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The effects of incorporating fee-based integrated crop management consulting services in grain marketing and input supply cooperatives

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by

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This work is dedicated in memory of my Uncle-

Stanley E. Wheaton

"He is truly missed by all that knew and loved him."

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CHAPTER I. INTRODUCTION AND PROBLEM STATEMENT

A. Economic Sustainability

Midwest crop producers continue to be driven toward an ever-increasing size through the development of new technology. But until now, technology has largely been used alone to solve producers' production goals and problems. Producers are compelled to continually adopt new technology in the struggle to remain economically competitive. Users of more advanced technologies need to better understand the technological input's full economic benefit, as well as the costs, which come with their use and application. To fully utilize production inputs, producers are turning to specialists for management recommendations about how to use technology in a more sustainable manner. Integrated Crop Management (ICM) is evolving as a technological management service that may provide a valuable link between input providers and users of agricultural inputs. An ICM service can be defined as a consulting service that reviews all the input and management decisions a producer had or could make, and recommends a resource usage plan for maximum economic return.[1]

ICM services may provide benefits to both the users and the providers of agricultural inputs. Producers gain by using only the amount and combinations of inputs required to produce maximum economic returns. Fee-based ICM services could provide an additional revenue source to input providers, and may allow them to tap new customer markets. In either case, ICM services have potential to become a new mechanism to further enhance agriculture's economic sustainability.

B. Why Input Supply Firms may be Leaders in Marketing ICM Services

Currently a wide array of businesses are offering ICM services to producers including grain marketing and input supply (GMIS) firms and independent consultants. Independent

consultants are leading the development and marketing of ICM services; however, GMIS firms have potential to be major providers of ICM services. Three main factors are projected to make GMIS firms leaders in marketing fee-based ICM services:

The first factor favoring the marketing of ICM services is the existing working relationship between these firms and producers. Agricultural input suppliers heavily influence producers decisions in all phases of crop production.[2] Input dealers are often producers first and last-place producers go to receive assistance in making major cropping decisions such as input usage, field operations, and fertilizer and pesticide applications.[3] Many current recommendation services fail to provide the detail producers need to effectively manage production inputs for maximum economic efficiency, because they are blended in scope.

Second, economic and regulatory forces are causing producers to demand more information than what most current GMIS crop recommendation services provide. As policies and regulations increase on fertilizer and chemical usage producers could be forced to use less inputs, and at the same time find ways to grow crops more economically.[4] Input supply firms see consulting services as a way to fulfill producers' changing informational needs, and at the same time, serve as a profit center marketing information.[5] Therefore, as producers demand more information from conventional recommendation services, input suppliers could evolve these services into broad-scope fee-based ICM services and become the dominate supplier of ICM services.

Industry structural changes are a third factor providing an incentive for GMIS firms to become a dominate supplier of ICM services. Structural changes likely to affect the GMIS firms include increased vertical coordination in the grain industry. Such vertical coordination in the grain industry may create the need for specialized crop production practices in meeting a specific type of grain processing, and or marketing requirement. The management practices needed to meet these contract requirements can be incorporated into a fee-based ICM service, and thus benefit both the producer and grain marketer through a more coordinated production process.[6]

C. Features of a Complete ICM Service

A complete ICM service takes into account all technology and resources available to the producer and brings them to bear on recommendations for specific farms and fields. Although soil testing, fertilizer recommendations, pesticide recommendations, and field scouting are part of the ICM service, the scope a complete ICM service goes well beyond these factors. Preseason planning is the most important phase in a ICM consulting service, because it is when the production process has the greatest decision making flexibility.[7] Kay Connelly, a private crop consultant currently providing ICM services to farmers, stresses that an ICM service is 25 percent scouting and 75 percent planning.[8] In Connelly's practice planning begins in winter reviewing producers past yield levels, fields' soil types and tests, tillage, equipment, labor availability, and production schedules. Crop consulting services without a planning phase have fewer options for making production adjustments if adverse conditions occur.[9] A complete crop production plan allows both producer and ICM consultant to adjust input technology in maximizing economic return over ever changing cropping conditions and commodity prices.

During the growing season field visits are made at critical times to check crop progress, to examine general field conditions, and to see if any adverse conditions warrant action. During visits farming practices along with the adverse condition are noted and mapped. By noting field and growing conditions, a crop consultant has more encompassing information to recommend the most efficient solution in dealing with current crop production. This practice also enlarges a crop consultant's field data base, and becomes highly valuable in planning for future crop production.

Another difference between some presently marketed crop consulting services and a complete ICM service is marketing techniques. Current consulting services generally offer individual diagnostic service areas where an ICM service covers the complete cropping environment from planter to harvester and beyond. Non-ICM consulting services are more

focused on finding and treating problems after they occur than preventive crop management. The main goal of an ICM consulting service is more analogous to a health maintenance organization in that it attempts to diagnose problems before they develop into major ones as well as treating the more acute problems as they arise. Crop consulting based on the producers selecting individual service items may not be gathering enough overall information to effectively correct and treat crop problems with the most efficient or economic solution.

In order to address cropping problems in the most efficient and economic way, a crop consulting service needs to be all encompassing. "A true or complete integrated crop management consulting service takes a much broader approach to the production process and generally includes three distinct phases: preseason planning, production monitoring, and post season evaluation."[10] Also, the complete ICM consulting package can be distinguished from other consulting services by the scope of services provided and the time horizon used in planning.[11,8]

D. Organizational Structures for Delivering Fee-based ICM Services

A complete ICM consulting service can be organized and delivered to the client in one of two ways. One way a complete ICM service can be organized and delivered is by a structural hierarchy based on scouting. In a scouting structure (the scouting model) the ICM manager hires seasonal employees with specific training to monitor fields on a weekly basis. Crop scouts report field findings back to the manager, who then makes recommendations back to clients via the scouts. A second possible organizational structure for fee-based ICM services is through individual technicians (the professional model). The professional model consists solely of highly trained personnel with a broad set of skills and experiences who plan, scout fields when conditions dictate, and make cropping plans and recommendations directly with the client.[12]

Both of these ICM organizational models provide excellent crop consulting services compared to most of the limited scope crop consulting services offered by GMIS firms. For

the GMIS firm the professional model appears to provide the best results in terms of profit and customer service. Table 1-1 shows the profitability difference between the two ICM models. The scouting model's hierarchical organizational structural for information flows could inherently create communication problems between the client and service provider. Therefore, with a higher profit potential and a direct communication link between client and consultant, the professional model was selected for use in this study.

Table 1-1. ICM organizational models' revenue and expense projections

ICM Budget Item	ICM Organizational Model			
	Professional		Scouting	
Revenue:				
Subscribed Acres	15,000	18,000	18,000	20,000
Fees Charged per Acre	$ 4.00	$ 4.00	$ 5.00	$ 5.00
Total Service Revenue	$ 60,000	$ 72,000	$90,000	$100,000
Expenses:				
Direct budgeted	$ 15,000	$ 18,000	$25,000	$ 26,000
Personnel				
Manager	35,000	40,000	30,000	35,000
Scouts at $6.00/hr-16wks	-	-	23,040	26,880
ICM Profit/(Loss)	$ 10,000	$ 14,000	$ 8,960	$ 12,120

Source: Ginder, and Connelly (1993)

E. Public Good vs. Club Model Crop Consulting

Current crop consulting services that are provided along with input sales are unlikely to develop into a complete ICM service for two reasons. First, input suppliers' staff agronomists are overburdened making general input recommendations on customers' purchases. When every customer thinks they are entitled to input use recommendations, staff agronomists are left with no time to make detailed soil testing, field scouting, and an overall farm plan essential in a complete ICM service for everyone. Second, product information is usually considered part of the product sale, input suppliers often provide free information to

maintain good relations with customers. Any farmer who has purchased inputs from an input supply firm would have more or less equal access to crop information as the next farmer. Since the information is nearly always "free" and focuses on supporting product sales, input suppliers crop consulting services usually provides little or no specific advice on producer profit maximization.

Input suppliers lack an incentive to market true ICM services unless they can recover the costs incurred in providing detailed information services. To provide an incentive for input suppliers to market true ICM services a mechanism is needed to capture a sufficient portion of the producer's improved efficiency to cover the firm's cost of providing the service. The most practical mechanism for capturing cost savings and encouraging the marketing of true ICM services is charging producers for the consulting service. Studies have shown that when ICM services are marketed as a club good, both ICM provider and client can profit from the arrangement. A club good approach to marketing ICM services is necessary to eliminate the free rider and over use problems associated with providing valuable information.[13] Free riding is best defined as not paying, or paying less than the value of the benefits received from using a public good. Free riding in providing public goods diminishes the incentive to provide true ICM service to producers, since there is no way firms can recover the full cost of providing highly detailed site specific information. Over use diminishes the value to the producer since there is no assurance that the service will be available in the required quantity in terms of time spent reviewing a producer practice and operation. Limiting access to the detailed, broad-scope, production information can prevent over uses.

Furthermore, marketing ICM services as a club good reduces the conflict of interest between the input supplier and the producer. By selling information separate from input sales, an input supply firm need not be concerned about selling products to cover the cost of the consulting service. Producers may feel more confident that the consultant's input recommendations are valid when able to separate products what they are purchasing from information they are purchasing. Therefore, producers are under no contract to purchase

input supplies from a firm selling ICM services and can purchase inputs from either the firm marketing the ICM service, or shop around for lower priced inputs at another firm.

A club good marketing approach to ICM services improves the informational content of the consulting service to the benefit of both providers and clients. ICM provides benefits to service providers by limiting access to those who have paid consulting fees, and producers benefit by receiving a known amount and quality of site specific crop consulting service toward their specific farming operation.

F. Problem Statement and Research Objectives

An owner or a manager of an input supply firm must address many questions when deciding whether to offer a complete ICM fee-based service. Is a firm's trade area large enough to support at least one or two ICM managers? Can the firm financially handle losses in starting up an ICM service? How will a consulting service that is designed to help producers' achieve maximum economic return affect the firm's input sales and ultimately firm profit levels? How will the competitive climate in the industry be affected? These and similar questions, are confronting firms in the GMIS industry as it attempts to develop and market complete ICM services on a fee-basis.

A problem statement regarding decisions by input supply and marketing firms to begin or continue offering fee-based ICM consulting services may be formulated in three parts:

1) How can a input supply and marketing firm determine if it has a large enough service territory to draw enough potential customers to profitably offer an ICM consulting service?

2) Are financially strong firms more likely to offer ICM services due to the risks in starting up a new business enterprise?

3) Will the service income from selling consulting be high enough to replace the margins lost from reductions in product sales that an ICM program may create?

GMIS firms must strike a balance between providing services their customers need and generating sufficient profits to operate. If producers receive more in benefits than what a service or product costs the GMIS firm can be forced out of business. This is currently plaguing the development of ICM programs in GMIS firms. Most producers obtain a $2.00 to $5.00 return for every dollar they spend on broad-scope crop consulting services.[14] However, some of their increased return comes at the expense of a GMIS firm through reduced input usage. The benefit disparity between ICM provider and producers has almost certainly slowed the development of GMIS firms marketing ICM services. This paper is an attempt to help clarify qualitatively and quantitatively what may happen if GMIS firms market complete ICM services for a fee.

NOTES

[1]Eileen M. Gannon, and Roger G. Ginder, "Evaluating future strategies for Iowa farmer-owned cooperatives in supplying agricultural products and services: An assessment of Integrated Crop Management serivces," (Ames, Iowa: Leopold Center for Sustainable Agriculture, 1992), 1.

[2]Roger G. Ginder, "Farm input suppliers in sustainable agriculture," Building Bridges, Third annual Leopold Center for Sustainable Agriculture Conference held on February 18-19, 1992, 36.

[3]Wendy L. Hoffman, Stemming the flow, (Washinton D.C.: Environmental Working Group, 1993), 13.

[4]Ginder, 36.

[5]Hoffman, 14.

[6]Ibid.

[7]Roger G. Ginder, "Establishing integrated crop management services in Iowa agricultural input supply and marketing firms," (Ames, Iowa: Department of Economics, Iowa State University, January 1995), 5, staff paper.

[8]Kay A. Connelly, "What is ICM?," Lecture presented at the ICM Dealer Project meeting in Okoboji, Iowa on 23-24 August 1993.

[9]Ginder, 5.

[10]Ibid., 4.

[11]Idid., 5.

[12]Idid.,11.

[13]Kevin Siqueira, and Roger G. Ginder, "A club model of integrated crop management," (Ames, Iowa: Department of Economics, Iowa State University, January 1995), 3-6, staff paper.

[14]Peggy Petrzelka, "Crop consulting in Iowa: A survey of farmer users and numbers," (Ames, Iowa: Department of Sociology, Iowa State University, 1995), 4.

CHAPTER II. METHODOLOGY

A. Study Framework

Two empirical procedures were employed to answer the problem statement questions. First the initial state of the GMIS industry was documented with no firms marketing ICM services. Analysis of the industry's initial state was used to establish the contribution of current commodity and product marketing activities and their importance in the firm. The second procedure modeled the effects of firms adding an ICM services. ICM services were modeled based on the size of GMIS firms' existing trade area, and the ability of ICM services to replace lost sales from fertilizer and pesticides. This chapter describes the methods that were developed to evaluate fee-based ICM services in GMIS firms.

B. Data and Farmer-Owned Cooperatives as the Investigation Sample

The data drawn for this study were taken from financial statements of GMIS cooperatives and private investor-owned firms located in Iowa. Sales, gross margin, and service income data from the financial statements were organized into seven profit centers. Common firm expenses from the consolidated GMIS financial statements were allocated across the profit centers to estimate their net profits.

From the two types of agribusiness GMIS financial data available for this project, (investor-owned firms and farmer-owned cooperatives) only cooperatives were ultimately selected to be used. This decision was based solely on data quality and the ability to separate out departmental activities. The audit reports and financial statements available to researchers from investor-owned GMIS firms lacked departmental details required for effective profit center analysis. From the initial sample of sixty-five investor-owned firms, only fifteen firms had enough product sales and margin information to permit complete departmental analysis

and the estimation of net profit. In the remaining investor-owned firms, aggregated sales and margins information prevented the isolation of fertilizer and pesticide sales, margins, and profits.

Because statements from seventy-five farmer-owned GMIS cooperatives had sufficient detail and were numerous enough to conduct statistical tests they were used as the focus for the study. However, four firms were rejected from the initial sample of seventy-five due to lack of fertilizer and pesticides sales. These firms were removed to avoid understating the industry averages for fertilizer and pesticide sales and the modeled ICM results. The final sample size consisted of seventy-one farmer-owned GMIS cooperatives that were marketing both fertilizer and pesticides.

C. Modeling Time Frame

The analysis spanned five years from 1988 to 1992. From that five year time period three fiscal years 1988, 1990, and 1992 were modeled. These years included a broad spectrum of economic conditions cooperatives faced including different physical, market, and government policy. Large grain storage income in 1988 was a carry-over from high crop yields and government storage programs in the years prior to 1988. 1990 was a somewhat more normal crop production year, although financial records for a portion of firms showed lagged or carry-over effects from previous years in the grain profit center. The fiscal year end and the specific grain merchandising program for some firms also contain lagged effects from previous years. Although 1992 was a record crop production year, the lags in financial reporting and grain merchandising make 1992 more representative of a "normal" crop production year than a record setting year. The three years chosen show something of the volatile industry conditions that are placed upon GMIS cooperatives. Of the three years studied, 1988 represents a year of high income, 1990 represents a low income year, and 1992 represents an average or "normal" income year for GMIS cooperatives.

D. Decreased Fertilizer and Pesticide Sales from ICM Recommendations

As farmers purchase fee-based ICM services to better manage input usage for profit maximization, GMIS firms' total profit could be adversely affected. As a result of ICM recommendations fertilizer and pesticide input sales for some products could decline. Phosphorus (P) and potassium (K) fertilizer are inputs an ICM consultant is likely to find in overabundance in many fields. Recommendations for these inputs would likely be reduce or eliminate application when the soil tests indicate nutrient levels are high to very high and well above what is necessary to meet the desired yield goal.[15] Nitrogen (N) fertilizer is another nutrient often over applied by farmers. This occurs largely because the possibilities for larger economic gain can be realized from applying N when growing conditions are ideal. Often the ideal growing conditions never materialize and the full N volume is not available from the application. This is not only an unnecessary cost, but the extra applied may leach or be washed into streams which can pollute the water supply.

The low cost of N encourages this scenario at the beginning of every growing season. Assume that N costs $0.20 per pound and corn sells for $2.00 per bushel and that one additional pound of N produces one more bushel of corn provided growing conditions will support the yield gain. "Thus, applying $0.20 worth of N would add $2.00 worth of corn in the ideal year. By assuming the above conditions, a farmer can afford economically to apply N for a target yield level that growing conditions will support as few as one year in ten."[16] A properly trained ICM consultant would review previous growing conditions along with long range weather forecasts to predict what the growing conditions might be, and recommend a nitrogen application consistent with realistic yield expectations for the field. Many recommendations would be for a lower application rate than the one ideal growing season on average every ten years.

Pesticides, unlike fertilizer, face a more uncertain future in terms of how much product sales would be affected by cooperatives marketing ICM services. Insecticide usage for insect pest control is likely to decline as ICM managers accurately determine the pest's economic

threshold levels and scout target areas within the field. Reductions in herbicide broadcasting by shifting towards banding applications or spot spraying pesticide in targeted areas where there is a visible weed pressure is also likely to reduce pesticide sales for input supplies.

As tillage practices shift away from conventional tillage toward more reduced tillage practices, some type of herbicide sales could actually rise when producers adopt ICM services. Producers who are currently practicing conventional tillage or reduced tillage might be encouraged to adopt no-till to maximize their return. Using reduced tillage practices could increase their use of pesticides to control pest that were otherwise controlled by tillage. In this study it will be assumed that producers are currently over applying pesticides, and that the level of no-till is fixed and does not change from year to year. This assumption was made to avoid speculation on the adoption rate of no-till among producers. It permitted a more consistent measure of the effects ICM services might have on different profit centers given a consistent mix of conventional tillage, reduced tillage, and no-till.

It is recognized that other agricultural production inputs and commodity sales categories could be affected positively or negatively by an ICM service. For example feed sales could rise as producers intensify livestock enterprises and time spent in managing crop production is reduced. Petroleum sales could fall as producers change tillage practices and equipment in response to ICM recommendations. Seed sales could increase as producers switch to more specialized highly advanced hybrids developed specifically for local growing conditions or increase population per acre. Grain sales and storage could fall as producers produce for maximum profit level or they could increase as the same level of inputs are used to produce more bushels. No attempt was made to investigate all the possible secondary effects or outcomes that could arise from offering ICM services. Current industry research adequately supports the assumptions that aggregate fertilizer and pesticide input sales are likely to decline (at least initially) as cooperatives market ICM services to producers. The study was confined to the direct effects on fertilizer and pesticide profit centers.

The actual magnitude of sales reductions for fertilizer and pesticide will be unknown until a significant number of cooperatives begin offering ICM services and actual data are

generated. It was therefore necessary to make assumptions about the degree to which fertilizer and pesticide sales would fall. ICM industry leaders and observers indicated that fertilizer and pesticide applications could fall anywhere from ten to forty percent of current usage depending on the particular input and its present level of application. Section I-2 presents the method that was used to estimate a firm's input reduction percentage.

E. Development and Allocations to Profit Centers

1. Development of Profit Centers

Commodity and product sales were grouped into profit centers. Profit centers were organized based on the following commodity and input product sales categories: grain, feed, seed, fertilizer, pesticide, petroleum products, and supplies. Commodity and product sales were directly allocated into a specific profit center based on commodity or product characteristics. The grain profit center consisted of the following commodities: corn, soybeans, oats, and other crops. Dry bulk, liquid, and anhydrous ammonia fertilizer sales were combined into the fertilizer profit center. Gasoline, fuel oil, liquid petroleum gas, oil, grease, tires, batteries, and other vehicle supply sales were combined into the petroleum profit center. The supplies profit center combined sales from a variety of products including livestock health and feeding aids, lumber and other building supplies, and other miscellaneous. Feed, seed and pesticides sales were listed as individual items and did not need to be grouped with other products to form an individual profit center.

2. Allocation of Service Revenue and Expenses to Profit Centers

Service and other revenue were allocated to profit centers by both the direct and the common allocation methods. The additional service and miscellaneous income consisted of the following: grain storage, grain drying, grinding , trucking, spreading and spraying, service, finance charge and interest, and general miscellaneous income. Most service and other revenue income was directly allocated to profit centers based on an identifiable association with a product. Such income could be allocated based commodity or product sales. Service

revenue items that were allocated directly to profit centers included: grain storage, grain drying, grinding, and trucking. The service and miscellaneous income not directly attributable to any single product or profit center was allocated among all (or a set of applicable centers) based on the department's sales as a percentage of total sales. Service and miscellaneous revenue that was allocated among all centers (except grain) on this basis were as follows: service revenue, finance charges and interest income, and other miscellaneous income. The grain profit center did not receive any of the previously mentioned revenue, since income of this nature is typically generated from input product sales and is not typically associated with grain marketing activities. Spreading and spraying revenue was allocated between the fertilizer and pesticide profit centers based on relative sales levels.

Expenses consisted of the following: total employee (wages and benefits for non ICM employees), insurance, interest, property taxes, depreciation, repair and maintenance, truck, lease and rental, supplies, data processing, utilities, telephone and telegraph, advertising, directors' fees, travel and meeting, dues and subscription, professional services, bad debts, and other expenses. The cooperatives' financial statements did not associate individual expense items with sales of any particular commodity or product. Therefore all expenses had to be allocated as common costs to the individual profit centers A method to allocate common costs among product categories was experimentally determined with COST-AL, a Lotus 123 template developed by Purdue University's Center for Agricultural Business.

Purdue University developed COST-AL to help agribusiness managers make decisions on an appropriate allocation of common costs. Ten firms were randomly selected from the sample to be evaluated with COST-AL. Experimentation with many different allocation schemes produced two methods of common cost allocation. Expense allocation was based on either the profit center's percentage of total sales or the percent of gross profit it generated. In general fixed costs were allocated based on sales and variable costs were allocated based on gross profit. See Appendix A for a more detailed description of the cost allocation procedure.

F. ICM Profit Center Budget

To project the effects of a fee-based ICM service on GMIS cooperatives a budgeting approach was used. Table 2-1 presents an technician based ICM service program with revenue and expense projections for one and two managers. Budget assumptions were developed from discussions with independent crop consultants, asset purchase costs from local retailers, and previous ICM budget research by Connelly, Frieberg, and Ginder. The ICM service program was then modeled in cooperatives as a profit center and added to the seven initial centers.

1. Revenue

ICM service income for one manager was calculated based on 15,000 subscribed acres with an average consulting fee of $4.50 per acre equaling $67,500 of revenue. A producer's actual per acre fee could be higher if the subscribed acres are below the firm's minimum acre charge threshold level. High levels of fixed costs are involved in the planning phase of an ICM service for a individual producer whether 500 or 1,000 acres are subscribed, because a nearly constant amount of planning cost is incurred. It should be noted that although the current basic consulting charge is about $4.00 per acre, other researchers have estimated that a true ICM services could cost as high as $4.50 per acre with soil testing an additional charge.[17] The higher dollar per acre charge was used as a basis for this study and may permit the ICM budget to have some relevance in years following this investigation.

Soil testing revenue was based on the actual field acreage tested. The assumption was made that in each year only one-third of all subscribed ICM acres would need soil testing. This amounted to between 5,000 and 10,000 acres in the budgets used. Producers were assumed to be charged $1.00 per acre for soil testing. The revenue yielded at this level was $5,000 and $10,000 for an one and two manager ICM service respectively.

2. Expenses

Expenses for the ICM budget presented in Table 2-1 were developed in accordance with previous and current complete ICM service research and in discussions with actual

service providers. The reader should note that expenses were based on nominal prices on 1 April, 1995 and are subject to change over time.

The first five expenses listed represent traditional fixed cost items. These five expenses are insurance, interest, depreciation, licenses and taxes, and lease and rent. Excluding the ICM manager's salary, these items represented a majority of the costs required to run a fee-based ICM service. Insurance expense covers payments to insure the manager(s)

Table 2-1. ICM budget for one and two managers at 15,000 and 30,000 subscribed acres

ICM Budget Item	No. of Managers	
Revenue:	1	2
Consulting Fees	$ 67,500	$ 135,000
Soil Testing Charges	5,000	10,000
Total Service Income	$ 72,500	$ 145,000
Expenses:		
Insurance	$ 3,500	$ 7,000
Interest	2,000	4,000
Depreciation[a]	5,900	11,800
Licenses & Taxes	2,750	5,500
Lease & Rent	2,000	3,000
Repair & Maintenance	-	-
Vehicle Expenses	1,550	3,100
Supplies	800	1,200
Utilities	750	750
Telephone	1,200	1,800
Advertising	500	750
Professional Services	500	750
Bad Debt	-	-
Other Expenses	300	450
ICM Manager(s)[b]	35,000	65,000
Lab Fees	3,750	7,500
Total Expenses	$ 60,500	$ 112,600
Net Profit/(Loss)	$ 12,000	$ 32,400

[a]In actual practice a firm would take advantage of all first year expensing allowed by law, and in come cases could depreciate assets much more rapidly.

[b]Some observers believe that the salary necessary to obtain and hold persons with the appropriate skills could be much higher. The projected personnel compensation was estimated at the time of publication to be above current crop consulting salaries.

medical benefits and to insure physical production assets against loss or damage. The interest expense item includes interest charges incurred during the first year start up and is estimated to cover assets such as office equipment and vehicles at an annual percentage rate of 9%. First year interest calculations were based on a loan term equal to the asset's deprecation life. The depreciation lives of assets were as follows: pickup truck five years, motorcycle three years, computers three years and other office and technical equipment three years. It is highly possible that the interest expense might be lower if strategies such as purchasing used equipment and or borrowing money from the parent company are employed. The depreciation expense is based on new assets including a full-size half ton pickup truck costing $17,000, a motorcycle for scouting at $3,500, and appropriate computer, office and technical equipment totaling $4,000. Depreciation was placed on a straight line depreciation schedule with no salvage value. Licenses and taxes expense was derived from licensing fees on vehicles and other professional fees placed on ICM providers. Lease and rent expense was an assumed payment to the input supply firm for the office space used by the ICM coordinator(s) and any other asset the firm decides to lease rather than purchase.

Expenses dependent on business operations are listed next in the ICM budget. These expenses are as follows: repair and maintenance, vehicle, supplies, utilities, telephone, advertising, professional services, bad debts, and other expenses. Vehicle maintenance expenses and fuel costs were included in the vehicle expense item. It was estimated that an ICM consultant would travel approximately 15,000 miles per year to service clients with a pickup truck averaging 18 miles per gallon at a fuel cost of $1.15/gal. Approximately $600 was estimated to cover fuel for scouting vehicles, and all maintenance and repairs not covered under warranty. The supply expense item accounted for paper, office supplies, and field mapping and reports an ICM manager would use to service clients. Utility expenses was estimated to cover all heat and electrical needs that an ICM office would require. Telephone expense item was estimated to include basic hookup and line charges for office and mobile phones. The Advertising expense item included promotional mailings and telemarketing prospective new ICM clients.

The professional services expense item was estimated to account for payments to the input supply firm's accounting department and a share of the cost for auditing services. Some ICM services give discounts to encourage producers to pay early. Service can be easily denied for failure to pay, so it was assumed that an ICM service would not incur any bad debt expense. The other expenses category was included to account for any usage expense items that did not appear in an existing expense category on the original GMIS financial statements.

ICM manager salary and laboratory fee expenses are the last two budget expense items. The lead ICM manager's compensation was an estimate of what the necessary compensation would have to be to hire a person with the training and experience needed to run a complete ICM service. Laboratory fee expense was derived from sample charges at Iowa State University Soil Testing Laboratory. The Soil Testing Laboratory charges $7.00 per sample to test for nutrient levels. Soil testing laboratory fees were adjusted from an average acre cost of $.70 per acre to $.75 per acre to account for future price changes.

3. Number of ICM Managers Employed

The threshold for employing one or two ICM managers was based on two criteria. First criterion was based on the amount of acreage in a firm's ICM service territory, and second was the ICM budget break-even acreage requirements from Table 2-1. All cooperatives were considered eligible for at least one ICM manager as long their service trade territory was large enough to support a defined minimum level consulting service.

The break-even acre requirements were defined where ICM expenses equals revenues as shown in Table 2-1. Thus, a minimum of 13,200 acres was required for one ICM manager. An additional manager increased the minimum service acreage break-even level to 24,568 acres. GMIS cooperatives with a trade area in the range of 13,500 to 17,500 acres were assumed to operate an ICM service employing a single manager. A two technician service was defined in the range from 25,000 to 35,000 acres. The lower acre boundaries were assumed conservatively to ensure that an ICM service would be profitable, while the upper boundary represents an assumed acre limit imposed by time limitations of the manager or technicians. If an ICM service manager became overburdened either in the number of acres or

producers serviced the quality of service would be expected to decline. If the consulting territory includes too many producers, or too many managed acres, or the farms are too widely dispersed the quality of the consulting service can be expected to deteriorate. If the consultant does not have adequate time to give producers personalized information about the client's farming operation, or if the consultant is not available at critical growing season times such service quality would be inadequate. A diminished service would fail to provide enough added benefits over free non-ICM services to induce producers to pay for a complete ICM service.

In actual practice an ICM service cut off depends largely on the size and number of individual farmers. If all producers are in the 1,000 acre plus size then the upper boundary could rise another 1,000 to 5,000 acres, because of the fixed planning costs associated with an ICM service. The planning phase of an ICM service requires about the same amount of work whether the producer is farming 500 or 2,000 acres. Therefore, if most producers enrolled in a GMIS firm's ICM program are farming large acreage (eg. 1,000 plus acres), the total acres enrolled could increase without diminishing the quality of service as much as if most producers are farming 500 acres.

The narrow band of feasible acres and client caseloads in operating an ICM service creates a go-no go situation when deciding to offer or expand consulting services. From data in Table 2-1 it was calculated that for an ICM service to break-even with one manager the service would have to subscribe a minimum of 13,200 acres. When an GMIS firm expands an existing ICM service by adding a second employee direct expenses were assumed to double, while the indirect expenses common to both coordinators were assumed to increase to one and one-half their original value. Since the additional manager would not use a measurable amount of additional heat light, or power, the utility expense was projected to remain constant as an ICM service is expanded. Expenses that are estimated to double as ICM managers are added are as follows: insurance, interest, depreciation, licenses and taxes, vehicle expenses, and soil testing. Expenses that are projected to increase at a rate of one and one-half with an additional ICM manager was as follows: lease and rental, supplies, telephone, advertising,

professional services, and other expenses. The second ICM manager was assumed to be hired at a rate less than the lead ICM manager, since the second person can rely on the lead manager's technical skills and experience.

Where a firm's trade territory and demand for ICM services warranted an additional manager both revenue and expenses were projected to increase. In all cases ICM services were confined to a set of values where the minimum level of subscribed acres was possible to support a manager.

Complete ICM consulting involves building a personal relationships with producers. GMIS firms that market complete ICM services must invest heavily in professional human resources. These resources generate a large fixed cost but are absolutely essential if producers are to get the appropriate level of professional consulting services from year to year. A consulting service that has rapid human turnover of ICM personnel would fail to maintain the necessary working relationship with producers and would likely go out of business.

G. Modeling a Firm's Trade Area with Fertilizer Sales

It was necessary to estimate a given GMIS cooperative's trade area in acres in order to determine how many ICM managers an individual firm could employ. To accomplish this a relationship was established between input product sales and the acreage territory a GMIS cooperative might have in its trade area. In actual practice a cooperative's geographical service territory would not likely be precisely related to any specific level of product sales. This is because more than one firm may share a given trade territory. However it was possible to indirectly estimate how many acres a firm currently serves using its sales and the average volume of product applied to an acre.

The approach taken was to estimate the average GMIS cooperative acreage base using fertilizer sales. Average fertilizer and pesticide costs per acre data were obtained from the "Estimated 1995 Costs of Crop Production in Iowa." Table 2-2 presents selected data from

this Extension publication that were obtained from a sample of producers. Crop production estimates were obtained for the year 1992 to keep the comparisons constant from year to year. Using the most recent cost data was judged to be more representative of current production practices and the current status of production usage. Therefore the 1995 input usage levels and costs were used. Costs were selected for a yield goal on 135 bushels of corn following soybeans and 45 bushels of soybeans following corn using conventional tillage practices.

Table 2-2. Estimated fertilizer and pesticide cost per acre in Iowa for 1995

Production Input	Corn[a]	Soybeans[b]
Nitrogen @ $0.20 per lb.	$23.40	-
Phosphate @ $0.26 per lb.	$13.26	$9.36
Potash @ $0.13 per lb.	$5.33	$8.84
Pesticide	$20.85	$19.85
Approximate Farm Fertilizer Cost per Acre	$30.10	
Approximate Farm Pesticide Cost per Acre	$20.35	

Source: Estimated Costs of Crop Production in Iowa, 1995, Iowa State University Extension

[a]Corn following soybeans with a yield goal of 135 bu. per acre
[b]Soybeans following corn with a yield goal of 45 bu. per acre

The decision to select fertilizer sales (rather than pesticide sales) to estimate a trade territory was made after testing both fertilizer and pesticide estimated territory means for statistical significance. Average trade areas estimated based on fertilizer sales were follows: 40,573 acres in 1988, 45,972 acres in 1990, and 49,560 acres in 1992. Estimated trade areas calculated with pesticide sales increased more rapidly overall than fertilizer calculated territory size. Pesticide trade area acreage means were as follows: 43,883 acres in 1988, 53,919 acres in 1990, and 64,596 acres in 1992. Analysis of variance procedures (ANOVA) using Scheffe's comparison test revealed that fertilizer means were not significantly different among years. However, ANOVA procedures indicated that pesticide means were significantly different among all years, while fertilizer usage levels were more stable.

The dollar fertilizer and pesticide input cost per acre was held constant at the 1995 levels in all years of the study and tested to note any changes in usage or pricing. Since the trade area means calculated with the average fertilizer costs per acre were not significantly different they appeared to represent changes in price rather than variation in input application levels. Pesticide means, on the other hand, seem to reflect more than just price changes over time and possibly included changes in product usage. Changes in usage would make them a less reliable measure of a firm's geographic trade area.

Another possible cause for increased product usage could have been a change in tillage practices which was occurring over the period. More producers have shifted away from conventional tillage to no-till practices during the period and the average herbicide usage per acre has almost certainly increased as a result. A third reason for the instability might be the variation in purchasing patterns. Pesticides are less bulky and have a higher value per unit volume permits pesticides to be purchased from more distant vendors outside a typical trade area and economically transported over long distances. Therefore, fertilizer sales divided by the average input cost per acre of $30.10 was selected to be used as a indicator of a GMIS cooperative's geographic sales territory.

H. Percentage of a Firm's Trade Area Subscribed in an ICM Program

An assumption was made that about ten to fifteen percent of a GMIS cooperative's customer base would demand ICM services. "Experience from the few broad scope crop consulting programs now operated by input supply dealers indicate that only a relatively small fraction of their current customer base are likely clients for fee-based ICM consulting programs."[18] Some customer characteristics of ICM customers are as follows: large efficient producers seeking to improve, producers with limited management time, producers seeking decision making assistance, producers seeking monitoring and technical service assistance, and a producer in a "must perform" situation.[19] No one profile will perfectly categorize any single most producer. Most will have more than one of these characteristic. If there is one most

prevalent motivation for subscribing to a fee-based ICM services it is the demand and need to achieve maximum economic efficiency.

Producers who can be served economically will be a small percentage of a GMIS cooperative's total customer base, but will represent a relatively large portion of the cooperative's geographic trade area. This occurs for two reasons. First, the minimum acreage which can be served economically by an ICM consultant tends to be higher than the acreage farmed by the "average" customer in the trade area. Thus, smaller operations are much less likely to be potential fee-based ICM clients. Second, there is a heavy concentration of production in most GMIS cooperatives' trade areas in the hands of a minority of producers.

To estimate the percentage of the cooperatives' trade area which might be placed under ICM services, the asymmetry in producers numbers and the fraction of production produced was examined. Table 2-3 breaks farms into groups based on the total market value of all agricultural farm product sales. Farms selling less than $100,000 worth of agricultural products were not likely to be potential customers. These producers have a small number of crop acres and are less likely to be served economically by a ICM consultant. The average amount of cropland harvested for farms with sales under $100,000 was 132 acres. Farms with total agricultural sales from $100,000 to 249,999 averaged 420 acres of cropland, and farms with $250,000 or more in sales averaged 787 acres of cropland.

Producers most likely to adopt ICM services are currently producing at a low cost per

Table 2-3. Overall crop production factors by farm size

	Market Value of Farm Sales		
Percentage of	0- $99,999	$100,000- 250,000	$250,000 and above
Farms	68.00%	22.70%	9.30%
Total Farm Sales	21.02%	34.09%	44.89%
Grain Sales	27.13%	40.22%	32.65%
Total Harvested Cropland in Acres	31.55%	38.94%	29.51%
Fertilizer Expense	29.80%	41.08%	29.12%
Pesticide Expense	29.04%	40.77%	30.19%

Source: Census of Agriculture, 1992, U.S. Department of Commerce

bushel with crop operations above the 400-600 acre minimum threshold required to cover the fixed costs in an ICM service.[20] Therefore, only farms with a $100,000 or more in total agricultural product sales were considered as likely prospects for ICM services in this study. From Table 2-3 it can be seen that 32% of the farms were operating 68% of the total harvested cropland, and purchasing 70% of the fertilizer and pesticide. It is likely that a larger portion of producers selling over $250,000 in agricultural products as well as producers in the high end of the $100,000 to $249,999 group will be more likely to adopt ICM services.

It was projected that ten to fifteen percent of a cooperative's customer base would be willing to purchase fee-based ICM services. From this projection a percentage was derived to estimate what fraction of a GMIS cooperative's trade area these producers would represent. The 68% of all producers selling less than $100,000 in product sales represent on average about 32% of a typical GMIS firm's trade area. These farms were considered ineligible for ICM services, because they would not be served economically. An assumption was made that two-thirds of the producers selling more than $100,000 in total farm sales would have potential to purchase ICM services. If two-thirds of the producers in both groups marketing over $100,000 in products were to purchase fee-based ICM services the average percentage of a GMIS cooperative's trade area under reduced input management recommendations would be 45%.

I. Methods of Calculating Industry Averages with Profit Centers

Equations (1-4) were used to calculate the initial industry average sales, cost of goods sold, and expenses for the GMIS cooperatives. Individual profit center net profits were calculated as individual sums. Fee-based ICM services were modeled into equations (1-4) as a separate department based on the budget presented earlier in Table 2-1. Along with the added ICM profit center fertilizer and pesticide sales and expenses were reduced to estimate the impact ICM recommendations could have on GMIS cooperatives. This step is shown in equations (5-8).

1. The Initial State of the Grain Marketing and Input Supply Industry

Equation (1-4) was developed to solve the problem of firms with missing product categories and expense items. Zero values resulted when a firm did not have all product categories and this average for product categories were understated. Equation averages all income statement variables individually for each profit center and then sums across the profit centers to derive the industry average value.

$$AS = \frac{\sum_{i=1}^{n} gs}{n_i} + \frac{\sum_{i=1}^{n} fs}{n_i} + \frac{\sum_{i=1}^{n} ss}{n_i} + \frac{\sum_{i=1}^{n} fts}{n_i} + \frac{\sum_{i=1}^{n} ps}{n_i} + \frac{\sum_{i=1}^{n} pts}{n_i} + \frac{\sum_{i=1}^{n} sups}{n_i} \quad (1)$$

Where AS = average sales for all firms in the sample,
gs = grain sales,
fs = feed sales,
ss = seed sales,
fts = fertilizer sales,
ps = pesticide sales,
pts = petroleum sales,
sups = other farm supply sales,
n_i = the number of firms marketing the commodity or product from 1-71.

$$ACGS = \frac{\sum_{i=1}^{n} gcgs}{n_i} + \frac{\sum_{i=1}^{n} fcgs}{n_i} + \frac{\sum_{i=1}^{n} scgs}{n_i} + \frac{\sum_{i=1}^{n} ftcgs}{n_i} + \frac{\sum_{i=1}^{n} pcgs}{n_i} + \frac{\sum_{i=1}^{n} ptcgs}{n_i} + \frac{\sum_{i=1}^{n} supcgs}{n_i} \quad (2)$$

Where ACGS = average cost of goods sold for all firms in the sample,
gcgs = grain cost of goods sold,
fcgs = feed cost of goods sold,
scgs = seed cost of goods sold,
ftcgs = fertilizer cost of goods sold,
pcgs = pesticide cost of goods sold,
ptcgs = petroleum cost of goods sold,
supcgs = other farm supply cost of goods sold,
n_i = the number of firms marketing the commodity or product from 1-71.

$$ASR = \frac{\sum_{i=1}^{n} gsr}{n_i} + \frac{\sum_{i=1}^{n} fsr}{n_i} + \frac{\sum_{i=1}^{n} ssr}{n_i} + \frac{\sum_{i=1}^{n} ftsr}{n_i} + \frac{\sum_{i=1}^{n} psr}{n_i} + \frac{\sum_{i=1}^{n} ptsr}{n_i} + \frac{\sum_{i=1}^{n} supsr}{n_i} \quad (3)$$

Where ASR = average service and other revenue for all firms in the sample,
gsr = grain service revenue,
fsr = feed service revenue,
ssr = seed service revenue,
ftsr = fertilizer service revenue,
psr = pesticide service revenue,
ptsr = petroleum service revenue,
supsr = other farm service revenue,
n_i = the number of firms marketing the commodity or product from 1-71.

$$AE_k = \frac{\sum_{i=1}^{n} ge_k}{n_i} + \frac{\sum_{i=1}^{n} fe_k}{n_i} + \frac{\sum_{i=1}^{n} se_k}{n_i} + \frac{\sum_{i=1}^{n} fte_k}{n_i} + \frac{\sum_{i=1}^{n} pe_k}{n_i} + \frac{\sum_{i=1}^{n} pte_k}{n_i} + \frac{\sum_{i=1}^{n} supe_k}{n_i} \quad (4)$$

Where AE_k = the following average expenses: total employee, insurance, interest, licenses and taxes, depreciation, repair and maintenance, vehicle expenses, lease and rent, supplies, utilities, telephone, advertising, professional services, bad debts, and other expenses,
ge_k = grain expenses,
fe_k = feed expenses,
se_k = seed expenses,
fte_k = fertilizer expenses,
pe_k = pesticide expenses,
pte_k = petroleum expenses,
$supe_k$ = miscellaneous expenses,
n_i = the number of firms marketing the commodity or product from 1-71.

2. Average Industry Calculations with Fee-based ICM Services

Each firm was evaluated based only on the size of its current trade area to determine whether local demand could sustain a fee-based ICM service. In actual practice firms might seek out customers in adjacent firms' service territory to generate the needed acreage based to offer ICM services. Other strategies may include forming joint ventures with neighboring

firms, or aggressively marketing ICM services in competitors' trade territories. Such actions may permit firms with service territories too small to offer ICM services on their own to develop a fee-based consulting program. Estimation techniques using this type of analysis were not possible with the data available. The exact location for firms in the sample as well as their management characteristics would have to be known before reasonable assumptions could be drawn.

To determine whether a firm's existing service territory was large enough to sustain one or two ICM managers, fertilizer sales were divided by the average producer fertilizer cost per acre. Average producer fertilizer cost per acre was determined earlier to be approximately $30.10 A firm's ICM service acreage base was derived from multiplying a firm's total service territory acreage base with the estimated ICM acreage percentage developed previously. It was estimated earlier that roughly 45% of a cooperative's service territory acreage base could be expected to be enrolled in fee-based ICM services.

If the ICM trade area was greater than or equal to 13,500 acres the cooperative was considered large enough to offer an ICM service with one manager. Likewise, the minimum threshold required to offer an ICM service at break-even with two managers was calculated to be 25,000 acres. A discontinuous interval exists between the maximum levels for one manager at 17,500 acres and the minimum threshold acreage for two ICM managers at 25,000 acres. Between these two acreage levels an ICM service would have too many acres to be effectively handled by one manager, but not be profitable for two full time managers. For any firm that had a calculated ICM service area falling between 17,500-25,00 acres the acreage level was held constant (capped) at 17,500 acres with one manager. Likewise, for any firm ICM service area acreage above the 35,000 acre level was capped at 35,000 acres with two managers.

To determine at what rate fertilizer and pesticide sales would decline in firms marketing ICM services a general functional relationship was established. The functional relationship is presented as follows:

$$\text{Initial Sales Reduction} = f\left[\begin{array}{c} \text{percent} \\ \text{reduction in} \\ \text{input usage} \end{array}, \begin{array}{c} \text{percent of trade area} \\ \text{enrolled in} \\ \text{ICM services} \end{array}\right]$$

It was estimated that the initial sales reduction percentage for fertilizer and pesticides in GMIS firms at the minimum threshold level of 13,500 acres would be 15%. The initial level was estimated based on input usage reductions and the percentage of a firm's trade area in ICM programs. No definable data was available to the author on what firms could actual expect to occur when a service is implemented, and actual percentage reduction are expected to vary widely among firms in the industry. Such factors as firms ability to market ICM services in a competitor's trade area, varying rates of reductions in product usage, and varying subscription rates all play into a firm's rate of reduction in fertilizer and pesticide sales. As a proxy for these factors the rate sales reduction was increased from the initial starting point of 15% as the subscribed acreage increased to the maximum of 35,000 acres. At this level an assumed level of fertilizer and pesticide sales reduction of about 39% was imposed. For ICM trade areas between 13,500 to 17,500 the percentage was allowed to rise to 19%. In the interval between 17,500 acres and 25,000 acres the sales reduction percentage was held constant at about 19%. A fertilizer and pesticide sales reduction of nearly 28 % was imposed on firms that had an ICM trade area of 25,000 acres and allowed to rise to about 39%. This had the effect of placing an increasing sales reduction on the larger firms in the sample with more enrolled acres in a ICM service program.

To quantify changes over time in GMIS cooperatives' financial performance from marketing fee-based ICM services the number of ICM managers was fixed in all three years at the level calculated for 1992. In other words for years 1988 and 1990 the number of ICM acres could vary, but the number of managers was held constant. Out of the seventy one firms in the sample only forty firms had sufficient trade area to qualify at the threshold 13,500 acres to offer ICM services in 1992. The number of firms able to qualify one manager was equal to the number able to justify two ICM managers.

Equations (5-8) were used to calculate the industry average for firms marketing fee-based ICM services. The equations (5,6) are identical to equations (1,2) used to calculate the initial state industry averages except for a downward adjustment of fertilizer and pesticide sales and cost of goods sold to reflect reduced sales resulting form recommendations made by the ICM services. Equations (7,8) are adaptations of equations (3,4) by adding the ICM service revenue (consulting fees and soil testing charges) and ICM budget expenses.

Fertilizer and pesticide sales, cost of goods sold, service revenue, and certain expenses were reduced by the appropriate percentage based on the interval a firms ICM trade area fell into. All of the above income statement items were reduced in their entirety except for expenses. Expenses generated largely from input sales activities were reduced by the appropriate percentage. Fixed expense items remained at the initial state levels. Expenses that were reduced were as follows; total employee, repair and maintenance, vehicle expenses, supplies, utilities, telephone, advertising, and bad debts. Only those firms offering ICM services had the above mentioned income statement items reduced. The other firms were averaged in the sample as indicated by the initial state. Fertilizer and pesticide adjustments along with the added ICM service are indicated in equations (5-8) by variables in bold.

$$AAS = \frac{\sum_{i=1}^{n} gs}{n_i} + \frac{\sum_{i=1}^{n} fs}{n_i} + \frac{\sum_{i=1}^{n} ss}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{afts}}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{aps}}{n_i} + \frac{\sum_{i=1}^{n} pts}{n_i} + \frac{\sum_{i=1}^{n} sups}{n_i} \quad (5)$$

Where AAS = average adjusted sales for all firms in the sample,
gs = grain sales,
fs = feed sales,
ss = seed sales,
afts = adjusted fertilizer sales,
aps = adjusted pesticide sales,
pts = petroleum sales,
sups = other farm supply sales,
n_i = the number of firms marketing the commodity or product from 1-71.

$$AACGS = \frac{\sum_{i=1}^{n} gcgs}{n_i} + \frac{\sum_{i=1}^{n} fcgs}{n_i} + \frac{\sum_{i=1}^{n} scgs}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{aftcgs}}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{apcgs}}{n_i} + \frac{\sum_{i=1}^{n} ptcgs}{n_i} + \frac{\sum_{i=1}^{n} supcgs}{n_i} \quad (6)$$

Where AACGS = average adjusted cost of goods sold for all firms in the sample,
gcgs = grain cost of goods sold,
fcgs = feed cost of goods sold,
scgs = seed cost of goods sold,
aftcgs = adjusted fertilizer cost of goods sold,
apcgs = adjusted pesticide cost of goods sold,
ptcgs = petroleum cost of goods sold,
supcgs = other farm supply cost of goods sold,
n_i = the number of firms marketing the commodity or product from 1-71.

$$AASR = \frac{\sum_{i=1}^{n} gsr}{n_i} + \frac{\sum_{i=1}^{n} fsr}{n_i} + \frac{\sum_{i=1}^{n} ssr}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{aftsr}}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{apsr}}{n_i} + \frac{\sum_{i=1}^{n} ptsr}{n_i} + \frac{\sum_{i=1}^{n} supsr}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{ICMsr}}{n_i} \quad (7)$$

Where AASR = average adjusted service revenue for all firms in the sample,
gsr = grain service revenue,
fsr = feed service revenue,
ssr = seed service revenue,
aftsr = adjusted fertilizer service revenue,
apsr = adjusted pesticide service revenue,
ptsr = petroleum service revenue,
supsr = other farm service revenue,
ICMsr = ICM service revenue and includes consulting fees and soil testing,
n_i = the number of firms marketing the commodity or product from 1-71.

$$AAE_k = \frac{\sum_{i=1}^{n} ge_k}{n_i} + \frac{\sum_{i=1}^{n} fe_k}{n_i} + \frac{\sum_{i=1}^{n} se_k}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{fte_k}}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{pe_k}}{n_i} + \frac{\sum_{i=1}^{n} pte_k}{n_i} + \frac{\sum_{i=1}^{n} supe_k}{n_i} + \frac{\sum_{i=1}^{n} \mathbf{ICMe_k}}{n_i} \quad (8)$$

Where AAE_k = the following average adjusted expenses: **total employee**, insurance, interest, licenses and taxes, depreciation, **repair and maintenance**, **vehicle expenses**, lease and rent, **supplies**, **utilities**, **telephone**, **advertising**, professional services, **bad debts**, and other expenses,

ge_k = grain expenses,
fe_k = feed expenses,
se_k = seed expenses,
$\mathbf{afte_k}$ = adjusted fertilizer expenses,
$\mathbf{ape_k}$ = adjusted pesticide expenses,
pte_k = petroleum expenses,
$supe_k$ = miscellaneous expenses,
$\mathbf{ICMe_k}$ = ICM budget expenses,
n_i = the number of firms marketing the commodity or product from 1-71.

The ICM budget contains variables dependent on the number of subscribed acres as well as variables independent of the number of acres enrolled in ICM programs. ICM income, consulting fees and soil testing charges, are dependent on the number of acres subscribed in the ICM program. Nearly all ICM expenses, except for soil testing lab fees, are considered independent of the number of acres enrolled in ICM programs, and are allocated to firms at the indicated manager level budget.

J. Firm Groupings

It was hypothesized that some firms would be better able to make the transition to ICM services more easily than others. To determine which GMIS cooperatives' might have an advantage in offering a complete ICM services, firms were sorted into various groups and the results were then compared. Three different criteria were used to categorize firm performance. These were: (1) the degree of specialization in fertilizer and pesticide sales, (2) the level of total firm sales, and (3) the level of total firm net profit.

All the firm's category grouping schemes were based on firm performance in 1992. Analysis of data from 1988 and 1990 for the same set of firms (classified on 1992 performance levels) allowed a constant set of firms to be tracked between 1988 and 1992. It provided insight into how the set behaved under different market, weather, government policy, and general economic conditions. In addition using the same set of firms in all three

years provided a better understanding of how a fee-based ICM service would impact firm financial performance under different conditions. Finally, categorizing firms based on 1992 performance eliminated variations in the set due to firms migrating from one category to another in different years. Such migrations could mask changes when comparisons were made many years.

The final category groupings were based on top half or bottom half industry performance. Firms were placed into two divisions based on whether the firm's percentage of fertilizer and pesticide sales, total sales, or net profit fell into top or bottom half rankings. Group one consisted of thirty-six firms with top performance, and group two was made up of the thirty-five lowest performing firms. The top and bottom half cutoffs for 1992 occurred at the following divisions: the top bottom half division for the specialization category was at 14.6% of total sales accounted for by fertilizer and pesticide sales. The total sales category split occurred at $14,917,972, and the total firm net profit division between top and bottom half performance was at $87,865.

Originally the intended number of category groupings were to be as follows: firms grouped by specialization were to have four groups, firms grouped by total firm sales and total firm net profits were to have three groups. Bases for grouping firms this way is described in Appendix B. Firms with this type of grouping scheme did not generate enough firms per group meeting the minimum 13,500 acre criteria required to offer ICM services. The data would permit only two groupings to be used. The numbers of firms offering ICM services were too low for each grouping scheme to permit calculation of reliable industry averages.

Categorizing firms by the degree of specialization in fertilizer and pesticide sales, was done to predict whether more specialized firms would have advantages in providing ICM services. It was hypothesized that those cooperatives relied heavily on sales of the fertilizer and pesticide product categories to cover operating expenses and perhaps weak performance in other product categories would be more seriously affected by the sales reduction.

Categorizing firms based on total firm sales was done to determine whether larger or smaller firms were more likely to have an advantage in marketing ICM services. Larger firms

were expected to be better able to handle the financial start-up cost involved in creating a new ICM service. Although smaller firms may have more local control in marketing an ICM service than larger firms, the financial resources required to start a program may not be available. Beyond that reduced sales from the main profit making categories (fertilizer and pesticide) may cause greater profit pressures on small firms.

The final grouping strategy organized firms into categories based on individual cooperatives' profit performance. Analysis of firms categorized based on total profit might be expected to produce results similar to the sales category. However, firm size and the magnitude of a firm's profit were not necessarily directly correlated. Some smaller firms had higher dollar net profits than larger firms in the sample. This difference was not evident when firms were categorized based on total sales. Firms with large dollar net profit might be in the most desirable position to market ICM services if the profits from ICM services do not replace profits from fertilizer and pesticide sales.

K. Empirical Procedures

Two types of analysis were employed in this study. First cooperative GMIS profit center were documented and averages were calculated for the initial state of the industry. Secondly, a sales reduction was imposed and projected revenue were added to determine the financial impact that fee-based ICM services may have on fertilizer and pesticide product centers and total firm net profit.

To determine firms' initial of sales and net profits for cooperatives an average percentage share was calculated for each profit center. These percentages were based on the industry average sales and net profits for the years 1988, 1990, and 1992. Fertilizer and pesticide average percentage share of gross margin, service and other revenue, gross profit, and net profit was calculated to determine the profit center's mark up and profit percentage based on sales. Percentages were also calculated to determine fertilizer and pesticide average percentage contribution to firms' sales, service income, gross margins and net profits.

Then firms were modeled with fee-based ICM services and the changes observed were compared to the industry initial state. The same average percentage shares that were calculated to analyze cooperative initial state were regenerated with firms marketing ICM services. Average dollar changes between the initial state and modeled ICM services were also calculated to note the financial impact in monetary terms.

In the course of calculating means, two ways of obtaining industry averages were researched. One method involved averaging firms together on the aggregate level and another method research was summing averages from profit center profit centers. Theoretically either method would produce the same result, but since all firms did not participate in all product categories different results are obtained. Appendix C contains a discussion used to resolve the method of calculation industry averages with missing values.

NOTES

[15]Craig Chase, Michael Duffy, John Webb, and Regis Voss, "An economic assessment of maintaining high phosphorus and potassium soil test levels," American Journal of Alternative Agriculture, (Institute for Alternative Agriculture, 1991), 83.

[16]John Ikerd, "Economic and environmental tradeoffs in farming," Building Bridges, Third annual Leopold Center for Sustainable Agriculture Conference held on February 18-19, 1992, 39-40.

[17]Cheryl K. Contant, Michael Duffy, and Maureen A. Holub, Tradeoffs between water quality and profitability in Iowa agriculture, (Iowa City, Iowa: Public Policy Center, The University of Iowa, March 1993), 2.

[18]Roger G. Ginder, "Establishing integrated crop management services in Iowa agricultural input supply and marketing firms," (Ames, Iowa: Department of Economics, Iowa State University, January 1995), 32, staff paper.

[19]Ibid.

[20]Ibid.

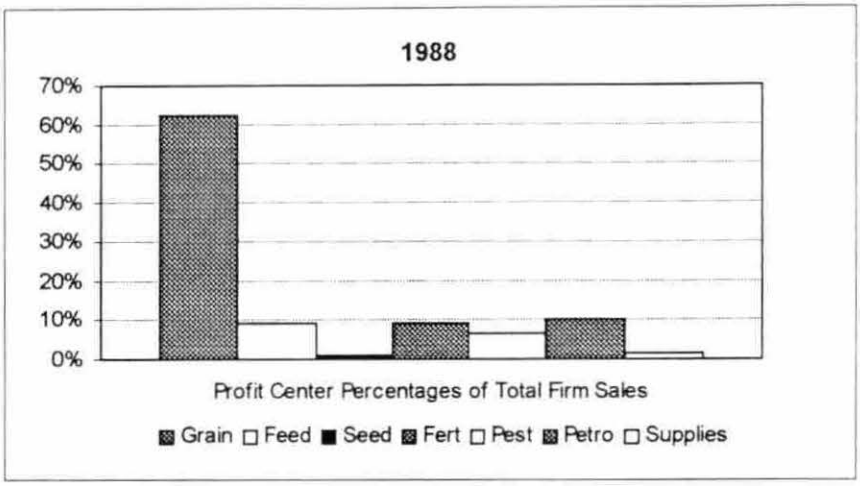
CHAPTER III. ANALYSIS

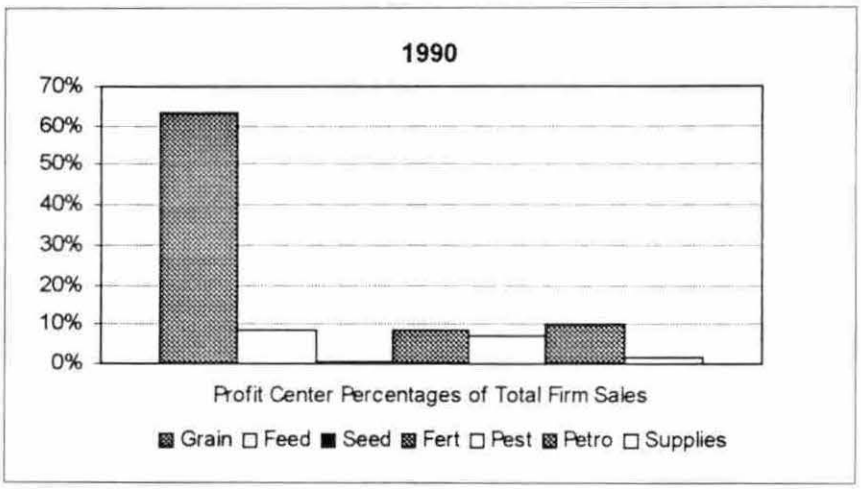
A. Current Industry Performance

As stated in chapter two, one of the main objectives of this study was to document the amount and degree that fertilizer and pesticide contribute financially to GMIS firms. The second emphasis of the study was to determine the impact that ICM services would have on fertilizer and pesticide sales and profit margins, and to what degree that these losses might be recovered by an ICM service. All sample firms sold fertilizer and pesticides, but due to trade area constraints established in chapter two not all firms had sufficient trade area to market an ICM service. Out of the seventy-one firms in the sample only forty firms were large enough to market an ICM service. Within the sample of forty firms marketing ICM services twenty had sufficient trade area to justify the service with one manager and twenty could justify two managers. In the analysis the current initial status of the industry was documented, and then the firms' financial condition after adopting ICM services was compared to the industry initial state. Appendix D lists the data that were used to graph Figure 3-1 through Figure 3-20 in this chapter. Appendix E presents the industry averages for all firms with and without ICM services over the modeling time frame.

1. Sources of Sales and Net Profits

The average contribution of various profit centers to total sales is shown in Figure 3-1 for the years 1988, 1990 and 1992. Figure 3-1 reveals that the fraction of total firm sales contributed by the profit centers was relatively stable over the sample time frame. Despite somewhat volatile grain prices and volumes during the study period, the grain profit center consistently accounted for about 62% of total sales. Feed, fertilizer and petroleum product sales consistently produced around 8-10% of total firm sales, while pesticides generated about 6-7% in total firms sales. Seed and supply profit centers were consistently a minor fraction of total sales generating around 0.5-2% of total firm sales.





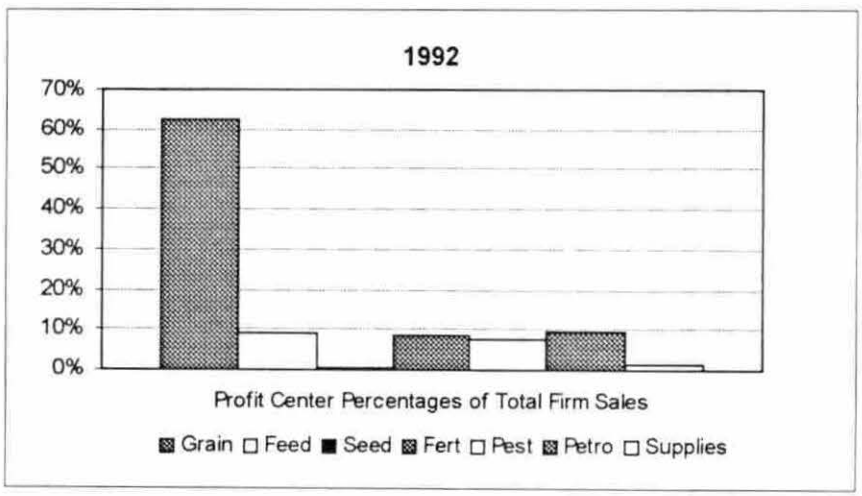


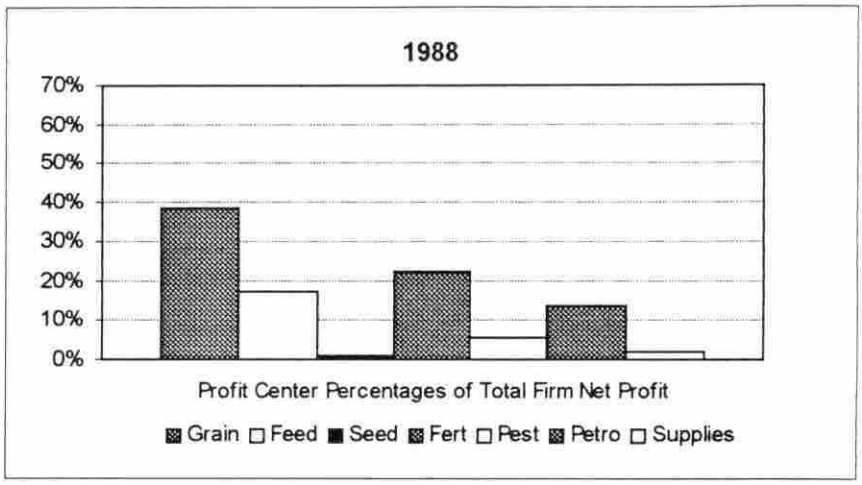
Figure 3-1. Average initial state percentage contributions of individual profit centers to total firm sales for years 1988, 1990, and 1992

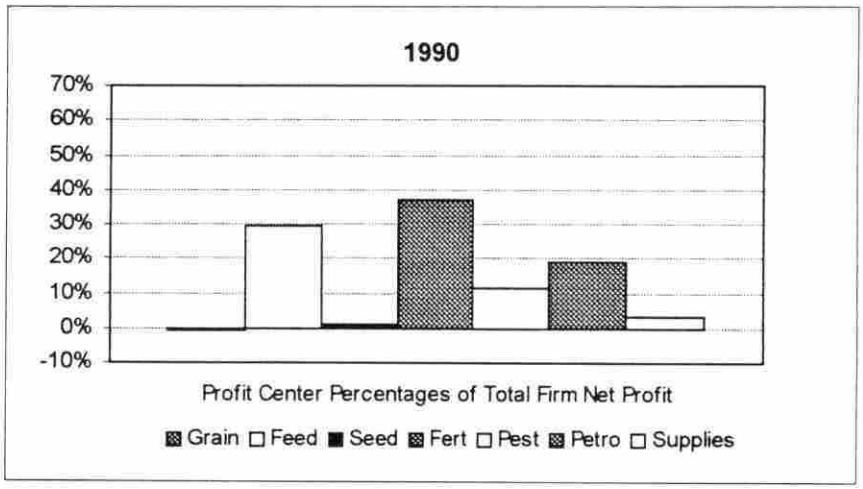
The relatively low fraction of total sales in fertilizer and pesticides somewhat understates the importance of these profit centers to GMIS cooperatives' financial success. Figure 3-2 illustrates that these profit centers were much more important in terms of generating profits than what their percentage of total sales might imply. For example, due to changing factors in the grain market the grain profit center went from generating 38% of total profits in 1988 to a loss equal to 50% of total profits generated by other departments in 1992. Fertilizer was consistently the main profit generating department in all three years followed closely by feed sales. Petroleum profits led pesticide profits in years 1988 and 1990, but pesticides' percentage of total sales led petroleum in 1992 as changes in crop production practices toward reduced tillage or no-till became more wide spread.

The fertilizer profit center's percentage contribution to total firm net profit was variable from year to year due largely to reductions in grain storage revenue. In 1988, fertilizer contributed roughly 22% of the firms total net profit. In 1990, its contribution had risen to 36% and by 1992 fertilizer contributed nearly 60% on average to firms' total net profit. Thus, grain volatility directly contributed to much of fertilizer's variable net profit over the time frame. Abnormally high grain margins and storage income in 1988 created larger than normal profits in the grain marketing category for that year.

Pesticides average profit center's percent contribution to total firm profits behaved in a similar manner as the fertilizer profit center. Contributions from the pesticides product center increased on average from about 5% in 1988 to around 19% in 1992. As with fertilizer sales pesticides dollar sales were relatively stable over the sample time frame in comparison to its percentage contribution to total firm net profits.

Table 3-1 presents the percentage changes between the sample years for grain, fertilizer, and pesticide profit center sales, gross margin, service and other revenue, and allocated expenses. From 1988 to 1992 gross margins from marketing grain fell or dropped by 6% and income from storage and other grain handling services fell off by 36% from 1988 Figures. The effects of declines in the grain profit center's gross margins and service income was a large operating loss in 1992. This consequently caused higher percentages of total firm





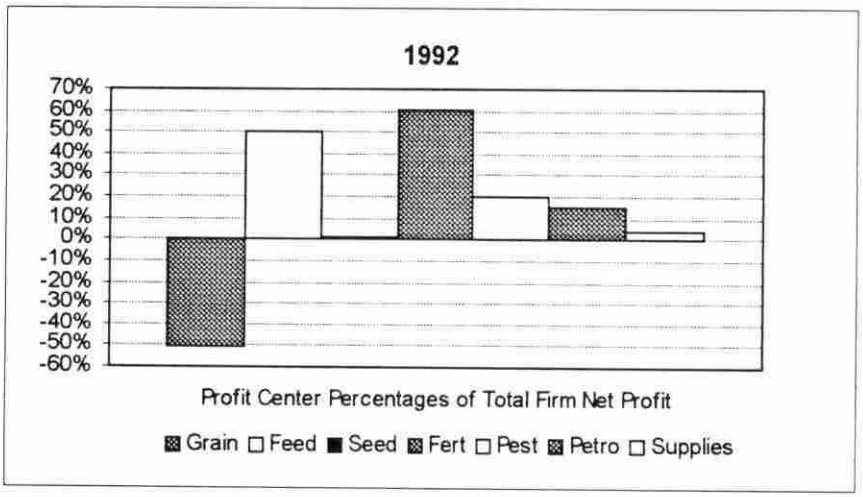


Figure 3-2. Average initial state percentage contributions of individual profit centers to total firm net profit for years 1988, 1990, and 1992

Table 3-1. Profit center percentage changes for sales, gross margins, service and other revenue, total allocated expenses, and dollar amount change for department net profits in grain, fertilizer and pesticide for years 1988 to 1992

Profit Center	Change from 1988 to 1990	Change from 1990 to 1992	Overall Change fro 1988 to 1992
Grain:			
Sales	18.00%	5.47%	24.46%
Gross Margin	-7.88%	1.91%	-6.12%
Storage & Other Revenue	-30.50%	-8.25%	-36.24%
Total Allocated Expenses	-4.42%	4.46%	-0.16%
Net Profit/(Loss)	($144,100)	($50,587)	($194,687)
Fertilizer:			
Sales	13.31%	7.80%	22.15%
Gross Margin	12.89%	10.25%	24.45%
Service & Other Revenue	19.14%	12.99%	34.62%
Total Allocated Expenses	22.41%	17.17%	43.43%
Net Profit/(Loss)	($10,058)	($12,323)	($22,381)
Pesticides:			
Sales	22.87%	19.80%	47.20%
Gross Margin	46.05%	28.29%	87.37%
Service & Other Revenue	27.16%	24.14%	57.86%
Total Allocated Expenses	44.07%	32.60%	91.04%
Net Profit/(Loss)	($3,082)	($3,107)	($25)

profits to be contributed by fertilizer, feed, pesticide, and petroleum profit centers. Since sales and gross margins for the fertilizer, feed, pesticide, and petroleum profit centers were relatively stable (as indicated in Figure 3-1), it can be concluded that these profit centers serve as a buffer for volatility and losses arising from grain marketing activities. Despite this relative stability these firms received lower dollar profits from fertilizer and pesticides in 1992 than in earlier years.

2. Fertilizer and Pesticide "Mark Up"

An estimate of the mark-up and profit as a percent fertilizer and pesticide profit center sales is illustrated in Figure 3-3. Figure 3-3 presents fertilizer and pesticide profit center's service and other revenue, and gross profit as a percentage of the profit center's total sales.

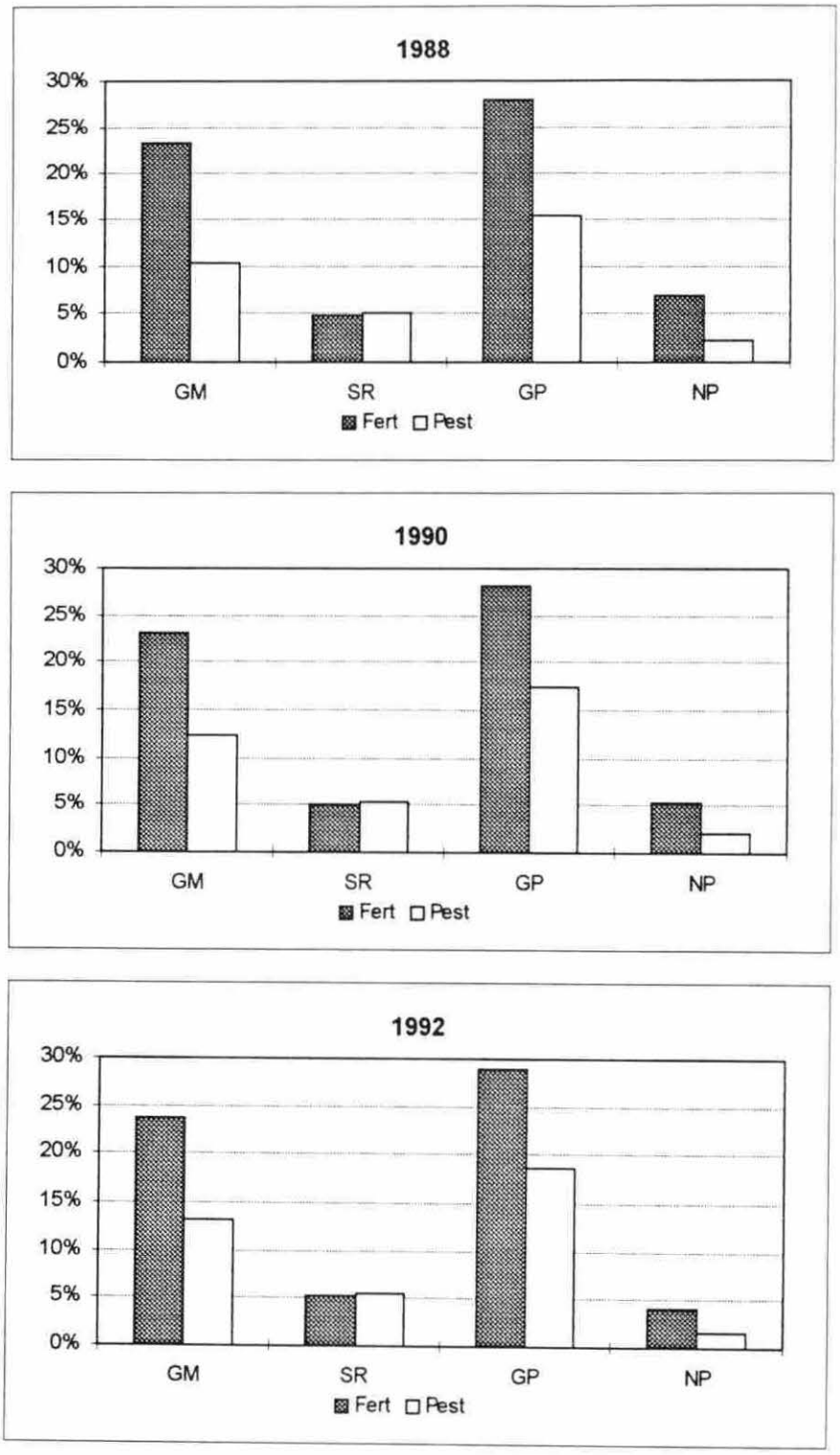


Figure 3-3. Average initial state fertilizer and pesticide gross margin, service revenue, gross profit, and net profit as a percentage of the profit center's sales

Service revenue and gross profit are shown to provide a visual link between fertilizer and pesticide gross margin and net profit percentages.

The first pair of bars in Figure 3-3 illustrate gross margin (GM) (selling price minus the wholesale cost of the product to the firm) as a percent of sales for fertilizer and pesticides profit centers. Average fertilizer gross margin as a percentage of sales was approximately 23% for each year analyzed. Pesticides gross margin as a percent of sales averaged between 10-13% over the study period.

Service and other revenue (SR) is represented by the next pair of bars in Figure 3-3. Service revenue and other income is the income received from the application of fertilizer and pesticide, as well as, an allocated share of interest and other income the firm received. This income source averaged about 5% of sales for both fertilizer and pesticides.

Gross profit (GP), which is the sum of gross margins and service income, is represented in Figure 3-3 as the third pair of bars from the left. This pair of bars in each panel represents the total amount of money available to pay operating expenses such as labor, depreciation, taxes, insurance, interest, and other expenses. Between 1988 and 1992 fertilizer's profit center gross profit percentage of product sales averaged around 28%, and pesticides gross profit percentage of product sales averaged between 15-18%.

The pair of bars on the far right of Figure 3-3 illustrate fertilizer and pesticide net profit (NP) percentage of profit center's sales. The profit center's net profit percentage represents what is left from each dollar of sales after, the wholesale cost of products, all labor, equipment, and other expenses have been deducted. Fertilizer net profit percentages of sales were highest in 1988 (about 7%), fell to less than 5% in 1990, and declined further to about 4% of category sales in 1992. Pesticide sales were nearly constant at 2% of sales in 1988 and 1990, and declined to about 1.5% of its category sales by 1992.

The gross margin and net profit percentages of fertilizer and crop protection pesticides sales are indicative of the degree to which a fee-based ICM service would affect these profit centers. Any reduction in fertilizer or pesticides sales would have a major financial impact on net profits generated by these profit centers. For every dollar of fertilizer and pesticides sales

lost, gross margin would decline by $.23 and $.12 respectively. Since not all fertilizer and pesticides expenses are expected to decline, these gross margin percentages represent the short run financial vulnerability cooperatives face if fertilizer and pesticide sales were to be reduced as a result of recommendations from an ICM service.

3. Fertilizer and Pesticide as a Source of Gross and Net Profit

The relative importance of fertilizer and pesticides in generating total sales, service revenue, gross margins, gross profits, and net profits over the study period is shown in Figure 3-4. Fertilizer and pesticides sales were relatively stable over the five year time span, but fertilizer and pesticides' service revenue, gross profit, and net profit percentage of total sales did increase from 1988 to 1992.

Figure 3-4 illustrates fertilizer and pesticide average percentage share of firms' gross margin, service and other revenue, and gross profit. Fertilizer consistently accounted for about 24%, 12%, and 20% of firms' gross margins, service and other revenue, and gross profit (respectively) over the study time period. Pesticide on average contributed around 7%, 10%, and 10% to firms' gross margins, service and other revenue, and gross profit (respectively) over the study time period.

The importance of fertilizer and pesticide as a relatively stable source of firms' gross margins, service and other revenue, and gross profit was revealed in Figure 3-4. This especially important in times of volatile grain marketing. Margins and profits from these two profit centers would be difficult to replace if reduced, and are critical to a GMIS cooperative's profitability. On average fertilizer sales amounted to about 9% of firms' total sales, but provided nearly 40% of the firms' net profit from 1988 to 1992. Pesticides generated on average around 12% of firms' total net profit based on average total firm sales of as about 7% over the same time period. Therefore, any reduction in a cooperative's fertilizer and pesticides sales that might arise from marketing a fee base ICM service are important. At least some firms could suffer major profitability problems in some cases if the added consulting service failed to replace lost margins and profits.

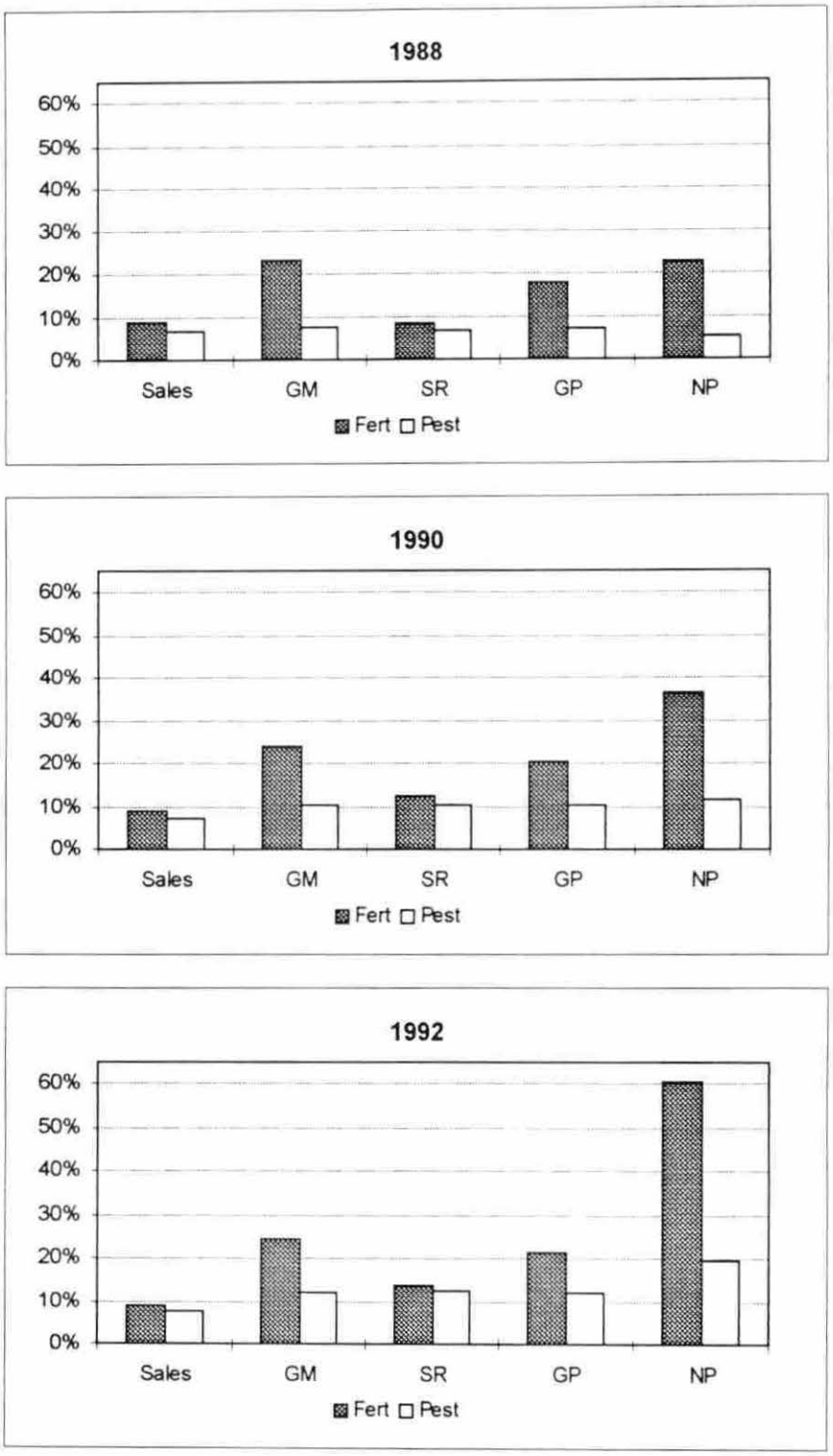


Figure 3-4. Average initial state fertilizer and pesticide sales, gross margin, service revenue, gross profit, and net profit as a percentage of total firm sales

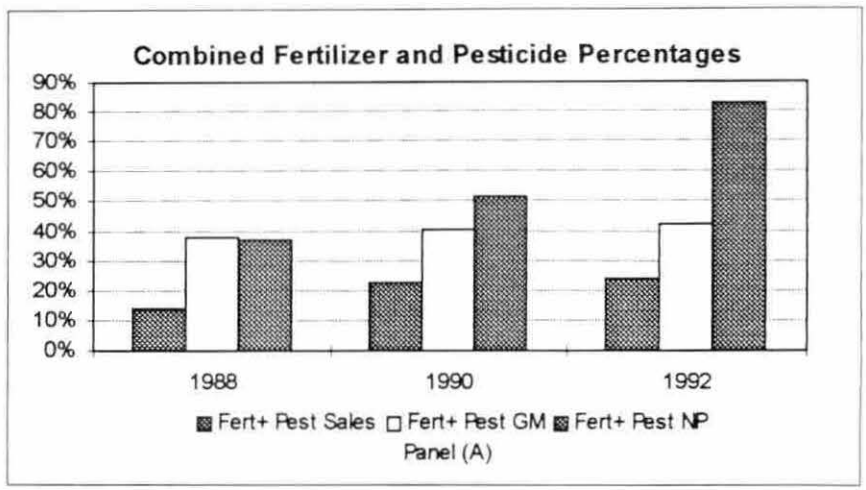
4. Differential Effects on Firms within the Sample

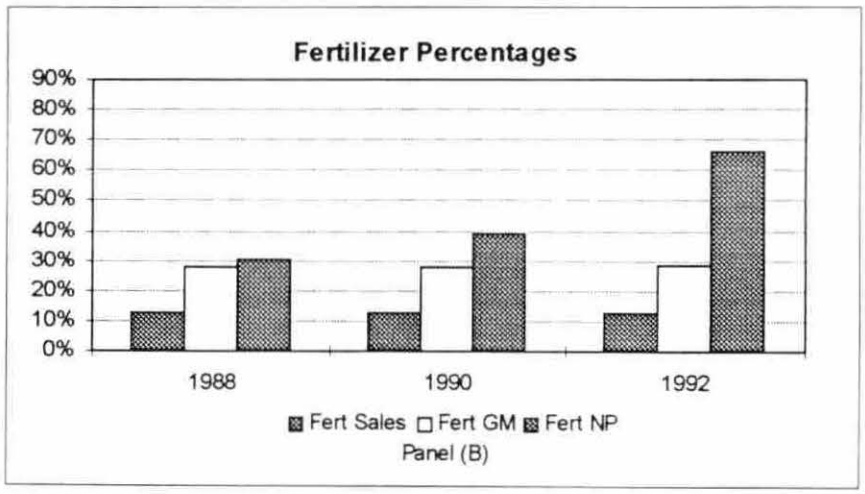
a. Firms Categorized by Specialization in Fertilizer and Pesticides Sales

Within the population of diversified firms, there were differences in degree of specialization in fertilizer and pesticide product sales, or profitability. Reductions in the sales of fertilizer and pesticide from firms offering ICM services could, therefore, affect the profitability of the sample firms differently. To determine the possible differential effects on cooperatives, the sample was categorized as follows: the degree of specialization in fertilizer and pesticide products, firm size measured by total sales, and overall firm profitability. Sample firms were divided within these categories based on their top or bottom half performance relative to other firms within the sample. In all categories, group one firms represented the top half of the grouping category, and group two represented firms ranked in the bottom half of the grouping category.

Firms categorized by their degree of specialization in fertilizer and crop protection pesticides sales. Firms in group one (most specialized) had on average a combined fertilizer and pesticides percentage of net profit of about 37%, and sales of approximately 22% in 1988. By 1992 combined fertilizer and pesticides percentage share of net profits in these specialized firms were almost 83%. Since this occurred with only a combined 2% share increase in total firm sales the change was largely due to decrease in the profits from other departments. Data illustrated in panel (B) and panel (C) in Figure 3-5 indicate that the share of profits from both fertilizer and pesticides increased between 1988 and 1992. By 1992 firms in this group were almost solely dependent on the sales of fertilizer and pesticide to generate firm net profits. Any sales reduction from a fee-based ICM service can be expected to have a major impact on their profitability for these specialized (group one) firms.

Firms categorized as less specialized (group two) are shown in Figure 3-6. The less specialized firms also experienced increases in the combined fertilizer and pesticides percentage share of net profit from 1988 to 1992. In 1988, fertilizer and pesticides profit centers on average contributed almost 20% to firms net profit with an average sales percentage of slightly less than 10%. However by 1992, the less specialized firms (group





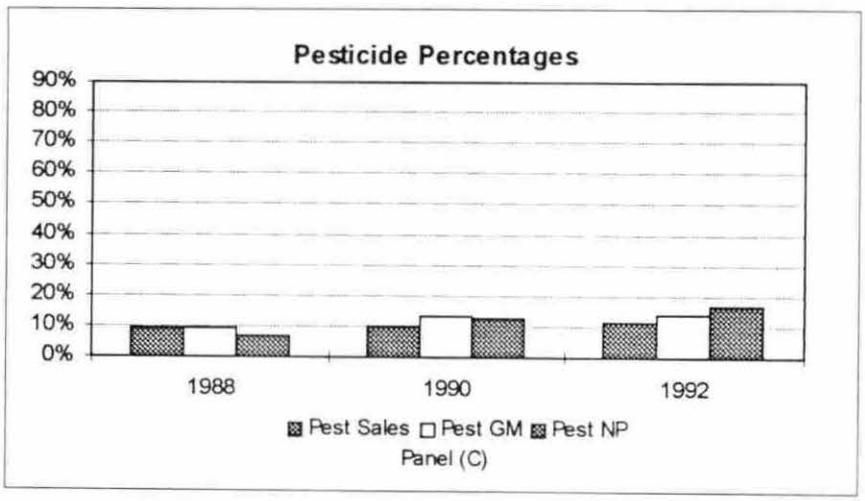
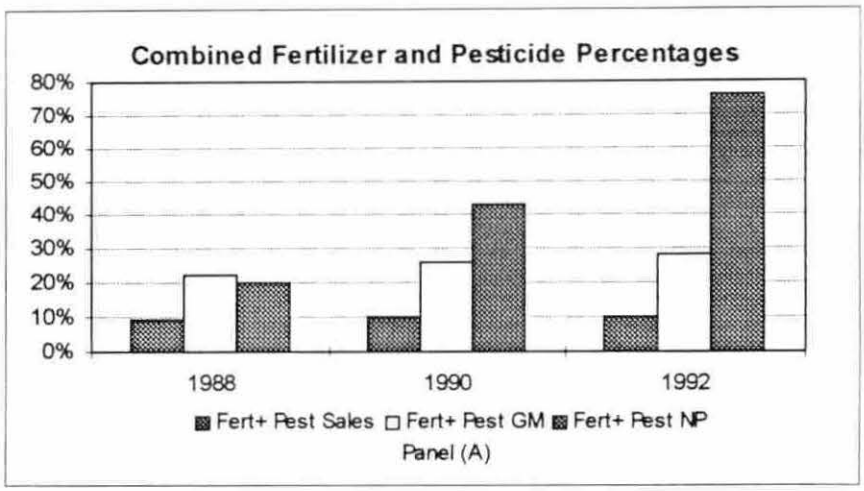
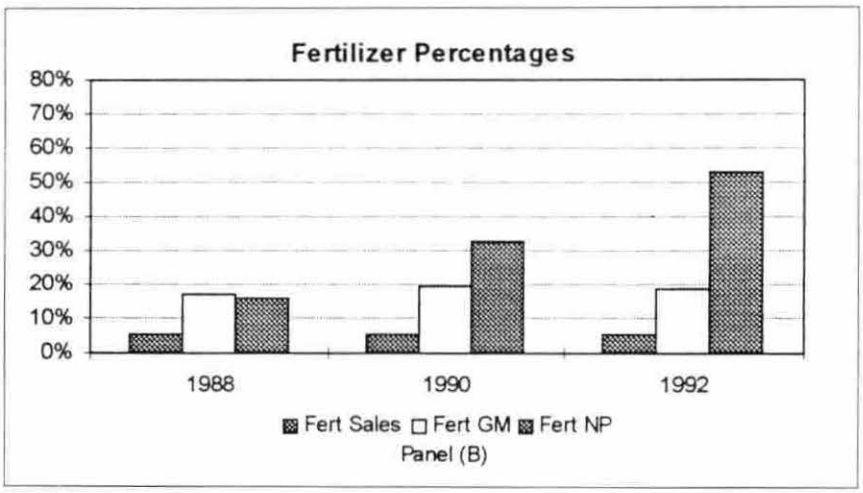


Figure 3-5. Specialization category group one average initial fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits





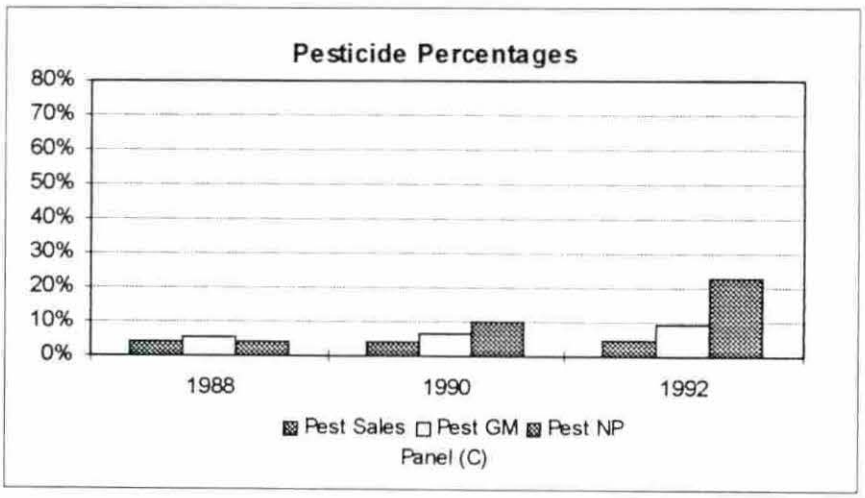


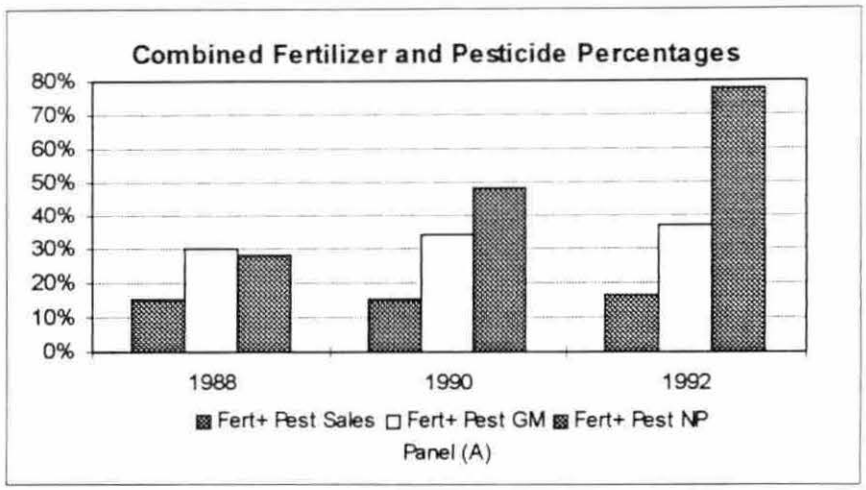
Figure 3-6. Specialization category group two average initial fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits

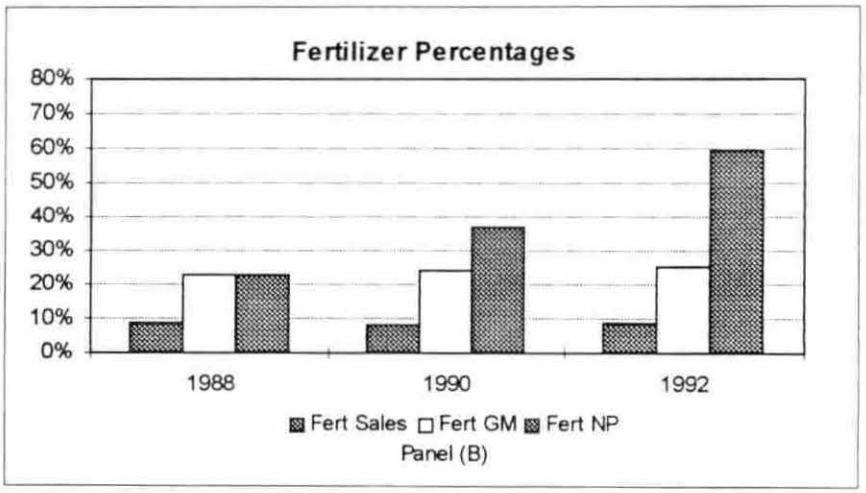
two) generated a higher percentage of their net profits from fertilizer and pesticides sales than the more specialized (group one) firms. Group two firms' combined fertilizer and pesticides share of net profits was around 75%, which was almost as high as the most specialized group one firms. This finding is even more astounding given the fact that the least specialized firms' fertilizer and pesticide sales accounted for about 10% of total sales. Even though this group generated its sales from a more diverse set of activities, it was nevertheless heavily dependent on fertilizer and pesticides sales to generate net profits. Since other product lines lacked profitability fertilizer and pesticide sales were even more important in 1992 than in 1988 for those firms less specialized in fertilizer and pesticide sales.

By 1992 firms not specializing in fertilizer and pesticide had become just as reliant as the most specialized firms on fertilizer and pesticides sales ability to generate net profits. This occurred because the less specialized firms had larger grain activities, and by 1992 many firms were losing money on their grain activities. Of the thirty-five group two firms that were marketing grain, only about 26% were generating a net profit from grain in 1992. The magnitude of the losses ranged from $(15,222) to $(433,945). The more specialized (group one) firms had about 27% of the thirty-six firms in this group in 1992 generating net profits, but those firms with grain losses were considerable less than the losses in the least specialized (group two) firms' grain departments. This indicates that even the less specialized firms (firms more dependent on grain and other product sales activities) had become quite dependent on profits from fertilizer and pesticides to generate total net profits by 1992. The grain profit center's large sales volume and low average contribution to net profits made the question of specialization less significant. By 1992 both groups relied heavily on feed, fertilizer, pesticides, and petroleum for net profits.

b. Firms Categorized by Total Firm Sales

Figure 3-7 represents cooperatives that were ranked with the highest total firm sales. In 1988 firms larger firms (group one) had a combined fertilizer and pesticide share of net profit of around 28% with about 15% share of total firm sales. Fertilizer and pesticides share of net profit increased from about 29% in 1988 to almost 78% in 1992. The sales share





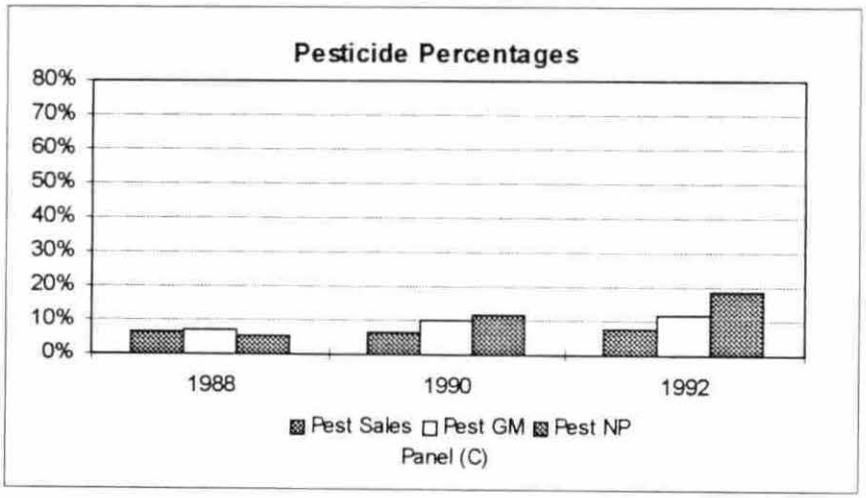


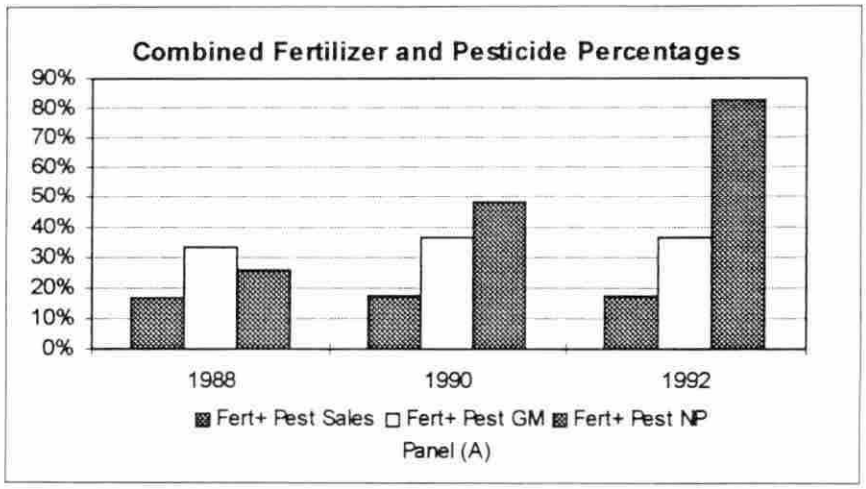
Figure 3-7. Sales category group one average initial fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits

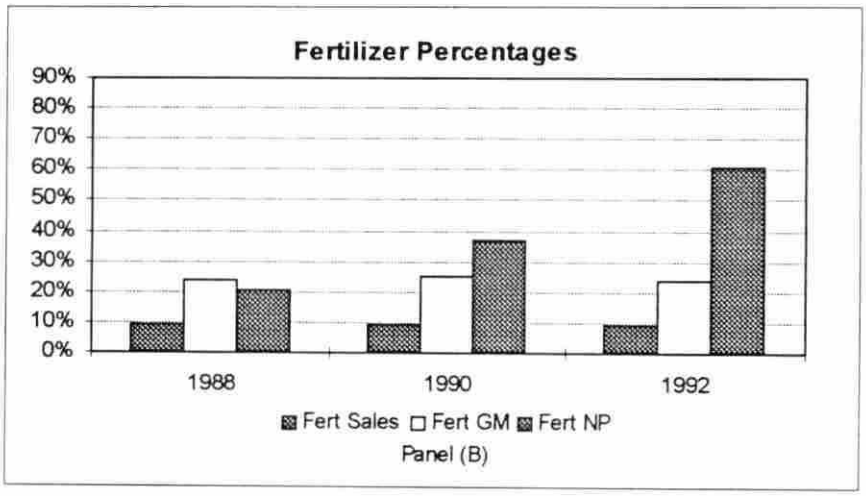
increased by only about 1% during this period. This is represents nearly a three fold percentage increase in firms' combined share of net profits from fertilizer and pesticides. Data in panel (B) and panel (C) illustrate that both fertilizer and pesticides contributed to this result. Both profit centers increased their percentage share of firm net profit.

Smaller firms (group two) basically had the same percentage share of their firms' net profits generated in the fertilizer and pesticides profit centers as larger firms. Group two firms are graphically illustrated in Figure 3-8. In 1988, combined fertilizer and pesticide categories generated almost 27% of firms' net profit with roughly 17% of the firms' total sales. By 1992 fertilizer and pesticides generated nearly 83% of their net profits from about 24% of total sales. Panel (B) and panel (C) illustrate separately that both fertilizer and pesticides individually increased their share of firm net profits between 1988 and 1992.

Small (group two) firms displayed a phenomenon similar to firms more specialized in fertilizer and pesticide sales in that their share of net profits was higher than the larger, and or least specialized firms. However, the underlying cause was different for firms grouped according to total sales than was the case for firms specialized in fertilizer and pesticides sales. The reason for the lower profit percentages for the sales category group one (large) firms was the large grain losses. In 1992 only about 20% of the largest firms (sales category group one) had a grain department that was generating a net profit. This compares to approximately 32% of the smallest firms (sales category group two) that had a grain department generating a net profit. Group one (large firms) total firm losses ranged from $(11,624) to $(433,945) while group two (small firms) losses ranged from $(5,105) to $(151,490) in 1992.

For firms group based on their degree of specialization in fertilizer and pesticide sales the net profit percentages were almost identical. This was due to firms in the less specialized group having large losses in grain activities. However, the opposite grouping arrangement occurred in firms grouped based on total sales. Firms with lower sales had higher net profit percentages in fertilizer and pesticides than larger (group one) firms due to the magnitude of grain losses in group one. Therefore, firms with the lowest sales are likely to be affected more than firms with the highest sales if reduced input recommendations from an ICM program





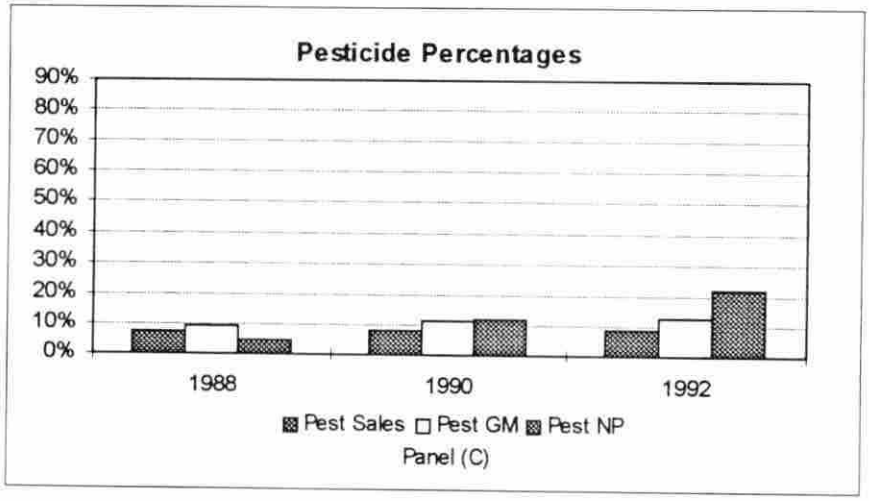


Figure 3-8. Sales category group two average initial fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits

causes a reduction in fertilizer and pesticide sales greater than the revenue generated by ICM services.

c. Firms Categorized by Total Firm Net Profit

Figure 3-9 shows results for the high profit group of cooperatives. All of the most profitable firms (group one) generated profits in 1992. While only fifteen firms in the sample of thirty-five low profit cooperatives (group two) generated net profits in 1992. In the highest profit group the combined fertilizer and pesticides contributed approximately 26% of the net profits based on about 14% of total firm sales in 1988. The share of net profits contributed by fertilizer and pesticides increased to almost 52% in 1992 with an increase in their percentage share of total firm sales of less than 2%. Data presented in panels (B) and (C) illustrates that both fertilizer and pesticides profit centers increased their percentage share of net profits over the study time period.

The lower profit (group two) firms are graphically presented in Figure 3-10. Firms in group two (low profit firms) continued the trend of fertilizer and pesticide being the main source of firms' net profits. Adjustments were made to data in Figure 3-10 for 1992 due to the wide spread firm losses. In 1992 twenty firms incurred a net loss when all activities were summed. Fertilizer net profits declined to $3,600 and pesticides had an average net loss of $(11,970) for 1992.

To adjust for the amount of losses in this group fertilizer's net profit share was based its contribution to net profits. It was necessary to calculate the share of fertilizer and pesticide contribution to either net profit or losses due to the magnitude total loss. The added departmental losses were large enough the fertilizer's departments average percentage share of net profits was above (100%). Therefore it was decided that fertilizer net profit percentage would be calculated with other net profit generating departments (only feed) and pesticides' percentage would be based on its contribution to the total loss with other departments reporting losses.

Due to the large number of departments generating losses in group two (low profit firms) percentage calculation were based fertilizer contribution toward profit and pesticides

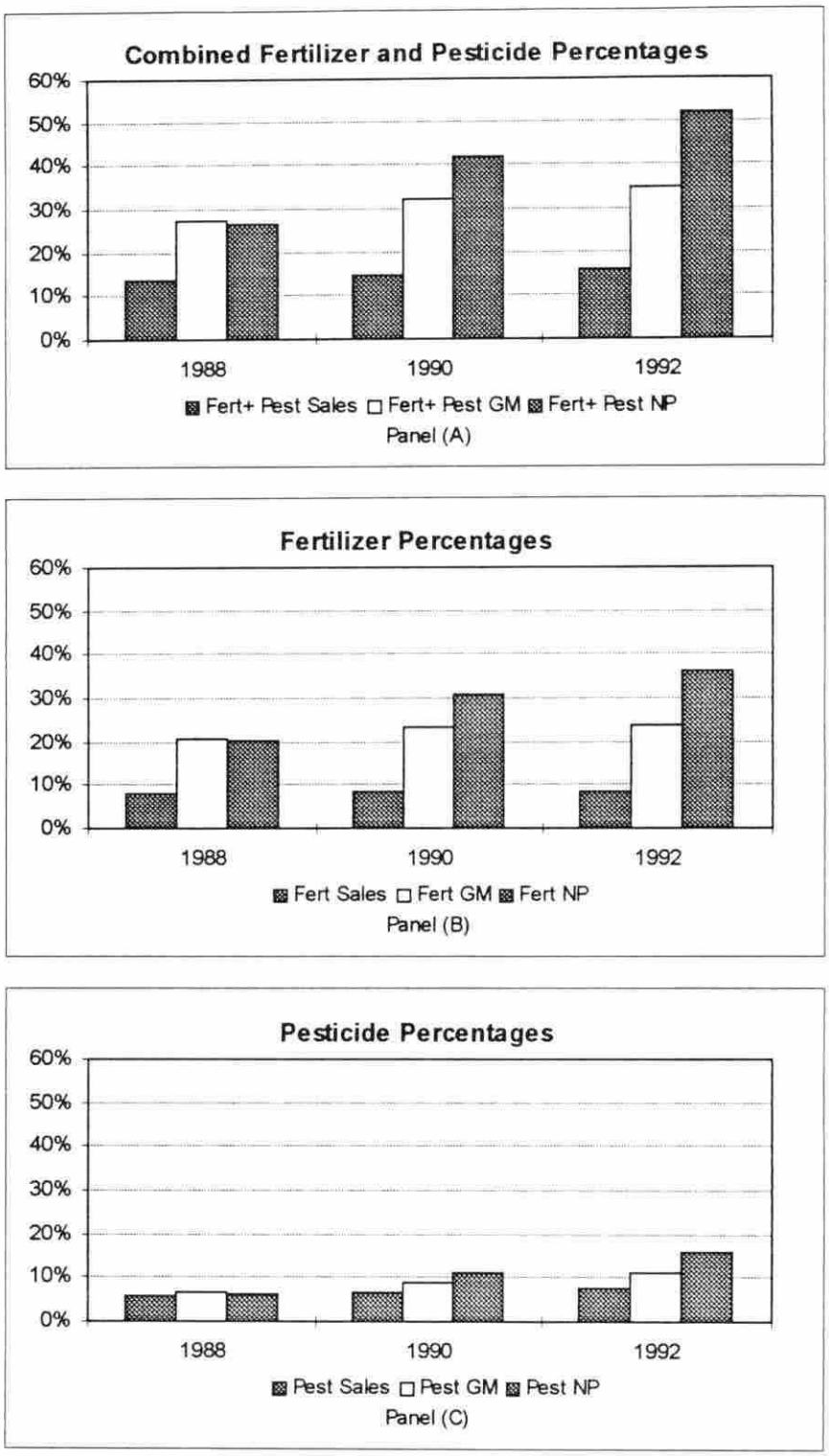
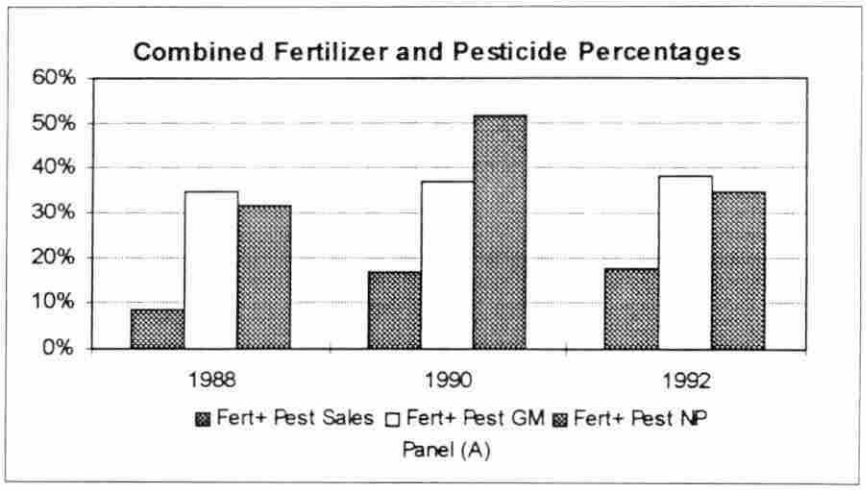
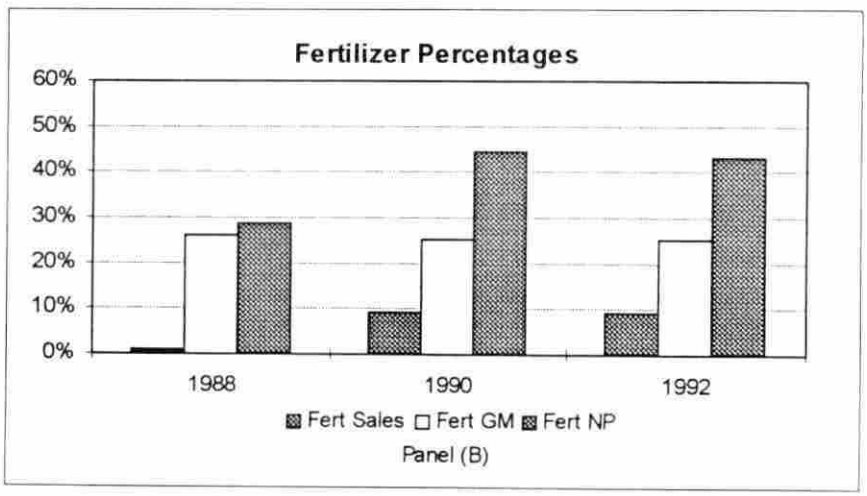


Figure 3-9. Net profit category group one average initial fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits





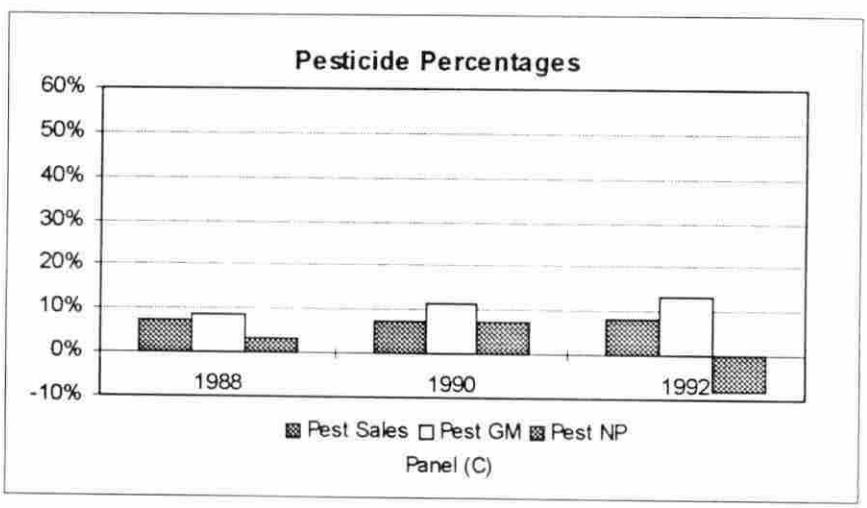


Figure 3-10. Net profit category group two average initial fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits

contribution of firm losses. Fertilizer and pesticide generated about 32% of firms profits with approximately 18% of firm sales in 1988. By 1990 the combined fertilizer and pesticide percentage had increased to almost 52% with a decrease in sales of about 1%. By 1992 firms' average percentage share of combined fertilizer and pesticides sales remained steady at about 17%, but contribution to net profits declined to around 35% as some firms lost money on pesticide. Panels (B) and (C) illustrate fertilizer and pesticide individual percentage contributions to firms' total sales, gross margin, and net profit.

Comparing the high profit group with the low profit group graphically demonstrates how important fertilizer and pesticides are to GMIS cooperatives. From Figure 3-9 it can be seen that the most profitable firms generated over 50% of their profits from fertilizer and pesticides profit centers in 1992. Figure 3-10 illustrates how important fertilizer and pesticide profit centers are to firms that produce on average low or no profits at all. If it was not for the positive net profits generated in the fertilizer or feed profit centers all the least profitable (group two) firms would be reporting an average loss for 1992. Firms in group two appear to be the most financially vulnerable to reductions in fertilizer and pesticide sales. Such reductions would worsen already weak profit conditions in these firms.

B. Industry Performance After Marketing Fee-based ICM Services

1. Overall Analysis of ICM Services Financial Impact on Cooperatives

An overall analysis of the financial effects ICM services would have on GMIS cooperatives' profit centers is shown in Figure 3-11 and Figure 3-12 for the years 1988, 1990, and 1992. Figures 3-11 and Figure 3-12 present data on firms' profit center percentage contribution to total sales and net profit similar to data presented in Figures 3-1 and 3-2. The ICM service in Figure 3-11 was added in as a "profit center" for comparative purposes even though product sales and service income are typically treated differently on the income statement. Although the ICM activity is a service income item under the assumptions of this

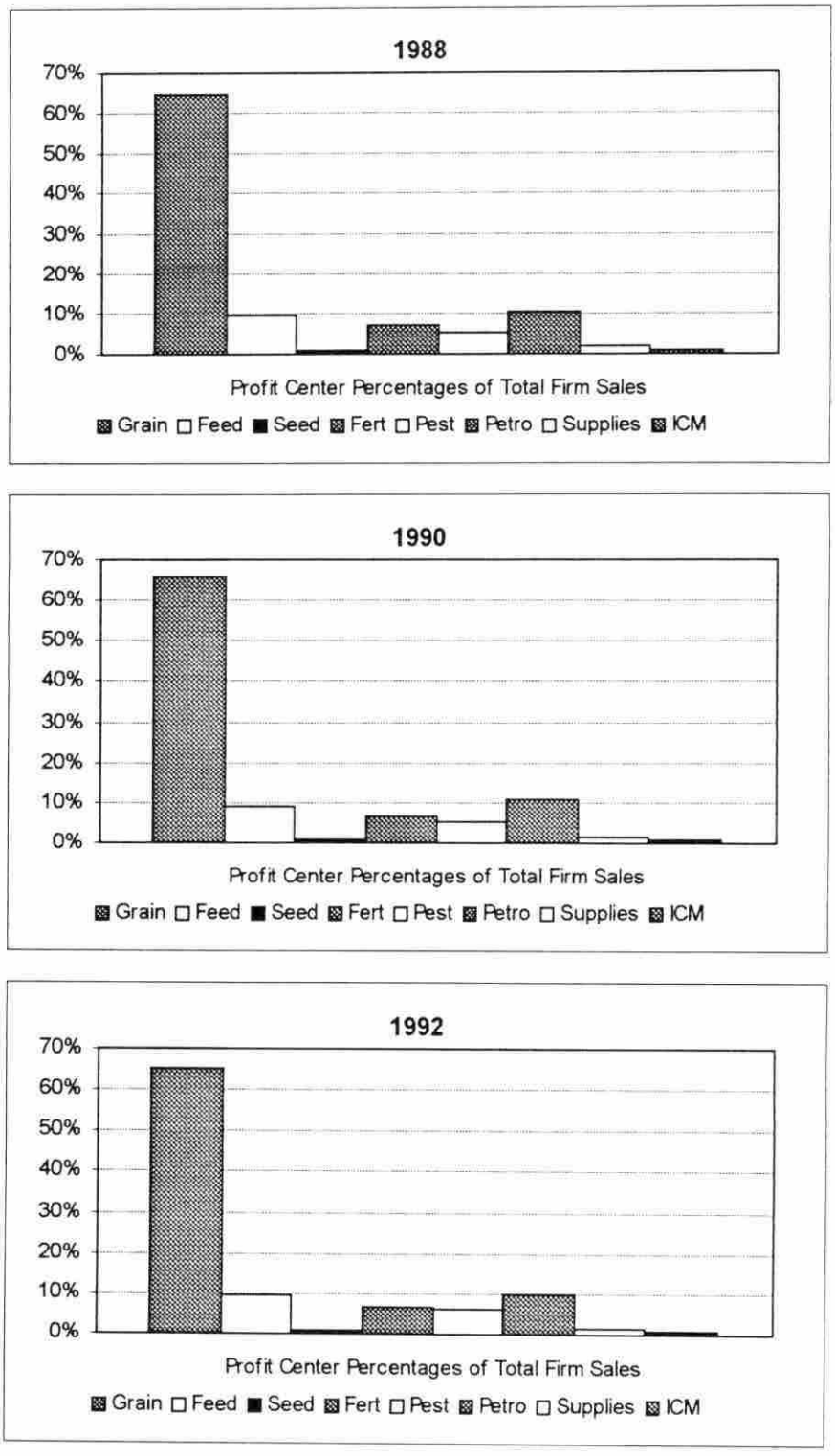


Figure 3-11. Average percentage contributions of individual profit centers to total firm sales with ICM service revenue included for years 1988, 1990, and 1992

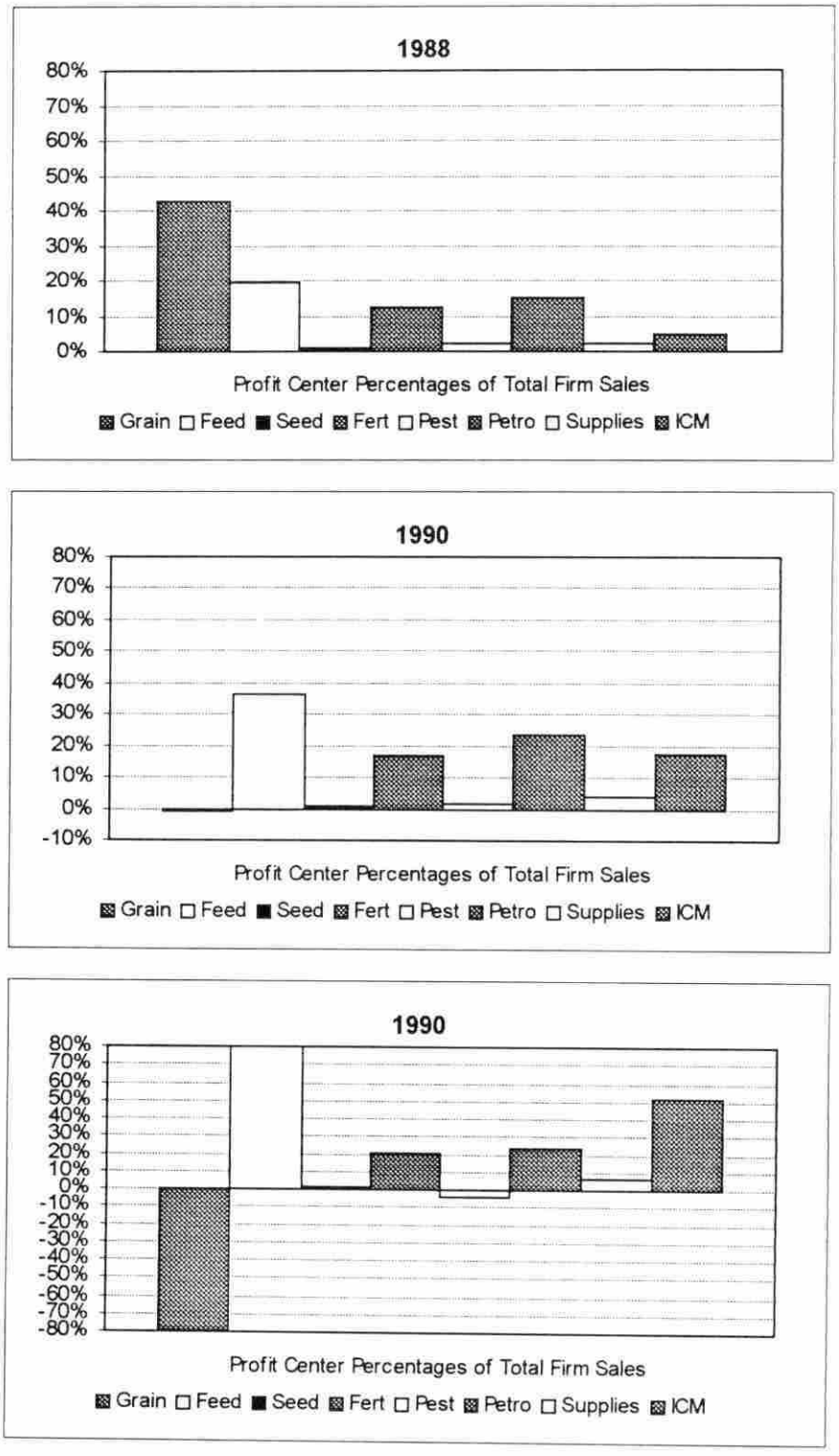


Figure 3-12. Average percentage contributions of individual profit centers to total firm net profit with ICM net profit included for years 1988, 1990, and 1992

study, it is not associated with product sales that occurs in the fertilizer and pesticide profit centers.

In Figure 3-1 grain was the dominate sales leader at an average of 62% for the study period. Grain profit center's average sales percentage for all firms in the study period increased slightly to about 65% once ICM services were added. The fertilizer and pesticide share of total sales declined from the initial state with the addition of ICM. Feed, seed, petroleum, and supply profit centers remained roughly the same average percentage of total firm sales. The ICM service "profit center" contributed less than 1% to total firm sales in all years. The fertilizer percentage of firm sales declined about 2% from the initial state level of around 9%. Pesticide sales percentage fell approximately 1% over the study period from the initial state level of about 7% after firms adopted ICM services. The overall effect on the firms' average sales compensation was not affected much by the addition of ICM services. Sales percentages remained relatively constant regardless of whether firms offered ICM services.

Table 3-2 presents the average net profit percentage in profit centers for the initial state and after the adjustment to reflect marketing fee-based ICM services. Fertilizer and pesticide share of net profits were drastically reduced after firms adopted ICM services. Before ICM services fertilizer and pesticides contributed 40% and 12% of average net

Table 3-2. Initial and ICM adjusted average net profit percentages for the years 1988, 1990, and 1992

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Grain	38.36%	42.92%	-0.49%	-0.61%	-50.67%	-80.26%
Feed	17.46%	19.53%	29.41%	36.31%	50.50%	80.00%
Seed	0.80%	90.00%	0.75%	0.92%	0.84%	1.33%
Fertilizer	22.52%	12.47%	36.71%	16.83%	60.54%	20.47%
Pesticide	5.37%	1.98%	11.48%	1.53%	19.65%	-4.13%
Petroleum	13.54%	15.15%	18.89%	23.32%	14.95%	23.69%
Supplies	1.93%	2.16%	3.26%	4.03%	4.18%	6.62%
ICM	-	4.89%	-	17.64%	-	52.29%

profit respectively. After ICM services were introduced, the fertilizer and pesticide contribution to net profits fell on average to about 17% and -.2% respectively. Pesticides' negative net profit in 1992 contributed to the negative percentage over the study period. Overall ICM services net profits averaged nearly 25% for the three years studied.

Fertilizer and pesticides generated lower net profits and the lost profits were not completely replaced by the profits contributed from the addition of ICM services. Over the study period the fertilizer and pesticides profit centers average percentage share of net profits fell by almost 36 %, while ICM services on average contributed about 25% to firms' total net profit. The 11% difference between the reduced fertilizer and pesticide share of net profits and the added contribution from ICM services to net profit indicates that reductions in fertilizer and pesticides profits were not fully compensated by an ICM service profits. Therefore on average, firms that offer ICM services can expect their total net profits to decline by 11% in the short run. In the longer run the profit differential would be expected to shrink as firms adjust to new market conditions by reducing the fixed costs needed to market fertilizer and pesticides. However, the short run financial effect is of significant interest to firms making the decision to market fee-based ICM services. Firms must survive during the period between the short and long run. The rest of this paper will attempt to identify which firms would most likely market fee-based ICM services.

2. ICM Financial Impacts on the Fertilizer and Pesticide Profit Centers

ICM services had virtually no effect on firms' average gross margin, service and other revenue, gross profit percentage for fertilizer and pesticides profit centers' sales as presented in Figures 3-3 and 3-13. This occurred because these figures were based on the departments sales level and reducing most income statement items the same rate (except for the fixed expenses) basically did not change the mark up percentages. However, fee-based ICM services did produce a reduction in the percentage of net profits attributable to fertilizer and pesticide sales when firms added ICM services. Fertilizer and pesticide percentage reduction is due to sales and expenses declining at different rates.

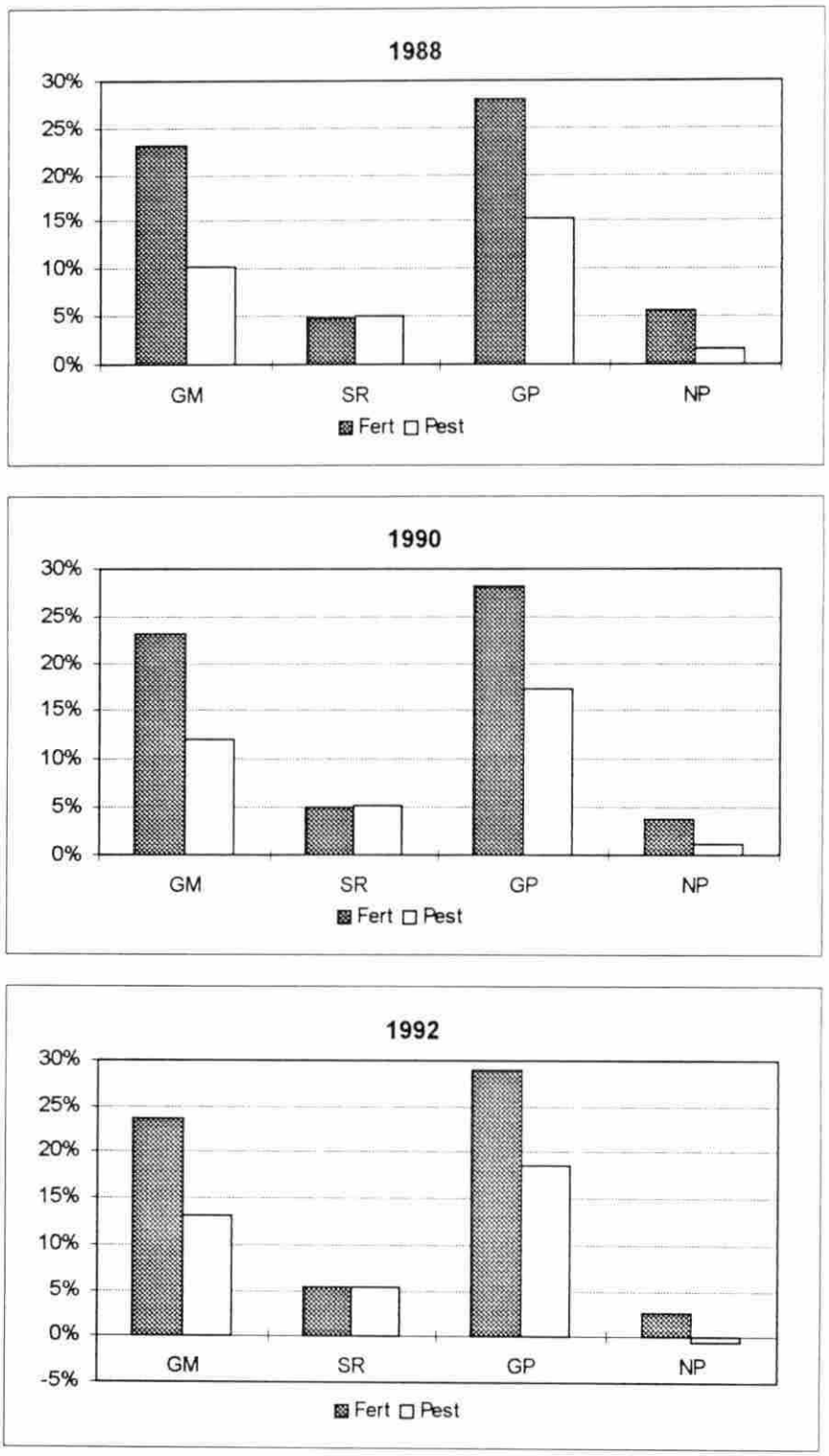


Figure 3-13. Average fertilizer and pesticide gross margin, service revenue, gross profit, and net profit as a percentage of the profit center's sales with ICM services

Figure 3-14 illustrates the impact ICM services had on fertilizer and pesticide profit center contribution to total sales, gross margin, service other revenue, gross profit, and net profit. Earlier analysis of the decline in fertilizer and pesticide share of net profit is the same as in Figure 3-11 and Figure 3-12 over the study period when firms added ICM services.

Gross margin percentages for both fertilizer and pesticides decreased more rapidly than sales. Fertilizer sales over the study period declined by about 2% while fertilizer gross margin decreased by almost 4.5%. The pesticide profit center displayed similar results with decreased sales of approximately 1%, accompanied by a decline in pesticides gross margins of about 2%. The more firms rely on fertilizer and pesticides to generate gross margins the more these firms will be affected by ICM services. The relatively small contribution of fertilizer and pesticide sales to total sales (less than 9%) proved to be somewhat misleading because fertilizer made up almost a quarter of the gross margins and pesticides made up around a tenth of the firms' total gross margins. On average ICM services reduced cooperatives gross margin by about 5.5%.

Like gross margins, service and other revenue declined more than profit center sales over the study period. Fertilizer's service revenue declined about 4%, and pesticides service revenue decreased around 3%. The decrease of fertilizer and pesticides profit centers' percentage contribution to firms' service and other revenue was due to a combination of the introduction ICM service as additional service revenue and a decline in more traditional product related revenue from these profit centers.

3. Section Summary in Dollar Values

While percentages are useful to describe the relative impact ICM services had on GMIS cooperatives, the dollar impact is often more meaningful in terms of what might be expected to happen to financial performance. Table 3-3 displays the initial state of cooperatives' fertilizer and pesticide profit centers sales and these categories after modeling ICM services.

The percentage of firm sales attributable to fertilizer declined 2% during the study period. This translated in to an average dollar reduction of $344,783, while the 1% decline in

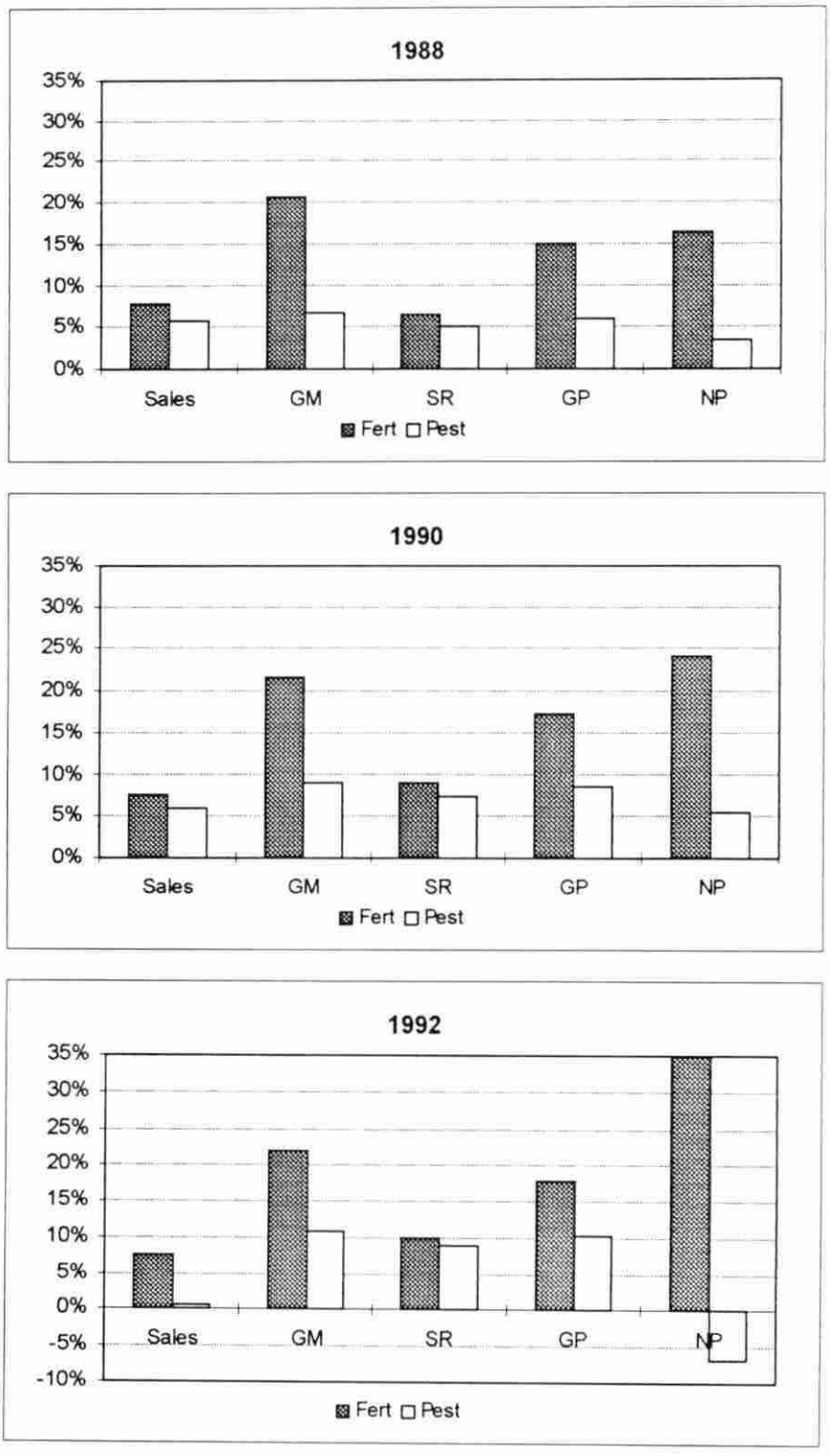


Figure 3-14. Average fertilizer and pesticide sales, gross margin, service revenue, gross profit, and net profit as a percentage of total firm sales with ICM services

Table 3-3. Initial and ICM adjusted average dollar sales and net profits for the years 1988, 1990, and 1992

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Fertilizer:						
Sales	$1,217,202	$922,031	$1,379,177	$1,030,999	$1,486,812	$1,095,812
Net Profit	84,016	41,566	73,958	27,465	61,635	13,155
Pesticide:						
Sales	$893,024	$680,648	$1,097,256	$820,242	$1,314,535	$979,637
Net Profit	20,034	6,605	23,116	2,543	20,009	(2,655)
ICM:						
Sales	-	$102,530	-	$115,691	-	$120,777
Net Profit	-	16,302	-	28,782	-	33,604
Total Firm:						
Sales	$13,577,072	$13,069,526	$15,809,668	$15,184,476	$16,920,255	$16,194,356
Net Profit	373,011	333,433	201,444	163,159	101,806	64,266

sales for pesticides produced an average $274,763 reduction sales. The most noticeable financial impact ICM services had on cooperatives' fertilizer and pesticides dollar values were in the net profit generated by profit centers. Firms' net profit declined due to the fact that not all expenses were reduced when sales reductions were imposed in response to recommendations from the ICM service. Over the study period the fertilizer contribution to firm net profits declined by 23% (an average dollar reduction of $45,808). Pesticides averaged a 12% reduction to firm net profits or an average $18,889 decrease in the profit center's net profit.

As stated earlier ICM services were viewed as an independent sales item rather than associated with the fertilizer department. During the study period ICM services contributed an average revenue $112,999 in service revenue. This made up less than 1% of total sales. While ICM services played a minor role in contribution to total sales, ICM profit center net profit contributed heavily to offset the decline in fertilizer and pesticides net profits. Fee-based ICM services made an average contribution of $26,229 in net profits, or a percentage equivalent to almost 25% of firms net profit during the study period.

Nevertheless, fee-based ICM services failed to fully compensate profits reduced from fertilizer and pesticides. Over the study period cooperatives fertilizer and pesticides profit

centers averaged a total decline in net profits of $64,697, while ICM services generated an average of $26,229 in net profit. Thus, cooperatives net profits on average declined by $38,468 as a result of adding ICM services.

C. ICM Financial Effects Over Time

Over the study period outside market forces caused different profit centers to take on a different level of financial importance in terms of their contribution to net profits in GMIS cooperatives. Table 3-4 contrasts actual profit center net profits with profits from added fee-based ICM services and the sales reductions that were imposed.

Changes in government storage programs, grain marketing contracts, and yearly yield fluctuations produced a noticeable decrease in net profits for the grain profit center. Table 3-4 reveals that GMIS cooperative profits margins from grain marketing activities decreased in importance. Firms were more dependent on feed, fertilizer, and pesticides sales to generate net profits. By 1992 the average net profit generated in the feed profit center was completely canceled out by grain's negative net profit. This left fertilizer, pesticides, and petroleum as the remaining profit sources.

Table 3-4. Initial and ICM adjusted average department net profits for the years 1988, 1990, and 1992

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Grain	$143,104	$143,104	($996)	($996)	($51,583)	($51,583)
Feed	65,133	65,133	59,235	59,235	51,412	51,412
Seed	2,985	2,985	1,504	1,504	856	856
Fertilizer	84,016	41,566	73,958	27,465	61,635	13,155
Pesticide	20,034	6,605	23,116	2,543	20,009	(2,655)
Petroleum	50,523	50,523	38,055	38,055	15,223	15,223
Supplies	7,216	7,216	6,573	6,573	4,254	4,254
ICM	-	16,302	-	28,782	-	33,604
Total Net Profit	$373,011	$333,433	$201,444	$163,159	$101,806	$64,266

Net profit declined by different magnitudes when analyzed by percentages and dollar amounts. The percentages indicated a larger impact of ICM services on GMIS firms than dollar measures. This was caused by reduced importance of the grain profit center as a contributor to firm net profits. In 1988 cooperatives experienced an average decline in net profits after the addition of ICM services of $39,578 (from about $373,011 to $333,433), or slightly more than a 10% reduction. Total firm net profits declined by $38,285 (or about 19%) as a result of ICM services in 1990. By 1992 the decline in total firm net profits was to $37,540, but in percentage terms the decline in total net profit was almost 37%. The large losses in the grain department magnified the percentage effect of lower fertilizer and pesticide profits after ICM services were added. The size of an ICM trade territory, and thus the amount of revenue, had no effect on the average percentage reduction in firm net profit. Since the same firms were locked into offering a constant level of ICM service, any increase in the ICM service revenue was offset by an increased reduction in fertilizer and pesticide sales. However, the absence of grain profits reduced the total dollar profit. Even though the reduction in dollar profits due to failure of ICM services to fully replace lost product profits was nearly constant. This reduction was a higher percentage of the lower Dollar profits.

D. Differential Effects on Firms that Market Fee-based ICM Services

As in the previous percentage analysis firms were categorized and grouped based on specialization, size, and profitability characteristics to identify the dollar effects and which firms from the sample population would most likely offer fee-based ICM services. The population of diversified firms were categorized and grouped based on firm top half/bottom half performance in terms of their percent sales in fertilizer and pesticide to measure specialization. Total firm sales was used as a measure of size, and firm dollar net profits were used as a profitability measure.

1. ICM Impacts on More Specialized vs. Less Specialized Firms

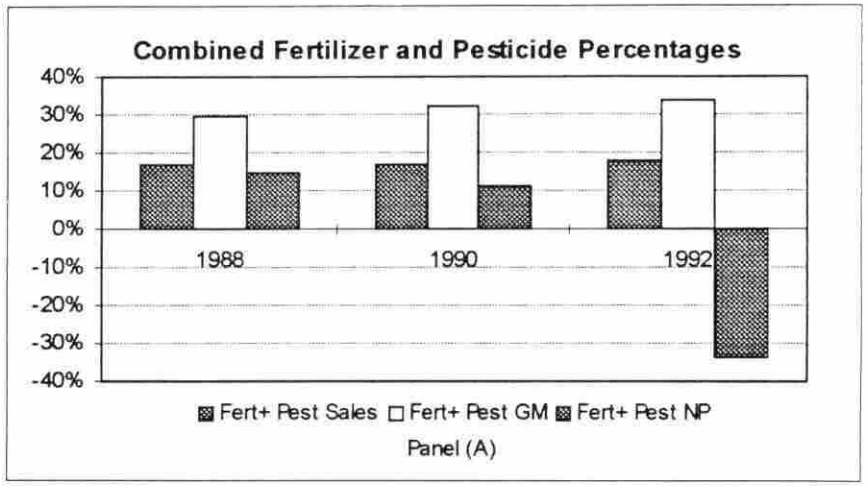
Figure 3-15 reveals the effects that fee-based ICM services had on those GMIS cooperatives that were more specialized in fertilizer and pesticide sales. Data in Figure 3-5 showed the initial state for this category grouping. Since 1988 these firms have increasingly relied on fertilizer and pesticide as the major contributor to net profits.

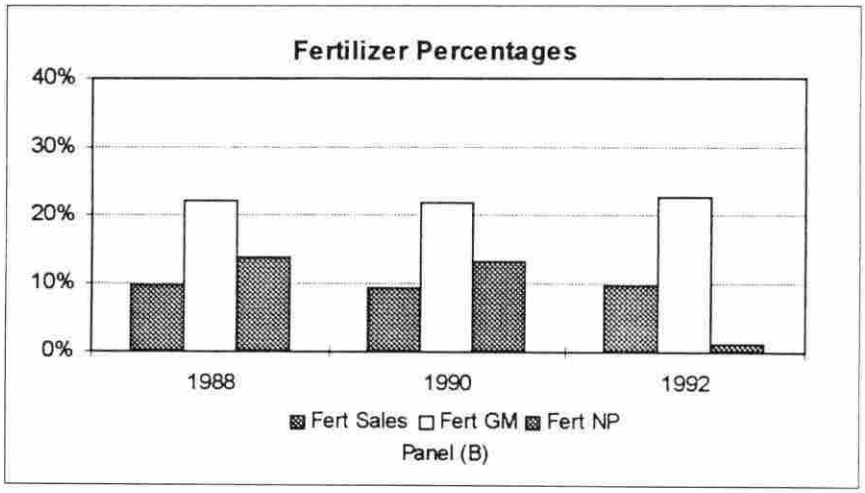
Comparisons between panel (A) in Figure 3-15 and Figure 3-16 illustrates that increased specialization in fertilizer and pesticide profit centers would tend to discourage firms who wish to provide a fee-based ICM service. In 1992 the most specialized firms initially generated on average almost 83% of their total net profits from fertilizer and pesticides sales. When these firms began to added ICM services the net profit contribution from fertilizer and pesticides sales dropped by more than 116%. Net profits initially generated by fertilizer and pesticides profit centers by the more specialized firms in 1992 averaged $91,880. After the adoption of ICM services cooperatives net profit contribution from these profit centers averaged a loss of ($14,444). In the less specialized firms fertilizer and pesticides' net profit contribution declined by over 32% in 1992. the reduction caused average firm net profit to decline by $9,690. Table 3-5 summarizes firms' average initial state sales and profits with sales and profits after adding an ICM service for more specialized (group one) and less specialized firms (group two).

Panel (B) and panel (C) in Figure 3-15 and 3-16 reveal the individual effects fee-based ICM services had on fertilizer and pesticide profit centers. One noticeable difference between the panels in Figure 3-15 and Figure 3-16 was that both the fertilizer and the pesticide percentage share of firm net profit declined over time. Initially both the fertilizer and the pesticide share of firm net profits increased over time as shown in panel (B) and panel (C) of Figure 3-5 and 3-6. This indicates that the more specialized firms are in fertilizer and pesticide sales will experience a more rapid reduction in their net profits than the less specialized firms.

2. Analysis of ICM Effects in Large Firms vs. Smaller Firms

Figure 3-17 and Figure 3-18 illustrate the effects fee-based ICM services had on the top and bottom half of the sample based on total sales. Table 3-5 presents selected initial state





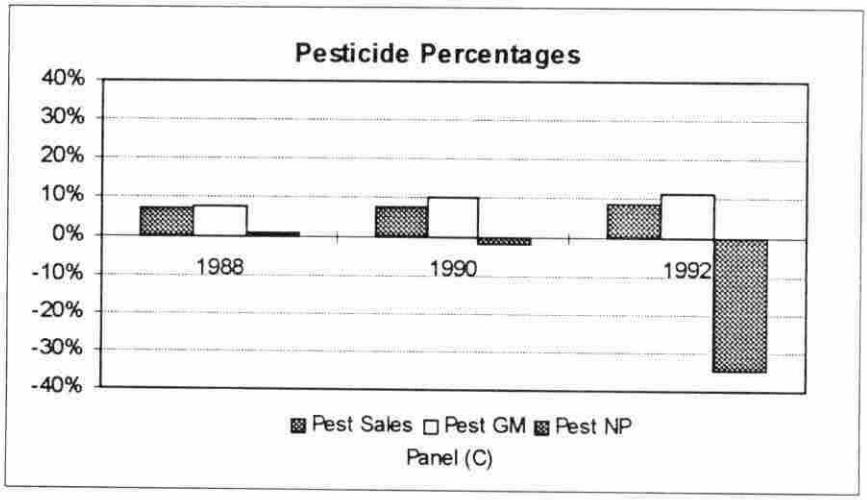
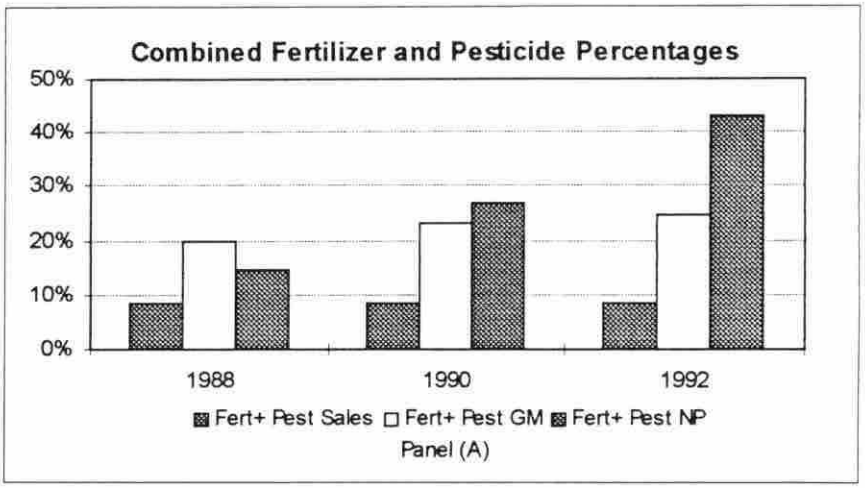
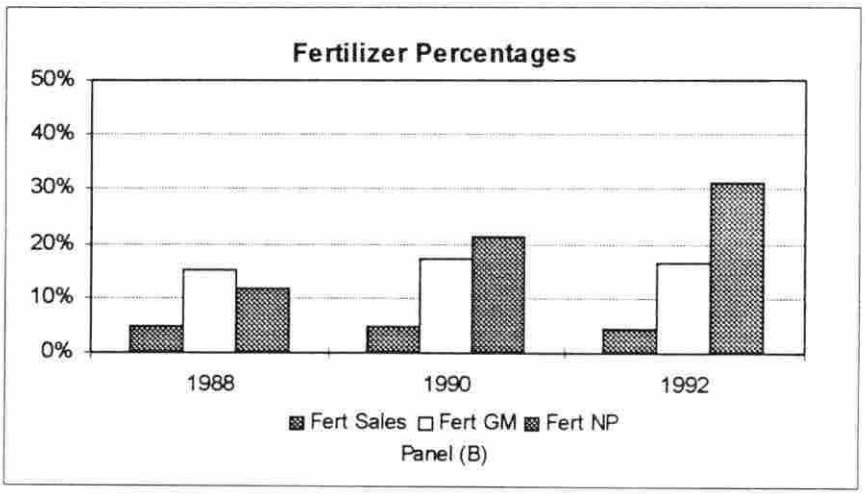


Figure 3-15. Specialization category group one average fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits with ICM services





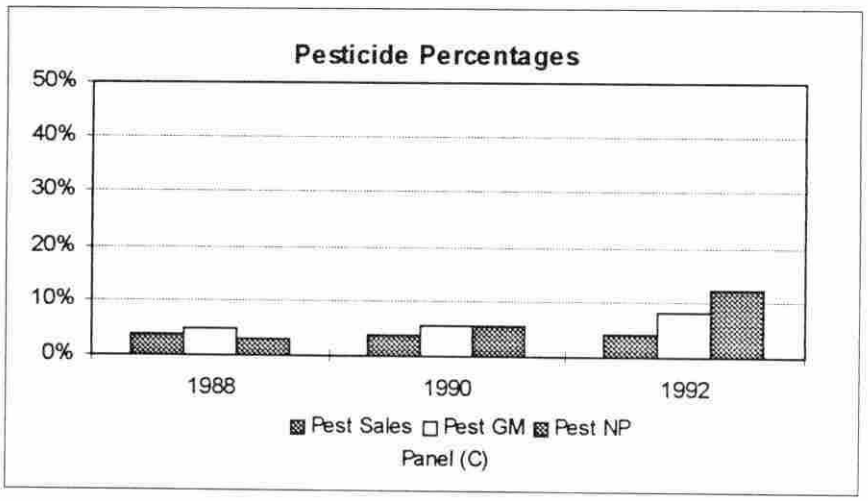
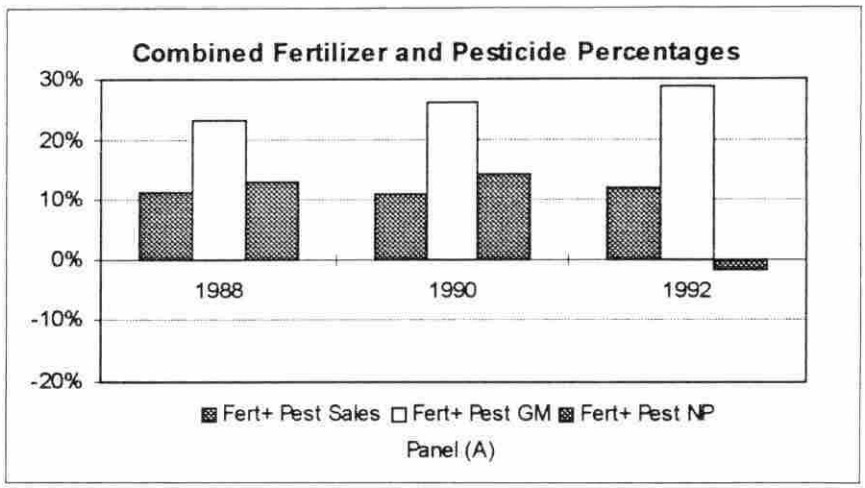
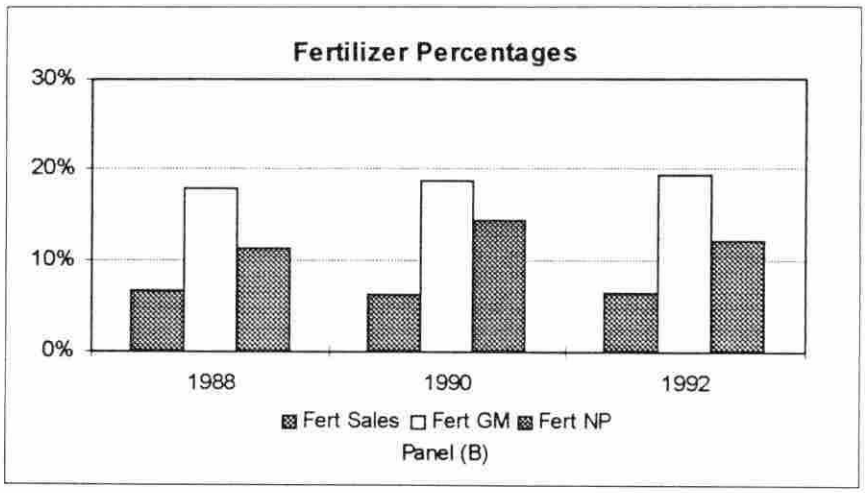


Figure 3-16. Specialization category group two average fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits with ICM services





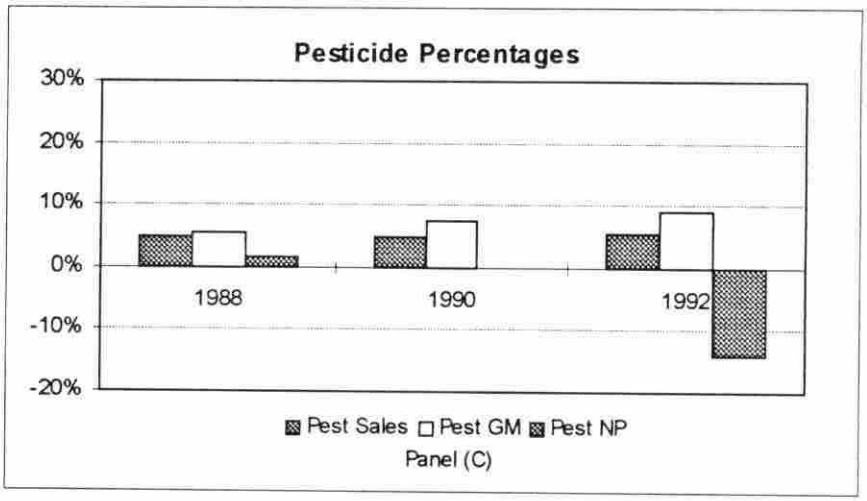
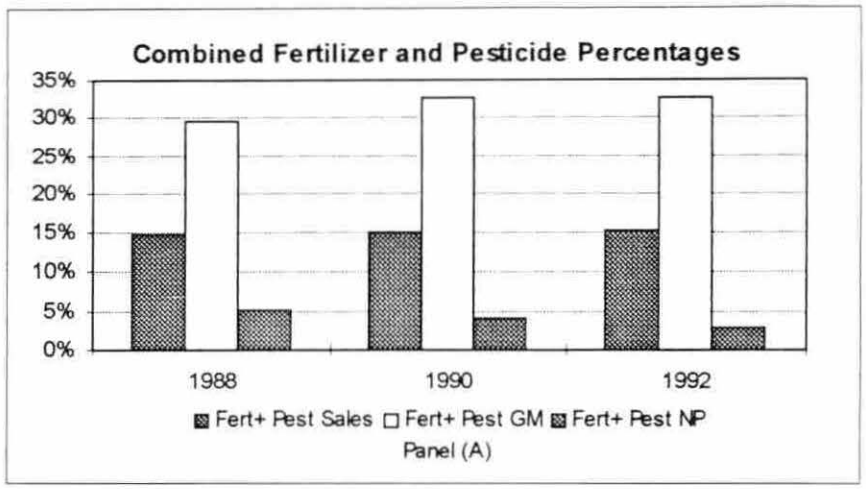
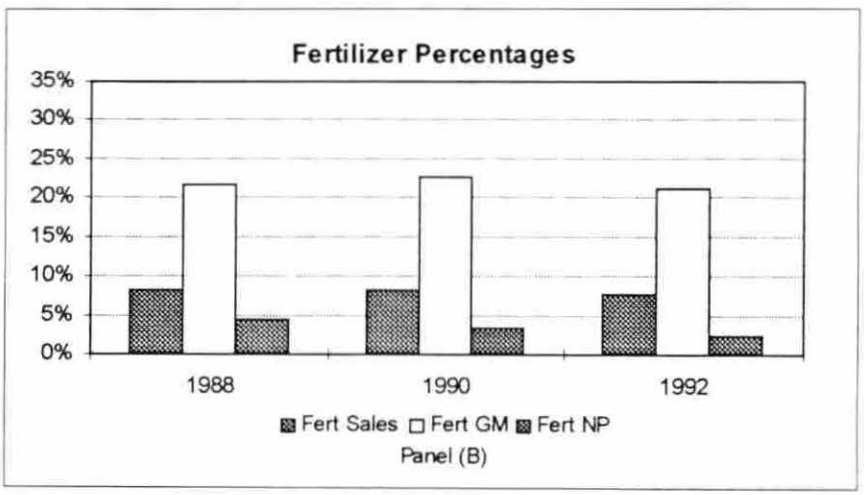


Figure 3-17. Sales category group one average fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits with ICM services





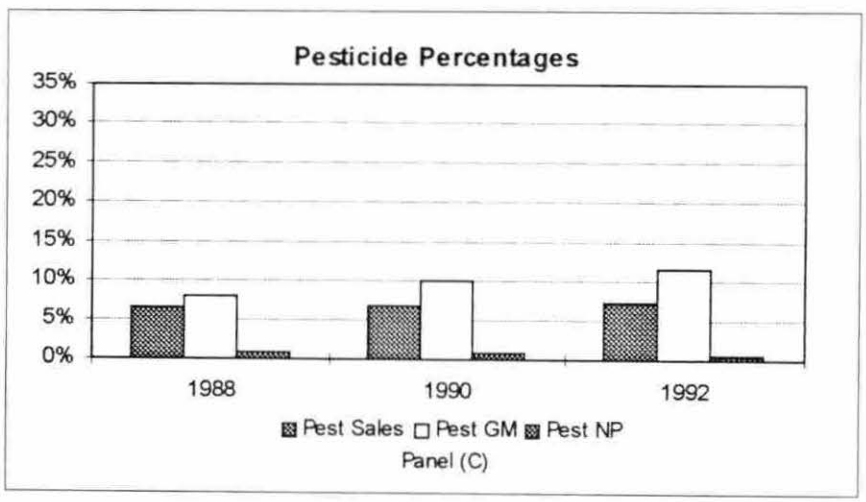


Figure 3-18. Sales category group two average fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits with ICM services

Table 3-5. Initial and ICM adjusted average sales and net profits for firms categorized by specialization in fertilizer and pesticide sales

GROUP I

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Fertilizer:						
Sales	$1,652,261	$1,169,073	$1,851,395	$1,283,991	$2,028,415	$1,404,261
Net Profit	105,624	38,888	92,233	21,950	73,362	484
Pesticide:						
Sales	$1,197,739	$855,158	$1,485,607	$1,035,817	$1,779,449	$1,245,452
Net Profit	23,210	2,694	29,379	(3,183)	18,518	(14,928)
ICM:						
Sales	-	$114,932	-	$129,083	-	$133,156
Net Profit	-	20,623	-	34,043	-	37,905
Total Firm:						
Sales	$12,845,852	$12,020,083	$14,856,245	$13,839,052	$15,779,972	$14,621,821
Net Profit	347,331	280,701	234,639	165,838	111,133	42,714

GROUP II

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Fertilizer:						
Sales	$769,712	$667,931	$893,468	$770,780	$929,735	$778,549
Net Profit	61,741	44,280	55,401	33,308	50,290	26,715
Pesticide:						
Sales	$579,347	$501,005	$679,810	$598,508	$836,388	$706,227
Net Profit	16,779	10,664	16,898	8,598	22,074	10,341
ICM:						
Sales	-	$79,499	-	$90,820	-	$97,787
Net Profit	-	8,276	-	19,011	-	25,618
Total Firm:						
Sales	$13,977,531	$13,797,409	$16,297,014	$16,075,024	$17,573,480	$17,292,183
Net Profit	389,907	374,608	167,244	155,862	95,499	85,809

and post ICM income statement values for group one and two firms. Comparisons between group one and two was of limited value due to the fact that there was a very low number of firms marketing ICM services in the smaller firm category (group two). This occurred because fewer of the small firms met the minimum acreage for marketing ICM services. Only nine firms were large enough to offer ICM services based on assumptions presented in chapter two.

The low number of firms marketing ICM services created a situation where fertilizer and pesticide net profit was somewhat overstated. Because only nine firms had fertilizer and pesticide sales reduced under the ICM assumptions and the remaining firms not marketing fee-based ICM services were unaffected the average could not be fairly compared to the larger firms in group one. In Table 3-6 firm net profit for group two increased by over $4,500 in

Table 3-6. Initial and ICM adjusted average sales and net profits for firms categorized by total sales

GROUP I

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Fertilizer:						
Sales	$1,647,363	$1,174,323	$1,879,965	$1,315,609	$2,067,483	$1,424,274
Net Profit	123,106	52,183	109,856	30,576	90,897	8,293
Pesticide:						
Sales	$1,165,560	$837,425	$1,477,141	$1,038,067	$1,784,238	$1,240,697
Net Profit	29,447	7,266	34,232	(214)	28,531	(9,505)
ICM:						
Sales	-	$104,906	-	$118,019	-	$123,086
Net Profit	-	17,775	-	30,210	-	35,015
Total Firm:						
Sales	$18,616,992	$17,815,727	$22,215,502	$21,212,072	$23,372,567	$22,185,817
Net Profit	536,458	461,129	297,367	213,850	153,610	67,985

GROUP II

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Fertilizer:						
Sales	$774,750	$662,531	$864,082	$738,259	$889,551	$757,964
Net Profit	43,593	30,394	37,467	24,609	32,374	18,932
Pesticide:						
Sales	$612,380	$519,260	$706,518	$596,194	$831,412	$711,119
Net Profit	10,169	5,740	11,928	5,559	11,671	4,773
ICM:						
Sales	-	$94,345	-	$107,672	-	$112,822
Net Profit	-	11,226	-	23,864	-	28,747
Total Firm:						
Sales	$8,259,502	$8,054,164	$9,163,092	$8,926,945	$9,952,555	$9,700,675
Net Profit	201,169	194,768	101,799	106,436	53,321	61,728

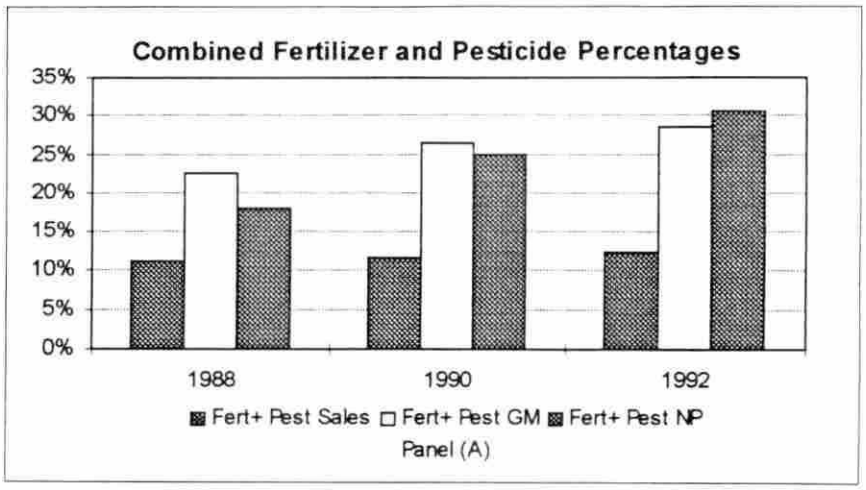
1990 and 1992. Over time firms might see an increase in total firm net profits they adjust to new market conditions, but this study was to model how fee-based ICM services would affect firms in the short run.

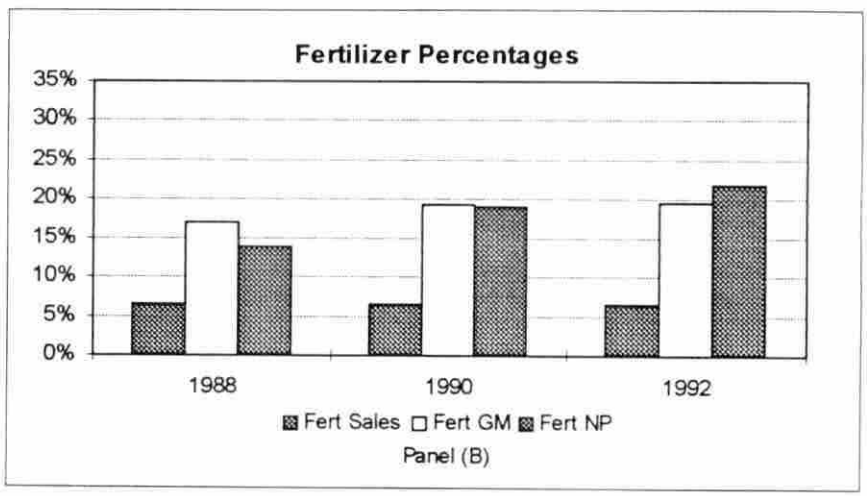
Firms with total sales in the industry's top group were in the best financial position to effectively market fee-based ICM services. Panel (B) and panel (C) of Figure 3-17 illustrate fertilizer and pesticide share of firm net profits for the years 1988, 1990, and 1992. Fertilizer percentage contribution to firm net profits remained positive over the study period, but the combined percentage was negative in 1992 due to a net loss in pesticides. From Table 3-6 group one averaged $83,517 lost net profit in 1990 and $85,625 lost net profit in 1992. Net profits declined almost 45% after firms added ICM services when compared to the initial state level in 1992. Larger firms would be more likely to market ICM services than smaller firms. Despite the reduction in firm net profit of nearly 45%, the firms in this larger firm group still averaged almost $68,000 in net profit compared to the smaller firms average profits of $61,000. This substantial profit base would be helpful for firms experimenting in and the developmental stages of establishing a fee-based ICM service. Firms that are in a loss situation would need to commit nearly all of their financial and managerial resources toward survival. The start up costs of an ICM service would be seen as a short term drain profits and probably would not be a high priority.

3. Analysis of ICM Impacts on High Profit vs. Lower Profit Firms

Average percentage contribution to firm net profit after GMIS cooperatives adopt fee-based ICM services is presented graphically in Figure 3-19 and Figure 3-20. Percentage calculations in Figure 3-20 were adjusted to reflect fertilizer and pesticide profit centers' negative contribution to net profits. This was necessary because the dollar amount losses in these profit centers, combined with the lack of substantial net profit in 1990 and losses in 1992. Table 3-7 presents the selected initial and ICM income statement values for high profit vs. low profit firms.

Panel (A) in Figure 3-20 and group II in Table 3-7 reveals that firms combined fertilizer and pesticides profit centers contributed positive net profits only in 1988. By 1992





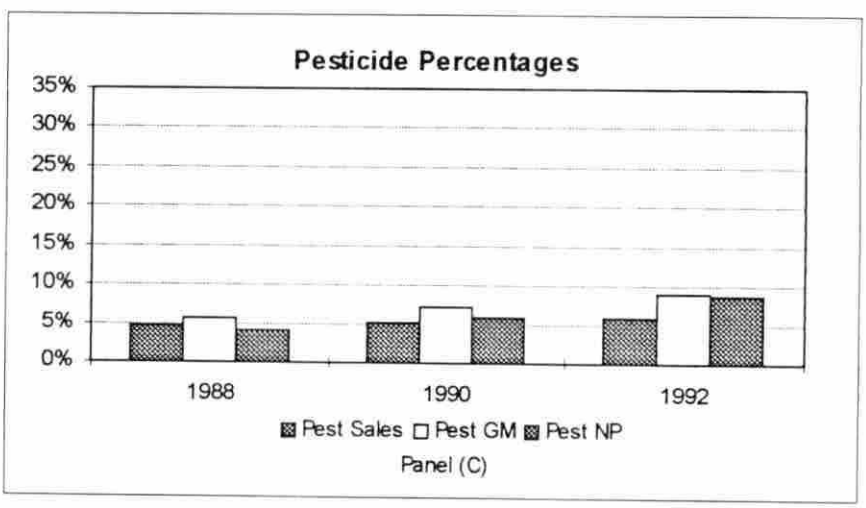
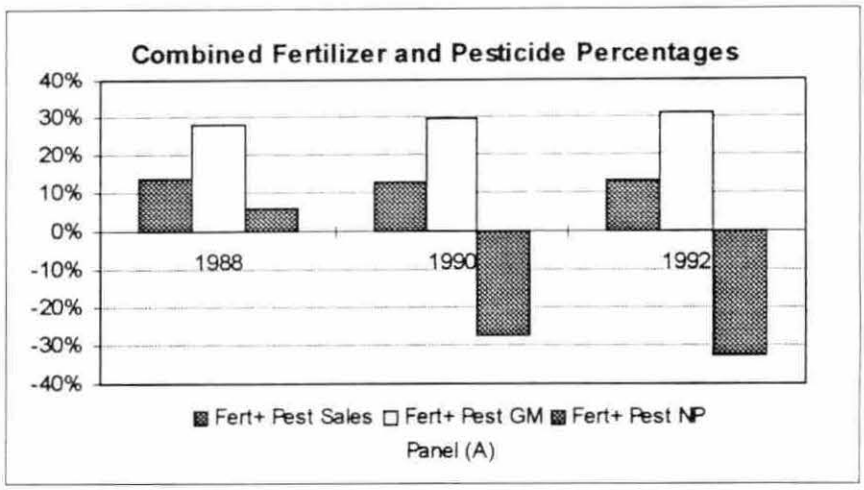
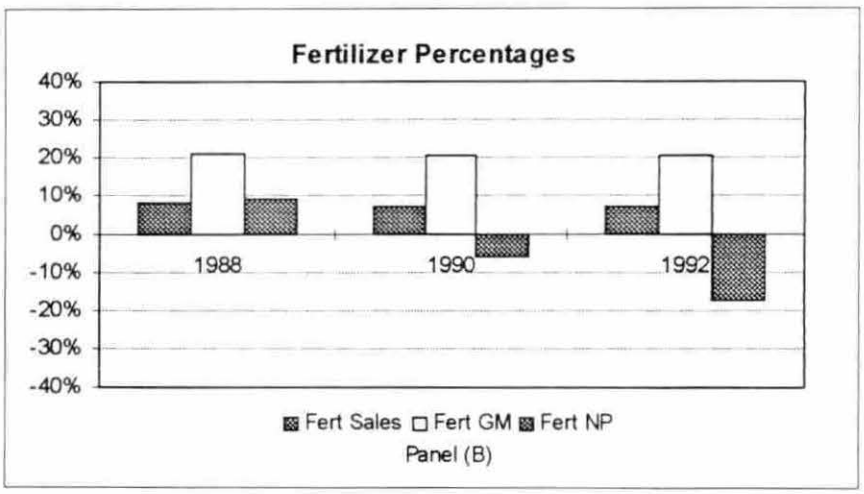


Figure 3-19. Net profit category group one average fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits with ICM services





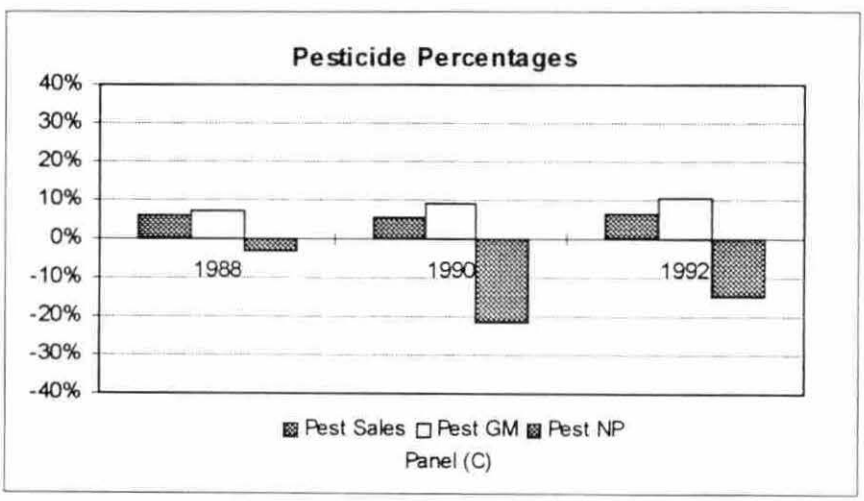


Figure 3-20. Net profit category group two average fertilizer and pesticide percentages of firms' total sales, gross margin, and net profits with ICM services

Table 3-7. Initial and ICM adjusted average sales and net profits for firms categorized by total net profit

GROUP I

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Fertilizer:						
Sales	$1,091,008	$858,657	$1,324,039	$1,009,602	$1,494,993	$118,753
Net Profit	103,468	64,005	107,568	57,628	118,343	59,374
Pesticide:						
Sales	$803,558	$640,393	$1,048,347	$802,171	$1,336,679	$1,004,403
Net Profit	32,175	18,921	39,034	18,223	51,382	23,577
ICM:						
Sales	-	$87,215	-	$106,473	-	$114,848
Net Profit	-	4,932	-	23,194	-	31,135
Total Firm:						
Sales	$13,969,037	$13,573,521	$16,061,557	$15,500,944	$17,901,048	$17,192,533
Net Profit	510,871	463,086	350,724	303,169	325,498	269,860

GROUP II

	1988		1990		1992	
Profit Center	Initial State	ICM	Initial State	ICM	Initial State	ICM
Fertilizer:						
Sales	$1,347,001	$987,216	$1,435,891	$1,053,008	$1,478,398	$1,072,214
Net Profit	63,728	18,244	39,190	(3,710)	3,600	(34,210)
Pesticide:						
Sales	$985,122	$722,087	$1,147,563	$838,829	$1,291,759	$954,164
Net Profit	7,357	(6,229)	6,566	(13,719)	(11,970)	(29,454)
ICM:						
Sales	-	$123,250	-	$128,162	-	$128,798
Net Profit	-	31,684	-	36,342	-	36,945
Total Firm:						
Sales	$13,125,150	$12,502,330	$15,538,653	$14,847,038	$15,843,223	$15,099,444
Net Profit	223,849	196,463	42,320	15,476	(134,511)	(152,860)

the net profit contribution from grain handling and merchandising created a situation where firms' average total net profit was negative even for the initial state column. The addition of fee-based ICM services and the consequent reduction in fertilizer and pesticides sales was amplified the lower profit half of the industry. Average initial state net profit (loss) for the low profit group in 1992 was $(134,511) and dropped to $(152,860) with the addition of ICM

services. Firms with losses of this magnitude are not likely to have the financial resources necessary to fully develop and market fee-based ICM services.

For the high profit half of the industry the fertilizer and pesticide percentage share of firm net profits declined. However, the reduction observed for this group was less than the reduction seen in any of the other grouping categories analyzed. The only other group category that displayed increasing net profits for both fertilizer and pesticides over the study period was the least specialized firms as revealed in Figure 3-16. Figure 3-19 panels (B) and (C) show that both profit centers have increased their percentage share of firm net profits. Combined fertilizer and pesticide share of net profit was almost 18% in 1988, 25% in 1990, and had increased to nearly 31% by 1992. Table 3-8 also shows that on average total firm dollar net profits for group one were the largest of all grouping categories. Firms positioned in this segment were considered to be in the best position of any firm type to establish fee-based ICM services.

CHAPTER IV. CONCLUSIONS

A. Purpose of Research

The objective of this study was to model a hypothetical fee-based ICM service into existing GMIS cooperatives and observe how these firms would be affected by the consulting service. Complete ICM service programs at the time of this paper's publication are only beginning to be offered by either cooperative or investor owned GMIS firms. Much of the actual effects have yet to be observed.

In the course of this study's development many assumptions were made based on current independent ICM businesses and academic research. All assumptions were made to reflect crop production practices in Iowa at the time of publication, and were adjusted to provide this study with value over time.

B. Results and Findings

Cooperative GMIS sources of total sales and net profits were not closely related. It was discovered that while grain sales accounted for on average about 60% of all firm sales, only in 1988 did this product category on average contribute positively to total net profits. The decline in contributions to total firm net profits was due mainly to a reduction in grain storage and other revenue over the study time frame rather than a reduction in product margins. This correlates with a change in the government storage programs and an overall decline in grain stocks from poor growing seasons.

Feed, fertilizer, and pesticide average share of total firm sales also remained relatively constant over the study time period. However, their role in contributing to total firm net profit greatly intensified. Fertilizer led all other product categories in the generation of firm net profits at about 40% during the study period. Pesticide on average contributed roughly

12% to firm net profit. Fertilizer and pesticide's combined product sales of approximately 15% generated on average 52% of firms' net profit over the study period. Dependency on these two product lines intensified in 1990 and 1992 as the grain profit center began to lose money. The concentration of firm net profit in fertilizer and pesticide profit centers created a situation whereby any reduction in their sales would create a noticeable impact on firms' total net profit.

On average GMIS cooperatives were generated lower profits after the effects of marketing fee-based ICM services are considered. Under the restrictive assumption that only their current product trade area would be serviced, ICM services failed to fully replace lost fertilizer and pesticide sales and net profits. Average net profits fell from a high in 1988 at $373,011 to $64,952 in 1992 for the initial and ICM modeled state respectively. On average firm net profit declined by over 61% from initial state levels over the study period when firms incorporated ICM service. But most of this reduction occurred independently of whether an ICM service was started. Profits declined from $373,011 to $101,806 in the initial state analysis.

Firms were differentially affected by marketing fee-based ICM services. The cooperatives most specialized in selling fertilizer and pesticides experienced a decline in profits of almost 62% in 1992. This implies an average dollar reduction of $68,419. For cooperatives grouped based on size rankings no real conclusions could be drawn about whether or not smaller firms would find it profitable to start an ICM service. The lack of an adequate number of smaller firms with service territories large enough to support an ICM service at the given budget break-even requirement made it difficult to draw reliable conclusions. It is unlikely that cooperatives with the lowest firm net profits will be able to successfully market ICM services independently. The lack of adequate trade area and financial resources to start a service and maintain it during development period will be a serious barrier. However, both the smaller and the low profit firms may be able to work together with neighboring firms, or contract with an independent crop consultant to provide services to their customers. Not all small firms were also low profit firms. Some firms

ranked in the industry net profit bottom half may have an adequate size of service territory to offer ICM services, but probably are not in a position finance the development period for any new product lines or services. This is especially true if their most profitable product categories (ie. fertilizer and pesticides) experience a decline in profits during and after the development of a fee-based ICM service program.

C. Industry Implications

Although no one type of firm is totally excluded from marketing fee-based ICM, some firms were found to be in a much better position to offer such services. One minimum criteria that all GMIS firms must meet to successfully market ICM services is the acreage committed to ICM services. Based on the ICM budget developed a firm should have at least 13,500 acres subscribed from its service territory to begin to marketing an ICM service. Firms size appeared to be an important factor. For a firm to be large enough to marketing an ICM service at a profit it appears to need around $15,000,000 in total sales. While smaller firms more specialized in input sales with less than $15,000,000 total sales could succeed they must be able to subscribe enough ICM acres to break-even. The study indicates that such smaller specialized firms may be worse off than larger firms with a more diversified (fertilizer and pesticides generating high not profits) in their commodity or product sales base. This occurred because the two product categories are negatively affected by an ICM service. Finally, a firm that is losing money is not likely to have the resources and the willingness to undertake an investment in an ICM service which will not immediately improve profit position and which could actually increase the size of their losses. Therefore, a likely firm profile that would be able to market a fee-based ICM service is as follows: (1) total firm sales over $15,000,000, (2) diversified product mix, and (3) a positive total firm net profit.

D. Forecast of ICM Services in Grain Marketing and Input Supply Firms

This study indicates that GMIS cooperatives net margins will be negatively affected by the addition of ICM services. However, some firms are likely to offer programs despite the absence of large profits. Several non profit factors and motives exit for GMIS firms to offer fee-based ICM services even at a loss. GMIS firms may offer ICM services at a loss to continue or build goodwill with their customers. ICM services are designed to economically through reduced input costs per acre, increased yields, or a combination of both. Firms unable to meet such customer needs may lose patrons to competitors who do. The larger volume customers who are most likely to demand ICM services can have a strong influence on GMIS firms to provide these services.

Firms that decide to establish a fee-based ICM service will have the incentive to go beyond their existing product trade area to secure ICM clients. Incentive to go beyond the firm's existing trade area will be greater if the firms outside the trade area do not have an ICM service program. Expansion beyond the existing trade area would provide extra income to the GMIS firm and moderate some of the profit reduction modeled in this study where operation was assumed to be limited to the existing trade area. An ideal situation would be to have most ICM clients coming from outside the firm's trade area. Since ICM customers would be purchasing at least some of their inputs from competing firms the reduction in product sales would be born by the competition and the ICM service would belong to the firm offering the ICM service program. This situation would allow some of the lost fertilizer and pesticide sales to be recovered from the competition and produce a higher ICM service profit.

In the long run GMIS firms offering ICM services might recover some of the lost profits from reduced fertilizer and pesticide product sales by adjusting their fixed assets. ICM services for this study were modeled in the short run, and firms were not allowed to significantly vary fixed costs. In the longer run firms will have enough time to adjust to the

reduction in fertilizer and pesticide product sales levels, and bring their fixed assets in line with reduced demand. These adjustments might allow a firm to return to the profit level position which existed before the ICM service activity was added.

Finally, one of the most important factors that may drive GMIS firms to offer ICM services is the need to capture some of the lost income from the recommendation made by outside crop consultants. As either independent crop consultants, or other GMIS firms' crop consultants charge producers for making ICM cropping recommendations and helping the producer maximize profits the ICM income is lost. Since ICM recommendations for profit maximization often involve reductions input usage, especially fertilizer and pesticides a GMIS firm not offering the service could also lose profits from product sales. This translates into reduced product sales and profits for GMIS firms. Thus, those GMIS firms who fail to develop an internal ICM service program for their customers will lose not only money from reduction in input purchases, but also potential income which could be generated by selling ICM services. Although, ICM income may not fully replace lost profits from product sales it will replace at least some of the lost profits. Consequently, even though GMIS firms may lose money overall by providing a fee-based ICM service, they would lose even more money if they offer no ICM services and the competitors do.

BIBLIOGRAPHY

Amos, Franklyn B. Jr., James L. Baker, Donald R. Timmons, and Rameshwar S. Kanwar. Optimum time(s) of nitrogen application to improve nitrogen use efficiency and reduce leaching. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1990. Integrated Farm Management Demonstration Program Progress Report.

Baker, James L., Donald R. Timmons, Rameshwar S. Kanwar, and Franklyn B. Amos, Jr. Optimum time(s) of nitrogen application to improve nitrogen use efficiency and reduce leaching. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1991. Integrated Farm Management Demonstration Program Progress Report.

Blackmer, Alfred M. Operating procedures for use of the late-spring soil test by fertilizer dealers and consultants in Iowa. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1993. Report No. 89-28.

Brown, Susan S., Kay A. Connelly, and Gerald A. Miller. Iowa State University Extension Handbook for Integrated Pest Management. Version 1.0. Ames, Iowa: Iowa State University Extension, 1993.

Carver, Nancy. "Model Farms helped boost producer profitability." Wallaces Farmer, February 1994, 12-13.

Colvin, Thomas S. On-farm demonstration of alternate tillage systems for energy conservation. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1990. Integrated Farm Management Demonstration Program Progress Report.

Connelly, Kay A. "What is ICM?." Lecture presented at the ICM Dealer Project meeting in Okoboji, Iowa on 23-24 August, 1993.

Contant, Cheryl K., Michael D. Duffy, and Maureen A. Holub. Tradeoffs between water quality and profitability in Iowa agriculture. Iowa City, Iowa: Public Policy Center, University of Iowa, 1993.

Cruse, Richard M., and Thomas S. Colvin. Effect of different tillage systems on energy conservation. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1990. Integrated Farm Management Demonstration Program Progress Report.

Duffy, Michael D., and Alan Vontalge. "Estimated costs of crop production in Iowa, 1995." Ames, Iowa: Department of Economics, Iowa State University Extension, January, 1995.

Frieberg, Kathleen, R. "A business plan for offering integrated crop management services." M.S. thesis. Iowa State University. Ames, Iowa, 1993.

Gannon, Eileen, M., and Roger G. Ginder, "Evaluating future strategies for Iowa farmer-owned cooperatives in supplying agricultural products and services: An assessment of Integrated Crop Management serivces." Ames, Iowa: Leopold Center for Sustainable Agriculture, 1992.

Ginder, Roger G. "Establishing integrated crop management services in Iowa agricultural input supply and marketing firms." Ames, Iowa: Department of Economics, Iowa State University, January, 1995. staff paper.

Ginder, Roger G. "Farm input suppliers in sustainable agriculture." Building Bridges: Cooperative research and education for Iowa agriculture. In Proceedings of the 1992 Leopold Center for Sustainable Agriculture third annual conference held in Ames. IA 18- 19 February 1992, edited by E. F.Weber, E. A. Larson, 29-37. Ames: Leopold Center for Sustainable Agriculture, 1992.

Ginder, Roger G., and Kay A. Connelly. "Workshop Case Materials." Department of Economics, Iowa State University. Ames, Iowa, March, 1993.

Hartzler, Robert G., Thomas B. Smidt. Utilizing potential weed pressures to improve efficiency of weed management programs. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1993. Report No. 90-20.

Hoffman, Wendy L. Stemming the Flow. With a Foreword by Kenneth A. Cook. Washington, D.C.: By the Environmental Working Group, 1993.

Ikerd, John. "Economic and environmental trade-offs in farming." Building Bridges: Cooperative research and education for Iowa agriculture. In Proceedings of the 1992 Leopold Center for Sustainable Agriculture third annual conference held in Ames. IA 18- 19 February 1992, edited by E. F. Weber, E. A. Larson, 39-48. Ames: Leopold Center for Sustainable Agriculture, 1992.

Jurik, Thomas W. Weed population dynamics in ridge-tiled soybeans with and without herbicides. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1993. Report No. 89-19.

Killorn, Randy, Regis Voss, and Joyce Hornstein. Nitrogen management demonstrations. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1990. Integrated Farm Management Demonstration Program Progress Report.

Nowak, Peter, Steven Wolf, Heather Hartley, and Robert McCallister. Assessment of 1992 Wisconsin Atrazine rule (Ag30). Madison, Wisconsin: University of Wisconsin, 1993.

Nowak, Peter. "Regulations versus incentives-a frame work for change." Building Bridges: Cooperative research and education for Iowa agriculture, In Proceedings of the 1992 Leopold Center for Sustainable Agriculture third annual conference held in Ames. IA 18-19 February 1992, edited by E. F. Weber, E. A. Larson, 7-14. Ames: Leopold Center for Sustainable Agriculture, 1992.

Padgitt, Steve. "Northwest Iowa farm supply dealers survey report." Ames: Iowa State University Extension, 1993.

Padgitt, Steven C. Lessons from monitoring surveys. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1991. Integrated Farm Management Demonstration Program Progress Report.

Roberts, Rebecca S., and David Lighthall. A developmental approach to the adoption of low-input farming practices. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1993. Report No. 89-35.

Petrzelka, Peggy. "Crop consulting in Iowa: A survey of farmer users and numbers." Ames, Iowa: Department of Sociology, Iowa State University Extension, 1995.

Rolling, Nicholas R., Gerald A. Miller, and Vincent McFadden. On-farm management services project. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1990. Integrated Farm Management Demonstration Program Progress Report.

Siqueira, Kevin, and Roger G. Ginder. "A club model of integrated crop management."Ames, Iowa: Department of Economics, Iowa State University, January, 1995. staff paper.

Smidt, Thomas B., Kay A. Connelly, Dale R. Thoreson, and Regis D. Voss. Integrated crop management project. Ames, Iowa: Leopold Center for Sustainable Agriculture, 1990. Integrated Farm Management Demonstration Program Progress Report.

U.S. Departmant of Commerce. 1992 Census of Agriculture, Iowa. Washinton D.C.: Bureau of the Census, 1994.

Walter, John, and Mike Holmberg. "Leave it to the dealer?." Successful Farming, November, 1993, 14-15.

Williams, Myron. "Farming fields foot by foot." Iowa Farmer Today, 23 April 1994, 1, 1-10.

Wolf, Steven, Nowak, Peter. "The Statue of information-based agrichemical management services in Wisconsin's agrichemical supply industry." Wisconsin Agrichemical Dealers Project. Madison: University of Wisconsin, 1994.

Wolf, Steven, Peter Nowak, Robert McCallister, Jonathan Leitner, and Don Ferber. "Competition in agrichemical supply markets: Implications for farmers' use of agrichemical management services." Wisconsin Agrichemical Dealers Project. Madison, Wisconsin: University of Wisconsin, 1994.

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APPENDIX A. EXPENSE ALLOCATION PROCEDURES

COST-AL revealed that variable costs tended to track gross profit more closely, while costs largely fixed tended to be more accurately allocated based on sales. This was discovered to be opposite of the experimental hypothesis that variable and fixed costs parallel sales and gross profit respectively. One explanation to discount the hypothesis was that some firms had low gross profits but relatively high sales figures. Fixed cost allocations were skewed in these situations when costs were allocated based on gross profit even though they had relatively large total firm sales. These firms must have a large amount of "fixed expenses" in order to service the high sales volume, thus fixed costs were allocated based on sales and variable costs allocated based on gross profit.

Expenses allocated based on sales were as follows: utilities, repairs and maintenance, local taxes and licenses, advertising, bad debt loss, truck, and telephone and telegraph. Bad debt loss was allocated to all product centers except grain, which would not incur the expense in most cases. Common expenses allocated based on gross profit were as follows: depreciation, rent and lease, insurance, supplies, accounting/legal, interest, total employee expenses except ICM managers, and other expenses.

While reviewing cooperatives' financial statements it was noticed that occasionally a profit center's cost of goods sold exceeded sales and produced a negative gross margin. In actual practice product lines are not categorized and a firm may be selling a product below cost due to shrinkage, theft, or other inventory related factors. Negative gross margins posed a problem in allocating expenses when the added service revenue was less than the gross margin. This situation resulted in a negative gross profit. Allocating expenses with a negative gross profit would have created a situation where some of the profit center's expense items would be negative rather than positive. Negative expense items subtracted from the gross profit would essentially add to the cooperative's net profit and distort the true result.

To systematically address this problem, in those cases where it occurred, product categories (except grain) with negative gross margin the cost of goods sold was set equal to sales. While this did not occur frequently it was expedient to avoid distorting profit center averages. The assumption behind this was that under normal circumstances a firm would not knowingly sell a supply product below cost if product categories were being viewed as individual profit centers. However, the hedging component of grain marketing and accounting practice of marking contracts to market when the balance sheet is drawn up, may put a firm in a negative gross margin situation for grain marketing. In all cases in which grain gross margins were negative, the grain service revenue more than compensated for grain's negative gross margin. Since there were no adverse affects to expense allocations, grain profit center did not need to be corrected.

APPENDIX B. ALTERNATIVE FIRM GROUPINGS

Category grouping based on firms specialization in fertilizer and pesticide were intended to be four mutually exclusive groups. The actual grouping division was to be based upon the percentage of total firm sales from fertilizer and pesticide. Percentage groups were to be as follows: group one with 0-10%, group two with 10-15%, group three with 15-20%, and group four with firms having 20% or more of their total sales in fertilizer and pesticide. When the category groupings were produced the seventy-one firm sample size were distributed in 1992 as follows: group one with 14 firms, group two with 23 firms, group three with 15 firms, and group four with 19 firms.

Category groupings based on total firm sales and net profit were each initially divided into three groups based on thirds. The intended number of firms per category group were to be as follows: group one with 24 firms, group two with 23 firms, and group three with 24 firms. Actual division between groups in the total sales category occurred in 1992 as follows: group one total sales ranged from $3,642,383 to $9,513,578, group two firms ranged from $9,702,432 to $17,683,516, and group three firms ranged from $17,797,059 to $54,928,956 in total sales. In the total firm net profit category group divisions occurred in 1992 as follows: group one total firm net profits ranged from ($832,963) to $18,408, group two firms ranged from $24,141 to $198,099, and group three ranged from $206,308 to $887,786 in total firm net profit.

APPENDIX C. ISSUES IN CALCULATING INDUSTRY AVERAGES

In the course of calculating means, two ways of obtaining industry averages were researched. One method involved averaging firms together on the aggregate level and another method research was summing averages income statement items individually in the profit centers. Theoretically either method would produce the same result, but some firms did not participate in all product categories, different results were obtained. When this occurred different results raised a methodological question. The validity of calculating industry averages with zeros representing missing profit centers was the main issue. In essence calculating profits with zero values underestimated the true average of the firms that were actually marketing the commodity or product item although it gave an accurate indication of the average for all firms in the sample.

The fact that a large number of firms were not engaged in selling all the commodities or products available lead the researcher to calculate industry averages with missing values rather than zeros. Table C-1 reveals the total number profit centers in each product category in the sample and during the sampling time frame. Since firms not marketing a profit center would distort the

Table C-1. The total number of firms initially engaged in each department for the years 1988, 1990, 1992

	No. of Firms in Each Profit Center		
Profit Center	1988	1990	1992
Grain	66	65	65
Feed	70	69	69
Seed	68	69	68
Fertilizer	71	71	71
Pesticide	71	71	71
Petrolum	53	54	55
Supplies	69	69	69

industry average for that profit center, missing profit centers were excluded from the product category average.

Generally industry averages calculated with zeros for missing profit centers are expected to be lower than only averaging profit center that have product sales. This was generally the case except for industry averages calculated in 1992 as shown in table C-2. Years 1988 and 1990 follow what one would expect when calculating industry using zeros to represent missing profit centers. Further research into this area found the discrepancy for 1992 to be due to the number and magnitude of firms with negative net profits. Table C-3 illustrates the number and magnitude of firms with losses for the years 1988, 1990, and 1992. The following example further illustrates the disparity in 1992. Of the twenty firms that were losing money, twelve firms had losses exceeding ($100,000), and only twenty-four firms that had total profits above $200,000. Therefore, the 1992 industry averages calculated with missing values to represent lack of activity in a profit center were understated when compared to averages calculated with zeros. This occurred due to the positive influence zeros had on the averages given the number of firms with losses and the magnitude of those losses.

Table C-2. Industry averages with and without zeros for year 1988, 1990, and 1992

	1988	1990	1992
Industry average including zeros	$354,983	$194,817	$111,449
Industry average not including zeros	$373,011	$201,444	$101,806

Table C-3. Number and range of firm losses and profits for years 1988,1990, and 1992

	Distribution of Firm Loses				Distribution of Firm Profits		
	Lowest	Highest	No. of Firms		Lowest	Highest	No. of Firms
1988	$ (63,934)	$ (43,621)	3	1988	$ 10,210	$2,533,514	68
1990	(335,648)	(23,946)	11	1990	2,321	1,068,276	60
1992	(832,963)	(11,204)	20	1992	1,026	887,786	51

APPENDIX D. CHAPTER THREE FIGURE DATA

Table D-1. Data for figure 3-1

	1988	1990	1992
Grain	62.51%	63.35%	62.43%
Feed	9.12%	8.51%	9.23%
Seed	0.96%	0.69%	0.75%
Fert	8.97%	8.72%	8.79%
Pest	6.58%	6.94%	7.77%
Petro	10.16%	10.33%	9.58%
Supplies	1.69%	1.45%	1.45%

Table D-2. Data for figure 3-2

	1988	1990	1992
Grain	38.36%	-0.49%	-50.67%
Feed	17.46%	29.41%	50.50%
Seed	0.80%	0.75%	0.84%
Fert	22.52%	36.71%	60.54%
Pest	5.37%	11.48%	19.65%
Petro	13.54%	18.89%	14.95%
Supplies	1.93%	3.26%	4.18%

Table D-3. Data for figure 3-3

	1988		1990		1992	
	Fert	Pest	Fert	Pest	Fert	Pest
GM	23.27%	10.35%	23.19%	12.31%	23.71%	13.18%
SR	4.77%	5.02%	5.02%	5.19%	5.26%	5.38%
GP	28.04%	15.37%	28.20%	17.50%	28.97%	18.56%
NP	6.90%	2.24%	5.36%	2.11%	4.15%	1.52%

Table D-4. Data for figure 3-4

	1988		1990		1992	
	Fert	Pest	Fert	Pest	Fert	Pest
Sales	8.97%	6.58%	8.72%	6.94%	8.79%	7.77%
GM	23.23%	7.58%	24.25%	10.24%	24.50%	12.04%
SR	8.60%	6.64%	12.35%	10.18%	13.72%	12.42%
GP	18.02%	7.24%	20.70%	10.22%	21.44%	12.15%
NP	22.52%	5.37%	36.71%	11.48%	60.54%	19.65%

Table D-5. Data for figure 3-5

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	13.79%	22.46%	24.13%	12.86%	12.46%	12.85%	9.30%	10.00%	11.28%
GM	37.41%	40.48%	42.48%	28.05%	27.53%	28.38%	9.36%	12.95%	14.10%
NP	37.09%	51.83%	82.68%	30.41%	39.31%	66.01%	6.68%	12.52%	16.66%

Table D-6. Data for figure 3-6

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	9.65%	9.76%	10.05%	5.51%	5.48%	5.29%	4.14%	4.28%	4.76%
GM	22.07%	25.84%	28.20%	16.86%	19.65%	19.06%	5.21%	6.20%	9.14%
NP	20.14%	43.23%	75.77%	15.83%	33.13%	52.66%	4.30%	10.10%	23.11%

Table D-7. Data for figure 3-7

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	15.11%	15.11%	16.48%	8.85%	8.46%	8.85%	6.26%	6.65%	7.63%
GM	30.02%	33.91%	36.89%	22.98%	24.08%	25.10%	7.05%	9.83%	11.79%
NP	28.44%	48.45%	77.75%	22.95%	36.94%	59.17%	5.49%	11.51%	18.57%

Table D-8. Data for figure 3-8

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	16.79%	17.14%	17.29%	9.38%	9.43%	8.94%	7.41%	7.71%	8.35%
GM	33.06%	36.30%	36.40%	24.11%	24.95%	23.56%	8.95%	11.34%	12.84%
NP	25.58%	48.52%	82.60%	20.74%	36.80%	60.72%	4.84%	11.72%	21.89%

Table D-9. Data for figure 3-9

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	13.56%	14.77%	15.82%	7.81%	8.24%	8.35%	5.75%	6.53%	7.47%
GM	27.43%	32.25%	34.89%	20.69%	23.36%	23.88%	6.74%	8.89%	11.02%
NP	26.55%	41.80%	52.14%	20.25%	30.67%	36.36%	6.30%	11.13%	15.79%

Table D-10. Data for figure 3-10

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	8.55%	16.63%	17.48%	1.04%	9.24%	9.33%	7.51%	7.39%	8.15%
GM	34.73%	36.89%	38.53%	26.17%	25.20%	25.26%	8.56%	11.69%	13.27%
NP	31.76%	51.78%	34.68%	28.47%	44.35%	43.06%	3.29%	7.43%	-8.38%

Table D-11. Data for figure 3-11

	1988	1990	1992
Grain	64.94%	65.96%	65.23%
Feed	9.48%	8.86%	9.65%
Seed	1.00%	0.72%	0.79%
Fert	7.05%	6.79%	6.77%
Pest	5.21%	5.40%	6.05%
Petro	10.56%	10.76%	10.01%
Supplies	1.76%	1.51%	1.51%
ICM	0.78%	0.76%	0.75%

Table D-12. Data for figure 3-12

	1988	1990	1992
Grain	42.92%	-0.61%	-80.26%
Feed	19.53%	36.31%	80.00%
Seed	0.90%	0.92%	1.33%
Fert	12.47%	16.83%	20.47%
Pest	1.98%	1.56%	-4.13%
Petro	15.15%	23.32%	23.69%
Supplies	2.16%	4.03%	6.62%
ICM	4.89%	17.64%	52.29%

Table D-13. Data for figure 3-13

	1988		1990		1992	
	Fert	Pest	Fert	Pest	Fert	Pest
GM	23.14%	10.29%	23.12%	12.13%	23.68%	13.14%
SR	4.77%	5.04%	5.03%	5.22%	5.30%	5.43%
GP	27.92%	15.33%	28.14%	17.34%	28.98%	18.57%
NP	5.62%	1.56%	3.92%	1.15%	2.58%	-0.57%

Table D-14. Data for figure 3-14

	1988		1990		1992	
	Fert	Pest	Fert	Pest	Fert	Pest
Sales	7.83%	5.76%	7.57%	6.02%	7.59%	0.68%
GM	20.67%	6.77%	21.66%	9.04%	21.84%	10.78%
SR	6.49%	5.05%	8.94%	7.38%	9.91%	9.03%
GP	15.05%	6.09%	17.27%	8.47%	17.90%	10.21%
NP	16.41%	3.35%	24.16%	5.62%	34.97%	-6.80%

Table D-15. Data for figure 3-15

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	16.84%	16.76%	18.12%	9.73%	9.28%	9.60%	7.11%	7.48%	8.52%
GM	29.61%	31.95%	33.85%	22.14%	21.81%	22.55%	7.47%	10.14%	11.30%
NP	14.81%	11.32%	-33.82%	13.85%	13.24%	1.13%	0.96%	-1.92%	-34.95%

Table D-16. Data for figure 3-16

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	8.47%	8.50%	8.59%	4.84%	4.79%	4.50%	3.63%	3.70%	4.08%
GM	19.67%	23.00%	24.80%	15.01%	17.43%	16.69%	4.66%	5.57%	8.11%
NP	14.67%	26.89%	43.18%	11.82%	21.37%	31.13%	2.85%	5.52%	12.05%

Table D-17. Data for figure 3-17

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	11.29%	11.10%	12.01%	6.59%	6.20%	6.42%	4.70%	4.89%	5.59%
GM	23.23%	26.13%	28.74%	17.78%	18.68%	19.51%	5.45%	7.45%	9.23%
NP	12.89%	14.20%	-1.78%	11.32%	14.30%	12.20%	1.58%	-0.10%	-13.98%

Table D-18. Data for figure 3-18

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	14.67%	14.95%	15.14%	8.23%	8.27%	7.81%	6.45%	6.68%	7.33%
GM	29.56%	32.58%	32.70%	21.58%	22.64%	21.21%	7.98%	9.95%	11.49%
NP	5.23%	4.08%	2.88%	4.40%	3.32%	2.30%	0.83%	0.75%	0.58%

Table D-19. Data for figure 3-19

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	11.04%	11.69%	12.35%	6.33%	6.51%	6.51%	4.72%	5.17%	5.84%
GM	22.76%	26.45%	28.60%	17.11%	19.19%	19.50%	5.65%	7.27%	9.11%
NP	17.91%	25.02%	30.74%	13.82%	19.01%	22.00%	4.09%	6.01%	8.74%

Table D-20. Data for figure 3-20

	Fertilizer + Pesticides			Fertilizer			Pesticides		
	1988	1990	1992	1988	1990	1992	1988	1990	1992
Sales	13.67%	12.74%	13.42%	7.90%	7.09%	7.10%	5.78%	5.65%	6.32%
GM	27.84%	29.68%	31.28%	20.99%	20.49%	20.46%	6.85%	9.20%	10.82%
NP	6.12%	-27.46%	-32.72%	9.29%	-5.84%	-17.58%	-3.17%	-21.61%	-15.14%

Table E-1. 1988 Calculated industry averages for profit centers- All firms

	Amounts	Grain	Feed	Seed	Fert	Pest	Petro	Supplies
Sales	$ 13,577,072	8,487,300	1,238,739	130,805	1,217,202	893,024	1,379,924	230,078
Cost of Goods Sold	$ 12,357,748	8,157,541	1,030,412	112,827	933,904	800,571	1,132,678	189,815
Gross Margin	1,219,324	329,760	208,328	17,978	283,298	92,453	247,246	40,262
Service & Other Revenue	675,523	484,553	46,678	2,486	58,066	44,824	34,322	4,593
Gross Profit	1,894,847	814,313	255,006	20,464	341,363	137,277	281,568	44,856
Expenses:								
Total Employee	624,734	242,684	83,281	7,245	120,587	48,273	106,046	16,617
Insurance	74,115	30,296	9,729	832	13,953	5,659	11,872	1,775
Interest	114,529	52,822	12,056	1,248	20,502	8,732	16,549	2,619
Depreciation	221,018	103,728	29,860	2,227	36,873	14,971	28,651	4,709
Licenses & Taxes	56,231	35,891	5,209	536	4,894	3,611	5,059	1,031
Lease & Rental	26,934	12,043	3,660	371	4,475	1,865	3,871	650
Repair & Maintenance	105,752	54,961	9,849	1,203	13,003	9,443	15,067	2,225
Vehicle Expenses	82,130	37,588	8,688	1,036	10,654	7,610	14,412	2,141
Supplies	24,772	11,136	3,299	293	4,312	1,725	3,442	566
Utilities	57,016	36,230	5,430	629	4,816	3,581	5,346	983
Telephone	12,802	5,537	1,171	169	1,832	1,336	2,403	354
Advertising	19,848	9,493	2,291	286	2,361	1,715	3,218	484
Professional Services	13,612	5,917	1,741	147	2,458	984	2,039	326
Bad Debt	13,289	-	3,514	387	3,211	2,178	2,574	1,426
Other Expenses	75,053	32,882	10,095	871	13,415	5,559	10,498	1,734
ICM Manager(s)	-	-	-	-	-	-	-	-
Lab Fees	-	-	-	-	-	-	-	-
Total Expenses	$ 1,521,836	671,208	189,873	17,479	257,347	117,243	231,045	37,640
Net Savings/(Loss)	$ 373,011	143,104	65,133	2,985	84,016	20,034	50,523	7,216
71 Firms		n=66	n=70	n=68	n=71	n=71	n=53	n=69

Table E-2. 1990 Calculated industry averages for profit centers- All firms

	Amounts	Grain	Feed	Seed	Fert	Pest	Petro	Supplies
Sales	$ 15,809,668	10,015,423	1,346,008	108,709	1,379,177	1,097,256	1,633,339	229,756
Cost of Goods Sold	$ 14,490,717	9,711,649	1,119,668	93,663	1,059,374	962,226	1,354,810	189,327
Gross Margin	1,318,950	303,774	226,339	15,046	319,804	135,030	278,528	40,429
Service & Other Revenue	560,082	336,753	52,190	2,098	69,178	56,998	38,351	4,513
Gross Profit	1,879,032	640,527	278,529	17,144	388,981	192,029	316,880	44,942
Expenses:								
Total Employee	713,958	225,602	103,979	7,095	152,553	75,695	130,690	18,343
Insurance	78,182	26,964	11,343	709	16,377	7,920	12,999	1,870
Interest	141,185	53,172	16,353	1,307	28,998	14,600	23,629	3,126
Depreciation	227,694	87,831	33,710	1,877	44,610	21,667	33,228	4,771
Licenses & Taxes	60,070	38,707	5,239	426	5,067	4,066	5,643	921
Lease & Rental	26,292	9,119	2,616	240	5,677	3,112	5,035	494
Repair & Maintenance	113,432	57,326	9,471	1,078	14,158	11,307	17,812	2,279
Vehicle Expenses	94,042	43,155	9,153	959	12,155	9,507	16,913	2,201
Supplies	29,089	10,534	4,195	258	5,959	2,900	4,572	671
Utilities	63,945	41,766	5,490	418	5,138	4,094	6,145	894
Telephone	15,101	6,623	1,305	162	2,106	1,680	2,855	370
Advertising	19,572	9,449	2,005	197	2,375	1,883	3,240	422
Professional Services	15,768	5,762	2,126	140	3,275	1,589	2,564	312
Bad Debt	7,893	-	2,285	110	1,712	1,565	2,006	215
Other Expenses	71,367	25,514	10,023	662	14,863	7,327	11,496	1,482
ICM Manager(s)	-	-	-	-	-	-	-	-
Lab Fees	-	-	-	-	-	-	-	-
Total Expenses	$ 1,677,589	641,524	219,294	15,640	315,023	168,913	278,825	38,370
Net Savings/(Loss)	$ 201,444	(996)	59,235	1,504	73,958	23,116	38,055	6,573
71 Firms		n=65	n=69	n=69	n=71	n=71	n=54	n=69

Table E-3. 1992 Calculated industry averages for profit centers- All firms

	Amounts	Grain	Feed	Seed	Fert	Pest	Petro	Supplies
Sales	$ 16,920,255	10,562,931	1,562,230	127,223	1,486,812	1,314,535	1,621,323	245,202
Cost of Goods Sold	$ 15,481,435	10,253,347	1,291,949	107,183	1,134,244	1,141,306	1,351,393	202,013
Gross Margin	1,438,820	309,584	270,280	20,039	352,569	173,229	269,930	43,189
Service & Other Revenue	569,761	308,967	65,299	2,795	78,166	70,757	39,069	4,707
Gross Profit	2,008,580	618,551	335,579	22,834	430,734	243,986	308,999	47,896
Expenses:								
Total Employee	830,088	240,504	138,460	10,140	180,669	102,230	136,245	21,840
Insurance	92,975	24,133	13,930	1,251	21,601	12,170	17,531	2,360
Interest	137,623	46,398	19,235	1,627	29,900	16,936	21,021	2,506
Depreciation	251,784	86,958	42,874	2,492	51,333	29,162	33,877	5,088
Licenses & Taxes	70,089	44,706	6,343	521	5,917	5,232	6,363	1,007
Lease & Rental	29,699	8,369	4,138	514	6,577	3,944	5,576	581
Repair & Maintenance	125,904	61,650	11,606	1,413	16,325	13,840	18,453	2,618
Vehicle Expenses	104,413	48,856	10,658	1,209	13,503	11,223	16,723	2,241
Supplies	32,784	10,814	5,243	369	6,775	3,907	4,938	738
Utilities	74,309	47,940	7,023	498	5,890	5,254	6,754	949
Telephone	17,988	7,853	1,688	228	2,615	2,158	3,028	418
Advertising	22,528	10,142	2,453	261	2,920	2,450	3,765	537
Profession Services	18,735	6,073	2,933	211	4,031	2,253	2,855	380
Bad Debt	18,906	-	4,528	404	4,371	3,775	5,176	652
Other Expenses	78,949	25,740	13,056	840	16,672	9,442	11,471	1,727
ICM Manager(s)	-	-	-	-	-	-	-	-
Lab Fees	-	-	-	-	-	-	-	-
Total Expenses	$ 1,906,775	670,134	284,168	21,978	369,100	223,977	293,777	43,642
Net Savings/(Loss)	$ 101,806	(51,583)	51,412	856	61,635	20,009	15,223	4,254
71 Firms		n=65	n=69	n=68	n=71	n=71	n=55	n=69

Table E-4. 1988 Calculated industry averages for profit centers adjusted with ICM services- All firms

	Amounts	Grain	Feed	Seed	Fert	Pest	Petro	Supplies	ICM
Sales	$ 13,069,526	8,487,300	1,238,739	130,805	922,031	680,648	1,379,924	230,078	-
Cost of Goods Sold	$ 11,943,865	8,157,541	1,030,412	112,827	709,663	610,929	1,132,678	189,815	-
Gross Margin	1,125,661	329,760	208,328	17,978	212,368	69,719	247,246	40,262	-
Service & Other Revenue	753,602	484,553	46,678	2,486	44,031	34,408	34,322	4,593	102,530
Gross Profit	$ 1,879,263	814,313	255,006	20,464	256,400	104,126	281,568	44,856	102,530
Expenses:									
Total Employee	580,752	242,684	83,281	7,245	88,930	35,948	106,046	16,617	-
Insurance	79,365	30,296	9,729	832	13,953	5,659	11,872	1,775	5,250
Interest	117,529	52,822	12,056	1,248	20,502	8,732	16,549	2,619	3,000
Depreciation	229,868	103,728	29,860	2,227	36,873	14,971	28,651	4,709	8,850
Licenses & Taxes	60,356	35,891	5,209	536	4,894	3,611	5,059	1,031	4,125
Leases & Rent	29,434	12,043	3,660	371	4,475	1,865	3,871	650	2,500
Repair & Maintenance	99,078	54,961	9,849	1,203	9,113	6,661	15,067	2,225	-
Vehicle Expenses	79,122	37,588	8,688	1,036	7,534	5,397	14,412	2,141	2,325
Supplies	24,323	11,136	3,299	293	3,269	1,319	3,442	566	1,000
Utilities	55,883	36,230	5,430	629	3,720	2,795	5,346	983	750
Telephone	13,302	5,537	1,171	169	1,251	917	2,403	354	1,500
Advertising	19,374	9,493	2,291	286	1,719	1,258	3,218	484	625
Professional Services	14,237	5,917	1,741	147	2,458	984	2,039	326	625
Bad Debt	12,476	-	3,514	387	2,728	1,847	2,574	1,426	-
Other Expenses	75,428	32,882	10,095	871	13,415	5,559	10,498	1,734	375
ICM Manager(s)	50,000	-	-	-	-	-	-	-	50,000
Lab Fees	5,303	-	-	-	-	-	-	-	5,303
Total Expenses	$ 1,545,830	671,208	189,873	17,479	214,834	97,522	231,045	37,640	86,228
Net Savings/(Loss)	$ 333,433	143,104	65,133	2,985	41,566	6,605	50,523	7,216	16,302
71 Firms		n=66	n=70	n=68	n=71	n=71	n=53	n=69	n=40

Table E-5. 1990 Calculated industry averages for profit centers adjusted with ICM services- All firms

	Amounts	Grain	Feed	Seed	Fert	Pest	Petro	Supplies	ICM
Sales	$ 15,184,476	10,015,423	1,346,008	108,709	1,030,999	820,242	1,633,339	229,756	-
Cost of Goods Sold	$ 13,984,485	9,711,649	1,119,668	93,663	793,318	722,049	1,354,810	189,327	-
Gross Margin	1,199,991	303,774	226,339	15,046	237,681	98,193	278,528	40,429	-
Service & Other Revenue	644,440	336,753	52,190	2,098	51,914	42,930	38,351	4,513	115,691
Gross Profit	$ 1,844,431	640,527	278,529	17,144	289,595	141,123	316,880	44,942	115,691
Expenses:									
Total Employee	652,975	225,602	103,979	7,095	112,294	54,972	130,690	18,343	-
Insurance	83,432	26,964	11,343	709	16,377	7,920	12,999	1,870	5,250
Interest	144,185	53,172	16,353	1,307	28,998	14,600	23,629	3,126	3,000
Depreciation	236,544	87,831	33,710	1,877	44,610	21,667	33,228	4,771	8,850
Licenses & Taxes	64,195	38,707	5,239	426	5,067	4,066	5,643	921	4,125
Leases & Rent	28,792	9,119	2,616	240	5,677	3,112	5,035	494	2,500
Repair & Maintenance	105,424	57,326	9,471	1,078	9,708	7,750	17,812	2,279	-
Vehicle Expenses	89,646	43,155	9,153	959	8,379	6,563	16,913	2,201	2,325
Supplies	27,858	10,534	4,195	258	4,479	2,150	4,572	671	1,000
Utilities	62,471	41,766	5,490	418	3,898	3,110	6,145	894	750
Telephone	15,333	6,623	1,305	162	1,399	1,118	2,855	370	1,500
Advertising	18,916	9,449	2,005	197	1,662	1,316	3,240	422	625
Professional Services	16,393	5,762	2,126	140	3,275	1,589	2,564	312	625
Bad Debt	7,380	-	2,285	110	1,444	1,320	2,006	215	-
Other Expenses	71,742	25,514	10,023	662	14,863	7,327	11,496	1,482	375
ICM Manager(s)	50,000	-	-	-	-	-	-	-	50,000
Lab Fees	5,984	-	-	-	-	-	-	-	5,984
Total Expenses	$ 1,681,271	641,524	219,294	15,640	262,130	138,580	278,825	38,370	86,909
Net Savings/(Loss)	$ 163,159	(996)	59,235	1,504	27,465	2,543	38,055	6,573	28,782
71 Firms		n=65	n=69	n=69	n=71	n=71	n=54	n=69	n=40

Table E-6. 1992 Calculated industry averages for profit centers adjusted with ICM services- All firms

	Amounts	Grain	Feed	Seed	Fert	Pest	Petro	Supplies	ICM
Sales	$ 16,194,356	10,562,931	1,562,230	127,223	1,095,812	979,637	1,621,323	245,202	-
Cost of Goods Sold	$ 14,893,668	10,253,347	1,291,949	107,183	836,635	851,147	1,351,393	202,013	-
Gross Margin	1,300,688	309,584	270,280	20,039	259,176	128,490	269,930	43,189	-
Service & Other Revenue	653,579	308,967	65,299	2,795	58,405	53,560	39,069	4,707	120,777
Gross Profit	$ 1,954,267	618,551	335,579	22,834	317,581	182,050	308,999	47,896	120,777
Expenses:									
Total Employee	754,346	240,504	138,460	10,140	131,710	75,448	136,245	21,840	-
Insurance	98,225	24,133	13,930	1,251	21,601	12,170	17,531	2,360	5,250
Interest	140,623	46,398	19,235	1,627	29,900	16,936	21,021	2,506	3,000
Depreciation	260,634	86,958	42,874	2,492	51,333	29,162	33,877	5,088	8,850
Licenses & Taxes	74,214	44,706	6,343	521	5,917	5,232	6,363	1,007	4,125
Lease & Rent	32,199	8,369	4,138	514	6,577	3,944	5,576	581	2,500
Repair & Maintenance	116,268	61,650	11,606	1,413	11,057	9,472	18,453	2,618	-
Vehicle Expenses	99,153	48,856	10,658	1,209	9,307	7,833	16,723	2,241	2,325
Supplies	31,094	10,814	5,243	369	5,038	2,953	4,938	738	1,000
Utilities	72,375	47,940	7,023	498	4,448	4,013	6,754	949	750
Telephone	17,879	7,853	1,688	228	1,724	1,440	3,028	418	1,500
Advertising	21,464	10,142	2,453	261	1,992	1,690	3,765	537	625
Professional Services	19,360	6,073	2,933	211	4,031	2,253	2,855	380	625
Bad Debt	16,597	-	4,528	404	3,120	2,717	5,176	652	-
Other Expenses	79,324	25,740	13,056	840	16,672	9,442	11,471	1,727	375
ICM Manager(s)	50,000	-	-	-	-	-	-	-	50,000
Lab Fees	6,247	-	-	-	-	-	-	-	6,247
Total Expenses	$ 1,890,001	670,134	284,168	21,978	304,426	184,705	293,777	43,642	87,172
Net Savings/(Loss)	$ 64,266	(51,583)	51,412	856	13,155	(2,655)	15,223	4,254	33,604
71 Firms		n=65	n=69	n=68	n=71	n=71	n=55	n=69	n=40