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**FERTILIZER BULK BLENDING
IN COSTA RICA**

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TABLE OF CONTENTS

| | <u>PAGE</u> |
|-----------------------------------|-------------|
| Introduction ----- | 1 |
| Fertica ----- | 3 |
| World Market Situation ----- | 9 |
| Local Market Situation ----- | 10 |
| Bulk Blending in Costa Rica ----- | 11 |
| Marketing ----- | 19 |
| Summary and Recommendations ----- | 21 |

TABLES:

| | |
|--|----|
| 1 - Capital Cost for Bulk Blend Plant ----- | 14 |
| 2 - Blending Plant Operating Costs ----- | 15 |
| 3 - Raw Material Requirements ----- | 16 |
| 4 - Working Capital Estimate ----- | 17 |
| 5 - Profit or Loss ----- | 18 |
| 6 - Costa Rican Fertilizer Consumption by Crop ----- | 23 |
| 7 - FEDECOOP Fertilizer Sales ----- | 24 |
| 8 - Pre-1983 Fertilizer Distribution System ----- | 25 |

INTRODUCTION

The objective of this study was to develop a preliminary economic and technical analysis for the establishment of a fertilizer bulk blend plant for the cooperative sector in Costa Rica.

A preliminary investigation determined that the Government owned production facility known as Fertica has approximately 160,000 tons of surplus capacity. The construction of a bulk blend plant will add to this surplus and decrease the efficiency of the entire fertilizer industry in the country. The operation of a bulk blend plant appears to be marginal for the immediate future.

Bulk blending plants have been successful in the midwestern United States. Transportation is generally an important component in the eventual price of fertilizer. Mixing operations have eliminated some of the freight cost of plant food. Raw materials are shipped from the most economical source to the locale of the end user. They are physically combined to produce the desired fertilizer grade or formula. Chemical mix fertilizers are produced at a central factory using a variety of raw material sources. The finished product is then shipped to the consumer. This system may entail overlapping freight, a raw material may often be shipped through the vicinity of a group of consumers to a factory and then shipped back to the same area in the

form of a complete fertilizer. A considerable saving to the retail customer could have resulted if the raw material had been deposited for blending on the first trip through the use site.

Further economies may result in the physical mixing of small quantities of fertilizer. Twenty five hundred tons of chemical mix fertilizer is considered to be the minimum quantity which may be fabricated economically in a single production cycle. Specialty fertilizers using specific formulas or micronutrients may not be commercially available in chemical process fertilizers and therefore must be physically blended. Higher analysis plant food formulas may also be blended physically; there are limitations in the analysis of chemical mix fertilizers.

There can be disadvantages in the use of bulk blended materials. The incompatibility of some types of basic substances may produce chemical reactions and lead to poor quality. Physical segregation may occur due to differences in the size and shape of granules. Uneven distribution during application may result due to the varying weights of granular particles. Raw materials for bulk blending must be uniformly granulated. This represents an additional cost because raw materials size is of little importance for chemical formulation.

The Costa Rican fertilizer market has been supplied for many years with a majority of chemically blended complete fertilizers. Wide ranging interviews indicate that there is a definite preference for

this type of product, particularly among small and medium sized producers. This predilection is manifested in the strong opinion that a bulk blend of the same formula as a chemical mix would have to be at least ten percent cheaper to command the market. Large producers or multinational companies seem much less likely to hold this prejudice against physical mixes.

None of the raw materials used in commercial fertilizer are available in Costa Rica. The basic elements of plant food or the finished products must be imported for agricultural use. The extent to which value is added to raw materials locally is the extent to which foreign exchange is saved. The chemical process provides for the addition of more value to the fertilizer locally than does a bulk blending operation. Additionally, local chemical fabrication provides for the possibility of export sales or for the exchange of finished product for raw materials. The importation of inputs for bulk blending does not provide for these possibilities.

FERTICA

There is a chemical process fertilizer plant in Costa Rica which has surplus capacity. Fertica, the fertilizer manufacturing and marketing company, was purchased by the Government of Costa Rica in 1980. A Mexican company had operated the plant for ten years; the sales price was approximately twenty million dollars. Included in the purchase price was an office building valued at two million dollars

which is now being used by the Government of Costa Rica. Payment for the plant is extended over several years with a preferential interest rate. There is also an agreement that Mexico will supply Costa Rica with ammonia, an important raw material, at the best world market rate available with quarterly adjustments in price. The replacement cost of the manufacturing equipment as it is installed in the plant would have been one hundred twenty million dollars. The world market value of the plant at the time of purchase from the Mexicans was approximately fifty to sixty million dollars.

The Fertica facility at Puntarenas consists of the following:

- No.1 Nitric Acid Plant, 225 MT/day, 1960 technology
- No.2 Nitric Acid Plant, 225 MT/day, 1972 technology
- Contact Sulfuric Plant, 200 MT/day, idle but operative
- No.1 Ammonium Nitrate Plant, 150 MT/day
- No.2 Ammonium Nitrate Plant, 200 MT/day
- Ammonium Sulfate Plant, 150 MT/day, idle but operative
- NPK Fertilizer Plant, 400 MT/day
- Bulk Blend Fertilizer Plant, 300 MT/day

The Ammonium Nitrate plants have capacity to grill high density and low density products for agricultural and industrial needs. Production appears to be excellent quality.

The Sulfuric Acid and Ammonium Sulfate plants are idle due to the availability of low cost by-product ammonium sulfate and the high cost of imported sulfur.

The NPK fertilizer plant utilizes the PEC process for Nitrophosphate production. The plant is typical for European fertilizers and utilizes two granulators for production. Although somewhat uncommon for this climate, it is adequate and meets the demand for the grade variation in this area.

Fertica's production has approached the 250,000 Metric Ton per year level, distributed as follows:

| | |
|-------------------------------|-----------|
| Complete Chemical Fertilizers | 95,000 MT |
| Blended Fertilizers | 45,000 MT |
| Ammonium Sulfate | 45,000 MT |
| Ammonium Nitrate Fertilizer | 55,000 MT |

Industrial products have approached the 30,500 Metric Ton level, distributed as follows:

| | |
|----------------------------------|-----------|
| Ammonium Nitrate, blasting grade | 24,000 MT |
| Sulfuric Acid | 5,000 MT |
| Nitric Acid | 500 MT |
| Ammonia | 1,000 MT |

The plant receives Anhydrous Ammonia by ship and off loads directly into plant storage via pipeline from the mooring. Solid raw materials are transhipped via barges through a canal to the plant.

Product from this plant can be shipped via truck, railroad inland or via barges to the harbor for export.

The storage area has capacity for 25,000 Metric Tons of bulk materials and 40,000 Metric Tons of bagged product.

The Fertica Plant appears to be in excellent condition. The plant and equipment have been adequately maintained and should be capable of many years of production. The bulk blend plant is of recent vintage, produces an excellent blend and has excess capacity. The Fertica management is stable, has the technical expertise to adequately operate and maintain this facility. Employment levels at Fertica do not seem to be excessive for operation of the plant at normal production levels. The product in the plant and in distributors storage areas appears to be of excellent quality. The Fertica facility must be considered a valuable asset to the nation.

Fertica sells approximately 95% of the domestic consumption in Costa Rica. Fertica incurred an operating loss for the fiscal 1982 period of approximately \$7,000,000.00. This loss was not due to operating inefficiencies, but came from two areas outside of the Fertica's direct control. First, Fertica was subject to significant

foreign exchange losses due to currency fluctuations. Second, a political decision was made by the prior administration to subsidize the retail price of fertilizer. The Government agreed to make up the difference in price represented by the mandated discount. Fertica has yet to receive any payment for the subsidy; this represents the majority of their loss. Working capital in the company was drastically reduced by these events and Fertica is paying considerable interest on short term borrowings to finance raw material purchases. It was not possible to obtain financial statements from Fertica to verify the extent of the loss or the exact source of the loss. Fertica adjusted their prices in October 1982 to permit a small operating profit in 1983.

Fertica must pay its own way; forced subsidies have been eliminated. Fertica has traditionally marketed its products through a distributor/dealer network and has used a corresponding price structure. In order to reduce expense Fertica eliminated the existing distribution and price structure, which included the cooperatives, and elected to sell direct with only one price per product.

Warehouses are strategically located where growers can obtain their fertilizers. Many cooperatives and growers' associations handle fertilizers made by Fertica as a service to their members at a very low margin.

The market place has not adjusted to this change in market philosophy according to those dealers and distributors interviewed. They report that problems have been created by this market change. Specific product grade or formula outages are common and shipping delays are often 4-6 weeks long. Lack of sales input, such as early order scheduling and technical sales assistance that was previously provided by distributors and dealers are no longer available.

In the absence of distributor and dealer price structure, distributors began to look for other sources of supply. Interest in bulk blend plants grew rapidly. One large distributor has already installed a bulk blend plant on the coast of Puntarenas and others are considering bulk blends.

The Government owned plant of Fertica has approximately 60,000 tons of surplus chemical mix capacity and 100,000 tons of physical mix capacity. The construction of additional blend plants will add materially to this surplus production capacity and will decrease the efficiency of this production facility.

Fertica suffers from the idea that "big is bad" and that a production enterprise owned by the Government is worse. Time and again negative comments surfaced comparing Fertica to Recope, the state owned petroleum enterprise. Fertica's recently revised monolithic marketing structure has no doubt exaggerated this attitude. The prior administration's market intervention to force fertilizer

subsidies clearly underlines the tremendous political temptation presented by Government ownership of a plant food facility in an agricultural economy. Apparently, the price of this temptation is one that Costa Rica cannot afford to pay in view of the current economic situation.

WORLD MARKET SITUATION

Over the past two years all fertilizer ingredients have been severely overproduced in the U.S. This has resulted in a glut on the fertilizer market. This overproduction was caused by a sudden drop in export shipments and a weak U.S. agricultural economy.

Price reductions followed in the wake of inventory surplus to the extent that producers were selling product at cost and below cost. Plant closures became widespread, many on a permanent basis. High cost plants shut down first followed by curtailment of high volume plants. These closures were made in an effort to reduce high inventories and to eliminate high cost production. Today it is estimated that 35% of U.S. Nitrogen production is shut down or curtailed.

Once inventories are reduced to a manageable level prices will begin to increase to the level of cost recovery and on to a profitable level. For the next decade, prices are expected to increase by 10% annually to cover inflation. The major market adjustment will be

between now and 1984. Historically reliable industry sources indicate that by the second quarter of 1984 some products, Urea and DAP specifically, may be at levels which are sixty percent above today's prices.

Several important factors could affect these projections. Continued depression in commodity prices and resulting acreage reductions in the United States, along with uncertainty in energy markets could limit the extent of short term price increases.

LOCAL MARKET SITUATION

Fertilizer consumption in Costa Rica has remained stable over the last five years. The distribution of demand among major crops has also been fairly constant. Flat prices for Costa Rican agricultural commodities and increased fertilizer prices due to the devaluation of the local currency have made the market for agricultural inputs very price sensitive. Additional price increases seem inevitable, drastic upward swings, as some sources predict, would likely decrease fertilizer consumption. There does not seem to be anything on the horizon to push plant food consumption higher. None of the cooperatives or grower organizations representing the majority of fertilizer consumption were willing to indicate that acreage increases were probable for their respective crops. Development projects on new lands just brought into production would not normally need fertilizer for the first several years. In summary, demand for fertilizer in

Costa Rica is projected to be flat with the possibility that some decline in consumption might be experienced.

Fertica and the world market have been able to supply Costa Rica's fertilizer needs. Shortages experienced in the past have only been for specific products and have been for short periods; production has not been affected. Possible supply interruptions could occur if foreign exchange became unavailable to pay for imported raw material or finished product. Fertilizer and related raw materials are considered essential imports and would be priority items due to the importance of agriculture in the Costa Rican economy.

Bulk Blending in Costa Rica

Although Costa Rica has excess fertilizer manufacturing capacity, the trend towards bulk blending in other areas encourages interest here. The placement of a bulk blend plant within the cooperative system points quickly to Fedecoop, the Federation of Coffee Cooperatives, as the only cooperative organization with the fertilizer sales potential, capital requirements and management capability to operate such a facility. The example used here approximates the situation of Fedecoop in the fertilizer market.

The following tables present a preliminary capital cost estimate, plants operating costs, raw material requirements, working capital estimates and a simplified profit and loss statement for a 10,000 ton

per year plant. The tables include current (1983) raw material conditions and expected raw material conditions in 1984 after this fertilizer industry works out of its inventory problems. The idealized case is to operate the plant at full capacity and sell all the output. With 1983 raw materials, this case would show a gross profit before sales and distribution costs of \$705,000 or a 11.2% margin. However, it would be 1984 before a plant could be organized and placed in operation. At that time the organization would have to increase the sales price (before sales and distribution costs) by 38% to breakeven.

If the marketing organization runs into sales resistance and predicts the sale of only 20,000 tons per year, the plants could make a gross margin of 8.5% with 1983 raw materials, but it would have to increase sales prices by 44% to breakeven with 1984 raw materials. The losses could be greater if marketing cannot properly forecast the sales in time to adjust for raw material scheduling.

A major factor to be considered is the value added in Costa Rica by making chemical fertilizers. The conversion of anhydrous ammonia and phosphate rock along with the ability to utilize cheaper grades of potash offers a potential savings of about \$3.3 million in foreign exchange compared to the blending of this 30,000 tons of fertilizer with 1984 materials. The savings with 1983 materials would be \$1.56 million.

The viability of blending plants in any country must be evaluated based on the applicable asset of that country and on its particular fertilizer needs. Countries without indigenous production must evaluate physical mixes against imported chemically manufactured complete grades.

TABLE 1

CAPITAL COST FOR BULK BLEND PLANT
(30 ton per hour capacity)

MECHANICAL EQUIPMENT:

| | |
|--|---------------|
| 1. Unloading Conveyors (2) | |
| 2. Unloading Elevator | |
| 3. Weight Hopper System | |
| 4. Drum Mixer System | |
| 5. Product Elevator | |
| 6. Product Screens | |
| 7. Oversize Mill | |
| 8. Product Hopper | |
| 9. Bagging System | |
| | <hr/> |
| | \$ 182,900 |
| 10. Front End Loader | 18,000 |
| 11. Forklift | <u>16,000</u> |
| | \$ 216,900 |
| Crating, Domestic and Ocean Freight | 62,000 |
| Installation Wiring | 36,000 |
| Building for 10,000 tons of bulk material plus blending and bagging equipment | 343,000 |
| Unloading Equipment | 40,000 |
| Contingencies, 5% | 36,700 |
| Interest on construction, 6 months at 20% | <u>73,500</u> |
| T O T A L | \$ 808,100 |

Some of the above equipment may be obtained locally to reduce the foreign exchange requirements. Also, suitable storage buildings may be available which could be adapted for blending operations.

TABLE 2

BLENDING PLANT OPERATING COSTS

(30,000 Ton Per Year)

| | |
|--|---------------|
| Utilities and Power | 13,530 |
| Labor, 20 men | 56,100 |
| Maintenance Materials, 8% of equipment | 26,400 |
| Bags and supplies | 172,500 |
| GS and A, 10% of labor | 5,610 |
| Insurance | 2,020 |
| Contingency, 5% | <u>14,500</u> |
| T O T A L | 290,660 |

These costs assume that land is owned by the organization.

No lease or rent costs are included.

TABLE 3

RAW MATERIAL REQUIREMENTS

(30,000 tons per year)

Assume following production:

| | |
|---------------|-------------|
| 18-5-15-6-2 | 10,000 tons |
| 20-7-12-3-1.2 | 10,000 tons |
| 15-15-15 | 5,000 tons |
| 10-30-10 'S' | 5,000 tons |

Raw material cost, unloaded at port storage location:

| <u>MATERIAL</u> | <u>TONS^{1/}</u> | <u>CURRENT COST</u> | <u>PROJECTED '84 COST^{2/}</u> |
|--|--------------------------|---------------------|--|
| Urea, 45% | 8,625 | 1,394,824 | 2,699,938 |
| DAF, 18-46-0 | 7,197 | 1,362,392 | 2,490,882 |
| TSP, 0-46-0 | 495 | 71,874 | 154,935 |
| Potash, Gran. | 1,281 | 152,055 | 193,047 |
| K ₂ SO ₄ , Gran. | 4,285 | 1,070,822 | 1,377,628 |
| S.P.M. | 5,125 | 653,438 | 834,350 |
| Borate | 506 | 268,180 | 295,504 |
| Filler | 3,236 | 97,080 | 110,126 |
| | | \$ 5,070,665 | \$ 8,156,410 |

1/ Material tonnage includes 2.5% for overgrading and losses.

2/ Projected '84' cost reflect a move toward stability in the world market. The current costs are depressed and must be adjusted to cover manufacturing costs.

TABLE 4

WORKING CAPITAL ESTIMATE
(30,000 ton production schedule)

| | | <u>1983 Costs</u> | <u>1984 Costs</u> |
|---------------------------------|------------|-------------------|-------------------|
| Raw materials | 6,600 tons | 1,115,550 | 1,794,410 |
| Product, Bagged | 8,920 tons | 1,757,460 | 2,726,500 |
| Supplies for | 6,600 tons | 37,950 | 37,950 |
| Operating cash | 60 days | <u>9,330</u> | <u>9,330</u> |
| | | \$2,920,290 | \$4,568,190 |
| Interest at 10.5% ^{1/} | | <u>307,000</u> | <u>480,000</u> |
| | | 3,227,290 | 5,048,190 |

^{1/} Short term interests rates libor rate plus commission.

TABLE 5

PROFIT OR LOSS

| | | | |
|---|-------------|-------------------|-------------------|
| <u>Sales Income</u> | 10,000 tons | 18-5-15-6-2 | 2,159,090 |
| (Basis 044/\$, | 10,000 tons | 20-7-12-3-1.2 | 2,063,640 |
| Fertica, Oct.82 | 5,000 tons | 15-15-15 | 1,050,000 |
| | 5,000 tons | 10-30-10 'S' | <u>1,343,180</u> |
| | | | 6,615,910 |
| <u>Expenses</u> | | <u>1983 Costs</u> | <u>1984 Costs</u> |
| Raw Materials | | 5,070,660 | 8,156,410 |
| Operating Costs | | 290,660 | 290,660 |
| Depreciation | | 80,810 | 80,810 |
| Interests | | <u>161,620</u> | <u>161,620</u> |
| T O T A L | | 5,603,750 | 8,689,500 |
| Interest on working capital | | <u>307,000</u> | <u>480,000</u> |
| | | 5,910,750 | 9,169,500 |
| Gross Earnings before sales and distribution | | 705,160 | (2,553,590) |
| Margin | | 11.2% | (27.8) |
| Assume same plant operating at 20,000 TPY on same grades: | | | |
| <u>Sales Income</u> | | | 4,410,610 |
| <u>Expenses</u> | | <u>1983 Costs</u> | <u>1984 Costs</u> |
| Raw Materials | | 3,380,440 | 5,437,610 |
| Operating Costs | | 228,680 | 228,680 |
| Depreciation | | 80,810 | 80,810 |
| Interests | | <u>161,620</u> | <u>161,620</u> |
| SUB-TOTAL | | 3,851,550 | 5,908,720 |
| Interest on working capital | | <u>212,300</u> | <u>452,000</u> |
| | | 4,063,850 | 6,360,720 |
| Gross Earnings before sales and distribution costs | | 346,760 | (1,950,110) |
| Margin | | 8.5% | (44.4) |

MARKETING

Some entities are able to handle fertilizer as a service with virtually no margin because they are supported by other activities. For example, Fedecoop and its member cooperatives are coffee marketing and credit organizations; their profits come from these activities. Sugar production associations are supported by a Government approved check-off system based on domestic sugar consumption. In these cases Fertica did not eliminate a middleman because the low markup and the relatively high level of service were a bargain. The service activity was dropped with an insignificant cost saving. In the case of strictly commercial distributors, legitimate services were being performed for which the consumer should be expected to pay. Sales agents with some technical expertise or agricultural engineers were available for consultation. Credit and warehousing services were also provided. Fertica's cash in advance policy penalizes creditworthy customers, both organizations and individuals, for whom it would be more convenient to pay on a ten day billing.

Fertica should be in constant contact with consumers as well as with dealers and distributors. Price changes and improved practices need to be explained to farmers. The resulting flow of information would likely increase sales. Farmer input is necessary, on the other hand, to insure that consumers understand the product and its use. Besides direct consumer/manufacturer communication, dealers and distributors must establish a dialogue with their supplier and with

their customers. A free flow of information at all levels will help to ensure that the marketing apparatus functions properly.

The problems attributed to Fertica by those involved in the provision of agricultural inputs are problems of marketing and communication. Fertica, as has been pointed out, is competent from a technical standpoint. Any perception that they are sloppy or inefficient has been earned by their marketing practices. At present, Fertica may point to the fact that they have a uniform pricing structure as evidence that they have eliminated the intermediary and that they are selling directly from manufacturer to consumer. While on the surface this would seem to be a good management, quite the reverse is true. The distributor/dealer organization performs several legitimate functions.

Among the most important inputs of a field sales organization is in relation to production planning. For instance, a cooperative federation may survey its members well in advance of the season of use and order its member cooperative's requirements. When the local cooperative needs the fertilizer they can acquire it from the federation on one or two days notice. If the individual cooperatives needs vary from those of the original plan, then the federation can provide backup inventory. Fertica's present system requires individual cooperatives to order four to six weeks in advance. Additional orders in season may face unavoidable delays or product substitution.

Cooperatives or production associations, whether they purchase fertilizer directly from Fertica or through a distributor or as a distributor, are handling the product as a service. Margins do not exceed five percent and are more often in the realm of two percent. These low margins hardly cover administrative costs, not to mention shrinkage, interest or warehousing.

SUMMARY AND RECOMMENDATIONS

The Fertica plant is well maintained and has no serious operational problems. A bulk blend plant operated by the cooperative system would provide only marginal profitability and could be subject to serious input problems, both from a cost and from a logistical standpoint. The Fertica finished product is of good quality and is versatile enough to supply the local market. The Fertica product presents the opportunity for export sales and saves foreign exchange by adding more value locally to imported raw materials than does the bulk blend alternative.

Fertica's problems are those of image, both because they have been a virtual monopoly and because they are Government owned. Government

ownership is a problem in that it presents the temptation for future political involvement in the operation of the company. Further, their difficulties are in the areas of marketing, because they eliminated the dealer/distribution system and its advantages. These problems tend to diminish Fertica's benefit to the agricultural community.

The most likely solution to these difficulties would be to restructure the marketing philosophy of Fertica with special attention to communication. The problem of Government involvement would most easily be solved by selling Fertica to the grower associations, cooperatives, and farmers who are their primary consumers. A majority of the company stock would have to be in non-government hands for this to be successful.

TABLE 6

COSTA RICAN FERTILIZER CONSUMPTION BY CROP

PERIOD 1978 - 1982

(expressed in Metric Tons)

| <u>CROP</u> | <u>1978</u> | <u>1979</u> | <u>1980</u> | <u>1981</u> | <u>1982</u> |
|-------------------------------|--------------|--------------|--------------|--------------|--------------|
| Coffee | 69,570 | 67,130 | 68,641 | 53,300 | 58,100 |
| Banana | 33,175 | 33,175 | 33,439 | 39,000 | 40,050 |
| Sugar Cane | 14,900 | 13,628 | 13,000 | 13,500 | 12,500 |
| Rice | 13,950 | 21,100 | 20,160 | 22,500 | 22,500 |
| Cotton | 5,200 | 2,880 | 1,000 | 750 | 350 |
| Vegetables | 8,570 | 9,000 | 9,900 | 9,120 | 9,600 |
| Tobacco | 2,880 | 1,300 | 1,320 | 2,100 | 1,250 |
| Sorghum | 3,000 | 4,500 | 4,500 | 5,000 | 4,700 |
| Pasture | 8,400 | 4,900 | 3,332 | 1,960 | 2,100 |
| African palm | 6,250 | 7,350 | 7,200 | 8,000 | 8,500 |
| Potatoes | 6,720 | 5,000 | 4,500 | 2,250 | 4,500 |
| Corn | 7,150 | 7,600 | 7,560 | 8,100 | 8,100 |
| Pineapple | 360 | 400 | 700 | 2,240 | 2,100 |
| Beans (including soybeans) | 2,800 | 2,250 | 3,600 | 3,000 | 3,125 |
| Others | <u>1,950</u> | <u>2,275</u> | <u>3,405</u> | <u>3,840</u> | <u>3,000</u> |
| | 184,875 | 182,488 | 182,257 | 174,660 | 180,475 |

Source: IDB Report, 1982

TABLE 7

FEDECOOP FERTILIZER SALES
(expressed in Metric Tons)

| <u>FORMULA</u> | <u>1979</u> | <u>1980</u> | <u>1981</u> | <u>1982</u> |
|-----------------|-------------|-------------|-------------|-------------|
| Amonium Nitrate | 1,526 | 2,749 | 3,598 | 3,348 |
| Anonium Sulfate | 38 | 32 | 142 | 32 |
| Urea | 927 | 1,166 | - | 1,859 |
| 10-30-10 PEC | 375 | 470 | 614 | 898 |
| 10-30-10 S | 711 | 1,207 | 1,821 | 278 |
| 12-24-12 | 163 | 228 | 597 | 497 |
| 12-24-12 S | 5 | - | - | - |
| 15-3-31 | - | - | 1 | - |
| 15-15-15 | 515 | 689 | 837 | 859 |
| 15-30-8 | 23 | - | - | - |
| 15-30-10 | - | - | 41 | - |
| 17-11-22 | 294 | 312 | 228 | 382 |
| 18-5-15-6.2 | 4,925 | 5,488 | 5,946 | 6,813 |
| 18-10-6.5 | 4 | 52 | 10 | 1 |
| 20-3-20 | - | - | 160 | 13 |
| 20-7-12-3-1.2 | 2,772 | 5,618 | 4,029 | 6,304 |
| 20-20-0 | <u>329</u> | <u>-</u> | <u>-</u> | <u>200</u> |
| T O T A L S | 12,607 | 18,011 | 18,024 | 21,484 |

Source: FEDECOOP

TABLE 8
PRE-1983 FERTILIZER DISTRIBUTION SYSTEM

