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Economic impact, Cargill Fertilizer, Inc

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Memorandum

To: H. Gray Gordon, Vice President, Community & Industrial Relations,
Cargill Fertilizer, Inc., 8813 Highway 41 South, Riverview, FL 33569

CC: Ken Wieand, Director, Center for Economic Development Research (CEDR)
Bob Anderson, Dean, College of Business Administration

From: Dennis Colie, Economist, CEDR

Date: June 15, 1999

Re: Economic Impact - Cargill Fertilizer, Inc.

The purpose of this memo is to transmit the findings of the economic impact analysis of Cargill Fertilizer. An explanation of the method of analysis and assumptions underlying the findings are also included herein.

The method used to derive my estimate of economic impact is called input-output (I-O) modeling. A brief, but somewhat technical, explanation of I-O modeling is at Attachment A, titled *Regional Economic Development Analysis*. There is also a glossary of specialized terms with their meanings at the end of this memorandum.

Economic impact is initiated by spending by a business, by households, or by an institution such as a university. The more the entity spends in a region the greater its economic impact. Spending is measured over a specified time period, usually one year. This analysis is based on spending and employment during calendar year 1998. The 1998 spending and employment information, which is provided by Cargill Fertilizer, Inc., is shown in Attachment B. Spending for payroll, operating costs, and recurring capital expenses were considered in this economic impact analysis. Non-recurring capital expenses were not considered. Therefore, the findings of this analysis should be understood as an economic contribution expected to continue from year to year as long as the firm maintains its 1998 level of business activity.

For this analysis, the economic impact region is first defined as Hillsborough County and then, for the second part of the analysis, the economic impact region is expanded to encompass the Tampa Bay Area. The Tampa Bay Area is the 7-county region around Tampa that includes the counties of Hernando, Hillsborough, Manatee, Pasco, Pinellas, Polk, and Sarasota.

Because of linkages among commercial enterprises within a region, the initial spending (direct effects) leads to more spending (indirect effects) by businesses, for example, to buy raw materials in order to satisfy customer demands from the initial spending. Additionally, this increased business activity produces more personal income and, subsequently, increased consumption by households. Further spending within the region for household consumption in response to the initial spending is called induced spending (induced effects). The total economic impact of initial spending is the sum of the direct, indirect, and induced effects. The total economic impact is the economic contribution of an entity to the region.

Successive rounds of indirect and induced spending continue until all of the initial spending “leaks” out of the regional economy. Leaks are due to savings, taxes, and the importation of goods and service from outside of the region. Under present economic conditions, the purchase of imports is the critical “leak” affecting regional economic impact. The greater the spending on imports the smaller will be the regional economic impact of an initial change in spending.

Regional Purchase Coefficients (RPCs) were used to estimate the portion of demand for goods and services that is met by regional production and Type II multipliers were used to estimate the direct, indirect, and induced effects. The total payroll, i.e. personal income of Cargill’s employees, was reduced by 12.11% to arrive at an estimate of personal disposable income. The 12.11% is the average of income and payroll taxes for all Florida workers at all income levels. (A personal disposable income factor by income level is not available.)

Economic contribution is assessed by three measurements: output, personal income and employment. Each measures the economic contribution from a slightly different perspective.

(1) My estimate of **Cargill’s economic contribution to Hillsborough County** is:

Output:	\$91.3 million of goods and services produced annually (measured in 1998 dollars),
Personal income:	\$31.7 million of income received by workers annually (measured in 1998 dollars),
Employment:	1,024 jobs.

(See Attachment C for a breakout of the direct, indirect, and induced effects attributable to Operations, Recurring Capital Spending, and Payroll.)

During 1998, the Cargill facilities in Hillsborough county spent \$165.8 million for commercial operations and \$12.8 million for recurring capital expenses. In addition, a \$32.6 million payroll provided employees with \$28.7 million in spending power, i.e. personal disposable income. This

spending by the company and its employees motivated \$91.3 million of business activity in Hillsborough.

Cargill employs 542 workers in Hillsborough County. And, Cargill's economic activity creates another 1,024 jobs within Hillsborough county for a total of 1,566 jobs. That is, for every 100 workers at Cargill in Hillsborough county another 189 jobs are created in the county.

In 1998, Cargill's 542 workers in Hillsborough county earned personal income totaling \$32.6 million. These are relatively high paying jobs averaging about \$60,280 in personal income in 1998, while the average personal income per worker in the county that year was about \$30,800. And, another \$31.7 million of personal income is earned by the workers in the 1,024 jobs created in Hillsborough county as a result of Cargill's economic activity. This \$31.7 million of personal income plus Cargill's payroll of \$32.6 million add up to an annual total of \$64.3 million. For every \$1 Cargill spends for its payroll another 97 cents in personal income is created for other workers in Hillsborough county.

(2) My estimate of **Cargill's economic contribution to the Tampa Bay Area** is:

Output:	\$258.7 million of goods and services produced annually (measured in 1998 dollars),
Personal income:	\$88.9 million of income received by workers annually (measured in 1998 dollars),
Employment:	2,915 jobs.

(See Attachment C for a breakout of the direct, indirect, and induced effects attributable to Operations, Recurring Capital Spending, and Payroll.)

During 1998, Cargill Fertilizer, Inc. facilities located throughout the Tampa Bay Area spent \$472.4 million for commercial operations and \$32.2 million for recurring capital expenses. In addition, a \$71.8 million payroll provided Cargill's employees with \$63.1 million in spending power. This spending by the company and its employees resulted in \$258.7 million of business activity in the Area.

Cargill employs 1,374 workers in the Tampa Bay Area, plus Cargill's economic activity generates another 2,915 jobs in the Area for a total of 4,289 jobs. For every 100 workers employed at Cargill facilities in the Area, another 212 jobs are created within the seven counties that comprise the Tampa Bay Area.

In 1998, Cargill's 1,374 workers in the Area earned personal income totaling \$71.8 million. Like Cargill jobs exclusively located within Hillsborough county, these are relatively high paying jobs averaging about \$52,300 in personal income. In comparison, the average personal income per worker in the 7-county Tampa Bay Area was about \$25,450 in 1998. Another \$88.9 million of personal income is earned by workers in the 2,915 jobs created in the Area as a result of Cargill's economic activity. This \$88.9 million of personal income plus Cargill's payroll of \$71.8 million

yield an total of \$160.7 million of payroll dollars every year in the Tampa Bay Area. Every time Cargill spends \$1 on pay for their employees another \$1.24 of pay is created for other workers in the Area.

In summary, Cargill Fertilizer, Inc. provides 1,374 workers in the Tampa Bay Area with jobs that pay, on average, wages that well exceed the Area's average income per worker. Almost 40%, or 542 of the 1,374 Cargill employees, work in Hillsborough County. Furthermore, Cargill's year-long business expenditures and personal spending by the firm's employees generate another 2,915 jobs in the Area. Workers holding these generated jobs earn \$88.9 million annually. In total, Cargill motivates \$258.7 million is sales by other businesses throughout the Tampa Bay Area. If Cargill were to continue its commercial activities at 1998 levels, we expect the its total contribution of 4,289 jobs, \$160.7 million of workers' income, and \$258.7 million in sales by local business is economically sustainable from year to year.

GLOSSARY

Employment. Employment is wage-rate and salaried positions as well as self-employed jobs. It includes full-time and part-time jobs at a given point in time.

Multiplier. A multiplier is the I-O model's prediction of the regional economic impact of a change in final demand or spending. For example, if the output multiplier were 1.84, the regional economic impact of a \$10,000 increase in government purchases is predicted to be \$18,400 (1.84 times the \$10,000 base amount of increased spending). A Type I multiplier measures the direct and indirect effects of a change in economic activity. It measures inter-industry effects only, i.e., businesses buying from other local businesses. A Type II multiplier measures direct, indirect, and induced effects. Using Type II multipliers, induced effects are a linear function of the income and expenditures of households due to a change in final demand or spending. A Type III multiplier also measures direct, indirect, and induced effects. It assumes the region is at full employment and, therefore, each job adds or subtracts from regional population with the associated average spending per person. Using Type III multipliers, induced effects are a linear function of average expenditures per job and the number of jobs created or lost due to a change in economic activity. Type II multipliers are more commonly used for impact analysis because of the large population shifts often implied by Type III multipliers.

Output. Output is the value of production of goods and services for a given time period. Output is measured as the total value of purchases by intermediate and final consumers. Output can also be thought of as the value of sales plus or minus inventory.

Personal income. Personal income is income, received over a given time period, from all sources including employment income, proprietor's income, and transfer payments linked to the recipient's place of residence. Personal disposable income is what remains from personal income after income and payroll taxes are deducted.

Regional Purchase Coefficient. Regional Purchase Coefficients (RPCs) are derived from econometric equations to predict local purchases based on the region's characteristics. The coefficients mathematically describe the actual trade flows (imports and exports) for the region for each commodity. The RPC represents the portion of the total local demand that is met by regional production. One minus the RPC represents the portion of total local demand that is met by importing the good or service from outside the region, thereby generating a "leak" from the regional economy.

Attachment A.

Regional Economic Development Analysis

*The Center for Economic Development Research (CEDR), College of Business Administration, University of South Florida (USF), uses the **IMPLAN Professional**TM Social Accounting and Impact Analysis Software for economic impact analyses. Data (1995 and 1996) for each county in the state of Florida are available. County-wide data may be aggregated to focus on a region, such as the 7-county region - Hernando, Hillsborough, Manatee, Pasco, Pinellas, Polk and Sarasota - of special importance to the USF community. The following article briefly explains the economic impact analysis and the assumptions upon which the analysis is based.*

The Impact Analysis.

Economic impact analysis is based on conditional, predictive models of the form: If ...then... An input-output model is one type of model used in impact analysis. Other generally accepted models are the economic base model and the income-expenditure model. Compared with the input-output model, both the economic base and income-expenditure models are limited in application to small economic regions in which the interdependencies (sales/purchase relationships) between producing sectors are insignificant.

Interindustry relationships were first described in 1758 by the Frenchman Francois Quesnay, founder of the physiocratic or “natural order” philosophy of economic thought. The physiocrats depicted the flow of goods and money in a nation, and thus made the first attempt to describe the circular flow of wealth on a macroeconomic basis. Wassily Leontief was born in Russia in 1906 and first studied economic geography at the University of St. Petersburg before moving to Berlin and China. He came to the United States in 1931 and, after a brief 3-month stint at the National Bureau of Economic Research in New York, he was hired by Harvard University. At Harvard, Professor Leontief undertook a research project that encompassed a 42-industry input-output table showing how changes in one sector of the economy lead to changes in other sectors. From this research, he developed the concept of multipliers from input-output tables, and was subsequently awarded the Nobel prize in economics in 1973 for his development of input-output (I-O) economics.

The historical transactions data in the I-O model represent the sales and purchases between sectors that occurred over an estimation period. These data describe each sector’s “purchases” and “sales” linkages with the rest of the economy. For each productive sector the transaction data take into account all sales revenue and costs, with the difference between revenue and costs being profit, which is a part of value added. (Total value added to a product at each stage of its production is the sum of wages and salaries, rents, profits, interest, and dividends.) The historical transaction or descriptive data are used to create the *descriptive* model of information about local economic interactions called *regional economic* accounts. These accounts, or transaction tables, describe a local economy in terms of the flow of dollars from purchasers to

Attachment A (continued).

producers within the defined region.

For example, an increase in government purchases (first round) of output from the “manufacturing” sector of a region may require the “manufacturing” industry, in order to expand output, to purchase (second round) factor inputs from other sectors of the regional economy. In turn, these other sectors may have to purchase (third round) inputs to deliver the supporting production of factors to the “manufacturing” sector. The rounds of spending will continue with each round becoming increasingly weaker in its impact because of leakages from the region attributable to imports, savings, and taxes.

The first round is called the direct effects of the change in final demand (consumption) in a sector(s) of the economy. The second and subsequent rounds are collectively referred to as the indirect effects of interindustry purchases (reduction in purchases) in response to direct effects.

The *open* I-O model just described does not take into account changes in spending in the region, in response to the direct effects, for household consumption. Changes in spending from households as income or population increases (decreases) due to changes in the level of production are called induced effects.

Induced effects are incorporated into the I-O descriptive model by forming a *closed* model. That is, transactions of the household sector are made endogenous to the model by treating households as a producing sector. The household sector sells its labor to the other producing sectors and purchases factor inputs, i.e. consumption expenditures, in order to maintain its labor.

There are two steps in impact analysis using the I-O model. First, the descriptive model is created; then, the predictive model is derived from the descriptive model. The descriptive model contains information about interindustry transactions called the *regional economic accounts*. The information describes the flow of dollars from purchasers to producers within the region.

In addition to the regional economic accounts, the descriptive I-O model includes the *social accounts*. Social accounting data include, for example, taxes paid by businesses and households to government, and transfer payments from government to businesses and households. Trade flows also are a part of the social accounts.

Trade flows describe the movement of goods and services between the region and the rest of the world, that is imports and exports. The analyst must choose between *regional purchase coefficients* (RPCs) or supply/demand pooling. RPCs are econometrically derived to predict local purchases based upon a region’s characteristics. In contrast, *supply/demand pooling* presumes everything that can be purchased locally, will be. Hence, it will lead to larger multipliers than RPCs, because the leakages for imports are less. (The analyst also decides if local purchase coefficients - LPCs - are to be applied to an event during impact analysis. If the

Attachment A (continued).

LPCs were to be applied, the model's RPCs are used to determine how much of the first-round expenditure is used to purchase local products and how much is for imported items. Otherwise, the RPCs are applied to second and subsequent rounds of spending only.)

The regional economic accounts and social accounts are used to build *multipliers*. The multipliers are the *predictive* I-O model. A set of multipliers are expected changes in output for each industry in the model given a one dollar change in final demand for any particular industry or commodity.

A multiplier measures the effects of a change in final demand(s) in a region. The change in economic activity is called the *impact*. The impact is essentially the expected or predicted consequence of a change in final demand(s) within the region due to a single event or a group of events. A group of related events may be referred to as a project.

A Type I multiplier measures the direct and indirect effects of a change in economic activity. It only captures interindustry effects within the region. In addition to the direct and indirect effects, a Type II multiplier captures the induced effects of changes in household income and expenditures. A Type III multiplier also captures direct, indirect, and induced effects. However, the Type III multiplier estimates the induced effects based upon changes in employment. It assumes the region is at full employment, then each job added or subtracted by the impact is associated with the region's average expenditures per person. A Type II multiplier is most commonly used in impact analyses.

Personal consumption expenditures (PCE) are spending by households and are strongly related to total personal income. Total personal income is income from all sources, including employment income and transfer payments that are based on place of residence. Because of commuting patterns, PCE in a region may not be strongly related to employment income in that location. Hence, the income based induced effects of the Type II multiplier are normally adjusted so that a regional average amount of transfer payments is associated with a change in employment income. Such multiplier is called a Social Accounting Matrices (SAM) Income multiplier. However, suppose that an increase (decrease) in employment income is not anticipated to be associated with a corresponding change in regional transfer payments. For instance, it may be believed that an increase in final demand will only generate low paying jobs. Then, it is likely that the under-employed will be hired and transfer payments will not increase in the region. Accordingly, a Specific Disposable Income may be applied to the Type II multipliers. That is, the change in household consumption expenditures is estimated by disposable income, which is defined as a specified (by the analyst) percentage of employment income.

A change in final demand may be applied to an industry or to a commodity. Industries are businesses producing goods and services; commodities are the goods and services being

Attachment A (continued).

produced. An industry can make more than one commodity. An industry usually is named for the primary, by value, commodity it produces. Commodities produced by an industry, other than its primary commodity, are called secondary commodities or by-products. An industry applied

change in final demand has a direct effect on the selected industry only. A commodity applied change in final demand directly affects all industries that produce the commodity, whether as a primary or secondary commodity. The analyst chooses between an industry or commodity applied change in final demand. The choice is appropriately based on the circumstance for the change in final demand. The choice will affect the predicted impact.

As an alternative to estimating the economic impact of a change in final demand (“at the factory door”), the analyst may estimate the impact of a change in sales and employee payroll for a particular institution, e.g. state/local government education, or business sector. Then, a typical expenditure pattern for the institution or industry is generated to assess the economic impact of the change in sales and payroll. (If the event under study is believed to have an atypical expenditure pattern, this alternative approach is inappropriate. Instead the analyst should specify the expenditure pattern of the institution or industry in detail.) Using this alternative approach, the direct effect on final demand, i.e. output, in the region will be less than the change in sales. This happens because the model includes the institution’s or industry’s production function and final demand is an estimate of the value, in producer prices, of the factor inputs needed to generate the specified change in level of sales. The difference between the estimated change in final demand and the change in sales is total value added. Also, with this approach, the induced effects are interpreted as resulting from a change in household spending by the suppliers of the institution’s or industry’s factor inputs (first round) as well as subsequent rounds of interindustry sales/purchases.

Margins are used to convert purchaser prices to producer prices. Margins depend on the consumer. For example, households pay the full retail margins, but government may pay little or no retail margins because it has more buying power than individual households. Margins split a purchaser price into appropriate producer values, each value impacting a specific industry. For example, the purchaser price of a tire at an automotive retailer includes the producer price at the factory door plus transportation costs, the wholesaler’s markup, and the retailer’s markup. Unless edited by the analyst, margins used in impact analysis are national averages.

A deflator may be used to convert expenditures to the base year (estimation period) used to calculate predictive multipliers and to inflate the reports of impact analysis to the current year. Deflators are associated with commodities, and are also used to adjust margin values.

A predicted regional impact may be gauged in terms of output (a change in production measured in dollars), of employment (a change in employment measured by number of jobs), or of personal income (a change in income from all sources, including employment and transfer payments, for persons residing in the region).

Attachment A (continued).

I-O Model Assumptions.

The following are the fundamental assumptions of the I-O model. First, it is assumed that the proportions in which each sector purchases its inputs from all other sectors are invariant over the period of analysis. The implications of this assumption are unchanged technology, constant relative prices, no shift in the mix production activities within sectors, and no new significant firm has moved into or out of the region.

Second, the I-O model assumes linear production functions, that is a sector's inputs remain in proportion to its output. This implies that no industry enjoys economies of scale. Third, each sector of the regional economy is assumed to be homogeneous. An increase (decrease) in a sector's final demand will always have the same impact on the economy. And fourth, in the closed I-O model, it is assumed that the household sector's marginal propensity to consume equals its average propensity to consume.

Prepared by:
Dennis G. Colie, Ph.D.
Economist
E-mail: DCOLIE@coba.usf.edu

Attachment B.

CARGILL FERTILIZER, INC.
ECONOMIC IMPACT ANALYSIS
(\$000)

DATE: APRIL 22, 1999

TO: DENNIS G. COLIE, Ph.D.
FROM: GREG LEFOR/TOM BLAUCH
SUBJECT: ANALYSIS PROJECT DATA - CYE 12/31/98

	Hillsborough:	7 County Region:
1) No. Of Employees:	542	1,374
2) Payroll:		
\$0 - \$20,000:	\$3,037	\$3,877
\$20,001 - \$50,000:	\$12,059	\$35,069
\$50,001 & over:	<u>\$17,575</u>	<u>\$32,926</u>
Total Payroll:	<u>\$32,671</u>	<u>\$71,872</u>
3) Operating Costs: (excludes payroll)		
Raw Materials	\$100,270	\$226,425
Plant costs:	\$57,465	\$237,201
G & A:	<u>\$8,150</u>	<u>\$8,774</u>
Total Operating Costs:	<u>\$165,885</u>	<u>\$472,400</u>
4) Capital Expenditures: (base \$'s)	\$12,857	\$32,288

Attachment C.

Cargill Fertilizer, Inc. Economic Impact
on Hillsborough County

	Output Impact				
	Direct	Indirect	Induced	Total	Multiplier
Operations	\$32,450,130	\$8,023,141	\$10,066,231	\$50,539,502	1.56
Recurring Capital Spending	\$4,458,505	\$1,553,862	\$1,209,131	\$7,221,498	1.62
Payroll	\$20,184,023	\$5,575,875	\$7,778,131	\$33,538,029	1.66
Combined	\$57,092,658	\$15,152,878	\$19,053,493	\$91,299,029	1.60

	Personal Income Impact				
	Direct	Indirect	Induced	Total	Multiplier
Operations	\$9,794,129	\$3,189,969	\$3,806,721	\$16,790,819	1.71
Recurring Capital Spending	\$971,865	\$565,140	\$457,254	\$1,994,259	2.05
Payroll	\$7,813,029	\$2,168,051	\$2,941,436	\$12,922,516	1.65
Combined	\$18,579,023	\$5,923,160	\$7,205,411	\$31,707,594	1.71

	Employment Impact				
	Direct	Indirect	Induced	Total	Multiplier
Operations	260.6	95.4	137.6	493.6	1.89
Recurring Capital Spending	23.9	15.9	16.5	56.3	2.36
Payroll	300.6	67.5	106.3	474.4	1.58
Combined	585.1	178.8	260.4	1,024.3	1.75

on 7-County Region

	Output Impact				
	Direct	Indirect	Induced	Total	Multiplier
Operations	\$93,721,487	\$23,951,424	\$33,380,150	\$151,053,061	1.61
Recurring Capital Spending	\$17,695,163	\$6,962,711	\$6,302,866	\$30,960,740	1.75
Payroll	\$44,426,012	\$12,456,789	\$19,833,533	\$76,716,334	1.73
Combined	\$155,842,662	\$43,370,924	\$59,516,549	\$258,730,135	1.66

	Personal Income Impact				
	Direct	Indirect	Induced	Total	Multiplier
Operations	\$28,010,483	\$9,405,044	\$12,691,330	\$50,106,857	1.79
Recurring Capital Spending	\$4,312,368	\$2,445,558	\$2,396,387	\$9,154,313	2.12
Payroll	\$17,300,350	\$4,804,971	\$7,540,826	\$29,646,147	1.71
Combined	\$49,623,201	\$16,655,573	\$22,628,543	\$88,907,317	1.79

	Employment Impact				
	Direct	Indirect	Induced	Total	Multiplier
Operations	774.7	295.4	470.1	1,540.2	1.99
Recurring Capital Spending	101.4	69.0	88.8	259.2	2.56
Payroll	680.6	155.9	279.3	1,115.8	1.64
Combined	1,556.7	520.3	838.2	2,915.2	1.87