sold four railcar loads of AN from Rustavi, Georgia. Product was acquired by paying the Russian supplier of natural gas directly and taking fertilizer in return. This company supplied all the fertilizer for three regions of northwest Armenia, but would not reveal profit margins, customers, or if retail distributors were part of marketing. This example shows that there is a basis and it is indeed possible to create and develop private input dealers. Unfortunately, this private business was one of the very few found in the region. It is precisely this type of "infant dealership" that deserves support in development envisaged in the strategy section of this report.

Seed

According to the MOA, increases in production of wheat and grain are a result of increases in area planted not improved yield. Among the reasons cited for a decline in productivity are poor tillage and cultivation practices, poor seed quality, lack of rotation, and manure being used for fuel rather than fertilizer. Virtually no high-yielding varieties (HYV) are used in Armenia. Thus, Armenia is practicing an extensive agricultural strategy without improved seed and, as discussed later, without other key inputs.

Open-pollinated varieties of spring and winter wheat, spring and winter barley, and oat seed are saved by farmers without cleaning or treatment. Seed potatoes are also being saved and serious virus problems are emerging.

At the Department of Soil Sciences and Chemical Research Center, biotechnology lab technicians were propagating potato plants from meristem tissue of virus free tubers furnished the center by the Government of the Netherlands. The cloned plants were transplanted from test tubes to flats and then to a greenhouse area. The greenhouse had no glass, but did have water and was usable during the normal growing season. The manager indicated that if the two damaged

greenhouses could be repaired and used year-round they would have the capacity to produce 200 mt of new disease-free seed stock, which is sufficient for the entire country.

Breeder seed was also being multiplied as follows: spring wheat — 45 ha, barley — 8 ha, oats — 60 ha, and winter wheat — 800 ha. The manager estimated that the station produced 1,050 mt of breeder seed in 1997. It is interesting to note that this center is contracting with local farmers for potato multiplication for the institute and plans to add a private contract for 6 ha of wheat in 1998. There were 17 farms in 1997 that were engaged in the state seed multiplication system, and in 1998 there will be 13. These farms have approximately 4,000 ha of land available for seed production. The station plans to produce 58,000 mt of super-elite seed and 270,000 mt of elite seed for use by farmers. He stated that the price would be set at 180 dram/kg for breeder seed and 120 dram/kg for super-elite seed. It is normal at the farm for elite seed (U.S. equivalent of certified seed) to sell at 1.7-2.5 times the underlying commodity. The farm price on this basis would be between 55 and 85 dram/kg. The director said that because farmers were not buying new seed it is doubtful if any significant increases would be made next season from the breeder seed increase.

The agricultural production potential of Armenia is not being realized. Although the country has the least productive soils and climate in the region and will always be dependent on imports for a significant portion of its basic food needs, Armenia can double agricultural productivity within 2 or 3 years given an efficient system of supplying and distributing improved seed varieties and agricultural inputs. The deputy director of Armgrain estimated that with adequate inputs, wheat production could provide 30% of the national requirement as opposed to the current 10%. This would result in approximately US $13,000,000 import substitution. It appears that Armenia has a great degree of entrepreneurial spirit and credit is available albeit at high rates of interest. A functioning soil testing lab and active trained extension agents in the field are also resources upon which to build.

As highlighted by the *Armenia Agriculture and Food Sector Review*, Vol. 1, February 6, 1995. World Bank:

> Employing high quality seed, a reduced number of field operations with the assistance of modern chemicals and machines, optimal rates of good quality balanced fertilizers, and appropriate machines for seeding, crop protection and harvesting, are all essential to sustainable improvements in crop production. Advanced technology has to be coupled of course, with professional farm management and a respect for the optimum timing for field operations for each of the crops.

There is a distinct need for professional farm management in alfalfa production. Farmers in the forage production areas typically cut alfalfa at 90% bloom. The optimum harvest for alfalfa is at 10%-20% bloom to obtain the highest protein content and feed conversion efficiency. Although extension agents are present in the regions, their advice is either outdated or ignored by farmers.

Focusing resources in areas where there is an output market, such as in production of basic animal feed grain and cereal grain for human consumption, will provide the fastest return on investment and improvement in development of the agricultural sector. Programs for development that can enhance seed testing, demonstrations, and multiplication of suitable varieties should be implemented through private sector entities.

Donor programs for wheat seed have been significant but have actually had a negative impact (see *Wheat Seed Project Evaluation*, Armenian Technology Group, March 1996). Unadapted varieties, poor quality control, late delivery, and lack of fertilizer and CPCs all contributed to difficulties. Furthermore, there was no development of enterprises that could sustain a seed program following the donor effort. Programs should be developed to test varieties and multiply suitable varieties. A recent donor program for 76 mt of Appolo alfalfa seed was apparently successful. A viable seed source for continuing improvement of pastures and alfalfa crops should be identified and developed.

Crop Protection Chemicals

As with fertilizer, there has been virtually no use of CPCs for the past several years. The Deputy Director for Research, Armenian Plant Protection Research Institute, reported that Armenia works with Ciba-Geigy, Bayer, Zeneca, and Rohne-Poulenc for most chemical products and follows the Russian registration system. The two most critical needs are soil insecticides to control wireworm

in 30,000 ha of potato production (losses of 75%-100% are reported in several areas) and seed treatments which can be applied to farmer-saved wheat seed and seed in multiplication. Additionally for vineyards and orchards, there is a need for fungicides and insecticides. There are individuals and companies who are beginning to acquire and distribute CPCs in the private sector on a very limited basis.

Working with the ATG group, the Berriutyum Company received some direct funding and trade credit to import pesticides from Ciba-Geigy via their Russian distribution system. Training, literature, and protective clothing were provided to employees. The company repackaged products in smaller units, distributed the chemicals, and reclaimed and disposed of all containers. It was estimated that the company had a net profit of 10%-15%. One problem noted was that literature and labels were in the Russian language and the customers did not read Russian. A license from the MOA is required to sell CPCs. There is only one other licensed company in Yerevan.

A visit was made to the village Karpi, located about 20 miles northeast of Yerevan. A local businessman marketed eight CPCs to an estimated 1,500 customers in 1997 and literature on proper use was available. The proprietor stated that there are 30 importers and wholesalers with whom he works to obtain supplies. The greatest problem was that some of the products from Russia were 20 years old and of very poor quality. He now submits samples to the state for analysis before purchasing. In addition to CPCs, he also obtained and sold 500 mt of AN and expects to market 1,500 mt in 1998 if the product can be acquired. If the business prospers, three or four people in the region are interested in becoming distributors to serve 28 villages. Such examples are few in the region and the limited nature of the business is characteristic of the state of marketing inputs in the Caucasus. This example is typical of the state of input marketing in the region.

The Berriutyum Company and one private business were the only providers of CPCs observed in Armenia. These concerns are severely limited in their ability to provide CPCs, and poor quality and high prices relative to farm product prices further constrain CPC use. These characteristics in conjunction with severely limited competition make the current system entirely inadequate to serve the needs of 250,000 small farms.

Machinery

Armagro Service is the parastatal that formerly supplied machinery in Armenia. Armagro is currently 34% held by the state and expects to be 100% privatized by mid-1998. Twenty centers are now private, and twenty secondary centers remain to be privatized. It is doubtful that the private companies will survive without access to replacement parts and some new equipment to sell and service. Observations from Armagro include:

1. The size of available machinery is not appropriate for small farms. As a result, large machinery is stored on farms for future use when land is consolidated into larger units.
2. The blockade by Turkey and Azerbaijan has affected availability of spare parts and new equipment.
3. Industry has ceased manufacturing spare parts in Armenia.
4. Motorblock Tractors, which are assembled in Armenia from imported components, are 5-hp units priced at about US $3,500 with all attachments. They are not durable enough to operate in rocky soils and farmers would probably not buy them at any price.
5. A critical need is for tractors in the 16- to 25-hp range, but credit is a constraint.
6. The 20 privatized centers have repair shops as well as "shops on wheels" that can reach small villages and farmers.
7. The operation is now 70% centered on spare parts, and dwindling supplies are causing severe problems.
8. Because services, spares, and new machinery are not considered agriculture, they are subject to 20% VAT and 30% profit tax. This is a major disincentive to all machinery enterprises.
9. Many machinery operators are not trained or qualified. It is estimated that only 20% of the agricultural equipment is in operation because of improper maintenance and operation.
10. Mini-tractors/tillers are manufactured in Armenia but are not suitable for the rough terrain and are reported by farmers to be "fragile."

It is interesting to note that Armagro has in stock 100 backpack sprayers manufactured in the Ukraine by LeVov that are for sale at US $20. These have been identified as a need for smaller farmers to apply CPCs properly. However, farmers are purchasing fewer than 20 units each year.

In the ATG Wheat Seed Project Evaluation of March 1996, it was reported that 26 land levelers were manufactured to U.S. design and specifications. These machines were used to prepare over 4,000 ha of irrigated land and seed beds for irrigation. In this same report it was mentioned that a team of technicians assisted in making combine adjustments that reduced harvest losses significantly. A set of instructions was developed to enable operators and mechanics to continue this process. Because all combines throughout the region appeared similar, these instructions and the experience of the local mechanics could be valuable as well. No private implement dealers or service centers were located.

Credit

The Director of the Agricultural Cooperative Bank in Yerevan estimated that the national credit requirement per cropping season is about US $80 million. Toward that end a number of NGOs and donors are providing credit in the country as part of their programs. UMCOR, the Peace Corps, Save the Children, USDA, CARE, World Vision (WV), and Gold Asset all provide credit facilities of various types for agricultural development and seasonal credit.

The team visited the Shirakinvestbank, a private bank in the Gyumri region. The bank was capitalized initially with US $150,000 and now has capital of US $600,000. This was achieved through pooling of funds from various donor sources. The bank has granted about 3,000 individual loans up to US $1,000 each and has a 100% repayment rate. Interest ranges from 16% to 21% annually. A customer database with 10-year production history is maintained and is available for a fee to interested third parties. The current total loans are US $4,000,000, which is estimated to be about 20% of the needs of the region. The bank has international correspondent relationships and can issue letters of credit. The bank has made loans exclusively to cooperatives for purchase of input supplies but is considering financing individuals who wish to begin agricultural input enterprises. The bank considers agroprocessing to be in its portfolio and is willing to loan for microprocessing enterprises. Consulting with customers to develop business plans is also a service of the bank, and land is accepted as collateral. Deposits are accepted and earn interest of 0.5%-1.5% monthly depending on amount and term. In addition to the banking system, remittances from overseas relatives provide some funding for individuals.

These examples show that if timely and adequate inputs are available, credit, albeit limited, is available.

Public Sector Resources

Armenia, with support from USDA, has begun a pilot effort in the areas of extension, soil fertility analysis, and seed maintenance. This includes extension offices and trained agronomists acting as village agents in selected villages. Extension offices produce fact sheets on CPCs. The extension activities were confirmed in Gyumri and extension service personnel also supported CPC distribution through Berriutyum. In general, resources available for these efforts are not sufficient for a large-scale, country-wide program.

Azerbaijan

Fertilizer

Although fertilizer has not been used to any extent for at least 5 years, a small quantity of AN was acquired from Georgia in 1997 and imported by rail to Salyan. Some remnant SSP inventory at former state distribution centers has been available. It in instructive to note that farmers in Massali said they could and would buy fertilizer, but there was no supply; while the manager of the SSP plant in Sumgyait stated that they could supply fertilizer, but there was no demand. This is a classic case of market confusion that should be addressed. There is simply no reliable fertilizer delivery system in Azerbaijan.

Seed

Virtually all seed is saved by farmers, but cotton mills have seed for sale. Some semi-portable seed cleaning equipment from the former state farms is available for rent. Farmers were observed cleaning wheat seed in the Uqar region. The seed to be cleaned was of poor quality with mixed varieties and approximately 15% weed seed and foreign matter. Seed was recleaned two or three times in order to obtain approximately 95% purity. There was no seed treatment available and no

equipment to apply seed treatments. This observation is certainly generalizable to all areas of Azerbaijan and likely to the entire region.

Crop Protection Chemicals

No private enterprise marketing crop protection chemicals were identified. Throughout the country CPCs are unavailable or unaffordable. This has resulted in negative consequences for cotton production and fruit production in particular. Both quality and yields have declined in all types of production to approximately 20%-40% of prior levels. Farmers in Salyan indicated that they could buy some small equipment such as backpack chemical sprayers if CPCs were available. They also indicated a willingness to attend training programs on safe application of CPCs and new variety management.

Machinery

Machinery in Azerbaijan is old and in poor condition but remains in general use. Throughout the Goycay, Agsu, Samaxi corridor, fall wheat seeding was in full progress. Although plowing was rough and ground was being reworked to make somewhat reasonable seedbeds, tillage and planting were underway throughout the area. Some broadcast fertilizer spreaders were being used to sow wheat seed where grain drills were inoperable, but many drill-type seeders with operable tubes and disc openers were observed. Cotton harvest was being done by hand because most of the cotton harvesters were out of commission. The wheat harvest was completed with operable combines that were rented or were owned by private individuals. Field losses from poorly adjusted combines were reported to be 20% or more. Numerous tractors were in operation and were able to move equipment and to perform basic tillage. No machinery dealers were found, but it was reported that some equipment and tractors could be purchased in Baku.

Credit

World Bank representatives indicated that they are prepared to establish credit for inputs and long-term credit for capital investment and machinery. It appears that the Agroprom bank, although bankrupt, will serve as an agent bank because it is the only bank with offices in all districts. A number of farmers showed us their account "seals" proving they had opened accounts with Agroprom. This

does not mean they have deposits — it means they are prepared to enter into credit agreements when the opportunity is available. Bank representatives at regional demonstration farms plan to offer credit of three types. Short-term credit for 1-3 years will be available for purchasing inputs. There will be a US $500/ha limit, and interest rates will be 12%/year. Loans of up to US $30,000 for 10 years with a 5-year grace period will be available for machinery. Interest will be discounted for 3-4 year payback. Irrigation systems will be financed over 35 years.

Georgia

Fertilizer

Saksoplanakopieri was the state organization that distributed fertilizer and CPCs. It is in the process of renaming itself Agro Service Company and has initiated privatization by a partial offering of shares to employees as a joint stock company. Among the assets being privatized are some 40 offices and warehouses. At its peak in the late 1980s, the organization procured and distributed 400,000 mt of fertilizer. In 1997 the Agro Service Company distributed 30,000 mt of fertilizer, about a 93% decrease. Customers were required to pay cash. Further stock offers will be made in an attempt to completely privatize this input system. According to the manager it is doubtful if investors will acquire the assets at any price. Thus, there is no effective system of fertilizer distribution in Georgia.

The newly formed farmers' credit union in Gori attempted to purchase AN directly from the factory in Rustavi. The factory procedure to purchase fertilizer is cumbersome and delayed issuing purchase orders and truck loading. The process required over 1 week of effort to obtain a truckload of product. There was no private fertilizer supply business identified in any of the four regions visited. It was consistently reported that retailers sold AN off trucks in towns and villages. The team was unable to identify or interview anyone who handled fertilizer in this manner, but this process appears to be the "modus operandi" for fertilizer sales throughout the Caucasus.

Seed

The primary reason that Georgia has been dependent on food aid to meet basic food requirements is the result both of historic agricultural priorities and the lack of knowledge and resources required to make the necessary changes. A primary variable inhibiting expansion of food and feed production in Georgia is the lack of high-yield potential seed, which can by itself increase food production significantly. When coupled with optimum fertility, weed and pest control, and irrigation in the drier areas, Georgia has enough land resources to fill its food requirements. The introduction of high-yielding maize, wheat, sunflower, and potatoes, without any other technical changes, can increase the yield of these crops by up to 50%-100%. In 1996 with improvements in fertility, weed and pest control, and the better seed, yield increases of 200%-400% were recorded. Thus of all the variables, major production increases can be achieved most quickly through the introduction of improved seed.

Seed for potatoes, maize, wheat, soybean, and sunflower are currently saved by farmers and are untreated and uncleaned. There were no seed supply businesses identified in any of the regions visited. The director of the Seed Research Institute, where breeder seed is maintained, reported that prior to collapse of the Soviet Union as much as 30% of the maize seed was hybrid. It was reported by the manager of the Wilbur-Ellis company, a private Canadian firm opening operations in Georgia, that Pioneer had attempted to enter the Georgian market 2 or 3 years ago. However, because there was little regard for intellectual property rights and farmers were saving seed, Pioneer withdrew.

Donor programs contributed some hybrid yellow maize over the past 2 years through ACDI/ VOCA and the Georgia Farmers' Union (GFU). Farmers were not generally provided proper management information, had few if any additional inputs such as fertilizer, there was no provision for continuing the supply of seed and farmers could not repeat the program even if successful. A potato seed donor program was initially a failure because the variety was highly susceptible to the Colorado beetle. However, a potato seed improvement project coordinated by ACDI/VOCA in south Georgia is experiencing success. Adapted varieties were selected from demonstrations and increased locally. The village is planning to export seed potatoes to Armenia.

An effort to privatize the former state seed distribution company through creation of a joint stock company, Martsvali, is supposed to be completed in seven regions of the country in November 1997. Employees and others will be offered the opportunity to invest in shares of the new company. Stations that were formerly responsible for multiplication of approved seed varieties will be made available for sale. Investors will be required to purchase 55% of the state-appraised value but may defer the balance of the purchase for up to 10 years. Two of these stations at Ajamati and Senaki were visited and found in very poor condition. At Ajamati, open-pollinated white corn amounting to an estimated 100 bushels or about 3 mt was available for farmers to purchase. The capacity of this facility is approximately 800 mtpy. It is doubtful that Martsvali will provide the basis of enterprises that can effectively produce, warehouse, or market seed.

ACDI/VOCA recently began implementation of the Seed Enterprise Enhancement and Development (SEED) Project in the Republic of Georgia, a 3-year initiative. The goal of the project is to create, test, and institutionalize a functioning production system for high-yielding maize, wheat, potato, and sunflower seeds. This will be accomplished through expanded research of new and improved seed varieties, promotion and demonstration of improved varieties and growing techniques, and increased production of quality seed. The three areas of the project — research, promotion, and production — are designed to be interrelated to create an overall system for an economically viable seed industry. To accomplish the project goal, the activity will use resources from USDA Food for Progress Program of ACDI/VOCA and the Farmer-to-Farmer Program, in addition to direct USAID funding.

The creation and development of private input dealers in areas where the ACDI/VOCA seed project is active would be complementary, beneficial, and an excellent example of efficient project linkage.

Crop Protection Chemicals

Agro Service, formerly Saksoplanakopieri, at its peak acquired and distributed 25,000 mt of 60 different crop protection chemicals. In 1997, 300 mt of 10 crop protection chemicals handled. A consortium of international chemical companies offered US $1.5 million in trade credit in the form

of consignment. Swiss companies provided US $700,000, French companies US $400,000, and a German company US $200,000. However, Agro Service was unable to market the products during the 1997 crop year. The director stated that farmers did not have money to purchase the products. It is worth noting that although trade credit and consignment were offered to this organization, there was no offer of crop cycle consignments or credit from Agro Service.

The only chemical used widely as a fungicide on grapevines is copper sulfate. Sprayers found on two farms were direct driven sprayers with no pressure controls and rusted nozzles and were impossible to calibrate. Five planters on five different farms had no insecticide or herbicide boxes, and farmers indicated they had never seen such attachments for application of pesticides. No seed treatments, soil insecticides, or herbicides were found anywhere. The only "distributors" were merchants in the farm markets. A few products were observed in shop windows or only the labels for the products were on display.

A persistent story was that a donor program distributed herbicides with labels not in the Georgian or Russian languages. When farmers applied the products, they thought they were fungicides to be sprayed on grapes and, of course, the grapevines died. Farmers frequently mentioned this in support of the idea that CPCs were not desirable and would not be used even if available. Wilbur-Ellis Company is attempting to form a company that would market inputs, including CPCs in Georgia through a subsidiary called AgroMarket, Ltd. This enterprise is just beginning and has not marketed any products as of this time. No other private enterprise distributing crop protection chemicals was located.

Machinery

Machinery marketing, both of equipment and of parts, is non-existent. There has been virtually no new equipment on farms in the past 5 years. Parts are routinely salvaged from inoperable machines. As a result, seed bed preparation is poor, seeding rates and placement are highly variable, planter and broadcast applications of fertilizer are either impossible or very inaccurate, spraying and chemical applications cannot be calibrated, and mechanical harvesting losses are severe. Machinery

condition in and of itself dictates that some technologies, such as pesticides, should be introduced with application technology.

In the maize and soybean region from Kutaisi to Senaki to Poti, all maize was hand harvested. Even large fields, which are operated by voluntary associations, were harvested in this manner. The team visited locations where combines were seen in farmyards and inquired as to the condition of the machines. In all cases the equipment was inoperable and parts were unobtainable. At the Ajamati research station, the combine engine had failed this past season. The manager estimated that it would cost US $500 to replace the motor. This was more than the entire budget, and he did not know where he could buy an engine even if he could find the funds. All soybeans in the region were often hand harvested for hay to feed to livestock.

In the central and eastern regions where wheat is a significant crop, harvest had been completed by combines. Field losses through the combines were reportedly 15%-25%. Large track-driven tractors were plowing and disking, and fall wheat seeding was in progress. Planters for corn, soybeans, and sunflowers had no sprockets to adjust seeding rates, no disc openers, and no fertilizer, insecticide, or herbicide attachments. Sprayers for chemicals were obsolete and incapable of proper calibration. Row crop tractors were in poor condition, and 80% were out of operation according to farm operators. Repair parts are not available. The overall machinery inventory is in very bad condition and is mismatched to farm sizes in many cases.

Credit

A report from the European Bank for Reconstruction and Development (EBRD), *Strategy for Georgia*, indicated that credit lines of US $5 million and US $8 million were marked for Georgian private banks. An additional US $12-$16 million in a privately sponsored investment fund for small- and medium-sized joint ventures was expected to be approved. According to this document "the main need in the sector, addressed by the financial and banking sector initiatives, is seasonal and term credit for smallholders small and medium-sized input supply, and trading and agri-processing enterprises."

The TACIS Regional Agricultural Reform Project provides funds to assist in development in order to end humanitarian aid programs. A parallel fund holds proceeds and allocates funds, 50% to MOA for targeted use focused on the cereal sector and 50% for commercial credit lines which are targeted to boost productivity and to reestablish local markets. Twenty banks are involved, and to date the program has a 100% repayment record. At least two banks are planning to continue the program after the project ends.

The British Know How Fund provides technical assistance for agricultural programs. Included in their portfolio are business planning, financial planning, and assistance for individuals who are trying to obtain loans. Banks do not appear willing to make loans for agriculture *per se*, and the Agrobank has no funds available. Interest rates are nominally stated at 24%, but actual transactions are at least 10% above this rate. The GFU reports that when credit is available from banks it is at interest rates of 36%-40%. The GFU is lobbying the government to take action to reduce the cost of funds for agriculture.

The ACDI/VOCA pilot credit union with 200 clients in the Gori region shows a very successful start. Credit was extended to 28 members in 1997 at an interest rate of 36% plus a 3% membership fee, and 100% repayment is expected. The credit focused on improving wheat production. A detailed input cost budget was worked out with each applicant. Applicants had to provide US $1 of their own cash for each US $1 of credit. New seed and some fertilizer were purchased through this program. With good wheat yields this season with good prices (US $300/mt), the funds available for next cycle have increased about 25%. There is a significant price distortion here. The world wheat price should be in the vicinity of US $150/mt as is the case in the other two countries of the region. The credit union management anticipates lowering interest rates in 1998 to 24% based on current markets. Management indicated that the organization can eventually serve about 200 farmers. The use of inputs should increase yields 150%-200% if inputs can be procured with the help of the credit program. A pilot program in the Telavi region in east Georgia is also planned in 1998. A number of other small monetization programs are pending.

Public Sector Resources

The ability to introduce and market seed varieties will be affected by a new seed law in the process of being drafted. The law will enable the unencumbered formation of businesses to market seed. However, the variety approval process as proposed appears to lead to a restrictive, 3-year state system testing and government approval of new varieties. This is similar to the European approach as opposed to the system in operation in the United States. On the positive side, there is a willingness to provide a framework for protection of intellectual property rights and to make an effort to coordinate with other countries in the region to harmonize seed laws and standards.

The privatization effort will affect seed multiplication and testing, but care should be taken to preserve and improve the Georgian national germplasm base. This is often a legitimate activity of the public sector. In close cooperation with the University of Oregon, 3,000 wheat lines were recently accessed by the Research Institute, and about 200 have been selected for adaptation and improvement. Several open pollinated maize populations, notably Ajamati Tetra (white), Abasha (yellow), and Kaguti (yellow) are being maintained and provide a valuable base for selection of lines and hybrids. Also, U.S. public lines are maintained, such as Mo17 and B73. Several accessions from the International Center for the Improvement of Wheat and Maize and breeding materials from the former Soviet Union are maintained. Soybean, alfalfa, clover, and pasture grasses are also maintained. This can be an important source of support for forming a seed industry based on good germplasm.

Appendix IV
Transportation and Distribution

Introduction

The Caucasus region is bordered by the Black Sea on the west, the Caspian Sea on the east, Russia on the north, and Turkey and Iran on the south. The Black Sea offers the opportunity for water transportation into and out of world markets via the Straits of Bosphorous and the Mediterranean Sea. The Caspian Sea is less accessible by water except via the Volga River-Volga Canal and Don River systems in Russia which reportedly will become available for use in the near future for small cargoes. Railways and roads provide regional land connections, which are capable of supporting regional agricultural trade and development (**Figures IV-1** through **IV-3**).

In general, both highways and railroads are in need of extensive maintenance and, in some cases, replacement. There are no viable internal waterway systems to transport materials by barge or small vessel through and into the region.

The relative density of highway and railroad lengths for each of the countries is shown in **Table IV-1**.

Table IV-1. Comparison of Highway and Railroad Density by Country

	Armenia	Azerbaijan	Georgia
Total Land (km^2)	28,400	86,100	69,000
Railroad Length (km)	825	2,090	1,570
Railroad Density (km/1,000 km^2)	29	24	23
Highways Length (km)	11,300	36,700	21,600
Highway Density (km/1,000 km^2)	398	426	313

Figure IV - 1. Administrative Boundary, Major Cities, Major Highways and Major Railways of Armenia

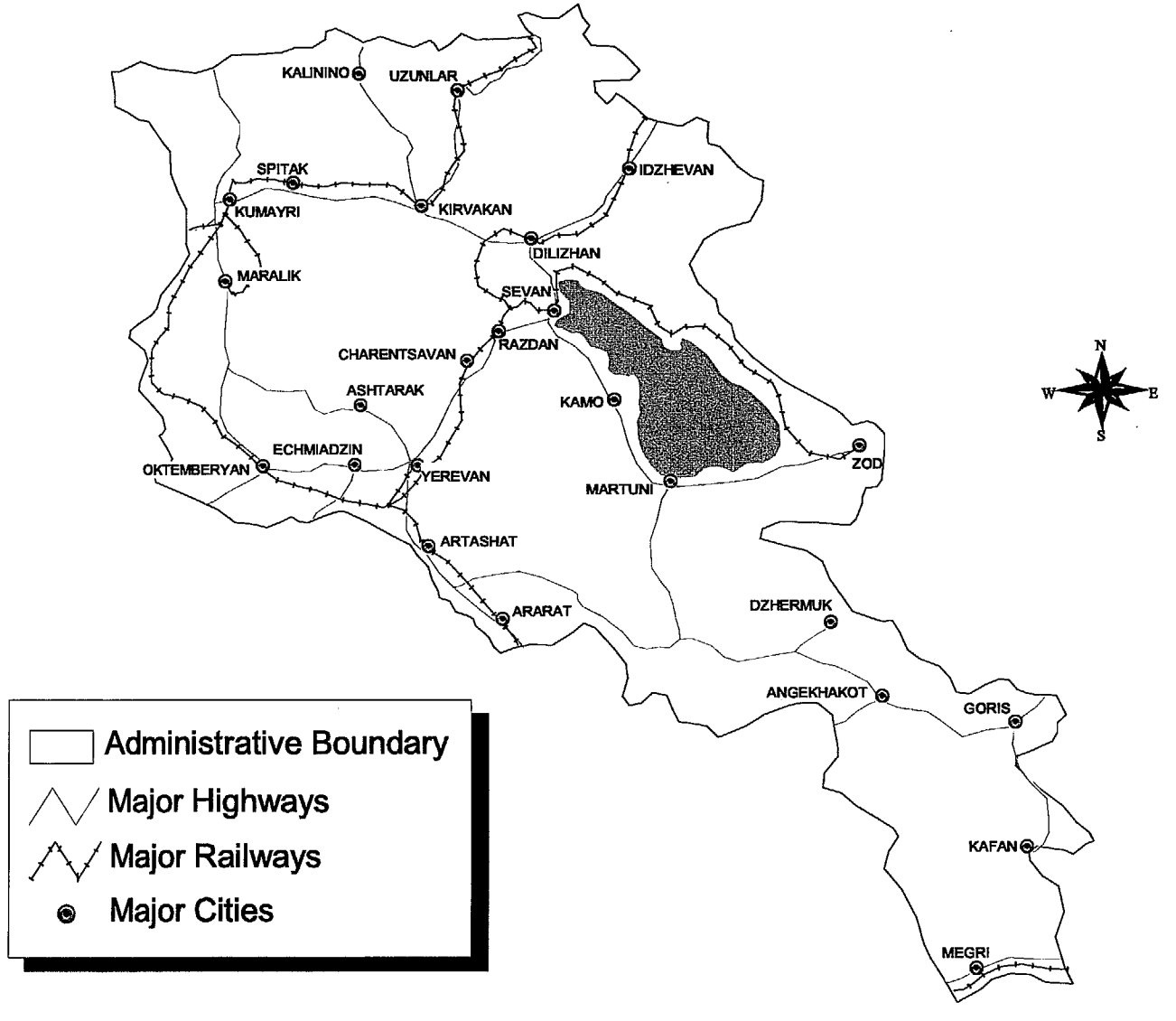


Figure IV - 2. Administrative Districts, Major Cities, Major Highways, and Major Railways of Georgia

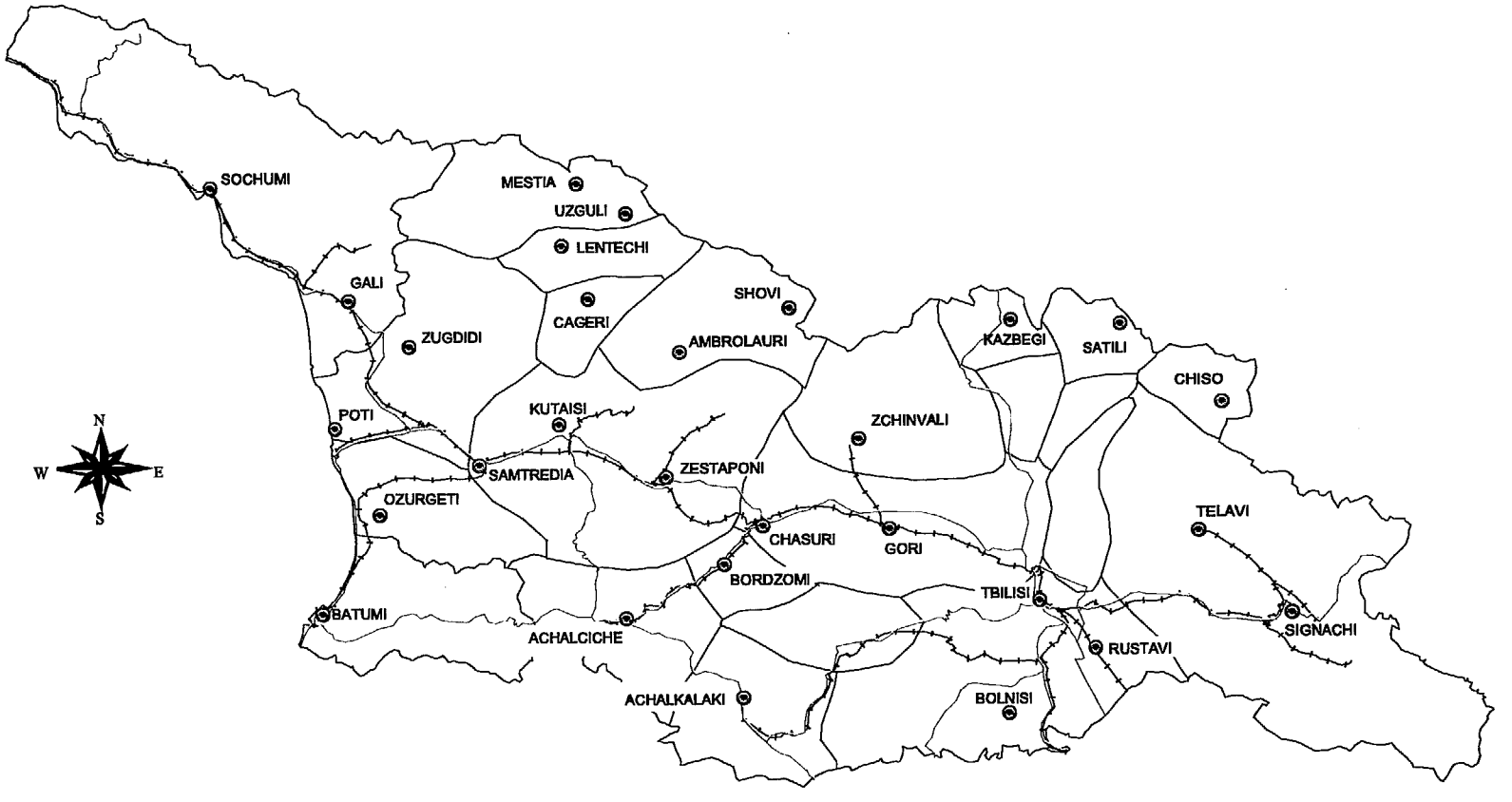
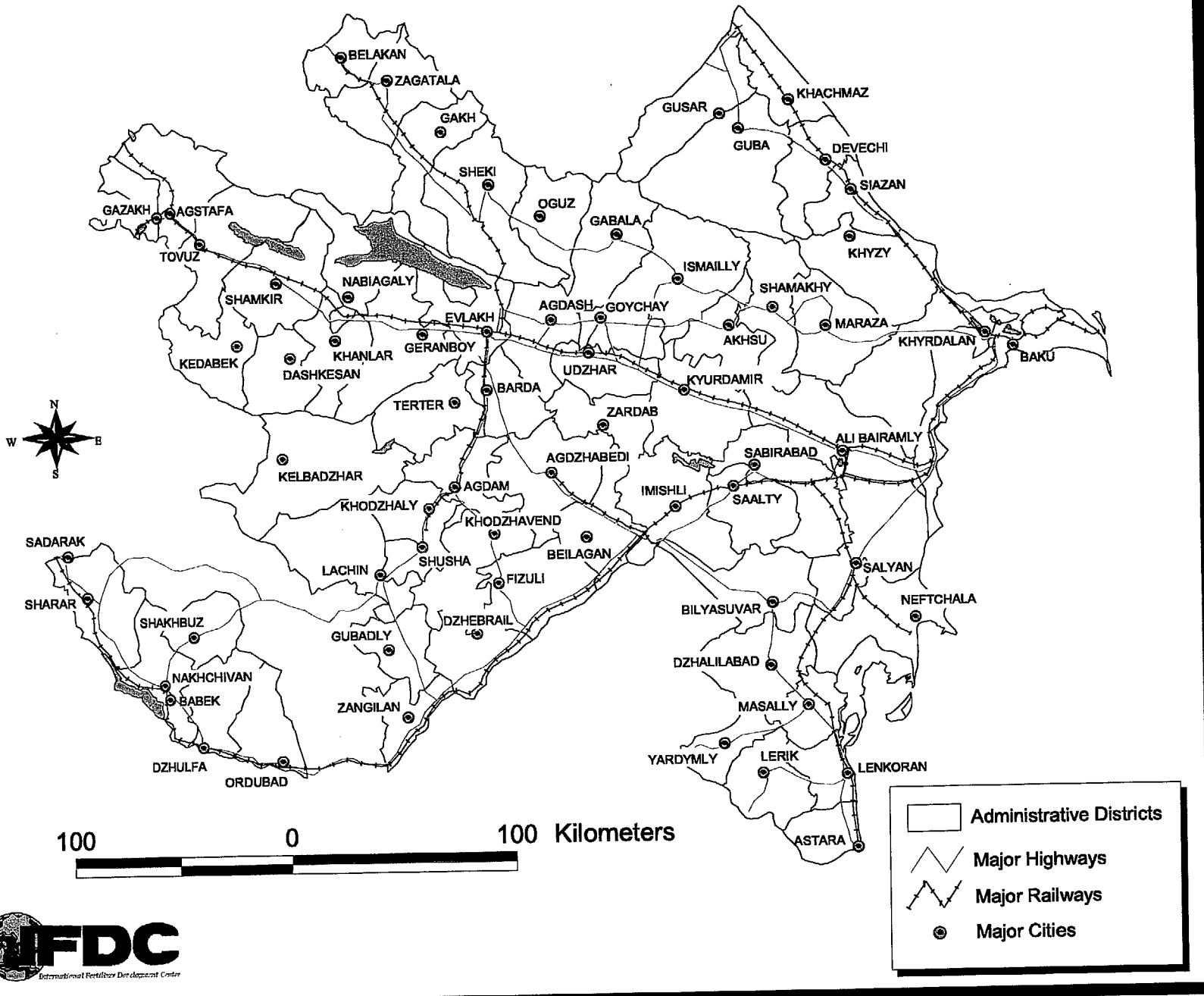


Figure IV - 3. Administrative Districts, Major Cities, Major Highways, and Major Railways of Azerbaijan



The data in **Table IV-1** indicate a fairly equitable distribution of roads and railways in each of the three countries. The practice of including graveled roads in the reporting of paved roads raises a question as to the relative density of good solid surfaced highways. Based on observations during travel, it appears that highway maintenance is a problem throughout the region.

Highway Transportation

The highway systems throughout the Caucasus consist primarily of hard-surfaced, two-lane roads that connect the major cities of the region, but seldom reach rural farming villages. The condition of the highway surfaces was generally fair with maintenance efforts visible in some areas.

The highway system is sufficiently developed to permit truck traffic to traverse the entire region. The distances between major cities in the Caucasus and supply points are shown in **Table IV-2**.

Table IV-2. Distances Between Selected Cities

To/From	To/From				
	Poti, Georgia	Batumi, Georgia	Hopa, Turkey	Rustavi, Georgia	Sochi, Russia
	(km)				
Kutaisi, Georgia	90	150	170	285	340
Tblisi, Georgia	345	405	425	30	595
Telavi, Georgia	486	546	566	180	736
Batumi, Georgia	60	-	20	435	490
Poti, Georgia	-	60	80	375	430
Yerevan, Armenia	595	615	675	225	1,025
Gandja, Azerbaijan	565	615	635	145	995
Baku, Azerbaijan	895	955	1,025	525	1,375
Sumgait, Azerbaijan	935	995	1,065	565	1,415

Note: Distances are either map measurements or from local data.

Highway density, as reflected in **Table IV-1**, indicates a fairly equal road density for each of the three countries. **Table IV-2** shows that the region is fairly small with a distance of only 895 km from Baku on the Caspian Sea to Poti on the Black Sea.

Truck movement of some agricultural inputs is being accomplished despite economic and political problems. This could be increased if the regional governments would agree to favorable regulations. Many of the problems of regional and intercountry trucking were reported in a document presented at the Caspian Infrastructure Conference and Trade Show in Baku. The same problems were discussed by many of those interviewed by the team.

The paper reported the following problems:

- **Highway Condition** — Progress in upgrading the physical condition of the highways needs to be improved in rapidity of accomplishment. Roughly 60% of the highways are in need of repair due to the drastic decline in routine road maintenance.

- **Equipment Availability** — Truck movement is used most extensively in short haul situations, especially when bulk cargos are involved. Bulk dump truck trailers are very seldom seen, and the most available vehicle is the straight frame variety of only 10 to 15 mt capacity and not suitable for economical long haul use. Equipment to move containers and packaged goods is more available and in frequent use.

- **Documentation** — There is a need to simplify the current procedure. Currently a company importing goods at Poti, Georgia, which are bound for Baku, Azerbaijan, must complete between 20 and 24 separate sets of documents. One shipper reported the following requirements: three original bills of lading, three copies of the bills of lading, three certificates of weight, three certificates of origin, three packing lists, three certificates of analysis, three manifests, and three statements of fact.

  At the port of Poti, the customs department also requires an authorized copy of the actual contract with a foreign company detailing quality, quantity, dimensions, price, shipment costs, payment methods, and basic documentation for the goods. All this bureaucracy adds to the cost of business, creates confusion, and begs for rationality.

There is a general belief that if the corridor between Georgia and Azerbaijan is secure enough to transport oil, then it will become safe enough for the transport of other goods because the proposed oil lines follow broadly the same lines as the principal road and rail links between the two countries.

Although the corridor is vital for regional transit of goods, the problems with the secondary roads are equally important for the movement of agricultural inputs and the transport of farm outputs to markets. These roads were found to be nearly impassable because of the lack of hard surfacing and the deep potholes. The condition of the secondary roads will continue to be a weak link in the system until repaired and made passable.

Rail Transportation

The railroad system throughout the region has a common gauge dimension which is the same as the Russian gauge of 1,520 mm. Thus, rail movement within the region does not require an adjustment for gauge changes. This does, however, present a problem when shipments are destined for Turkey or European countries where the narrower track gauge is 1,432 mm and adjustments are required. Special stations have been built at key border crossings where trains stop for replacement of wheel carriages. As an example, trains moving from Armenia into Turkey stop at the border city of Akhuryan where the capacity to change wheel carriages is about 25 freight cars per day.

The rail system in Azerbaijan is comparatively dense. The railroads (about 40% of whose distance is double tracked) have typically carried two-thirds of all freight traffic. The major rail lines traverse the Kur Valley and connect Baku with Tblisi and Batumi in Georgia. A rail connection follows the Aras Valley through the Lesser Caucasus, along the boundary with Iran and Turkey, and links Baku to Tblisi via Yerevan and Ayrum in northwest Armenia. Reportedly one-third of the rail system needs to be rebuilt, but it is usable at low speeds with caution.

In Armenia, the rail system serves the northern and central areas fairly well, but access to the southeastern regions is virtually nonexistent. This is mainly because the rail system along the Aras River valley to reach Meghri traverses within the borders of the former autonomous republic of Nakchivan, a territory claimed by Azerbaijan.

Georgia has an extensive rail system with most of the country within 50 km of a railway line, and the densely populated areas are in a 20-km range of the rail service. Although the condition of the rail system reflects the lack of maintenance in recent years, it is functional albeit at a much lower rate of activity than 1988. There is a question as to its ability to support a higher level of activity, but if the growth is gradual, improvements in equipment may meet demand.

Rolling stock and locomotives may limit the ability of the railroads to provide wagons in adequate quantities at ports for unloading cargoes. Hoppers to handle bulk are reported to be in short supply and many are in poor condition. Grain cars available for port unloading were reported to be about 100 per day. One shipper reported that if a car in poor condition is placed for loading, the shipper was expected to make the repairs. Under present conditions, the movement of bulk fertilizers by rail hopper cars would be very limited and subject to excessive losses.

Speed of delivery has also been affected by the condition of the system. Loaded freight trains normally have approximately 28 wagons hauled by one or two engines. This number is being reduced to 22 or less at the Georgian pass section of Sestafoni-Chasuri. The normal speeds of freight trains of 90 km/h has generally been reduced to 40 km/h because of the condition of the infrastructure. This has doubled the running time per trip compared to 1987.

The UN World Food Program (WFP) and its Caucasus Logistics Advisory Unit (CLAU) with representatives in Tblisi, Batumi, Yerevan, and Baku are beneficially assisting the rail systems and ports both financially and operationally. Continuous assessment and advice on the operational shortcomings and solutions to the problems are being provided. Additionally WFP has provided funding for new locomotives and for railway operations. Also, GTZ has funded technical assistance as a step toward future assistance programs.

Although there are many problems to solve with the rail systems, it appears that they represent the best alternative for cost effective long distance transport of agricultural inputs in the near term. Highway trucking will remain the best choice for the short distances and will be the choice where longer distances are not served by rail.

Ports and Marine Transportation

There are no navigable rivers in the Caucasus, but there are good seaport facilities on the Black and Caspian Seas. The Black Sea offers the best opportunity for advantageous importation of agricultural inputs through the Georgian ports of Poti, Batumi, and Sukhumi. At the time of this writing, Sukhumi is not available because of the unrest in Abkhazia.

Before dissolution of the Soviet Union, the ports of Batumi and Poti handled about 11.5 million mt of cargo but decreased to a combined total of about 3 million mt in 1996. Both of these ports offer maritime access to the Mediterranean Sea and shipments to and from all ports of the world. Batumi has been handling primarily bulk cargos, 45% dry and 55% liquid. It is situated in an area free of siltation with little need for dredging, but it has limited room for expansion as it is located at the heart of the city.

Batumi has five oil berths, one offshore oil terminal, four dry cargo berths, an offshore mooring for lightering, and a small container handling capacity. Land availability limits dry storage capacity at the port, but three miles away from the port, Adjara Agroservice formerly operated two buildings on a rail spur with capability of storing 3,500 mt of fertilizer each. Problems at Batumi reportedly are failure of the railroad to adequately and timely provide wagons for evacuation of cargoes, uncertain electric power supply, and spare parts for cranes and material handling equipment. It is anticipated that the movement of petroleum products will increase as the production from the Caspian Sea oil fields mounts in volume. Batumi will continue to operate and play an important but limited role for imports and exports in the Caucasian republics.

The Poti port is currently undergoing a privatization study and is expected to strongly attract private investment and achieve realization of its potential to serve the needs of the region. **Table IV-3** describes the activity at Poti in 1996 as compared to 1987.

Table IV-3. Port of Poti Cargo Distribution

Commodity	1987	1996	Change	1987	1996
	('000 mt)	('000 mt)	('000 mt)	(% of total)	(% of total)
Grain	1,010	382	(682)	22	23
Ore	2,383	46	(2,336)	53	3
Coal	638	0	(638)	14	0
Building material	205	0	(205)	5	0
Automobiles	0	57	57	0	3
Flour	149	258	109	3	15
Steel	84	89	5	2	5
Chemical	19	65	46	0	4
Cotton	0	28	28	0	2
Container	15	166	152	0	10
Petroleum products	0	601	601	0	36
Total	4,501	1,692	(2,809)	100	100

Note: Figures in parentheses indicate a decrease.

The port of Poti currently has the potential capacity to handle in excess of 6 million mt of cargo, and with additional modern cargo handling equipment, the capacity may be increased by an additional 25%.

The ability of the port to handle fertilizer and other agricultural inputs is not well tested, and port storage requires some investment. The Cornell Group stated that a building was available to store a cargo, but estimated a need for US $2 million and 6 months to rehabilitate it for bulk storage. Cargoes that can be offloaded to rail wagons immediately can be handled if wagons are available, a problem that requires further evaluation and study.

Cargoes in 20- and 40-foot containers do not need protected storage and can be moved expeditiously through the port. Pesticides in small packages can be shipped in 20- and 40-foot containers and moved by rail or highway to their final destination. Fertilizer in 50-kg bags or 1-mt bulk bags can be received and shipped onward with little difficulty. Interestingly, the port cost to unload bulk or bagged fertilizer only differs slightly; US $7/mt for bulk, $6/mt for 50-kg bags, and

$5/mt for bulk bags as shown in **Table IV-4** where selected unloading tariffs are shown to give some perspective of the cost of moving inputs and similar items through the port facility.

Table IV-4. Port of Poti — Selected Tariffs on Commodity Cargo Services

Commodity Cargo Services	Per	Rates in US $ (1.25/US $)
Chemical fertilizers — in bulk	mt	7
Chemical fertilizers — 50 kg bags	mt	6
Chemical fertilizers — in large bags	mt	5
Animal feed in bags	mt	6
Wheeled equipment below 3 mt	each	25
Wheeled equipment over 3 mt	each	30
Wheeled equipment over 5 mt	each	70
Crawler tractor below 10 mt	each	70
Containers loaded to terminal — 20 foot	each	45
Cargo in boxes above 50 kg	each	65
Gardening products — bags to 50 kg	mt	6

Note: Harbor and wharfage fees may be additional depending on the charter and contract.

The Georgian ports are currently the logical way for marine cargoes to move into the Caucasian corridor to Azerbaijan and beyond. Turkish ports can offer competitive systems by sending rail shipments through Armenia, but until the difficulties between Azerbaijan and Armenia are resolved, there will not be serious competition with the Georgian ports.

Comparative Transportation Costs

The railroad currently offers the most economical method of moving fertilizer and agricultural inputs in lot sizes of carload (60-70 mt) or truckload (18-22 mt). The rates in **Tables IV-5 and IV-6** are illustrative of the estimated costs. Average costs per metric ton kilometer are calculated to eliminate differences attributable to distances. These costs can be useful in calculating costs in models of distribution.

Table IV-5. Railway Rates

From	To	Distance	Total Cost	Cost	Load Weight	Cost	Cost
		(km)	(US $)	(per km)	(mt)	(per mt)	(per mt km)
Ayrum, Ar	Yerevan, Ar	285	480.00	1.68	60	8.00	0.03
Poti, Ga	Rustavi, Ga	375	600.00	1.60	60	10.00	0.03
Poti, Ga	Ayrum, Ar	420	1,020.00	2.43	60	17.00	0.04
Poti, Ga	Yerevan, Ar	705	1,500.00	2.13	60	25.00	0.04
Poti, Ga	Sumgait, Az	975	1,706.00	1.75	60	28.44	0.03
Rustavi, Ga	Kutaisi, Ga	285	460.00	1.61	60	7.67	0.03
Rustavi, Ga	Telavi, Ga	180	325.00	1.81	60	5.42	0.03
Rustavi, Ga	Batumi, Ga	435	650.00	1.49	60	10.83	0.02
Rustavi, Ga	Gyumri, Ar	230	480.00	2.09	60	8.00	0.03
Sumgait, Az	Agstafa, Az	466	543.53	1.17	60	9.06	0.02
Sumgait, Az	Masali, Az	261	397.78	1.52	60	6.63	0.03
Sumgait, Az	Ucar, Az	259	383.03	1.48	60	6.37	0.02
Sumgait, Az	Zagatala, Az	449	519.88	1.16	60	8.66	0.02
Sumgait, Az	Xacmaz, Az	125	295.38	2.36	60	4.92	0.04
Rail Averages				1.73			0.03

Table IV-6. Truck Rates

From	To	Distance	Total Cost	Cost	Load Weight	Cost	Cost
		(km)	(US $)	(per km)	(mt)	(per mt)	(per mt km)
Baku, Az	Masalli, Az	231	359	1.55	20	17.95	0.08
Baku, Az	Xacmaz, Az	157	359	2.29	20	17.95	0.11
Baku, Az	Ucar, Az	229	359	1.57	20	17.95	0.06
Baku, Az	Zaqatala, Az	419	410	0.98	20	20.5	0.05
Baku, Az	Agstafa, Az	436	359	0.82	20	17.95	0.04
Batumi, Ga	Tblisi, Ga	405	550	1.36	20	27.5	0.07
Kutaisi, Ga	Tblisi, Ga	255	350	1.37	20	17.5	0.07
Poti, Ga	Tblisi, Ga	345	500	1.45	20	25	0.07
Poti, Ga	Yerevan, Ar	595	1,560	2.62	20	78	0.13
Poti, Ga	Baku, Az	945	2,100	2.22	20	105	0.11
Rustavi, Ga	Tsalka, Az	131	350	2.67	20	17.6	0.13
Rustavi, Ga	Kutaisi, Ga	285	400	1.4	30	13.33	0.05
Tblisi, Ga	Lagodekhi, Az	155	250	1.61	20	12.5	0.08
Yerevan, Ar	Meghri, Az	250	650	2.6	20	32.5	0.13
Yerevan, Ar	Tashira, Az	150	450	3	20	22.5	0.15
Yerevan, Ar	Gyumri, Az	125	370	2.96	20	18.5	0.15
Truck Averages				1.91			0.09

The highway costs per kilometer for a 20-mt load appear high in view of the fact that labor cost is low by western standards. Azerbaijan transportation workers average a monthly pay of US $76, a rate that is typical for the region. Petrol costs in the three countries range from US $1.18 to $1.66/gal, which is reasonable and close to the cost range in the United States. However, the cost per kilometer, converted to cost per mile, will exceed US $2.00/mile in most cases. This exceeds the typical U.S. range of US $1.25 to $1.50/mile by at least 25%, which may be the result of paying unofficial service fees. The difficulty and cost of making repairs and obtaining replacement parts are also factors that increase trucking costs.

The railway transportation system offers the least cost for supplying the distribution warehouses located on or close to rail. Most of the warehouse locations were established under the old Soviet system and are on rail. Short hauls and site specific situations may well justify using highway

equipment that can provide delivery to off-rail locations, but estimates of the general cost of distributing agricultural inputs given later in this report are based on railway transportation.

At the present level of use, rail transport is reported to be satisfactory. With increased level of use, improvements will be necessary in quality and quantity of equipment as well as the condition of the trackage and roadbed. Support is being received from the European Commission (EC) and various international agencies. Much of the recent cargo movement by rail has involved moving food supplies into the region and improvements will be needed for substantial movement volumes of other commodities.

The option of an all water route to reach the Caspian Sea is reported to be possible sometime in 1998 using the Don River-Volga Canal-Volga River to connect the Black Sea with the Caspian Sea. Vessel sizes are limited to large river boats and small seagoing vessels. Due to its northern latitude it has a winter limitation for travel, but it usually is open for over 200 days a year. The Don River flows into the Sea of Azov at Russian port of Rostov and the Volga enters the northern shore of the Caspian Sea at Astrakhan, Russia. The economics of this alternative are not currently available, but the system should be studied for feasibility and use for the importation and exportation of bulk cargoes of 5,000 to 6,000 mt.

Storage and Warehousing Capacity

In all three countries, buildings were identified and reported as available in all the agricultural regions with substantial capacity to store and distribute fertilizers and other agricultural inputs on a seasonal basis. In general the buildings would be adequate for bagged materials with some maintenance to provide protection from the weather. Many of the buildings were built in the Soviet years and are located for access by rail. In some cases the rail enters the buildings on elevated track to permit unloading hopper cars by gravity flow. However, this system requires the fertilizer to be moved away from the track to storage. This action contributes to physical degradation of the product and inefficient use of the storage space.

In view of the current agricultural situation in the Caucasus, limited material handling equipment, small size farms, and inadequate storage for bulk product, it is recommended that bagged fertilizers be imported and used for dealer development. Buildings are not entirely necessary for bagged material which can be stored and protected in an outdoor area if properly stacked on dunnage such as pallets and covered with plastic sheeting.

Data on the availability of facilities for storing and distributing agricultural inputs were collected by a combination of personal visits and interviews with government officials and executives. However, the confidence factor in the data was improved by cross referencing of data from persons, interviews, and personal visits.

A comparison of available storage to needed storage was based on the nutrient metric tons used annually in 1988 to 1990 period adjusted to physical metric tons of product. Product metric tons were assumed to be three times the nutrient metric tons. Results of the comparison are given in **Table IV-7.**

Table IV-7. Fertilizer Storage Capacity Compared to Fertilizer Use

Country	Armenia	Azerbaijan	Georgia
Arable land (ha)	487,800	1,549,800	766,700
Fertilizer use/year 1988-90 (average nutrient metric tons)	65,000	144,000	237,000
Fertilizer use 1996 (nutrient metric tons)	4,000	11,400	12,000
Estimated annual fertilizer product metric tons (Basis 1988-1990 nutrient metric tons x 3)	195,000	432,000	711,000
Field storage capacity-product metric tons	176,000*	300,000**	332,000***
Storage capacity % annual need	92%	69%	47%

*22 buildings with an 8,000-mt capacity each.
**Report by Sumgait Plant management.
***46 districts reported a 7,000-mt capacity each.

As shown in **Table IV-7**, there is sufficient capacity to store bagged fertilizer, but as the bulk fertilizer market develops, there will be a need to rehabilitate buildings to protect the physical integrity of the material.

In addition, bulk fertilizers will require the acquisition of handling equipment to unload rail cars, move and pile efficiently into storage, remove from storage, and reload for shipment. Bulk materials are subject to segregation, contamination, and physical degradation if not properly handled in transit and storage. Truck scales at the facilities appeared to be in poor condition and in need of repair. Good inventory control requires scales be in good operating condition to provide accurate measurement of shipping weights.

Conclusions

This analysis of transportation and distribution in the Caucasus concludes that the infrastructure to move agricultural inputs in the region is sufficient to support the development of a network of private input dealers and input market development. Although the needs for improvement were noted, the system is adequate and is not an obstacle in providing farmers with inputs.

Appendix V

Persons and Organizations Who Assisted in the Assessment

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