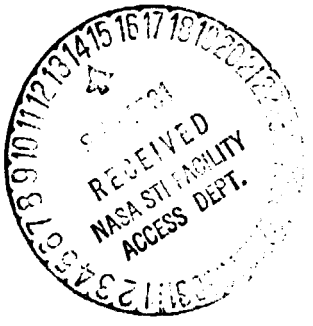
DEPARTMENT OF TECHNOLOGY AND HUMAN AFFAIRS

CENTER FOR DEVELOPMENT TECHNOLOGY

PROGRAM ON STIMULATING OPERATIONAL PRIVATE SECTOR USE OF EARTH OBSERVATION SATELLITE DATA

FINAL REPORT



BY

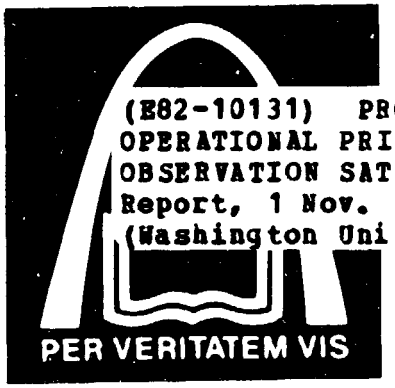
LESTER F. EASTWOOD, JR.
JERRY FOSHAGE
GUILLERMO GOMEZ
BECKY KIRKPATRICK
BARRY KONIG
ROBERT STEIN

JANUARY 15, 1981

(E82-10131) PROGRAM ON STIMULATING OPERATIONAL PRIVATE SECTOR USE OF EARTH OBSERVATION SATELLITE INFORMATION Final Report, 1 Nov. 1979 - 15 Jan. 1981 (Washington Univ.) 216 p HC A10/MF A01 CSCL 03/43

N82-21660

Unclas 00131



WASHINGTON UNIVERSITY
SAINT LOUIS, MISSOURI 63130

CENTER FOR DEVELOPMENT TECHNOLOGY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI 63130

PROGRAM ON
STIMULATING OPERATIONAL PRIVATE SECTOR USE OF
EARTH OBSERVATION SATELLITE DATA

FINAL REPORT

BY

LESTER F. EASTWOOD, JR.
JERRY FOSHAGE
GUILLERMO GOMEZ
BECKY KIRKPATRICK
BARRY KONIG
ROBERT STEIN

JANUARY 15, 1981

This study was supported by the National Aeronautics and Space Administration under Contract No. NAWS-3331. The views expressed in this report are those of the authors and do not necessarily represent those of the Center for Development Technology, Washington University, or the sponsoring agency.

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Program on Stimulating Operational Private Sector Use of Earth Observation Satellite Information		5. Report Date January 15, 1981 6. Performing Organization Code
7. Author(s) Lester F. Eastwood, Jr., et al.		8. Performing Organization Report No.
9. Performing Organization Name and Address Center for Development Technology Box 1106, Washington University St. Louis, Missouri 63130		10. Work Unit No. 11. Contract or Grant No. NASW-3331
12. Sponsoring Agency Name and Address NASA Headquarters Washington, D.C. 20546 Attn: Richard H. Weinstein		13. Type of Report and Period Covered Type III 11/1/79 - 1/15/81 14. Sponsoring Agency Code

15. Supplementary Notes

Original photography may be purchased from
EROS Data Center
Sioux Falls, SD. 57198

16. Abstract

This document reports on the project "Stimulating the Operational Private Sector Use of Earth Observation Satellite Information." The project, funded for the period November 1, 1979 through January 15, 1981, centered on developing and refining ideas for new businesses specializing in using remote sensing and computerized spatial data systems. Each such business serves as a "information middleman", buying raw satellite or aircraft imagery, processing these data, combining them in a computer system with customer-specific information, and marketing the resulting information products. Examples of the businesses the project designed are: 1) an agricultural facility site evaluation firm; 2) a mass media grocery price and supply analyst and forecaster; 3) a management service for privately held woodlots; 4) a brokerage for insulation and roofing contractors, based on infrared imagery; 5) an expanded real estate information service. In addition, the project created more than twenty-five other commercially attractive new "information middleman" ideas in agribusiness, forestry, mining, real estate, urban planning and redevelopment, and consumer information. The five ideas listed above the project analyzed in detail, assessing the commercial feasibility of these businesses. This assessment included market surveys, revenue projections, cost analyses, and profitability studies. The results showed that there are large and enthusiastic markets willing to pay for the services these five businesses offer, and that the businesses could operate profitably.

17. Key Words Suggested by Author	18. Distribution Statement
Business Opportunities Computerized Geographic Information Systems Remote Sensing Technology Transfer	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified			

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

LIST OF TABLES

LIST OF TABLES
(continued)

LIST OF FIGURES

PREFACE
(Executive Summary)

This report describes the project "Stimulating the Operational Private Sector Use of Earth Observation Information," funded by NASA for the period November 1, 1979 through January 15, 1981. Effort centered on developing promising ideas for new businesses specializing in remote sensing and spatial data information systems.

The project seeks to assist NASA in testing the feasibility of new, private sector activities based on remote sensing and computerized geographic information systems (CGIS). NASA plans to fund "Application System Verification and Transfer" (ASVT) experiments to demonstrate and assess model businesses. Each business serves a specialized application as an "information middleman," buying and processing raw satellite data and aircraft imagery, combining remotely sensed and customer-specific data in a CGIS, and marketing information or specialized services. Each ASVT's purpose is to test the marketplace viability of its model business. Publicized results should inspire entrepreneurs to copy the successful ideas.

Our staff generated nearly one hundred ideas for tasks that could be carried out using remote sensing and CGIS's. Of these ideas, about one-third seemed to be good bases for commercially viable businesses. (Twenty-three are listed in this document, others in our earlier progress report*.) The new businesses serve industry (forestry, agribusiness, mining, real estate, and transportation); local, regional, and state government

---

*Eastwood, et al., Program on Stimulating the Operational Private Sector Use of Earth Observation Satellite Information, Washington University, Center for Development Technology, St. Louis, MO., June 15, 1980.

(planning, transportation, and redevelopment agencies); and the consumer (advising in homebuying, food purchasing, and travel). These ideas have resulted from staff brainstorming and literature review, recommendations from experts, and surveys of firms already in the remote sensing business.

Resource limitations required us to narrow down this list of thirty ideas. Some appeared particularly commercially attractive, while others were duplicated by private sector firms already in the remote sensing/CGIS business. Contractually required to analyze three ideas in detail, we assessed three LANDSAT-based ideas and two others based primarily on CGIS or aircraft data gathering techniques. They are:

-- AN AGRICULTURAL CONSULTING firm that would use satellite images to help agricultural businesses, needing to be near productive crop land, to pick sites for production facilities. (We project a 15% to 20% return on investment after taxes for this firm.)

-- A WOODLOT MANAGEMENT firm that would use satellite images to assist absentee woodland owners in profiting from their investment. (Our market research calculates a $6 million a year market in the Missouri and Illinois area alone.)

-- A SYNDICATED TV "AGMAN", much like the current weatherman, who, using satellite images of farmland, would compare crop production in various areas and provide consumer tips on the best buys in fruits and vegetables. (CBS network staff like this idea, as do supermarkets, its potential sponsors. TV spots like this one are very profitable.)

-- AN ENERGY CONSULTING AND BROKERAGE firm that would take infrared images of cities, showing which homes and buildings were leaking energy, and act as a broker for insulating and roofing contractors in the area. (Our market research reveals a potential for $400,000.00 yearly brokerage commissions in one town of only 28,000 households.)

-- A HOMEBUYER INFORMATION service to supplement current real estate information with data on neighborhoods, available services, and population. (This service is especially attractive to people bypassing the full-service realtor to save money.)

1. INTRODUCTION

1.1 OBJECTIVES AND METHODOLOGY

The project on Stimulating the Operational Private Sector Use of Earth Observation Satellite Information was funded by NASA at Washington University for the period November 1, 1979 to January 15, 1981. The project assisted NASA in planning feasibility tests of new businesses. The businesses, based on remote sensing and computerized geographic information systems technology, are a means of transferring this technology to the private sector. The project was executed in the Center for Development Technology by an interdisciplinary research team whose members have backgrounds in business, engineering, geology, and public policy analysis.

Our research group comes to the project with extensive experience in identifying practical uses for remote sensing. Our Earth Observation Data Management System (EODMS) project determined information needs of potential users of remote sensing, translated these needs into feasible information product designs, and identified the skills, equipment and investment necessary to produce these products. We accomplished these tasks for over 50 state agencies in five midwestern states, developing an extensive data base and foundation of experience that we have applied to the current project.

The primary relevant EODMS finding is that raw remote sensing data requires extensive processing and combination in a CGIS with data from other sources, if it is to realize its full potential value. The processing requires skills and resources unavailable to most potential users. The profit motive can stimulate activity to bridge the gap between raw

remote sensing data and the maps, tables and reports from which most of society gets its information. This fact inspires our project.

The formal project objectives, as stated in the contract's statement of work, are:

1) Define information service areas.

2) Develop information product specifications.

3) Analyze market opportunities.

4) Design ASVT projects.

To achieve these objectives the contract dictates that we follow the plan indicated in our proposal. Our proposal categorizes three activities:

Activity A: Develop a List of Feasible ASVT Candidates

1. Develop preliminary ideas for "model business" ASVT's. Generate these ideas by brainstorming, reviewing the literature, interviewing or surveying interested entrepreneurs, and reviewing recent recommendations from formal sources.

2. Check to see that each ASVT idea is a new operational application. That is, review previous ASVT's and other operational/quasi-operational applications of remote sensing to verify that the idea breaks new ground. In particular, verify that it does not duplicate existing private sector activity.

3. Demonstrate by review of the literature on remote sensing applications and experiments that the ideas are technically feasible.

Activity B: Identify the ASVT Ideas That Are Most Likely to Be Commercially Successful

1. Review information needs in each ASVT's application area. Use surveys and in-depth interviews with potential customers, literature on remote sensing-based information products, and consultation with experts to identify and characterize the potential market information needs.

2. Design information packages -- the products of the "model businesses" -- to serve these information needs.

3. Survey potential customers' willingness to pay for these products. Make preliminary estimates of rates, costs, and potential profitability.

4. Where possible, make cost vs. income and return on investment estimates to demonstrate the potential for financial viability of a business producing these information products.

Activity C: Produce a Final Report Recommending the Most Attractive ASVT Ideas for Implementation

1. Present at least three recommended ASVT ideas, including details of product design and potential customers' needs and options.

2. Justify the recommendations. List ideas generated in Part A. Show how the recommended ASVT's compare to the others in terms of their potential for financial success.

3. Display the estimated financial statements.

It is important to understand the effect that these activity definitions and constraints had on the new business ideas that were generated. We were specifically prohibited from designing new applications of remote sensing technology. Untried applications of the technology are the realm of experimenters, not of entrepreneurs risking capital in a new business investment. Therefore, Activity A.3 of our project constrains us to proven technical ideas. The business ideas that we have generated are not novel applications of the technology, but they are new commercial applications. This is what makes the ideas unique and useful.

The methodology that we employed also affected the results. To generate as many ideas as possible, we used brainstorming sessions attended by all of our interdisciplinary staff. We also made use of the extensive EODMS analyses of tasks to which remote sensing could contribute by combing through EODMS records for tasks that might form a basis

for a business. Literature reviews and consultations with experts completed our sources.

From all of these sources, we generated more than one hundred ideas for new businesses. Thirty of them passed our tests for commercial and technical feasibility. This report assesses six that scored especially high and represent a broad range of applications: agriculture, forestry, consumer information, and energy.

1.2 PROJECT OUTCOMES

1.2.1 Contractual Outcomes

Project objectives were accomplished through the delivery of two major products to NASA: 1) a six-month progress report issued in June, 1980 describing preliminary ideas for new businesses; 2) a final report describing twenty-three ideas for new businesses and analyzing in detail five recommended ASVT designs.

The June report contains a survey of firms now in the remote sensing and computerized geographic information system based industry, describing their structure, products, and services. It also describes our progress as of June in developing new business ideas.

This Final Report focusses on analysis of the five ideas for new businesses listed in the Preface. The analysis includes surveys of potential customers, formal market surveys, revenue projections, cost analyses, profitability studies, and conclusions about the market viability of these five new business ideas. In addition, this report describes seventeen other ideas for new businesses which resource limitations preclude us from analyzing and one idea we analyze but do not recommend. The seventeen ideas also appear commercially attractive; following up these ideas is one area for potential future research.

1.2.2 Other Project Outcomes

Our staff developed an extensive data base on activities of the private sector in remote sensing and computerized geographic information systems in this project. This data base resulted from our survey of remote sensing-based industries (see our June report) and our customer surveys, described here.

The second noteworthy project outcome is the continuing publicity that the project has received. The June report contains copies of newspaper articles that appeared early on in the course of the project. These include St. Louis Post Dispatch Feature, a United Press International article, and others. Recently, Professor Eastwood, the project leader, was interviewed for the Christian Science Monitor, for Business Week Magazine, and for "All Things Considered" on National Public Radio. The Business Week article awaits production of this report, but the Christian Science Monitor article was published in the Monitor and also distributed on wire services.

This publicity, especially the forthcoming article in Business Week, is a valuable, although initially unexpected, outcome of the project. Through our project, NASA is seeking to interest entrepreneurs in the technology of remote sensing and computerized geographic information systems. Publicity in the national news media helps, especially in business-oriented publications.

1.3 PLAN OF THIS REPORT

Cahpter 2 presents the conclusions and recommendations of the study. Taken together, the Preface, Chapter 1, and Chapter 2 are a convenient summary of the entire project.

Chapter 3 details our study of the market potential for "information middleman" firms in agribusiness. The three firms analyzed are a crop forecasting information service for agribusiness, a site evaluation consulting firm to assist agricultural companies in locating new facilities, and a syndicated TV grocery price and supply analyst and forecaster. The chapter undertakes a detailed Net Present Value analysis to assess the attractiveness of an investment in the site selection firm.

Chapter 4 describes the woodlot management service for privately held woodlots. It also list five other forestry-related ideas that satisfy two criteria: they are able to make extensive use of LANDSAT and they are commercially attractive. The chapter details how the ideas derive from our data base of LANDSAT uses in forestry. The private woodlot management service boasts a very large potential market, a market survey of private woodlot owners in Missouri and Illinois shows.

Chapter 5 describes ideas for urban-oriented remote sensing or CGIS-based birms. It analyzes in detail a brokerage firm for insulation/roofing contractors. This brokerage idea is an unusual application of a proven technology, infrared imagery. A consortium of roofing and insulating contractors fund the imaging costs instead of municipal and federal governments. Being owners of the imagery, the contractors can use it as a sales tool.

Chapter 6 analyzes consumer information services, emphasizing an expanded realty information service. The chapter describes market survey results, evaluates the attractiveness of the business and makes financial calculations.

2. CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the project's findings. It begins with general recommendations and conclusions drawn both from the present document and from our midyear progress report. It then presents conclusions specific to the six business ideas examined in detail in this report (see the Abstract or Preface for descriptions of these six).

Recommendations

1. NASA should pattern the experimental businesses after existing successful small "information middleman" businesses. That is, the experimental businesses should

   - employ a small, full-time staff with knowledge of remote sensing and key applications disciplines
   - locate so that consultants and computer time are accessible (eg., near a university)
   - hold workshops to educate potential customers
   - identify customer needs and draw up proposals at no charge

2. NASA should carry out detailed return-on-investment analyses, along the lines of ours for the agricultural site selection business, for each experimental business it decides to test.

3. We recommend five new business ideas, listed in the next section's Conclusion 2, for NASA consideration for implementation as experimental/ illustrative ASVT's.

General Conclusions

1. There are more than 200 existing "information middleman" companies that

- most commonly supply an interpreted data product, processed using LANDSAT or CGIS's.
- vary in structure depending on their size; the larger ones have a multidisciplinary staff, some with expertise in remote sensing; the smaller ones have a core staff of remote sensing experts and hire consultants in application area disciplines.
- are active in application areas including:

  crop/vegetation monitoring
  crop forecasting
  land use mapping
  wildlife studies
  forest inventories/management
  insect studies
  crop inventory
  solid waste management
  environmental monitoring and impact assessment
  water quality
  census/demographics
  urban planning
  oil and mineral exploration
  power plant/pipeline/transmission line siting
  resource management.

2. Our market surveys and technology studies confirm that five unique and new "information middleman" businesses are technically feasible and show impressive potential for commercial success:

- an agricultural facility site evaluation firm
- a mass media grocery price and supply analyst and forecaster
- a management service for privately held woodlots
- a brokerage for insulation and roofing contractors
- an expanded real estate information service.

3. In addition, the project has created more than twenty-five other new "information middleman" business ideas with commercial promise. These ideas are listed in this report's chapter introductions.

4. Of the five recommended ideas, three make use of today's LANDSAT technology:

- agricultural site evaluation
- mass media grocery analyst
- woodlot management service

The remaining two ideas use either computerized geographic information system (CGIS) or aerial remote sensing technology. Commercial success using these technologies "plants the seed" for expanding the business into LANDSAT use.

5. In addition to the five recommended ideas, we assessed one other in detail that we cannot recommend. This business, a crop forecasting consultant to agriculture-related industries, would supply forecasts superior to those currently available. The improved resolution of the new generation of LANDSAT sensors, and the extensive federal

investment directed toward making the new LANDSATs effective forecasting tools will make the business technically feasible. Moreover our market survey has identified customers willing to pay for better information. However, political (rather than technical) restrictions on the timeliness of satellite data, and on the availability of USDA-gathered supporting data, preclude a viable new crop forecasting business.

Conclusions on the Site Evaluation Business

6. The site evaluation business is preferable to the crop forecasting enterprise for two reasons:

- all technology needed is in place today
- timeliness is less important; months-old LANDSAT and crop survey data suffice.

7. Of the ten agribusiness sectors we surveyed, all potential customers for the site selection service, five were especially enthusiastic. Seed producers and businesses involved in producing, transporting, storing, or buying and selling crops are the five. For our firm's improved service, this group would pay 25% more than they presently do for site selection; perhaps $8,000.00 per firm per year under conservative assumptions.

8. Selling site evaluations at $7,000. to $9,000. apiece, the agricultural site selection firm should realize a 15 to 20% return on investment after taxes.

9. The respondents to our site evaluation market survey have aggregate 1979 sales of at least twenty-three billion dollars, or $605 million per respondent.

Conclusions on Crop Forecasting

10. Nearly 40% of the agribusiness firms surveyed as potential customers for the crop forecasting business indicate that current reports of crop conditions are too general or too late for their needs. Timeliness especially needs improvement.

11. A new crop forecasting service is not justified unless it can overcome the timeliness limitations of existing systems. To do this usefully, a system based on LANDSAT imagery would have to receive and process imagery within two weeks.

12. A new crop forecasting business, based on LANDSAT, is not viable now because political limitations on LANDSAT timeliness and resolution and on availabilty of supporting USDA crop survey data prevent this two-week turnaround.

Conclusions on the Mass Media Food Price Forecast

13. Publicity that focusses on LANDSAT's potential utility as a crop forecasting tool might, by bringing political pressure to bear, remove the constraints that hinder the development of a commercial crop forecasting service. A daily TV news "spot", using LANDSAT graphics to illustrate food price forecasts, may gain the needed exposure. Moreover, such a service is attractive to CBS network staff and to potential sponsors.

Conclusions on the Woodlot Management Service

14. We have developed six commercially promising ideas for new forestry businesses based on LANDSAT:

- a management service for privately held woodlots
- a business to build and sell turnkey LANDSAT processing and CGIS systems for forest management.

- a fire hazard assessment service.
- a reforestation information service for seedling producers and forest owners.
- a land capacity assessment consulting firm.
- a firm specializing in insect and disease monitoring and control.

15. Although state and federal forestry agencies offer a number of free forest management services to woodlot owners, absentee woodlot owners are unwilling or unable to take advantage of them. In regions where the concentration of absentee owners is moderately high, a LANDSAT-based forestry management firm could do so, and add further services of its own, to manage and derive income from woodlots that currently earn very little.

16. Woodlot owners who live on their land are interested in a private consulting service to assess and direct their woodlot management practices.

17. Woodlot owners, especially absentees, are overwhelmingly enthusiastic about the forestry management service, operating on a percentage of new income generated. Eighty-five percent of absentee owners surveyed said they would subscribe to such a service. They would pay an average of 10% of their land's income to the firm in return for full management services.

18. The market size for this service is very large. We estimate that there are about four million small woodlot owners in the United States. There are more than 100,000 in Missouri and Illinois. In these two states alone, potential revenues are more than six million dollars per year.

Conclusions on the Insulation/Roofing Brokerage

19. There is an untapped commercial opportunity for a firm using aerial thermographic imagery to audit energy losses in residences. Existing firms offering this service sell exclusively to public sector entities. Our firm would operate completely in the private sector. It would act as a broker for insulation/roofing contractors, selling these contractors' services directly to homeowners. It would use the thermal imagery to identify customers and as a sales tool

20. Our survey of insulation/roofing contractors, who would pay the brokerage for its services, reveals that they would pay an average of 10% of their sales. Therefore, in one example community of 28,000 people for which we have market statistics the potential first-year market for the brokerage firm is about $400,000. First-year costs to serve the market may be $100,000. Thus the service has high potential profitability.

Conclusions on the Real Estate Information Service

21. Real estate customers want more information than they can now access on neighborhood demographics and nearby vital services. All the data necessary are commercially available in CGIS - compatible form. However, they have never been compiled and sold to residential real estate customers.

22. We have derived the categories of new information desired by real estate customers from a survey of agents. They include: investment-related information (trends in taxes; average prices of single family homes, condominiums, and rentals; and price trends), information on the living environment (e.g. average neighborhood lot size), demographics

(mean age of homeowners, number of children per family, and income of neighbors), and vital services information (schools, churches, transportation, recreation, and businesses).

23. A real estate "magazine," produced by a CGIS system containing census and vital services data, would serve these needs. It could be updated frequently and at small cost. The marginal cost of producing the magazine might be $1.50 per copy for 10,000 copies. Selling at $2.00 wholesale, it could realize a 30% return on investment.

3. MARKET POTENTIAL IN AGRIBUSINESS

3.1 GENERAL INTRODUCTION

The agribusiness section of the project examined three potential application areas: 1) a crop forecasting service for agribusiness, 2) a "site evaluation" or "location assessment" consulting firm to assist agricultural companies in locating new facilities, and 3) a food price forecasting service for consumers. Remote sensing's valuable contributions to crop forecasting in recent years, as exemplified by the LACIE project, inspired the crop forecasting analysis. The study of the market potential for remote sensing in site evaluation commenced under the advice of agribusiness/remote sensing experts Jack Huisinga, Dr. Christian Johannsen (University of Missouri), and Dr. Marian Baumgardner (LARS Purdue).

3.1.1 Site Evaluation (Brief Introduction)

The most promising idea is termed "location assessment" or "site evaluation". It involves analyzing remote sensing-based information and supporting market data to provide the information needed to make location decisions for business facilities serving agricultural producers. Increased pressure upon the agribusiness community to maximize efficiency has centralized service and sales centers. Many previously marginal seed, fertilizer, and chemical shops are no longer profitable as the target population has given up farming in the area or been attracted by a more efficiently located competitor.

The need for this business has not been investigated quantitatively before. Our preliminary study convinced us that this new business idea

holds high promise. Therefore, we pursued this avenue vigorously. Section 3.2 and 3.3 in this chapter describe the idea in more detail, present a market survey, and assess profitability potential based on the survey results.

3.1.2 Crop Forecasting (Brief Introduction)

The crop forecasting service, a consultant firm to agriculture-related industries, would supply forecasts superior to those now available. The customers would pay for the competitive advantage of better information.

Two aspects of the idea need assessment: the market for the information and the feasibility of providing it. An earlier project* surveyed eight agribusiness groups potentially in the market for crop forecasts. Examples are equipment or chemical manufacturers and commercial or speculative grain traders. Our project employs this survey's results, in the light of current remote sensing-based crop forecasting techniques, to assess feasibility of the business. We conclude that, although demand for improved forecasts is strong, and remote sensing technology is capable of improving current forecasting, political (rather than technical) restrictions on the quality and timeliness of satellite remote sensing-based forecasts, and on availability of supporting data, preclude a viable new crop forecasting business. The fourth section of this chapter assesses the survey data and draws this conclusion.

---

*Huisinga, J., "Private Sector Short-Term Grain Information Needs and Potential Delivery Technologies," M.A. Thesis, Dept. of Technology and Human Affairs, Washington University, Report No. THA/CDT-78/6 (175 pp.), June, 1978.

3.1.3 A TV Food Price Forecast With LANDSAT Graphics (Brief Introduction)

This concept modifies the crop forecasting idea to obtain one that is more feasible and attractive. It proposes a daily TV spot, syndicated on local news shows, to forecast food prices on the grocery shelf. The spot would use LANDSAT graphics to illustrate the natural phenomena that affect prices.

It is not feasible to use LANDSAT as a primary data source for these price forecasts. Nevertheless, an A-B comparison of LANDSAT images of growing areas in good years and bad, coupled with a discussion of current price trends, would not only be informative but also good, daily, widely-viewed publicity for LANDSAT. This publicity could be effective in ameliorating the political constraints that currently limit LANDSAT's usefulness as a crop forecasting tool.

This chapter's fifth section provides an example script for such a TV spot to illustrate the idea. It also describes the positive reactions of network personnel to the proposed program.

3.2 DESIGN OF THE SITE EVALUATION SERVICE INCORPORATING REMOTE SENSING

3.2.1 Importance to the Industry

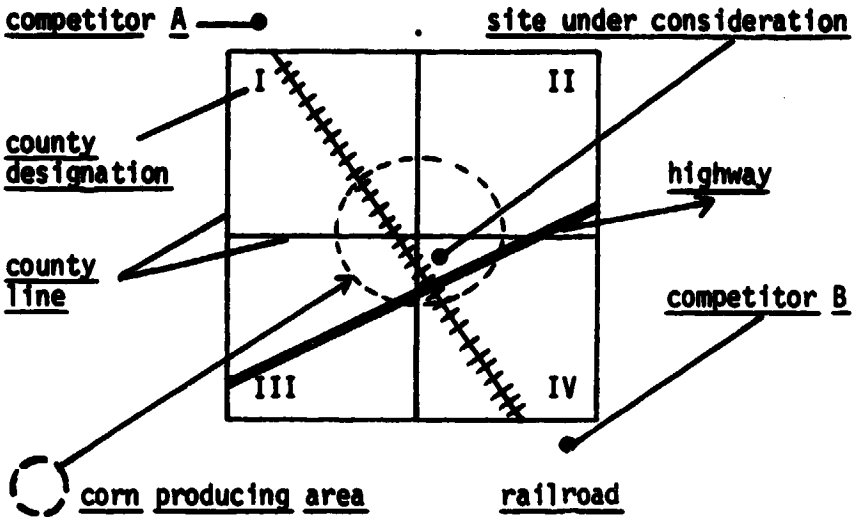
The idea is one which helps fulfill a need that has been developing for some time. Recently there has been a substantial increase in the importance agribusiness companies place in site evaluation. Half of the respondents to our survey, large agribusinesses all, indicated very strongly that it has become more valuable and important to them.

3.2.2 Design of the Service - LANDSAT's Role

Remote sensing by LANDSAT can provide information about the Earth's surface relating to field location, crop type, and acreage. It is unbiased in that it is not limited to data by a political division such as a county and thus may more precisely delineate the producing area for a particular crop across various county lines. For example, data as provided by the USDA by county may be presented as follows:

County	Corn Production
I	xx bushels
II	xx bushels
III	xx bushels
IV	xx bushels

In contrast, from LANDSAT imagery with a political map overlay, the following presentation may be derived which would seem substantially to increase the significance of the above data:



It would make a difference to a planner considering building a facility serving the corn growers of the area if the corn producing fields were scattered over the four counties - thus substantially increasing the likelihood that business would be lost to competitors A and B - or if the producing area were concentrated around the area convenient to the intersection - thus minimizing the likely effect of competitors A and B. The USDA information cannot address this problem by itself.

Through use of the LANDSAT and other additional input, this service could do the following:

1) Assess any current facility location relative to the current crop patterns and related trends over time in the area to:

   a) foresee potential obsolescence before it is reflected on the bottom line,

   b) foresee future capacity requirement increase vs. present constraints at the location, or

   c) help uncover the reason behind a particular facility's decline in profits and its potential for conversion to another profit-optimizing use.

2) The new system could analyze an area for the optimal location of a new facility - even one for which the raw material production does not yet exist in the area - by processing such data as the suitability of the area by soil type, slope, and climatology along with previously mentioned data related to current land use and planting trends and any other information of interest in the specific case.

We assume further that this system would be provided and supported by highly skilled specialists in the customer's area of interest (e.g., grain storage, farm equipment, food processing, etc.). It would produce supporting documentation for the related decision analysis in an easy-to-understand format.

An additional service could be to sell supportive services to the large agribusiness companies that will probably purchase the hardware and basic software with which to do their own remote-sensing assisted site evaluations. The supportive services may be valuable in keeping the companies' personnel adequately trained and current in the methodology as it continues developing. This service may not be profitable in itself, but may help a smaller consulting business cover fixed costs.

3.2.3 Technologies Used

One of the reasons the site evaluation business design appears preferable to crop forecasting is that the system is essentially in place technologically - the hardware and the major parts of the software exist. The hardware needed may be purchased for about one-half the cost of that needed for crop forecasting. The National Marine Fisheries (Bay St. Louis, Mississippi) recently purchased a system capable of processing LANDSAT images such as would be needed for site evaluation for $241,000. This included an image display and electrostatic printer. The system could

incorporate a Computerized Geographic Information System with an additional relatively small expense for the additional memory.

The system could utilize LANDSAT images that are several weeks or more old without problem (although just when in the harvest cycle they come from can be important). This more approximates the current availability of CCTs. Timeliness is the key element in crop forecasting, but accuracy is the key element in site evaluation.

One presentation method of the LANDSAT data is by overlay of transparencies bearing the LANDSAT derived crop-type classifications over political maps or other maps as may be needed.

There are a couple of NASA subsidized cooperative projects in progress in the application area. One is at the University of Missouri Agronomy Extension with the Missouri Farmer's Association. Dr. Christian Johannsen and Dr. Dale Coble are developing models incorporating LANDSAT imagery to enhance the efficiency in such endeavors as the site selection for grain elevators. This research is expected to continue for several years before concrete dollar benefit amounts may be calculated.

3.2.4 Marketing the Service

Our survey results indicate that the most likely markets for this service are those companies that are (in order): crop transportation, seed producers, machine producers, and (tied) crop producers, crop storage, crop buying and trading. In addition, the medium sized companies ($100,000,000 to $1,000,000,000 in sales) are the most interested in the new service.

The service would be sold primarily as a consultant service to perform site evaluations under contract. Each job would be performed individually according to specifications and constraints provided by the client.

There is no particular reason why a service located in the midwest could not serve the entire country. However, it is highly probable the majority of customers for this service will be seeking locations in the agricultural heartland of the plains and midwest. The selection of companies for the questionnaire included this bias. Some areas of the South may also be good candidates. In general there are two major advantages to a location in a major midwestern city. Besides strong agricultural and agribusiness roots, a major midwestern city is likely to have within it the specialist expertise that the service may be called upon to tap from time to time whenever a particularly perplexing problem is encountered.

The businesses closely associated with the production end of the agribusiness spectrum responded most favorably to the questionnaire. The size of the companies and their lines of business (such as seed production, fertilizer and pesticides, grain storage, transportation, and buying and selling) indicated that one of the most favorable customers would be found among the larger cooperatives in the midwest. The large farm implement and machinery manufacturers were also good candidates, but their numbers are limited by economics of scale. One good client of the magnitude of a large farm machinery manufacturer could insure the financial success of a site assessment firm. A billion dollar plus firm in farm machinery indicated that on the basis of the theoretic business design, the respondent would be willing to at least double current expenditures for site evaluation.

3.2.5 Structure and Size of the Business

We have designed the personnel structure of the business based on the presumption that it would be best to start with minimal fixed costs, but

with enough volume of business to cover fixed costs. A manager/marketer who should oversee the financial, administrative, and marketing functions of the enterprise, an executive secretary/bookkeeper, a half-time typist, a computer programmer, an agronomy generalist with experience in for-profit business or business-related studies, an associate for this senior staff member, and a half-time assistant to perform some operating of the computer and ground truthing or other particular chores under the supervision of the agronomist. The proposed salaries are as presented in the cost selection following. The total permanent staff costs are estimated to run $168,500 in the fourth year including social security and fringe benefits. The only other substantial cost is for the computer system which is at about $241,000 as mentioned earlier. For cost analysis purposes presented later, it is assumed this staff size represents the relatively mature (money making) company. At the beginning as a smaller, money losing company, only a core staff will be warrented until expected growth in clientele can sustain additional hirings.

3.3 ASSESSMENT AND VALIDATION OF THE SITE EVALUATION IDEA

3.3.1 Market Survey

3.3.1.1 Introduction -- Goals of the Survey

In order to perform an analysis of the potential profitability of the service, it was necessary to gauge its revenue generation capabilities. Other than direct observation, which was impractical, and telephone interviews (which were in fact used to a limited extent) the only other alternative was that of a written questionnaire. The advantages of a written questionnaire over a personal interview include: 1) standardization, 2) comparability, 3) lower cost, 4) less probability of introducing a bias to the responses and, 5) contact with a wider variety of potential clients.

3.3.1.2 Structure of the Survey

A written questionnaire was mailed to 170 agribusiness firms. The response rate within a month was 22% (38 respondents). A facsimile of the questionnaire appears on the following pages and in Appendix A.

The cover letter aims at attracting interest in the concept and a commitment to filling out the questionnaire.

The first two questions, on industry type and size, provide data by which to categorize the respondents and later to sort responses by these respondent characteristics. Question 3A, on current spending for site evaluation, is the first revenue-generation question. After the second one, question 7, we discuss responses to both. Only three firms answered affirmatively to question 3B, asking about current remote sensing use, and we assumed these were cases of the use of aircraft, not satellite remote imagery. Question 4A assesses current user satisfaction with site

WASHINGTON UNIVERSITY IN ST. LOUIS

enter For
evelopment Technology

I am a graduate student at Washington University doing research at the Department of Technology and Human Affairs. I am studying potential new uses of aircraft and satellite imagery in the agri-business sector under a grant from the National Aeronautics and Space Administration. As a part of this research, I am currently exploring the feasibility of a private company that would use aircraft and satellite imagery to enhance location assessment (sometimes called site evaluation or siting). Location assessment could include, as examples, searches for the optimal locations of new elevators, food processing plants, feed lots, or retail outlets for seed, chemicals, implements, large equipment, etc., and more generally, to locate new markets for new or existing products.

This company would either provide the service or sell systems and consultation back-up support for in-house location assessment with the use of aircraft and satellite imagery. Its features and advantage over conventional location assessment are described in question 7 (the final question on this questionnaire).

This information will be used to determine the economic potential of a company offering these services in the private sector. We have reason to believe this service is needed in agri-business today, but would like to further understand the market by use of a simple questionnaire.

Thus I am writing to you and to others in the agricultural community in the hope that you will be kind enough to provide me with some of the needed information and direct me to additional sources.

I have enclosed a questionnaire which I hope you will take 15-20 minutes to complete and return to me in the next week or so. Of course, I am not seeking proprietary information. I am seeking only information which you and your organization feel is or can be made part of the public domain without risk to your company or any of its individuals.

Thank you for your assistance.

Sincerely,

Guillermo Gomez

Guillermo Gomez
Graduate Research Assistant

shington University
mpus Box 1106
. Louis, Missouri 63130
14) 889-5486

SURVEY ON THE MARKET FOR LOCATION ASSESSMENT INCORPORATING THE USE OF SATELLITE IMAGERY AND AERIAL PHOTOGRAPHY IN THE AGRI-BUSINESS SECTOR

In Support of the Study Entitled

STIMULATING OPERATIONAL USE OF EARTH OBSERVATION SATELLITE INFORMATION

Dr. Lester Eastwood, Jr., Supervisor
Dr. Christian Johannsen, Advisor
Dr. Martin Bell, Advisor
Jack Huisinga, Advisor

When completed please return to:

Guillermo Gomez
Department of Technology and Human Affairs
Box 1106
Washington University
St. Louis, Mo. 63130
(314) 889-5482 or 889-5464

Please note that I am seeking only information which you feel is or can be made a part of the public domain. While the results of this study will be presented in aggregated summaries, I am part of the public domain. Therefore, if a response would require proprietary information, please note that fact and proceed to the next question.

Your identification is optional. However, if you identify yourself in the space allotted I will be better able to interpret your responses, and to follow-up via telephone if clarification of a response seems necessary.

Name_____

Position_____

Firm_____

Address_____

_____

_____

Telephone_____

Would you have use for the results of this survey? _____

Agri Business Site Evaluation Services Questionnaire

1. What activity area(s) best characterize your company?

_____ seed production or supply.

_____ crop production.

_____ chemical production or supply.

_____ machinery production or supply.

_____ crop storage.

_____ crop transportation.

_____ crop buying or trading.

_____ crop insurance or finance.

_____ food processing.

_____ processed food distribution.

2. Please indicate your company's gross revenues (sales) last year by checking the appropriate range: (all figures in thousands)

☐ less than or equal to $1,000

☐ greater than 1,000 but less than or equal to $ 100,000

☐ greater than 100,000 but less than or equal to $ 500,000

☐ greater than 500,000 but less than or equal to $1,000,000

☐ greater than 1,000,000

3A. Does your company employ outside services for site evaluation (location assessment)?

☐ Yes

If yes, please ≈ $ amount of services purchased:

$_____

☐ No

If no, do you perform site evaluations in-house?

☐ Yes ☐ No

If yes, ≈ what % of staff time spent in planning is spent on site evaluation?

_____

B. Do you employ or do you purchase services that employ remote sensing data (aircraft or satellite photography) insite evaluation?

☐ Yes ☐ No

4A. Are you currently satisfied with the information content of site evaluation work done by and/or for your company?

Please place check at appropriate level of satisfaction:

/___/___/___/___/___/___/___/___/___/___/

10 9 8 7 6 5 4 3 2 1

Very satisfied

Not satisfied at all

B. Has your opinion on the value of site evaluations changed over time?

☐ Yes ☐ No

If yes, please indicate the direction and strength of your change in opinion below:

direction of change:

☐ toward becoming more valuable

☐ toward becoming less valuable

strength of change:

/____/____/____/____/____/____/____/____/____/____/

10 9 8 7 6 5 4 3 2 1

Very strong — slight

5. What are the strengths or weaknesses of site evaluation work done currently? (e.g. accuracy or lack of, proper criteria or lack of, information on local agricultural, economic, and competitor trends or lack of, conciseness and clarity of format in presentation of conclusions or lack of, etc.)

Strengths:	Weaknesses:

6. What information do you consider to be the most important in evaluating a new facility site? Please indicate relative importance on the scale beside each type of information:

	very important				of no consequence
	5	4	3	2	1
1) Raw materials costs as they are affected by location:	/	/	/	/	/
2) In-plant handling, processing and storage costs as they are affected by location:	/	/	/	/	/
3) Historical raw material production figures by county as provided by U.S.D.A.:	/	/	/	/	/
4) All distribution costs as affected by location:	/	/	/	/	/
5) Clarity of format in presentation of results of location assessment to management.	/	/	/	/	/
6) Attention to existing patterns of competition in area:					
a) for procurement of raw materials:	/	/	/	/	/
b) for sales distribution of final product:	/	/	/	/	/
7) Attention to area's potential for producing other crops than those currently grown:	/	/	/	/	/
8) Ability to produce accurate and unbiased information as to field location, acreage, and type of crop unaffected by political boundaries:	/	/	/	/	/

	very important				of no consequence
9) A statistical and/or graphic representation of agriculturally-related trends over time in the area (i.e., crop patterns, density of crop types or homogeneity of crop types, rate of urbanization, etc.):	/5	/4	/3	/2	/1

10) Other - please specify:

_____

_____

_____ /5 /4 /3 /2 /1

11) Other - please specify:

_____

_____

_____ /5 /4 /3 /2 /1

12) Other - please specify:

_____

_____

_____ /5 /4 /3 /2 /1

7. A Hypothetical New System for Location Assessment in Agribusiness

In the original survey, the text describing the business idea in Section 3.2.2 of the report appears here.

A) Would you expect this system to be better overall than your current location assessment system or service?

Please check appropriate degree:

much better than current /___/ 10 /___/ 9 /___/ 8 /___/ 7 /___/ 6 /___/ 5 /___/ 4 /___/ 3 /___/ 2 /___/ 1 same as current

B) Would you expect to pay more or the same amount for this system as compared to your present costs for location assessment?

much more /___/ 10 /___/ 9 /___/ 8 /___/ 7 /___/ 6 /___/ 5 /___/ 4 /___/ 3 /___/ 2 /___/ 1 same amount

C) If a system such as this could provide you with better information than you now use, how much more, if any, would you be willing to pay than your current costs for location assessment?

/_____/ at least 100% more /_____/ 50-90% more /_____/ 20-40% more /_____/ 10-19% more /_____/ 5-10% more /_____/ 1-4% more /_____/ same

evaluation work done for and/or by the company. The high rating for current satisfaction was uniform, over the industry types responding. The fact that the response mean to this question was extremely high (7.9) presents an anomaly in the responses to the questionnaire. It is likely the case, given the responses to other questions in the survey, that most companies are satisfied with current site evaluation work done, but would be quite willing to purchase improved information if it were available.

Question 4B asks whether there has been a change in importance to the respondent of site evaluations. 48% answered yes, and on a scale of one to ten the strength of this change rated a mean 6.8 by those stating that it had become more important. This is evidence of a substantial increase in the importance agribusiness companies place in site evaluation.

If those respondents who answered negatively to this question are given "0" and the single respondent who answered "yes" to the first part and "toward becoming less valuable" given a negative number for his "strength of change" rating, then the mean response was 2.9 for "toward becoming more valuable." This cannot be interpreted as an overwhelming endorsement of the theory that site evaluations are becoming more valuable, but it is at least indicative of a trend in thinking favorable to the service.

Question 5 was an open-ended question seeking further to assess opinions on current site evaluation techniques. Except for clarifying examples, no particular answers were offered to the respondent. Sufficient space for answers on current "strengths" and "weaknesses" was available. The responses are presented verbatim in Appendix A. They demonstrate a wide range of priorities in site evaluation techniques done by and/or for the respondent companies. Various responses show up as both a strength or weakness from different respondents. Knowledge of the people

in the local area and knowledge of the local area appear a combined five times as strengths. Weaknesses stated were often related to "long range" or "future" considerations of being slighted in favor of "short-term" considerations.

Question six sought directly to benefit from customers' experience by asking them to weigh, in a range of 1-5, a number of criteria in evaluating a new site. Five was "very important" and a 1 was "of no consequence". Table A.3 contains detailed comments on the responses. Appendix A's statistical response Table A.2 contains additional information. Criteria for site selection rated most important were: all distribution costs as affected by location (6(4)); attention to existing patterns of competition in area for sales distribution of final product (6(6B)); and raw materials costs as they are affected by location (6(1)).

Criteria 6(3), 6(7), 6(8), and 6(9) all scored higher among a group of special areas in agribusiness than the overall mean response for each question might indicate. These groups included seed producers, crop producers, crop storage, crop transportation and crop buying and trading. These same groups are for various reasons prime candidates for the site evaluation service. Their products are those provided by middle to moderately large cooperatives. Questions 6(8) and 6(9) were regarded as tests of user needs for services that could be provided most efficiently using remote sensing technology. Appendix A contains additional statistical analysis of question 6.

The questionnaire included several blank spaces for additional criteria listing and rating under question 6. Appendix A includes Table A.5 with the

"other" criteria titles verbatim from the responses and the ratings given to those criteria.

Question 7 describes the hypothetical service to the questionnaire's readers. Because its descriptive text repeats that of Section 3.2.2, we do not display it in the sample questionnaire. The overall mean response to 7A (would the new service be better than the one you use currently) was better by 4.59 on a scale of ten. However, those groups cited as being the most likely candidates for the service again gave much higher means:

Specialty group	mean responses to 7A	number of n respondents
seed producers	6.8	(5)
crop producers	6.7	(3)
crop storage	5.8	(10)
crop transportation	6.0	(5)
crop buying and trading	6.25	(8)
overall for above group	6.20	

The overall mean for 7B (would you pay more) was 5.11 on a scale of ten.

For the statistical analysis of 7C (how much more), each box was assigned a number from 1-7 with 1 for "same" and 7 for "at least 100% more than my current location assessment costs". Using this approach, the overall mean response to 7C was 3.4. Logically, this is at about a "10% more" rating as it is about midway between 5-10% and 10-19% more. However, if each box were assigned a percent value at the average of the range each box represents such that box "same" is 0%, box "1-4% more" is 2.5%, box "20-40% more" is 30% and so on, the mean response becomes

"18.7% more". If only those companies specializing in seed production, crop production, machinery production, crop storage, crop transportation, and crop buying and trading are counted (one response only was counted per company if it indicated more than one specialty area) the mean response was "25% more". That is, the companies in those areas of specialty were on the average/company responding willing to pay 25% more for this hypothetical service than they are currently spending for site evaluation.

A sample of an actual returned questionnaire with the individual company information deleted is included in Appendix A to this text.

3.3.2 Conclusions of the Survey

3.3.2.1 Existence of Market

The existence of a strong market based on the data from the survey response appears nearly certain. A more difficult question is one that relates to the size of the market, or in particular, how much an individual company might be willing to pay for this service.

3.3.2.2 Size of Market; Willingness to Pay

Agribusiness in the aggregate constitutes the largest industry in the United States. Last year the market value of the farm production of the major grains alone had a value in excess of $30,000,000,000.[1] This is only a small part of the ultimate retail value after transportation, storage, processing, and distribution. For the 38 companies responding to this questionnaire, if each is given the minimum value for the size range they indicated, their aggregate sales were $23,000,000,000 last year. In sum, given previously presented evidence on willingness to pay, the size of the market is quite substantial.

---

[1]Survey of Current Business, U.S. Dept. of Commerce, Bureau of Economic Analysis, May 1980, Vol. 60, No. 5.

Any "willingness to pay" calculation entails some assumptions on spending habits for which we cannot obtain data. We have been conservative in making these assumptions. We attempt to allow for changes in assumptions with two different discounted cash flow analyses presented later. Readers are invited to make their own assumptions and add them to data provided.

In the questionnaire, question 3A dealt with whether or not the company purchased outside site evaluation services. If they did not, then it asked if they performed the site evaluations in-house. Only five of the 38 answered that they purchased site evaluations entirely from outside firms. The average purchase price for those few firms purchasing only outside services was $12,500/year of services purchased. This is based on a very small sample. However, 31 firms indicated that they did site evaluations in-house. Of these 31 firms, 22 gave responses to the question "if [you do perform site evaluation in-house] = what % of staff time spent in planning is spent on site evaluation?". Two responses were in the form of a range - "1-5%". These responses were counted once as a "1" and once as a "5". In total, the responses were as follows:

Value	Frequency of Appearance
1 %	6
2	1
3	1
5	6
10	6
30	1

If to be conservative, the values that only appeared once are eliminated and only the three values that appeared frequently considered, the mean value is 5.3%. This percentage may be used to produce a present expenditure figure for site evaluation given one seemingly reasonable basic assumption. The assumption is that a large firm (over $500,000,000 in sales annually) will spend an amount equal to one tenth of one percent of sales on long range planning. Again this seems conservative.

Given the minimum average yearly sales for the respondent companies as presented earlier of $605,000,000, one tenth of one percent equals $605,000/firm. Given the aforementioned mean response of 5.3% of this being for site evaluation, the mean dollar amount going to site evaluation per firm is about $32,000.

This figure is supported by follow-up phone calls made to twelve of the responding firms. The calls produced a number of more usable figures for the costs of site evaluations/year. If these figures are averaged with those given by those five firms spending about $12,500 a year in purchasing services outside the firm, the resulting mean figure is $21,400/year. This figure is about one half the probable cost of one employee full time on site evaluation work. This seems little for a firm with $605,000,000 in annual sales.

3.3.2.3 Potential Revenue

This $21,000 to $32,000 range per firm provides us with the basic data needed for the next step, an evaluation of potential revenue for the new business. We assume that services provided by the business are three: 1) it may sell just the image processed into the classifications desired by the client; 2) it may sell technical support for a

company that wants to establish such a system in-house and; 3) it may offer complete site evaluation services including the use of remote sensing technology. Here again, to go further the author must make assumptions not far above conjecture. There is no historical data that can be relied upon to price these services since the technology is new and in fact is only now being experimentally used in site evaluation work.

Thus, the reader must judge the validity of the prices quoted following:

Service 1) Image processing alone - a minimum of $3,300 for a two-county 2,000 square mile area. Fifty of these service packages sold at an average $3,300 @ would in a year's time provide sales revenue of $165,000. But 50 would require a larger staff and clientele than the service will start with.

Service 2) Technical support for a customer's turnkey site evaluation system. This could be done under a long term contract or by the hour as consultants. Hopefully, the service could charge $30/hour for the service of keeping the company's employees up to date on the state of the art and for breaking in new systems and software or updating present software with new refinements. One employee full time for a 48 week year would help the company gross $57,600. Here again, the company will start with only a core staff and can expect its full-time "Support Specialist/Computer Programmer" to be kept busy bringing the services own system on line for the first few months.

Service 3) The bulk of the revenue will probably stem from complete site evaluation services for moderate to large size firms that recognize the value of the venue, but do not want to acquire the expertise or necessary computer system in-house. These services should range in price from a minimum of $7,000 to a maximum of $9,000 per site evaluation. 20 of these in one year would gross $140,000 to $180,000 in annual sales revenue. It seems logical that here is where the company will record its early gains in sales and reputation as to the quality and usefulness of its service.

3.3.3 Cost Analysis

3.3.3.1 Fixed Costs

Permanent Staff: This has already been discussed as part of the design of the business. The table below shows that the mature company would have permanent staff costs of about $168,500/year (1980 dollars) while at inception the company should run on a core staff of a manager, a secretary, a programmer, an agronomist and an assistant for a total staff cost of about $124,000.[1]

3.3.3.1.1 Permanent Staff

Permanent Staff Expense

	1st Year	Increased staff due to expansion in 4-6th yr of operation
Manager	$35,000	$ 35,000
Secretary/Bookkeeper typist (part time)	$10,000	$ 10,000 4,500
Support Specialist/ Computer Programmer	$25,000	$ 25,000
Assistant Computer Operator/Programmer		$ 20,000
Agronomy Generalist	$35,000	$ 35,000
Associate Agronomist		18,500
1/2 time assistant	$10,000	$ 10,000
Sub Total	$115,000	$150,000
x .0783 (fringe benefits)	9,000	12,500
Total Staff Expense	$124,000	$168,500

[1]The reasonableness of salaries quoted was checked against the opinion of various people in Agronomy and Image Processing at the University of Missouri Agricultural Extension.

3.3.3.1.2 Debt Service

It has been determined that the computer system and auxiliary mechanisms necessary for the system would cost about $241,000 (see Section 3.2.3). Debt incurred at the commencement of the enterprise must cover these purchase costs plus the cash necessary to cover the cash outflows that will occur during the first few years of the enterprise.

Two different time periods for debt service cost are included in the following discounted cash flow analysis. The loan amounts are essentially the same ($700,000 for analysis #1 and $680,000 for analysis #2), however, the time periods are different. Number 1 is a ten year loan and number 2 is a 15 year loan. The interest is 15%. At the time this paper was written the prime rate stood at 11.5%. SBA loan guarantees were at 2.25% above the prime rate if they were made for longer than 7 years.

The need for the debt financing is substantially increased by the fact that this is an entirely new service commercially and it will take a while for the company to develop efficiency in production of reports and acceptance of the new service in its target market. For both these reasons the service starts at only about 1/6 to 1/5 of its ultimate level of service.

3.3.3.1.3 Office Space

Minimal office space needed for the service at its inception is estimated to be about 1,200 square feet. At a rental of $6/sq. ft. for a reasonably good quality office which would afford protection

for the expensive system, the annual rental would run about $7,200 to start.[1]

3.3.3.1.4 Miscellaneous (fixed)

Miscellaneous includes business supplies, copier, telephone, utilities, insurance, postage, and "other". The total alloted to miscellaneous is $8,600.

3.3.3.1.5 Start-Up Costs

Beginning Software: Beginning software can apparently be purchased from COSMIC (A U.S. government agency specializing in distribution of federally developed software) for a very reasonable sum - essentially reproduction costs. A price less than $2,000 was quoted by two sources at the Earth Resources Laboratory, Bay St. Louis, Mississippi. Refinement can be done by the full-time programmer.

Working Capital: It is expected the company will need to have the capacity to extend credit or financing when necessary for a sale. The cash effect of this would be expected to be 1/20 of all sales for the first two years.

Office Furniture: Without detailing all items, the cost is estimated at $5,000 total to start and $1,000 to maintain and replace. These purchases could be expensed as depreciation over a number of years.

3.3.3.2 Variable Costs

3.3.3.2.1 Consultants

Special problems will present themselves where the support of a specialist consultant would be very useful. These people could be hired

[1]Estimate from phone inquiries to real-estate firms in St. Louis Mo. area.

by the hour or by the day. They could review site evaluations performed, format of presentation of evaluations, the marketing effort, help keep track of developing trends, etc. The estimated use of consultants is about 2 days/month at $200/day and 16 individual hours/month at $30/hour for a total of $880/month consultants' fees or $10,560/year.[1]

3.3.3.2.2 Printing

Since promotional brochures and well-presented reports (with expensive color graphics) are key ingredients of the service's success, printing costs are expected to be substantial. It is estimated to run $150/job. For twenty-five site evaluations, the cost would be $3,750 - much more in later years as the number of jobs increases.

3.3.3.2.3 Data Acquisition

As of mid-1980 it still costs $200/LANDSAT image for a Computer Compatible tape. It is estimated there will be needed an average of 2.5 images/area processed. This is because it sometimes requires images at different times of the year to produce the breakdown in land-use and cover classifications required. To differentiate accurately between corn and soybeans, for example, three good images at the right times of the growth cycles are needed. Therefore, twenty-five jobs would potentially require about sixty-two scenes. This means an expenditure of $12,400 for the images. This amount may not increase in proportion to increasing job volume, however, as jobs are expected to overlap on another - more than one job may be processed from the same 10,000 square mile LANDSAT scene. A two-county area probably represents only 1/6 or so of a complete

[1] Reasonableness checked against specialists in agronomy at the University of Missouri Agricultural Extension.

LANDSAT image. Proper promotion of the service should encourage such efficiencies in operation. As the numbers of jobs increase, the data acquisition needs/job should therefore drop to an assumed two images/job and eventually 1.5 images/job.

3.3.3.2.4 Travel

Travel expense is based upon assumptions. It is estimated that to ground truth an image in processing and testing for accuracy, $100 in car expense will be incurred. Also, there will be jobs requiring travel by plane either to make a presentation of the site evaluation or to make a promotional sales visit. We estimate these trips will average at least one $150 trip by plane/job. Thus the travel expense estimate is $250.00/job and for twenty-five jobs the expense would be $6,250.

3.3.3.2.5 Marketing

In addition to travel, one other significant expense of marketing is likely to be entertainment. $200 in promotion/job acquired does not seem unreasonable. Thus, we allocate $5,000 for entertainment and $10,000 for special expert advice on promotion plus a $20,000 discretionary fund for extra travel or advertising. The quality of the work done in the promotion of the service in the first years may be the key to success or failure of the enterprise.

3.3.4 Is the Business Commercially Viable?

3.3.4.1 Introduction to Net Present Value Analysis

In any business, the investment in plant or equipment involves a pattern of present expenditure followed by annual receipts in excess of

annual disbursements and climaxed by disposal of the plant or equipment for some net salvage value. This cash flow pattern provides basic information for evaluating the investment. However, even when accurate estimates of cash flows have been made, inspection of these estimates alone seldom reveals answers to the questions: "Will it pay?", or "How does this investment compare with others?" The difficulty is that cash flows in different years are not directly comparable. We overcome this difficulty by taking into account the time value of money. By converting cash flows to an equivalent sum at the present date, we can determine whether the after-tax cash flow is sufficient to provide repayment of, and return at some minimum attractive rate on, the investment.

Basic to this analysis is the concept of equivalence of cash flows. If an investor is indifferent to receiving a certain sum now, or a larger sum a year from now, then we say that the two sums are equivalent in present value. The rate at which the sums must increase with time to be equivalent to the investor is called the "minimum attractive rate of return." To transform future receipts and disbursements into present equivalents, we discount them by the interest rate equal to the minimum attractive rate of return. Summing the present equivalents of all receipts and disbursements gives the present equivalent value or "net present value" (NPV) of the investment being considered.

The NPV analysis embodies the same information as either an equivalent annual cash flow or a rate of return analysis. For example, the rate of return of an investment is the discount rate for which its NPV equals zero.

The basic decisions one can make from NPV analysis are the key ones in evaluating an investment. Projects with positive net present values are acceptable because discounted benefits exceed cost. Projects with the largest net present value are the most desirable because they offer the greatest net gain. Those with negative net present values are economically unacceptable.

3.3.4.2 Agribusiness Site Selection Net Present Value

This section computes the NPV of an investment in an agribusiness site selection consulting firm. It is important at the outset to describe the assumptions under which the analysis takes place. First, the selected discount rate is 12%. This seems a reasonable after-tax rate of return to require for a business investment with some risk but, according to our market survey, a large and eager potential market. The analysis also assumes that the business begins with a loan of enough capital to make initial capital investments and pay initial cash outflows as the business gets started. We assume that the interest paid on this loan is 15% per year. At the time this analysis took place the prime rate was 11.5%. Allowing for increases we forsaw we chose the 15% loan cost. Later increases in the prime rate made this 15% interest seem inexpensive. However, we present the analysis so that new assumptions on this or any other cost item are easy to add and their effects are easy to track.

We attempt to account for other potential variations in assumptions by presenting <u>two</u> NPV analyses that take somewhat different views of the future of the business. Analysis #1 is a ten-year discounted cash flow analysis that assumes that the business gains widespread customer acceptance soon. In analysis #1 (see Table 3.1) marketing is intense, the staff

Table 3.1: Ten Year Discounted Cash Flow Analysis at 12%

Costs	Year 0	(n)++	Year 1	(n)	Year 2	(n)	Year 3	(n)	Year 4	(n)	Year 5
Revenues:											
Salvage value of computer	0	[13]	42,900	[20]	66,000	[30]	99,000	[45]	148,500	[60]	198,000
Service #1) ≈ 44% growth/yr to year 6											
Service #2) ≈ 46% growth/yr from year 2 through yr 6	0		0	[400 hrs]	12,000	[600 hrs]	18,070	[900 hrs]	27,000	[1400 hrs]	42,000
Service #3) ≈ 31% growth/yr to year 7	0	[12]	90,000	[20]	150,000	[32]	240,000	[40]	300,000	[40]	300,000
Total Revenue			132,900		228,000		357,000		475,500		540,000
Loan Amount, Year 0	700,000										
Fixed:											
Permanent staff (includ. fringe)			124,000		124,000		124,000		148,500		168,500
Staff Added							24,500*		20,000**		10,000***
Total Staff Cost			124,000		124,000		148,500		168,500		178,500
Interest 15% - 10 yr.			105,000		99,828		90,801		83,500		75,104
Office Space			7,200		7,200		7,200		7,200		7,200
Miscellaneous			8,600		8,600		8,600		8,600		8,600
Total Fixed Costs			244,800		239,628		255,101		267,800		269,404
Variable Costs:											
System Maintenance			10,000		10,000		15,000		20,000		25,000
Consultants			10,560		10,560		10,560		10,560		10,560
Data Acquisition		2.5+	12,500		20,000	2+	24,800	1.5+	25,500		30,000
Travel			3,000		5,000		8,000		10,000		10,000
Marketing			35,000		35,000		35,000		35,000		35,000
Printing			7,800		3,000		4,800		6,000		6,000
Total Variable Costs			72,860		83,560		98,160		107,060		116,560
Start-Up Costs:											
Working Capital	10,000										
Office Furniture	5,000										
Software	2,000										
Computer System	241,000										
Total Start-Up Costs	258,000										
Total Costs	258,000		317,660		323,188		353,261		374,860		386,964
Net Before-Tax Cash Flow In/(Out)	(258,000)		(184,760)		(95,188)		3,739		100,640		154,036
Depreciation			16,600		16,600		16,600		16,600		16,600
Interest			105,000		99,828		90,801		83,500		75,104
Taxable Income			(306,360)		(21,616)		(103,662)		540		62,332
Income Tax - 44%									238		27,426
Net After-Tax Cash Flow In/(Out)	(258,000)		(184,760)		(95,188)		3,739		100,402		126,610
12% Discounted After Tax Inflow/(Outflow)	(258,000)		(164,964)		(75,883)		2,661		63,813		71,872

TOTAL NET PRESENT VALUE = $207,233.

*1/2 time typist and associate agronomist.
**full-time computer operator.
***Another 1/2 time assistant agronomist.
+Average number of screens to be purchased per job.
++(n) = number of jobs.

Table 5.1: 10A Year Discounted Cash Flow Analysis at 12% (continued)

Costs	(n)*	Year 6	(n)	Year 7	(n)	Year 8	(n)	Year 9	(n)	Year 10
Revenues:										
Salvage value of computer										80,000
Service #1) ≈ 44% growth/yr to year 6	[82]	270,000	[82]	270,000	[82]	270,000	[82]	270,000	[82]	270,000
Service #2) ≈ 46% growth/yr from year 2 through yr 6	[1800 hrs]	54,000	[1800 hrs]	54,000	[1800 hrs]	54,000	[1800 hrs]	54,000	[1800 hrs]	54,000
Service #3) ≈ 31% growth/yr to year 7	[50]	375,000	[50]	375,000	[50]	375,000	[50]	375,000	[50]	375,000
Total Revenue		699,000		699,000		699,000		699,000		779,000
Loan Amount, Year 0										
Fixed:										
Permanent staff (includ. fringe)		178,500		198,500		198,500		198,500		198,500
Staff Added		20,000**								
Total Staff Cost		198,500		198,500		198,500		198,500		198,500
Interest 15% - 10 yr.		65,448		54,344		41,575		26,890		10,002
Office Space		7,200		7,200		7,200		7,200		7,200
Miscellaneous		8,600		8,600		8,600		8,600		8,600
Total Fixed Costs		279,748		268,644		255,875		241,190		224,302
Variable Costs:										
System Maintenance		25,000		25,000		30,000		30,000		30,000
Consultants		10,560		10,560		10,560		10,560		10,560
Data Acquisition		39,000		42,000		42,000		42,000		42,000
Travel		12,250		15,000		15,000		15,000		15,000
Marketing		35,000		35,000		35,000		35,000		35,000
Printing		7,500		9,000		9,000		9,000		9,000
Total Variable Costs		129,310		136,560		136,560		136,560		136,560
Start-Up Costs										
Working Capital										
Office Furniture										
Software										
Computer System										
Total Start-Up Costs										
Total Cost		409,058		405,204		392,435		377,750		360,862
Net Before-Tax Cash Flow In/(Out)		289,942		293,796		306,565		321,250		418,138
Depreciation		16,600		16,600		16,600		16,600		16,600
Interest		65,448		53,344		41,575		26,890		10,002
Taxable Income		207,894		223,852		248,390		277,760		391,536
Income Tax - 44%		91,473		98,495		109,291		122,214		172,276
Net After-Tax Cash Flow In/(Out)		198,469		195,301		197,273		199,035		245,862
12% Discounted After Tax Inflow/(Outflow)		100,550		88,344		79,675		71,527		79,168

*(n) = number of jobs.

**Add associate agronomist.

dedicates itself to a quality product, and efficient production without major "bugs" permits developing rapidly from a modest start to revenues of $774,000 by the 7th year. The second analysis (see Table 3.2) represents a slower growth and somewhat more modest start. It also assumes budget reductions. Travel has been reduced/job from $250 to $150, marketing from $25,000/yr to $20,000. There are other minor adjustments in system maintenance. Personnel additions come in later periods since the job volume does not increase so quickly. In this analysis, business lifetime (the period of analysis) increases to fifteen years.

Despite the pessimism in Analysis #2, we assert that the first discounted cash flow assumptions, strategy, and figures are more realistic. The market exists for this service, our survey has demonstrated. A dedicated staff with sufficient resources and marketing finesse should be able to find all the jobs it can handle, if the survey results are in fact representative of the interest among all agribusiness firms.

One concern may be that staff in later years may have to work hard to handle the number of jobs listed in the analyses. The sixty full site evaluations in final years represents twenty jobs/year/full time staff agronomist (with the additional help of a couple of half-time assistants). We have assumed that time, experience, and technological developments increase the staff efficiency by this point in the history of the business.

A dedicated and committed permanent senior staff will be essential to achieving this level of success. If staff were given an ownership interest in the business, that might supply the motivation needed.

Table 3.2: Fifteen Year Discounted Cash Flow Analysis at 12%

Outflows	(n)*	Year 0	(n)	Year 1	(n)	Year 2	(n)	Year 3	(n)	Year 4	(n)	Year 5
Revenues:												
Salvage of Computer Systems												
Service #1) initial number of jobs lower, rate of 30% growth/yr		0	[10]	33,000	[13]	42,900	[17]	56,000	[22]	72,600	[29]	95,700
Service #2) rate of 30% growth/yr		0	[0]		[400 hrs]	12,000	[520 hrs]	15,600	[676 hrs]	20,280	[878 hrs]	20,340
Service #3 overall rate of 30% growth/yr		0	[10]	75,000	[16]	120,000	[24]	180,000	[32]	240,000	[35]	262,500
Total Revenue				108,000		174,900		251,700		332,880		384,540
Loan amount Year 0		680,000										
Fixed:												
Permanent Staff				124,000		124,000		124,000		124,000		148,500
Staff Added										24,500**		10,000***
Total Staff Cost				124,000		124,000		124,000		148,500		158,500
Interest 15% - 15 yr.				102,000		99,856		97,390		94,555		91,294
Office Space				7,200		7,200		7,200		7,200		7,200
Miscellaneous				8,600		8,600		8,600		8,600		8,600
Total Fixed Costs				241,800		239,656		237,190		258,855		265,594
Variable Costs:												
System Maintenance				10,000		10,000		12,000		15,000		17,000
Consultants				6,000		6,000		6,000		6,000		6,000
Data Acquisition			2.5+	10,000		14,500		20,000	2+	20,800		24,800
Travel $150/job				1,500		2,400		3,600		4,800		5,250
Marketing (reduced)				20,000		20,000		20,000		20,000		20,000
Printing				1,000		1,600		2,400		3,200		3,500
Total Variable Costs				49,000		54,500		64,000		69,800		76,550
Start-Up Costs:												
Working Capital		10,000										
Office Furniture		5,000										
Software		2,000										
Computer System		241,000										
Total Start-Up Costs		258,000										
Total Costs		258,000		290,800		294,156		301,190		328,655		342,144
Net Before-Tax Cash Flow In/(Out)				(182,800)		(119,256)		(49,490)		(4,225)		42,396
Depreciation				11,067		11,067		11,067		11,067		11,067
Interest				102,000		99,856		97,390		94,555		91,294
Taxable Income				(295,867)		(230,179)		(157,947)		(109,847)		(59,964)
Income Tax - 44%												
Net After-Tax Cash Flow In/(Out)				(182,800)		(119,256)		(49,490)		(4,225)		42,396
12%/yr Discounted After Tax Inflow/(Outflow)		(258,000)		(163,222)		(95,071)		(35,227)		(2,685)		24,055

TOTAL NET PRESENT VALUE = $136,121.

*(n) = number of jobs.
**1/2 time typist and associate agronomist.
***1/2 time computer operator.
+Average number of screens to be purchased per job.

Table 3.2: Fifteen Year Discounted Cash Flow Analysis at 12% (continued)

Outflows	(n)	Year 6	(n)	Year 7	(n)	Year 8	(n)	Year 9	(n)	Year 10
Revenues:										
Salvage of Computer Systems										
Service #1) Initial number of jobs lower, rate of 30% growth/yr	[375]	122,100	[48]	158,400	[62]	204,500	[82]	270,000	[82]	270,000
Service #2) rate of 30% growth/yr	[1142 hrs]	34,260	[1485 hrs]	44,550	[1800 hrs]	54,000	[1800 hrs]	54,000	[1800 hrs]	54,000
Service #3) overall rate of 30% growth/yr	[42]	315,000	[48]	360,000	[54]	405,000	[58]	435,000	[60]	450,000
Total Revenue		471,360		562,950		663,600		759,000		774,000
Loan amount Year 0										
Fixed:										
Permanent Staff		158,500		168,500		178,500		198,500		198,500
Staff Added		10,000*		10,000**		20,000***				
Total Staff Cost		168,500		178,500		198,500		198,500		198,500
Interest 15% - 15 yr.		87,544		83,232		78,272		72,569		66,010
Office Space		7,200		7,200		7,200		7,200		7,200
Miscellaneous		8,600		8,600		8,600		8,600		8,600
Total Fixed Costs		271,844		277,532		292,572		286,869		280,310
Variable Costs:										
System Maintenance		20,000		25,000		25,000		30,000		30,000
Consultants		6,000		6,000		6,000		6,000		6,000
Data Acquisition		28,000	1.5+	25,800		30,600		36,000		42,600
Travel $150/job		6,300		7,200		8,100		8,700		9,000
Marketing (reduced)		20,000		20,000		20,000		20,000		20,000
Printing		4,200		4,800		5,400		5,800		6,000
Total Variable Costs		84,500		88,800		95,100		106,500		113,600
Start-Up Costs:										
Working Capital										
Office Furniture										
Software										
Computer System										
Total Start-Up Costs										
Total Costs		356,344		366,332		387,672		393,369		393,910
Net Before-Tax Cash Flow In/(Out)		115,016		196,618		275,928		365,631		380,090
Depreciation		11,067		11,067		11,067		11,067		11,067
Interest		87,544		83,232		78,272		72,569		66,010
Taxable Income		16,405		102,319		186,589		281,955		303,014
Income Tax - 44%		7,218		45,020		82,095		124,078		133,326
Net After-Tax Cash Flow In/(Out)		107,798		151,598		193,823		241,553		246,764
12%/yr Discounted After Inflow/(Outflow)		54,610		68,568		78,288		87,104		79,458

*1/2 time to full time computer operator.
**Another 1/2 time agronomist.
***Add associate agronomist.
+Average number of screens to be purchased per job.

Table 3.2: Fifteen Year Discounted Cash Flow Analysis at 12% (continued)

Outflows	(n)	Year 11	(n)	Year 12	(n)	Year 13	(n)	Year 14	(n)	Year 15
Revenues:										
Salvage of Computer Systems										80,000
Service #1 Initial number of jobs lower, rate of 30% growth/yr	[82]	270,000	[82]	270,000	[82]	270,000	[82]	270,000	[82]	270,000
Service #2) rate of 30% growth/yr	[1800 hrs]	54,000	[1800 hrs]	54,000	[1800 hrs]	54,000	[1800 hrs]	54,000	[1800 hrs]	54,000
Service #3 overall rate of 30% growth/yr	[60]	450,000	[60]	450,000	[60]	450,000	[60]	450,000	[60]	450,000
Total Revenue		774,000		774,000		774,000		774,000		[illegible],000
Loan amount Year 0										
Fixed:										
Permanent Staff		198,500		198,500		198,500		198,500		198,500
Staff Added										
Total Staff Cost		198,500		198,500		198,500		198,500		198,500
Interest 15% for 15 yr.		58,468		49,794		39,819		23,348		15,169
Office Space		7,200		7,200		7,200		7,200		7,200
Miscellaneous		8,600		8,600		8,600		8,600		8,600
Total Fixed Costs		272,768		264,094		254,119		237,648		229,469
Variable Costs:										
System Maintenance		30,000		30,000		30,000		30,000		30,000
Consultants		6,000		6,000		6,000		6,000		6,000
Data Acquisition		42,600		42,600		42,600		42,600		42,600
Travel $150/job		9,000		9,000		9,000		9,000		9,000
Marketing (reduced)		20,000		20,000		20,000		20,000		20,000
Printing		6,000		6,000		6,000		6,000		6,000
Total Variable Costs		113,600		113,600		113,600		113,600		113,600
Start-Up Costs:										
Working Capital										
Office Furniture										
Software										
Computer System										
Total Start-Up Costs										
Total Costs		386,368		377,694		367,719		351,248		343,069
Net Before-Tax Cash Flow In/(Out)		387,632		396,306		406,281		422,752		510,931
Depreciation		11,067		11,067		11,067		11,067		11,067
Interest		58,468		49,794		39,819		23,348		15,169
Taxable Income		318,097		335,445		355,395		388,337		484,695
Income Tax - 44%		139,963		147,596		156,374		170,868		213,266
Net After Tax Cash Flow In/(Out)		247,669		248,710		249,907		251,884		297,665
12%/yr Discounted After Tax Inflow/(Outflow)		71,205		63,844		57,279		51,535		54,383

3.3.5 Conclusions and Recommendations

Our market survey in agribusiness site selection shows strong interest among most market sectors. Various specialty areas in agribusiness expressing a willingness to increase spending over 25% over current site evaluation spending if they could get the sort of service hypothesized.

Based on this survey response, we projected a revenue stream for the business. For example, we estimated (optimistically) that it could grow to sell sixty full site evaluations at $7500. apiece, plus other simpler services for smaller fees. We projected costs for providing these services, and undertook Net Present Value analyses. Optimistic Analysis #1 found an NPV of $207,233.00 after taxes at a 12% discount rate. Analysis #2, using somewhat less optimistic assumptions on growth rate, calculated a $136,121.00 NPV. Both figures are positive, a healthy indication. Stated another way, the NPV analyses show that the businesses realize well over a 12% return on investment after taxes, a fine indication.

We recommend that an experimental business should be funded in the area of site evaluation incorporating remote sensing technology. A minimum five year experimental project (to test our cost and revenue projections) should be funded and sold after the fifth year, when it should be profitable. Senior level staff members should be given an interest in the progress of the business through partial ownership along with the government, or a generous profit-sharing agreement. By the fifth year there should be provided a good demonstration of the viability of the concept for commercial purposes and the stage should be set for a smooth transfer to private ownership and funding.

3.4 A CROP FORECASTING SERVICE

3.4.1 Introduction

Earlier we briefly described our idea for a new LANDSAT-based, crop forecasting service. Here we assess the feasibility of the idea in detail. We evaluate data from a market survey (done by us earlier) in the light of the current state of the art. We conclude that, although the technology for LANDSAT-based forecasts shows great promise, a new commercial forecasting service based on this technology would not be viable. Constraints on LANDSAT and supporting data timeliness and availability would make the service noncompetitive.

3.4.2 Previous Agribusiness Research

3.4.2.1 Huisinga Study

Previous to this summer, most of our research relating to the agribusiness community was based upon the EODMS project work of Jack Huisinga: Private Sector Short-term Information Needs and Potential Delivery Technologies. His work, conducted in the spring of 1978, surveyed 153 agribusiness companies from which the response rate was 32%.

For this study, the agribusiness community was divided into eight industry groups such as equipment manufacturers, chemical manufacturers, grain traders, etc. Note farmers were excluded from the survey. The survey was mailed to 153 firms, with the selection biased toward larger firms, as it was assumed that larger firms would be in a better position to make use of remote sensing-derived information.

The questionnaire contained thirteen multiple response questions, structured such that responses to previous questions did not bias responses to later questions. The last four questions were more open-ended,

inviting any level of detail the respondent cared to provide. The subjects covered included firm characteristics, unsatisfied information needs, desired temporal characteristics of provided information, desired form of presentation of information, the firm's current information sources, the use made of the information by the firm (extraction and interpretation), current expenditures for information, likelihood that the firm would purchase information if it could be provided at less cost by a private firm, and how much the firm would be willing to pay for such information (a range).

3.4.2.2 Conclusions of the Study

3.4.2.2.1 Unsatisfied Needs

Huisinga's findings are summarized by industry group in Table 3.3. The survey data indicate that approximately 40% of the firms responding feel the current reports of crop conditions are too general or too late for their needs (see Table 3.4). The greatest need for improvement was in the timeliness of information. Specific information items in which improvement could enhance the operating efficiency of the respondent firms included the traditional crop information areas of acreage planted (or to be planted), the condition of the crop, and forecasts on total production and final yield. The areas for which information was needed varied from local (one county to six county areas) for the farm equipment manufacturers, to world production forecasts for grain traders.

3.4.2.2.2 Willingness to Pay

The study results indicate a conditional willingness to pay for improved information. Some portion of the willingness assumes that access to the information is restricted. The value of the item to the

Table 3.3: Summary of Huisinga Survey Responses

Information Use Characteristics by Agricultural Industry Groups

Industry Group	Purpose of Information	Primary Information Item	Indicator Used	Needs and Constraints	Comments	Current Information Expenditures*	Individual Willingness to Pay for Improvements*
Equipment Manufacturers	Locate and evaluate sales potential	Local farm income Export demand	Crop acreage forecasts Marketing data Crop stress Foreign production	Accurate, specific acreage data Timely stress reports Private use	Production lead time is approximately 2 years Sales follow farm income by 6 months	$15000 ± ?	$3000 to $50000
Chemical Manufacture (fertilizer)	Locate and evaluate sales potential Timely delivery	Local farm income Local crop acreage Timing of field activities	Crop acreage Marketing data Local acreage estimates Crop stress Weather reports and forecasts	Accurate, specific acreage data Accurate weather forecasts timely stress reports Private use	Must program deliveries during application activities	~0 to $50000	$2000 to $50000
Seed Producers	Locate and evaluate sales, current and future years	Local crop acreage Crop performance Stress and identification	Crop acreage forecasts Marketing data Stress and identification	Timeliness of reports	Production lead time is approximately 2 years	?	"lots" estimated less than $5000
Grain Trade	Determine trading conditions and crop price Determine grain quality	Grain production Export demand Harvest progress	Most available crop indicators Crop condition and crop stress by agent	Proprietary use Timely condition reports Accuracy and objectivity of all measures	Activities are queued by USDA information Extensive forecasting, quantitative in nature	$25000 to $150000 (speculators) $500 (commercial)	$50000 or more $500
Information Service	Inform clientele of events and conditions and their impact	Most items	Most available crop indicators	Foreign production forecasts Accurate, objective and timely acreage forecasts	Provide a wide variety of information	"little to $250000	0 to $5000 (estimate)
Financial Service	Determine farmer credit worthiness	Farm income	Farm income reports			~0	"little"
Land Management		Crop condition, stress and agent	Moisture conditions Stress and agent	Timely condition reports		0 to $500	"little" to $400
Crop Transportation	Determine demand and program services	Grain production export demand	Production and export forecasts			~0	zero

*See the text on each group for context.

Table 3.4: Information Needs of Agricultural Industry Groups Which Need Improvement or Remain Unsatisfied

Information Item	Needed Improvement	Relative* Need %	Industry Group: Need Unsatisfied	Industry Group: Improvement Useful
Crop Acreage	Greater Accuracy Smaller Area Specificity	10% - 20%	Chemical Manufacture Equipment Manufacture	Grain Trade Information Services Seed Production
Crop Condition	Timeliness	30% - 60%	Grain Trade Equipment Manufacture Chemical Manufacture	Information Services
Existance of Crop Stress	Local Specificity Objective Measures		Grain Trade Seed Production	Information Services
Identification of Agent Causing Stress	Timeliness		Chemical Manufacture Seed Production	Grain Trade Information Services Land Management
Export Demand (foreign production forecast)	Accuracy and Timeliness	30% - 50%	Grain Trade Equipment Manufacture	Information Services

*Relative Need % is the approximate proportion of willingness to pay for that item compared to all items as indicated by responses to the questionnaire.

firm is greatly reduced if that information is publicly available. In addition, many firms find it advantageous to have access to values for some portion of the production relationship in advance of when the values are easily predictable. This may in some cases be interpreted as "before the publication of the U.S.D.A. forecasts" which are discussed below.

3.4.3 Existing Crop Forecasting Systems

The Huisinga study included a review of existing services, and an analysis of how well those services addressed the identified priorities of timeliness and accuracy. An abbreviated discussion of each follows.

3.4.3.1 U.S. Department of Agriculture (USDA)

The U.S. Department of Agriculture (USDA) is the most widely used source for crop-related data. Half the respondent firms listed it as their most valuable source. The Economics, Statistics, and Cooperative Service of the USDA uses area frame sampling in the form of aerial photography and ground truth verification to yield forecast data after the growing season has begun. This sample method is supplemented with list frame sampling - questionnaires sent out before planting for acreage planting intentions, as the crop progresses for yield expectations and after harvest for final acreage and production. The Crop Reporting Board uses the information to make its official reports.

3.4.3.2 The Statistics Service of the USDA/LANDSAT

USDA/LANDSAT has been used experimentally to improve the accuracy of acreage reported in August for corn and soybeans in a 29-county area of Illinois. Timeliness, however, was not improved. Its advantage is in accuracy, as the LANDSAT imagery is unbiased. This system could therefore be profitably employed as a part of any "location assessment" service.

3.4.3.3 LACIE (Large Area Crop Inventory Experiment)

LACIE experimented with the use of LANDSAT imagery, soil characteristic data, and meteorological data (real-time) to determine wheat crop condition and yield forecasts. LACIE has substantially improved the accuracy and timeliness of crop condition reporting and yield forecasting for the Soviet Union in particular. AGRISTARS, a follow-on program, will apply similar techniques to fourteen additional crops.

3.4.3.4 CROPCAST®

CROPCAST is a proprietary grain information delivery system provided by the Earth Satellite Corporation of Washington, D.C. CROPCAST forecasts acreage earlier than the USDA by using historical figures such as grain prices at harvest, crop acreage and yield for previous year's harvest, and other socio-economic figures that may be relevant to the area examined. A U.S.S.R. prediction, for example, might consider published goals for the area's production. Incoming data is processed through models developed by the corporation to provide forecasts of acreage before the USDA forecasts become available.

Yield forecasts are produced from daily meteorological information, soil characteristic data, historical data, crop varietal data, USDA data, and some use is made of LANDSAT imagery. The system specializes in wheat, corn, and soybeans.

3.4.3.5 Purdue Alfalfa Pest Management Project

This is an example of biotic modeling to predict the potential impact a pest (the alfalfa weevil) may have on a crop harvest (alfalfa). Output from an alfalfa weevil growth and population model and output from

an alfalfa growth model were input into a plant-pest interaction model to provide a forecast of the pest impact on alfalfa production.

3.4.4 Improved Crop Forecasting Service

3.4.4.1 Data Needs

Our project concluded that a new crop forecasting service was not justified unless it could overcome the limitations experienced by existing systems. An improved service could provide more timely forecasts if LANDSAT imagery could be received in the form of computer compatible tapes within a week of recording by the satellite. Direct access to the CGIS of incoming real-time meteorological data from the National Weather Service (NWS) could further enhance this system's efficiency. Current systems use meteorological data as part of the data base for modeling, but they are dependent upon forecasts from the NWS. Information services could produce their own forecasts from incoming data.

The production of improved forecasts requires equally timely and reliable information from a variety of related sources, such as:

historical data on crop yields and production variables such as soil moisture retention characteristics by soil composition

moisture levels at which stress begins for various crops

climatological data

crop variety data

pest distribution and associated bio-model

LANDSAT imagery and computer-extracted information on acreage and condition of crops

aerial photography-extracted information

ground-truth verification data.

Some firms interviewed expressed special interest in forecasts of crops for which the necessary technology is not yet in place. Sugar was of special interest due to its volatility in price. Inventory control of less volatile commodities would also be more efficient if the size of the forecoming harvest could be generally predicted (e.g., larger or smaller than normal). The advantage lies in efficiently storing items for which there is a short harvest period, a year-long demand, a fluctuating harvest size, but a relatively stable price. Apples or similar fruits and nuts for which consumers find many substitutes are good examples. Even general forecasts provided in this area on a timely basis at a reasonable price would appear to find a good market.

3.4.4.2 Cost Analysis

The data base and programming loads for versatile and timely processing of continually incoming data requires substantial computer capacity. The estimated cost of such a computer system is $500,000. According to the Earth Satellite Corporation, CROPCAST® cost $2M to develop. The software for a new forecasting service could be developed at a lower cost by building upon the programs available from LACIE and other projects. Expansion into new crop areas, however, would require significant investment.

Employment of professional personnel in various fields will contribute further to the costs of offering a service. It will need expertise in statistical-modeling and computer programming, agronomy, and meteorology, as well as market experts or consultants in the agribusiness specialties served.

A third major cost component of offering an improved forecasting service is data acquisition expense. An emphasis on timeliness and accuracy will increase the quantity of data -- LANDSAT imagery as well as supporting geographical and meteorological data -- which must be obtained and processed.

3.4.5 Assessment of an Improved Crop Forecasting Service

We conclude that a new crop forecasting business is not viable at this time. The essential ingredient of timeliness would be difficult to fulfill with the current five-week lag in distribution of LANDSAT imagery and limits on early dispersal of USDA statistical data. Competition from government sponsored projects, such as AGRISTARS, further discourages private development in this area.

LANDSAT's limitations as a data source for crop forecasts are largely political, not technical. There is no technical reason for a five-week delay in data delivery. Given the required political support, data delivery times could be much enhanced. Perhaps under the aegis of the U.S. Department of Commerce, the agency recently put in charge of LANDSAT data distribution, the situation will improve.

Another political restriction is the unavailability to the private sector of USDA statistical data. Protected from early dispersal by law, these data contain valuable supporting ground truth information needed in crop forecasting using LANDSAT.

The third political limit has been on the spatial resolution of LANDSAT's primary sensor, the MSS. The Department of Defense set the 80m limit for security reasons. Of the three constraints, this is the

only one likely to be loosened soon, with the launch of LANDSAT D's 30m resolution Thematic Mapper.

Perhaps if the potential value of LANDSAT as a crop forecasting tool were made more widely known, political pressure could be more effectively brought to bear to ameliorate this situation. The business idea discussed in the section to follow may be a way to gain this publicity. Moreover, it appears to be a good commercial opportunity.

3.5 THE LANDSAT TV FOOD REPORT

3.5.1 Introduction

Local television news, once a one- or two-man show of headlines, has become a large-scale production. It dispenses both information and extertainment. On any given newscast one can witness a series of pre-recorded investigative reports, live remote feeds, high-technology weather reports, in-depth sports reports, and brief, humorous stories.

With a volatile domestic economy, Americans have become increasingly concerned with business and financial affairs; hence the development of the "business person" on TV newscasts, an economic analyst who provides information on the marketplace. Some television stations have also been featuring a marketplace reporter of another kind -- the TV "food person", who gives consumers tips as to good foods and bargains in the grocery. Up until now the roles of these two reporters have not been combined into one, but this could conceivably happen in the near future.

LANDSAT may provide the motivation for this new news service. Earlier in Chapter 3, we saw the potential to use LANDSAT agricultural surveys in the United States, despite the timeliness and cost problem. Ideally, this information would be made accessible to consumers simply by turning on one's television set.

KMOX-TV, the local CBS-owned television station, features on its local newscasts a syndicated consumer service called, "The Green Grocer." Joe Carcione, the "reporter" for this program, tells shoppers how to select the best fresh fruit and vegetables, while also giving tips on preparing and storing foods. Carcione does not report on future price changes in food stocks; nor does he report on crop conditions.

It was our idea to combine "the Green Grocer" with an agricultural market analysis, thereby advising consumers on how to save money. This program's format would be similar to that of "The Green Grocer", but its advance crop information would enable consumers to save money on a regular basis. LANDSAT's primary role in the broadcasts would be to provide a graphic display of a crop-producing region. This role resembles that of the weather satellite data on TV weather forecasts. Some of the advance crop information might also be derived from LANDSAT-provided data, but much would stem from the futures pages of the Wall Street Journal or predictions from local grocers.

The station manager at KMOX-TV expressed interest in the idea and allowed our project staff to work with a student intern at the station to develop it further. Passing the scrutiny of one of the nation's five CBS-owned TV stations made us believe that the idea was worth pursuing.

3.5.2 Format, Timing, and Content of the News Reports

The program would air daily on local newscasts. Each report would concentrate on a particular food item, making a prediction as to how that item would fare in the marketplace in the near future. Each report would be accompanied by a LANDSAT scene of the area in which the particular food item is produced; this would show the viewer why we felt confident about our prediction. We would also support our prediction by consulting future price listings, either from financial publications or from teletype agricultural reports; these would have already been set on the wholesale level, translating out to a few days or weeks before these developments affected retail prices.

A local supermarket chain, the sponsor of "The Green Grocer", provided a list of the twenty highest dollar value items and the most frequently-purchased items at their stores. The daily reports would focus on the foods among these popular items:

1. meat
2. dairy products
3. produce products (fresh fruit and vegetables)
4. frozen foods
5. health and beauty aids
6. tobacco products
7. bakery products (both fresh-baked in the store and packaged products from other sources)
8. soft drinks and drink mixes
9. beer
10. paper products
11. coffee
12. housewares
13. cookies and crackers
14. pet products
15. soaps and detergents
16. canned vegetables
17. breakfast foods (cereal)
18. snacks (pretzels, potato chips, etc.)
19. candy and gum (separate category from snacks)
20. canned juice

3.5.3 Example Script

We based a prediction of summer fruit prices on data from a local market chain, and we transformed the prediction into a sample script. The example script appears below. Note in particular its use of comparison reporting, in which conditions from one year are weighted against those of another. This comparison can be greatly augmented by LANDSAT imagery.

"SUMMER FRUITS" SCRIPT

Regular viewers of this news service might know that weather and climatic conditions can affect food prices. This is especially true this summer, as our recent heat wave has taken its

toll on agricultural production. Fruit and vegetables have been affected along with everything else, though the news isn't all that bad.

Crops grown in the Missouri-Illinois-Arkansas area, such as sweet corn, watermelon, peaches and tomatoes, have been diluted by the heat, and they have not been harvested as they normally would be. Because of the low local supply, these items are now coming from other parts of the country. The prices have been raised somewhat because of freight costs, but you might say it's worth it, because the quality is generally very good.

The weather has also contributed to the increased price of California-grown summer fruits, though in a different way. Last year's hot weather in California saw many blueberries, strawberries, cherries, grapes and other tree fruits harvested over a short time span. That heavy supply in the markets was accompanied by a lower price. This year, the weather is cool in California, and the crops aren't coming in all at once, so prices are slightly higher. Yet there is one item that has a lower price than last year -- California pears. Even with freight costs, the price is still lower, and a bargain is a bargain. As far as your other favorite summer fruits go, you may have to pay a few cents more, but at least there's plenty of them. A consoling thought in even the hottest of times.

3.5.4 Role of LANDSAT

By using LANDSAT images as a supplement to the newscasts, the report could show the phenomena underlying the price prediction. Figures 3.1 and 3.2 are LANDSAT scenes of a section of northeastern Missouri and Western Illinois, imaged at different times. These scenes could be used to support the "Summer Fruits" report, as many of the items mentioned in that report are grown in this area. With scenes taken at the right time viewers could see for themselves how the heat and drought affected agricultural production.

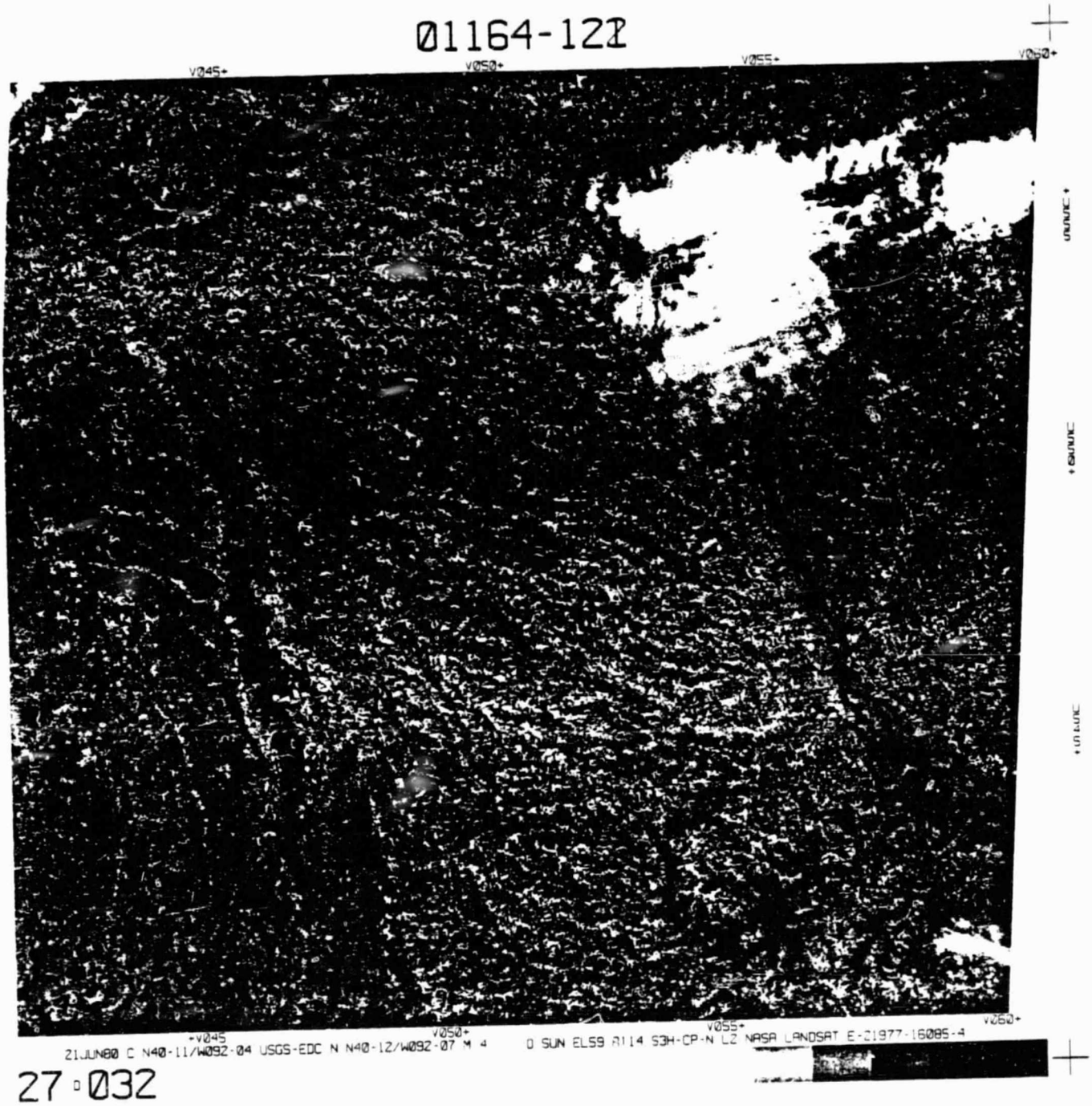


Figure 3.1. LANDSAT Image of Eastern Missouri and Western Illinois, June 1980

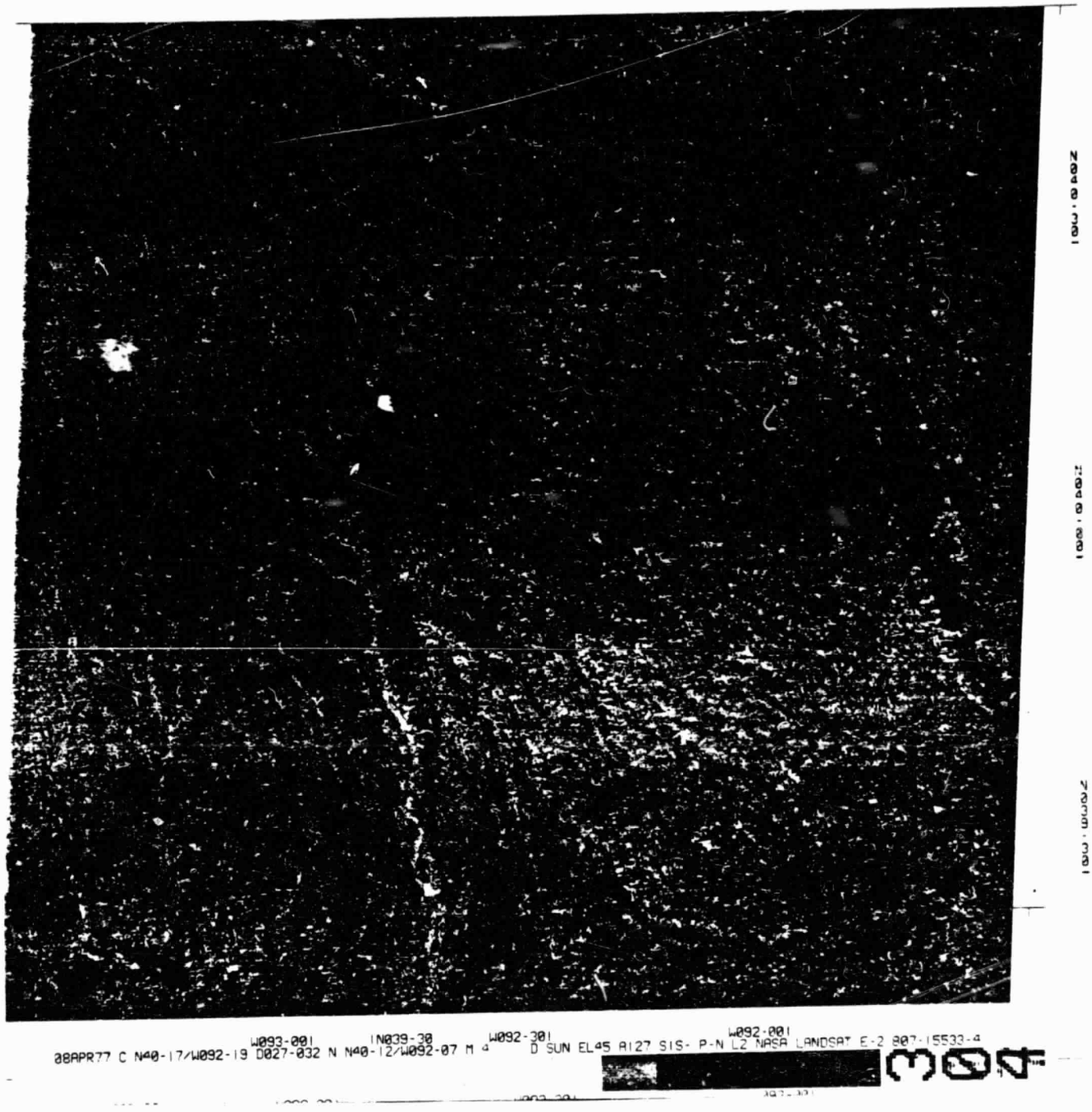


Figure 3.2. LANDSAT Image of Eastern Missouri and Western Illinois, April 1977

4. FORESTRY

4.1 INTRODUCTION

From information on forestry tasks and data needs, we developed six promising ideas for new businesses:

1. A management service for privately held woodlots.
2. A business to build and sell turnkey LANDSAT processing/ CGIS information systems to industry and government for forest management.
3. A potential fire hazard assessment service.
4. A reforestation information service for forest owners, seedling producers, etc.
5. A land capacity assessment consulting firm.
6. A firm specializing in insect and disease monitoring and control.

All of these ideas satisfy two criteria. They can make extensive use of LANDSAT, and they show promise of commercial feasibility. However, of the six ideas we were most enthusiastic about the first: the private woodlot management service. Its potential market is very large, and it shows very good potential for application of both LANDSAT and CGIS technology. Therefore, the next three sections of this chapter concentrate on this service. Section 4.2 describes it briefly and Section 4.3 designs it in detail. Section 4.4 assesses its market potential.

LANDSAT suitability was a key criterion in designing all six of the services listed above. Section 4.5 shows how we systematically derived these new business ideas from an analysis of LANDSAT's ability to satisfy forestry information needs. This section also describes the role that LANDSAT can play in the private woodlot management firm. Finally, it

briefly describes some of the other ideas listed. Appendix C displays the raw data derived in this chapter's market survey.

4.2 A PRIVATE WOODLOT MANAGEMENT SERVICE

4.2.1 Overview

A private woodlot management firm would serve a large and enthusiastic market. Over 73% of the nation's forests are owned by individuals, 28% are government owned, and 13% are held by the forestry industry. Of the 73% owned by individuals, 38% of this is distributed among four million people, who should form much of the market. Our survey of some of these individuals reveals that they need, and will pay for, a service to manage their holdings.

Forest management consists of, among other things, clearing dead trees, pruning, selective cutting, planting, harvesting and selling. The management service would be oriented towards the private small woodlot owner. By "small" we refer to any amount of land less than that owned by forestry, timber, or other companies that make use of large quantities of timber. These larger companies generally manage their own land. Small woodlot owners consist both of those who live on their land and absentee owners.

Presently the state and federal governments have free services available to the small woodlot owner. These services are provided by the U.S. Forest Service, State Foresters, the Agricultural Stabilization and Conservation Service (ASCS), and the American Tree Farm. The U.S. Forest Service provides foresters and makes recommendations for insect, disease, and fire control. State foresters offer onsite inspection, mark trees, and make various management recommendations. The ASCS presently has two programs in which the costs of planting and timber stand improvement are subsidized. These programs are the Forestry Improvement Program and the Agricultural Conservation Program. The forest industry is also helpful

to the small woodlot owner. The industry provides their own foresters for the small owner and sponsors tree farm families.

In the next part of this section, we evaluate the effectiveness of these services. More importantly, we show that they leave room for a private management service.

The private service would use and enhance the free government assistance. A minimum private service would simply make the woodlot owner aware of this assistance, while a maximum-level service, in contrast, would choose and employ all available government help without owner intervention. In the spectrum from minimum to maximum, three example business services are:

1. A one-shot consulting program to assess the small woodlot owner's forestry practices and suggest changes.
2. A periodic assessment of the progress of these suggestions.
3. A full managing service to improve the land and the trees, harvest and replace the timber, sell the product, and manage the financial affairs of the property.

Clearly services #2 and #3 include #1, and #3 includes #2. Services #1 and #2 are oriented towards the owner who lives on the land because the owner is present to oversee activities, while service #3 is oriented towards the absentee owner.

The business would solicit customers over a large region, e.g. statewide, to obtain the "critical mass" of customers necessary to support fieldwork. Employees would be skilled in business and forestry.

LANDSAT would play a role because of the large area covered. It could be used for large-scale inventorying, forest classification, and identification of potential customers. A CGIS could assist in formulating reports for owners.

Major operating costs would lie in acquiring and correlating LANDSAT and ground truth data in a CGIS, software development for the extraction of pertinent data and making optimal economic decisions, the actual costs of fieldwork and hardware acquisition. Initially hardware and software would be a large expense. As the business expands in scope, for example to acting as a middleman in selling timber, it should easily be able to recover this investment.

4.2.2 Present Funding Assistance and Services Available to the Private Woodlot Owner

This section provides more information on government services to illustrate where a private service fits. The State Forester is typically the main provider of government programs. Services from the State Foresters vary from state to state, but they are similar. These similar services include: woodland inventory, woodland management recommendations, actual physical assistance in monitoring planting and harvesting, and information distribution. See Appendix C for further discussion.

The federal government also provides services, primarily forest incentive programs. The Forestry Improvement Program (FIP) was created from the 1978 Cooperative Forestry Assistance Act as an incentive to private woodlot owners. The State Foresters and the Federal Agricultural Stabilization and Conservation Service (ASCS) administer this program. State Foresters are responsible for on the ground and technical assistance, but the primary contact is the ASCS. Program objectives are to stimulate production of timber from the private woodlot owner. The objectives are met through cost-sharing programs for development, management, and protection of timber. Eligible woodlots are defined as one-thousand or fewer acres of forest capable of producing fifty cubic

feet of growth per acre per year. FIP is divided into three categories:

1. FP I - tree planting
2. FP II - timber stand improvement
3. SF - special practices.

FPI has a minimum acreage requirement of ten acres and FPII has a maximum of ten acres of planting under management per year. Priorities for determining the improvement projects selected for the program are as follows:

- potential for enhancement of forest resources
- forty or more acres of woodland
- potential impact on water quality and erosion
- availability of vendors.

Cost sharing agreements can be annual or three to ten year long term agreements. Federal funds can be used up to seventy-five percent of the total cost with ten thousand dollars maximum per year. Woodlot owners are reimbursed upon completion of their project.

Those who do not qualify for the FIP are eligible for the Agriculture Conservation Program (ACP). This is a program for conservation and erosion prevention. The ACP also has a cost sharing program up to ninety percent reimbursement.

Private sector services are also offered to the small woodlot owner. These services are assisted by private foresters, tree farm systems, and commercial development.

Private foresters can offer economic assessments, while by law state foresters can not. The private forester also acts as a sales agent in

generating sales of the owner's timber and contracting with the buyer. These foresters are aware of up-to-date market conditions.

The tree farm program, administered by the American Forest Institute (AFI) is a certification program designed to recognize private foresters and owners involved in proper management practices. AFI also distributes literature for the woodlot owner. Certification is granted under certain stipulations:

1. The land must be inspected by a government forester.
2. The owner must be registered with the American Tree Farm system.
3. A management plan must be drawn up and implemented by the owner.
4. The timber stand must meet the standards defined by the system or certification is taken away.

This program is only for recognition. The owner defines a concise management plan for the program and thus is benefitting himself as well as limiting natural resources damages. The program stresses both economic and ecologic motivations for good management.

Private industry offers assistance in commercial development. Industry provides assistance for disease and pest control, fire control, property line assessment, and market information. It may also lease land from small private woodlot owners, manage the land, pay taxes, and sell the wood.

These are the available services to the small woodlot owner. Later in this chapter, the woodlot owners themselves evaluate their usefulness and effectiveness in the market survey.

4.3 DETAILED DESIGN OF THE SMALL WOODLOT MANAGEMENT SERVICE

4.3.1 Service Alternatives

4.3.1.1 One-Shot Consulting (Service #1)

Many small woodlot owners may be unaware of the potential profits they can receive from their land. A one-shot consulting program would educate the owner. It would analyze market and woodlot data to provide the following information:

1) Potential for income from the land
2) Steps for obtaining the income
   a) selective cutting
   b) appropriate planting
   c) general timber stand improvement
   d) site preparation
   e) other activities, non-forestry related
      i) wildlife management
      ii) other crop planting
3) Free services available, including cost sharing
   a) ASCS
   b) U.S. Forest Service
   c) State Foresters
   d) American Tree Farm
4) Appropriate market statistics
   a) harvest costs
   b) lumber prices
5) Other small woodlot owners in the area interested in forming a consortium to optimize sales.

One-shot consulting is solely an advisory service and once advice is given the firm is finished with the customer.

4.3.1.2 Periodic Reports and Consultations (Service #2)

After the woodlot owner implements suggestions from Service #1, he may want a professional periodically to check up on progress. Generally, this is where most federal and state programs fall short. For example, Minnesota does not have a viable consulting force; it employs only a few individuals for this purpose.[1] Moreover, because state foresters do not devote full time to the small woodlot owner, it may be that money from FIP funds is not utilized to its fullest extent. Thus, it would also be beneficial to government for a firm offering these services to check up on how they are spent.

Methods of charting progress would depend on costs. Aerial photography (remote sensing or otherwise) or fieldwork are alternative methods for monitoring, and the choice depends on economies of scale. Fieldwork would always be necessary in order to detect potential diseases or insect infestation, assess soil conditions, and seedling or other crop progress. Aerial photography could monitor growing stages. It can also assist in determining optimal cutting procedures to minimize costs and damage to land from erosion and to plan cutting so income from the land would be more frequently obtained.

This service will have both a greater need for data and higher costs than Service #1. Thus it may have to solicit a greater number of customers in a restricted geographic area to obtain the "critical mass" necessary for profitability.

---

[1]Small Woodland Owners Conference, July 20-21, 1978, St. Paul Minnesota.

4.3.1.3 A Complete Managing Service for Land Management and Sale of Lumber (Service #3)

Service #3 takes essentially complete control of the land. After suggestions are made to the owner, an agreement would be made as to the appropriate methods to be implemented. The firm would be responsible for obtaining those free services available, including cost-sharing funds, overseeing them, monitoring results, planning in ways not available from the government, contracting for harvesting the trees and/or other crops, selling the harvested goods, and reporting on the woodlot's financial status.

The firm would form a consortium of small woodlot owners -- its customers. The consortium would have more selling power and get better prices than its members could individually.

4.3.2 Selling the Service

A standardized solicitation package, sent to all potential customers, could give examples of small woodlot owners making money off their land as a result of the firm's advice. In particular, the literature should stress that full service management (Service #3) is available. This service, according to our survey, is the most attractive.

The service design permits selling in stages, another attractive feature. Those wishing to manage the land themselves would sign a contract for further detailed information, as described in Service #1, at a set price. These owners would have the option of utilizing Service #2 at a further cost. Finally, customers wanting full service would sign a contract for service, paying a percentage of gross sales.

4.3.3 Customers

Customers would be any woodlot owner whom it would be profitable to serve. That is, the land's potential income must be enough to support the services received.

A key factor in profitability will be obtaining as many customers as possible in one region (county, district, etc.) to reduce the costs of data acquisition and overhead. Geographical data, market data, and free obtainable services are similar in one region, further reducing costs. Consortia of woodlot owners to increase bargaining power would be easier to form. Decisions in terms of what to grow (trees, crops, etc.) would be easier to make.

4.3.4 Structure and Size of the Firm

The firm can develop from one facility to many regional ones, close to customers, when the volume of business permits. The firm will employ business, computer, and forestry experts. The computer and forestry experts need experience in using CGIS's and LANDSAT. The number of business and computer personnel should be largely independent of the number of customers, but more customers will require proportionally more foresters.

4.3.5 The Role of LANDSAT and Supporting Data

Section 4.5 provides a description of some of the data needs for this service and lists those data obtainable from LANDSAT. Acquisition of supporting data for the management service is also necessary. Supporting data consists of information necessary for market analysis of the lumber industry, relevant ground truth data, and information on services to the

small woodlot owner. Market data comprises information on current supplies and prices of timber throughout the market, trading practices, and purchasers for the lumber. Geographical data is that of soil types, land classification/land use, trees growing and recently cut on the land, and growing cycles.

C-2

4.4 ASSESSMENT AND VALIDATION OF THE WOODLOT MANAGEMENT SERVICE

4.4.1. Market Survey

4.4.1.1. Introduction--Goals of the Survey

The primary goal of the survey is as in the previous chapter: to assess the service's revenue generation capability. This survey contains two unique elements, however. First, because government agencies and private companies offer services that may compete with this one (see Section 4.1.2), the survey attempts to evaluate the potential customers' opinion of this competition. This opinion helps us in designing a new service. Second, because three services might be offered, the survey seeks to determine which of the three is most attractive.

4.4.1.2 Structure of the Survey

We mailed a five-page questionnaire to more than two hundred small woodlot owners. Half of the recipients owned woodland in Missouri in Reynolds County; the other half, in Washington County, Illinois. The total response rate was 20.5% (41 respondents), 21% from Illinois and 20% from Missouri. The even distribution enables comparing the countries with validity.

The survey, reproduced in Section 4.4.1.3., comprises a cover letter to describe the purpose of the survey and assure confidentiality, and four pages of questions grouped into three parts. The first part gathers general information; the second and third separate those owners that presently use federal and state services from those who do not.

The following list describes the purpose of each question. Refer to the questionnaire as a reference for the question number.

Part 1: General Information

Question	Purpose
1	Assess average woodlot size.
2	Assess how recently the land changed ownership, and correlate number of years owned to present services used.
3	Assess land use to verify whether it is forest.
4	Identify absentee land holders.
5	Assess extent of owner's holdings.
6	Assess current income derived from land.
7	Determine interest of absentee landholders in visiting land. Indicates potential need for full management services.
8	Obtain present value of land.
9	Determine respondent's use of present private or government forestry services.

Part 2: Questions for those potential customers not using existing forest services.

Question	Purpose
10	Assess the owner's interest in obtaining income from his woodlands.
11	Assess with an open-ended question ideas for income generation.
12	Determine whether the owner has investigated the advisory groups.
13	Assess owner's satisfaction with agencies sought out.
14	Analyze opinion on present agencies further with an open-ended question.
15	Analyze limited consulting services #1 and #2.
16	Assess a willingness to pay for services in question 15.
17	Analyze market for full management service #3 and a willingness to pay.

Part 3: Questions for those potential customers using existing forest services.

Question	Purpose
18	Assess most frequently used service(s). Identify other services.
19	Assess owner's satisfaction with existing services to indicate whether the market has room for a new firm.
20	As in question 14, provide a list of things to avoid or emulate when operating the new firm.
21	As in question 17, assess the market for the new firm among knowledgeable woodlot owners.
22	Assess these owners' willingness to pay.
23	Get more information on the potential customer's needs with an open-ended question.
24	Determine whether the knowledgeable small private woodlot owner is interested in the value of remote sensing imagery as a tool for forestry related decision making.

WASHINGTON UNIVERSITY IN ST. LOUIS

4.4.1.3. The Survey

r For
lopment Technology

Dear Sir/Madam:

This questionnaire has been sent to you as part of a NASA Funded research project to investigate new opportunities for private business using satellite graphics. Presently the Washington University Center for Development Technology is researching services that businesses might offer to woodlot owners. We have sent questionnaires to all the landowners in your county. If you could take ten minutes to fill out this questionnaire and return it in the self-addressed, stamped envelope, it would be greatly appreciated. If you have any questions, please feel free to call me at Washington University at (314) 889-5464.

All information will remain confidential so that you may respond in any way you wish. We request you do not sign the questionnaire or put a return address on the envelope so that you will be anonymous and our survey will be objective.

Thank you for your time.

Yours truly,

Jerry Foshage

JF:dbw

ıgton University
ıs Box 1106
'is, Missouri 63130
389-5455

QUESTIONNAIRE

1. How much land do you hold in _____ county?

   ___ 1-10 acres ___ 11-20 acres ___ 21-50 acres ___51-100 acres

   ___ 100-200 acres ___ 201-500 acres ___ over 500 acres

2. How long have you owned this land? _____ years

3. What percent is forest?

   /___/___/___/___/___/___/___/___/___/___/___/
   0% 50% 100%

4. How far do you live from your holding(s)? _____ miles (approximately)

5. Do you have holdings elsewhere? ___ yes ___ no

6. Do you receive any income (money made without subtracting expenses) from your land during the course of an average year?

   ___ yes ___ no *(NOTE: All information will be kept anonymous)*

   If yes, how much? ___ 0-$200 ___$201-$500 ___$501-$1000

   ___$1001-$5000 ___ over $5001

7. How many times in a year do you visit your land? _____ times

8. How much is your land worth per acre today?

   ___ 500 or less ___ 501-650 ___ 651-800 ___ 801-950

   ___ 951-1000 ___ over 1,000

   (If you do not know please list the cost of purchase per acre and check here _____).

9. Do you use an agency to improve your land, profit, or both? (e.g., state foresters, tree farm association, commercial consultants, etc.)

   ___ yes ___ no

****

IF <u>YES</u> PLEASE GO TO QUESTION 18. *IF <u>NO</u> PLEASE CONTINUE.*

****

10. Have you ever considered doing something to improve the woodland on your property and/or planting trees to convert fields to make money?

___ yes ___ no

11. If yes what? _____

_____

_____

_____

12. Have you ever obtained information or services from the following groups? (Check more than one if appropriate):

___ American Forest Institute
___ National Forest Service
___ State Forest Service
___ Other (please specify) _____
___ Other (please specify) _____
___ Other (please specify) _____

13. If you have obtained information please rate their :

service? /___/___/___/___/___/___/___/___/___/___/___/

usefulness? /___/___/___/___/___/___/___/___/___/___/___/

0 poor 5 average 10 excellent

14. What are their major strengths and weaknesses?

Strengths	Weaknesses
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

15. Would you use a service which could provide information on how to improve your land and it's value, increase profits from your land, and advise on free governmental services and matching funds?

___ yes ___ no

16. How much would you be willing to pay for this service?

_____% (in percentage of possible money to be made)

17. Consider a service to manage your lot which could perform selective cutting, selling wood, planting, fire control, etc. You would regulate all activity and receive a yearly report on the condition of your land.

Would you use such a service? ___ yes ___ no
If yes, how much would you be willing to pay? _____

****

THANK YOU FOR YOUR TIME. PLEASE RETURN THE QUESTIONNAIRE

****

18. What system did you use? (check more than one if appropriate)

___ a) American Tree Farm
___ b) State Forester
___ c) National Forest Service
___ d) Matching Funds
___ e) Other (please specify) _____

19. Please rate your satisfaction with these group(s).

a) /___/___/___/___/___/
b) /___/___/___/___/___/
c) /___/___/___/___/___/
high low

d) /___/___/___/___/___/
e) /___/___/___/___/___/
high low

20. What are their major strengths and weaknesses?

Group	Strengths	Weaknesses
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

21. Consider a service which could do an indepth analysis of your property holdings using information about your county and state. Information would include market characteristics, government programs and services, commercial services, local land and forest conditions, and others. Using this information this service would consult and handle business transactions, recommend management techniques and other similar services to help increase land values and profits from the land. This service would have experts in forestry, economics, and law on it's staff. Would you be interested in a service such as this?

___ yes ___ no

22. If yes how much would you be willing to pay?

_____% (in percentage of money made)

23. Are there any services that were not mentioned that you would like to have?

_____

_____

_____

24. Would you use a service which could supply you with interpreted data from aerial and satellite imagery about information and conditions about your land, county, and state?

___ yes __ no

How much would you pay? _____% (in percent of money made)

****

THANK YOU FOR YOUR TIME. PLEASE RETURN THE QUESTIONNAIRE

****

4.4.1.4 Response to the Survey

Appendix C presents the raw data from the forestry market survey, while this section reviews and summarizes survey results.

Part 1: General Information

1. Acreage

The acreage of the small woodlot owners' land ranged from 1-10 acres to over 500 acres with the breakdown as follows:

Number of owners	Acreage
2	1-10
1	11-20
9	21-50
2	51-100
9	100-200
12	201-500
6	over 500

Statistics on acreage:

total number of owners	41
total acreage range of owners	6616 - 12090*
mean acreage range of owners	161.36 - 294.88*
standard deviation in acreage range of owners	159.41 - 220.75*

2. Length of Ownership (Years)

Range	3-124
Total	892
Mean	21.76
Standard Deviation (years)	23.97

*Assumes mean acreage in the "over 500" range is 600.

Mean time of ownership is about two decades. This infreqeunt turnover could be because of the relative non-profitability of woodland. On the other hand, perhaps the present owners value their land for recreational or other purposes.

3. Percentage of Wooded Acreage

Range - Reynolds County	0-100
Range - Washington County	2-100
Mean - Reynolds County	77.22
Mean - Washington County	33.16
Standard Deviation - Reynolds County	23.72
Standard Deviation - Washington County	30.10

These statistics contrast the two counties. The Reynolds county land owners show that most of their land is wooded, whereas only one-third of the typical Washington County land owners' property is forested.

4. Distance from Residence to Land (Miles)

Range - Reynolds County	0-1,500
Range - Washington County	0-250
Mean Distance - Reynolds County	115.89
Mean Distance - Washington County	24.36
Standard Deviation - Reynolds County	159.91
Standard Deviation - Washington County	28.24

Most Washington County landowners reside near their land. In contrast, in Reynolds County, some owners live on their land but others apparently are absentee owners. These statistics might cause selling methods in the two counties to differ. The limited consulting services (#1 and #2) might sell best to resident owners; the full service #3 to absentee owners. Later questions in the survey confirm or deny this speculation.

5. Other Holdings

Twenty of the forty-one respondents own land other than that in Reynolds and/or Washington Counties. Only seven of the twenty-one owners in Washington County have holdings elesewhere, compared to thirteen of twenty in the more heavily wooded Reynolds county. Perhaps the owners in Reynolds county, with more widespread holdings, would be more interested in income generation and therefore in the management service. We confirm or deny this speculation with later questions.

6. Present Income from Land

Number of owners presently receiving income	
Washington County	14
Reynolds County	5

Owners currently receiving income (minimum value)	($/yr)
Mean Income/yr. - Reynolds County	351.00+
Mean Income/yr. - Washington County	3959.33+
Standard Deviation of Income/yr. - Reynolds County	173.21
Standard Deviation of Income/yr. - Washington County	1888.46

Nine respondents answered "over 5000," so these numbers maybe very conservative. The statistics show a clear contrast between the two counties.

7. Number of Visits Per Year

This statistic is inversely related to the distance the owner resides from his/her land. Those living farther away are less likely to visit their land.

8. Present Value of Land

Number of Owners (Reynolds Co.)	Number of Owners (Washington Co.)	Present Range of Value ($/acre)
13	3	500 or less
2	2	501 - 650
1	1	651 - 800
1	3	800 - 1000
1	12	over 1000

The above table again indicates that land in Reynolds County offers relatively little income generation capability, compared to that in Washington County.

9. Present Use of Governemnt or Private Services

Only nine of the forty-one small woodlot owners use government or private services. Service #1 would educate the majority of owners who do not take advantage of present available services. However, if it is absentee ownership, not ignorance, that causes the lack of interest, Service #3 would best be able to help.

Part 2: Survey of Owners Not Now Using Presently Available Services

10, 11. Owner Interest in Improving and/or Income Generation

Of those not using present services (32 people), twelve have considered doing something to improve their land or generate income. Their ideas range from planting a small garden to harvesting trees. Eight of the twelve people considered planting and harvesting Christmas, fruit, and pine trees. Other ideas are general timber stand improvement and orchard or pasture development.

12, 13, 14. Past Use of Government of Private Services

Some of the thirty-two nonusers have either employed these services in the past or have inquired about them. In Washington county two nonusers had pursued them; in Reynolds county, eight.

All ten had used the State Forest Service (SFS). Rated on a one (poor) to ten (excellent) scale, the State Forest Service scored as follows:

Number of respondents previously using SFS	10
mean rating of service (1-10)	6.87
mean rating of usefulness (1-10)	6.75
standard deviation in rating of service	2.47
standard deviation in rating of usefulness	2.43

Respondents also assessed SFS strengths and weaknesses. The strengths they listed are: good and accurate information (maps, literature, reports, etc.), no fee, good availability; good knowledge of land, values and timber; cooperation, diligence, and interest; help in locating land for purchase; and help in preserving land and privacy. Weaknesses listed were: they "talk much, do less"; information is too technical; they don't assess a cost vs. profit relationship; their information is not timely enough; they don't visit the land enough; and they don't assess land use potential.

Other services used in the past were State Farm Service, American Forest Institute, National Forest Service, and those offered by private companies. Respondents did not assess them.

15, 16. Response to the One-Shot Consulting Service (#1)

After seeing a description of Service #1, respondents reacted as follows:

County	Number not presently using available services	Number that would use limited consulting Service #1
Washington County	17	6
Reynolds County	15	13

Encouragingly, 19 of the 32 current nonusers (59%) are interested. The large difference in response between the richer (Washington County) and poorer (Reynolds) is interesting. Eleven of the nineteen positive respondents were willing to pay a mean 25% of income; eight were unsure.

17. Response to the Full Management Service (#3)

The response to this service was similar to that for #1.

Part 3: Survey of Owners Presently Using Available Services

18, 19, 20. Present Use of Government or Private Services and Satisfaction Thereof

The nine respondents, all using the State Forester, give the service a rating of 4 (5 is most satisfied) with a standard deviation of 1.2. Strengths they list are good advice, good service, constant help, availability, and useful help in fire control, and selective cutting. Weaknesses include: poor management supervision, politics, amount of work too much for one agency, and staff not concerned enough. Matching funds, American Tree Farm, and Forestry Crop Land Management services are also used by a few of the respondents. Suggestions included overseeing timber haulers and "cleaning up their mess," and creating an annual inspection report.

21, 22. Response to Full Management Service (#3)

We assumed that the present users would be interested only in Service #3, and so queried them only on this service. Some nonusers also responded, as follows:

Responses (Reynolds County)	10
Responses (Washington County)	6
Owners who would use the full management service (Reynolds County)	8
Owners who would use the full management service (Washington County)	2

All but two of the woodlot owners who responded to this question in the poorer Reynolds county, or 80%, are interested in our full management service. This is another optimistic statistic for entrepreneurs. Washington county had only 33% interest. Willingness to pay, as a percentage of income averaged about 20%, but few respondents answered this question. This figure was similar to that for the limited consulting and management services #1 and #2. Thus, the respondents did not differentiate the degree of involvement of the firm, which would be much greater for the full management service.

23. Respondents' Ideas for New Services

Responses to the open-ended request for respondents' ideas for new services gave us information on needs of the small woodlot owner.

24. Use of Aerial and/or Satellite Imagery

Half of the sixteen respondents said they would use a service that supplied interpreted aircraft or satellite data.

4.4.2. Conclusions

4.4.2.1. Existence and Characteristics of the Market

Both counties showed enthusiasm for the suggested services. The Reynolds County owners, typically not presently making use of government services, earning much money from the land, or living near it, were overwhelmingly enthusiastic. Seventeen of the twenty respondents would use

at least one of the services. The Washington County owners, currently more successful at earning income from their wooded land, expressed somewhat less interest. Even here, however, interest was strong, with 43% of the respondents willing to use at least one of the services.

The differences probably stem from the counties' contrasting land uses. Reynolds County is mostly forested land, Washington County generally agricultural. Agriculture, a money-making operation, premits resident ownership and reduces the need for a management service. Presently the Reynolds County mean income per year is only 351 dollars plus for an average lot of 160-300 acres, one to two dollars per acre per year.

The absentee owners in Reynolds County are enthusiastic about the idea of a management service that would permit them to earn more income from their land. Indeed, all but one of the respondents who were absentee owners expressed interest in our service.

These absentee owners may hold their land primarily as a speculative investment. Current income from the land does not justify their spending time on it. Yet if income could be increased, the land value would rise. Thus, the absentee owners in particular find the land management service attractive.

4.4.2.2. Size of the Market. Potential Revenues

As stated in this Chapter's introduction, there are four million owners of small woodlots in the U.S. If Missouri and Illinois have their share, perhaps 160,000 people own woodlots in the two states.

To verify this guess another way, we know that 31% of Missouri's 167,000 km^2 is forested land.* Small woodlot owners may possess about 28%

*Eastwood, et al. Program on EODMS Final Report, CDT, Washington University, St. Louis, MO, 12/76. p. 97.

of this forested area (assuming the national average cited in Section 4.2 applies). If each owner holds 200 acres, then there are 58,450 small woodlot owners in Missouri or well over 100,000 in Missouri and Illinois.

Conservatively applying the results of our survey, assume that at least 30,000 of these people might be interested in the services we offer. Let us say that two-thirds of these owners opt for Services #1 or #2, and that they will pay 25% of the income from the land for these services, as the survey suggests. Assume also that their passively-managed land yields only what it does in Reynolds County, about $350./year/owner. In addition, let us assume that one-third of the customers opt for the full management service #3, and that they pay 10% of the land's income for the service, a low figure according to the survey. Further suppose that this actively-managed land yields about $4000./year/owner, as it does in Washington County. Then the total yearly business revenue potential for Missouri and Illinois may be about $1,750,000. from Services #1 and #2 plus about $4,000,000. from Service #3.

Of course, all the assumptions we have made in estimating this nearly six million-dollar potential market are open to question. However, they rely as much as possible on survey results or additional facts. Certainly the results suggest that the idea be considered further. The next step must be a cost and profitability study along the lines of Chapter 3. We recommend that this study be carried out. Further, we advise that NASA support an experimental business along these lines if the profitability study predicts success.

4.5 SYSTEMATIC GENERATION OF IDEAS FOR LANDSAT-BASED BUSINESS IN FORESTRY

4.5.1 Ranking New Business Ideas According to LANDSAT Suitability

We began our work in forestry by systematically developing new business ideas in which LANDSAT could play a primary role. We discovered six prospects well-suited to LANDSAT use. Of the six, the woodlot management idea is the most viable commercially.

This section describes how we derived the LANDSAT-suitable business ideas. In the process, it details how LANDSAT data can be employed in the woodlot management firm that we recommend for further development.

To begin our development of business ideas, we referred to our earlier analysis of forestry tasks and data needs in the EODMS project.* This analysis provided basic information on forestry tasks and data needs, summarized in Table 4.1.

The EODMS work also provided us with detailed specifications (format, scale, resolution, frequency of update, etc.) for each data item. An example of this information appears in Table 4.2.

The information represented by Tables 4.1 and 4.2 allowed us to determine which data items were most suitably gathered by LANDSAT. We scored data items on how well their specifications fit LANDSAT characteristics. One example of this scoring for frequency of update, is described below.

Quarter-yearly data needs fit LANDSAT's data delivery schedule well, but a task performed weekly needs new data too often to be well-served by the satellite. Thus we rated task/data need pairs by how frequently they needed new data as follows:

---

*Eastwood, et al., Project on EODMS Final Report, Center for Development Technology, Washington University, St. Louis, Missouri, December 1976.

ORIGINAL PAGE IS
OF POOR QUALITY

Table 4.1: Forest Management Information Needs

Tasks \ Data Needs	Cover Type Identification	Forest Location	Stand Area	Stand Size	Stand Composition	Stand Condition	Ownership Class	Amount Harvest	Stand Maturity	Site Index	Timber Volume Estimate	Stand Density	Location of Harvest	Successional Stages	Seed Source	# Seedlings Planted
Forest Inventory	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
Reforestation	•	•	•	•	•	•	•	•		•					•	
Private Forestry Improvement	•	•	•	•	•	•	•	•	•	•	•	•	•			
Harvest Scheduling and Method	•	•	•	•				•	•	•	•		•			
Timber Stand Improvement	•	•	•	•	•	•	•	•	•	•	•	•				
Forest Conversion	•	•	•	•	•	•	•	•	•	•	•	•	•			
Disease and Pest Detection	•	•	•	•	•	•			•	•	•	•		•		
Fire Potential	•	•	•	•	•	•			•			•		•		
Distinguish Forest Industry	•	•									•		•			
Run Nursery Program	•	•					•						•		•	•
Fire Detection/ Fighting	•	•			•	•			•			•				
Fire Damage Survey	•		•	•	•	•	•		•	•	•	•		•	•	
Land Capacity	•															
Erosion Protection Plan																
Soil Mositure Availability																
Potential Cropping Scheme	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Soil Fertility Assessment	•															
LANDSAT Applications (possible)	•	•	•	•	•	•		•	•		•	•	•			

Tasks \ Data Needs	Regeneration Potential	Use of Tree	Land Use Trends	Activity Spectrum	Travel Time	Recreational Use Intensity	Practice Required	Site Preparation Needs	Conversion Method	Slope	Aspect	Elevation	Amount of Fuel Build-Up	Location of Industry	Size of Industry	# Persons Employed
Forest Inventory										•	•	•				
Reforestation	•	•										•				
Private Forestry Improvement			•	•												
Harvest Scheduling and Method			•		•	•										
Timber Stand Improvement						•	•	•								
Forest Conversion									•							
Disease and Pest Detection										•	•					
Fire Potential					•					•	•	•	•			
Distinguish Forest Industry		•	•							•		•		•	•	•
Run Nursery Program	•	•	•							•	•	•				
Fire Detection/ Fighting					•					•	•		•			
Fire Damage Survey	•							•		•		•	•			
Land Capacity																
Erosion Protection Plan						•				•	•	•				
Soil Mositure Availability																
Potential Cropping Scheme					•			•	•	•	•	•		•		
Soil Fertility Assessment										•	•	•				
LANDSAT Applications (possible)			•	•	•	•		•		•		•	•	•	•	

Tasks \ Data Needs	Presence of Air and Water Pollution	Type of Industry	Location of Fire	Wind Direction	Wind Speed	Humidity	Location of Firefighters	Size of Fire	Location of Rural Fire Protection District and Agreement	Time and Cause of Fire	Degree of Damage	Texture Profile	Soil Location	Bulk Density	Porosity	Depth to Bedrock
Forest Inventory																
Reforestation																
Private Forestry Improvement																
Harvest Scheduling and Method																
Timber Stand Improvement																
Forest Conversion																
Disease and Pest Detection																
Fire Potential																
Distinguish Forest Industry	•	•														
Run Nursery Program																
Fire Detection/ Fighting			•	•	•	•	•	•	•	•						
Fire Damage Survey			•					•			•					
Land Capacity												•	•	•	•	•
Erosion Protection Plan												•	•	•	•	•
Soil Mositure Availability												•	•	•	•	
Potential Cropping Scheme												•	•			
Soil Fertility Assessment												•	•	•		
LANDSAT Applications (possible)	•	•						•	•		•	/		•	•	

Tasks \ Data Needs	Structure Profile	A-Horizon Thickness	Rate of Erosion	Type of Erosion	Soil Series Name or #	Consistence Profile	Macro-Nutrient Status	Micro-Nutrient Status	Cation Exchange Capacity	PH of Soil	Salt Content	Depth to Water	Organic Matter Content	Subsoil Color	Surface Color
Forest Inventory															
Reforestation															
Private Forestry Improvement															
Harvest Scheduling and Method															
Timber Stand Improvement															
Forest Conversion															
Disease and Pest Detection															
Fire Potential															
Distinguish Forest Industry															
Run Nursery Program															
Fire Detection/ Fighting															
Fire Damage Survey															
Land Capacity	•	•	•	•	•	•	•	•	•	•	•	•	•		
Erosion Protection Plan	•	•	•	•	•									•	
Soil Mositure Availability						•						•			
Potential Cropping Scheme	•	•	•	•		•	•	•	•		•				
Soil Fertility Assessment	•	•			•		•	•	•	•	•				•
LANDSAT Applications (possible)	•		•	•				•					•		•

Table 4.2: Example of Data Specifications

Stand Density	USFS/ In-House	Table			10 years	1 year	
Location of Harvest	In-House	Text			On Demand	1 week	
Successional Stages	In-House	Text			Once	1 year	
Seed Source	In-House	Table			Continual		refers to genetic parents of seedlings
# Seedlings planted	In-House	Table			Annual	1 month	based on records
Regeneration Potential	In-House	Text			On Demand	1 month	
Use of Tree	In-House	Table			Continual		based on records
Land Use Trends	In-House	Table Text			On Demand	1 week	
Activity Spectrum	In-House	Table			Annual	1 month	
Travel Time	In-House	Map	1:24,000	2M	On Demand	1 week	
Recreational Use Intensity	In-House	Table			Annual	1 month	
Practice Required	In-House	Table			Annual	1 month	based on field studies and models
Site Preparation Needs	In-House	Table			Annual	1 month	based on field studies
Conversion Method	In-House	Table			Annual	1 month	
Slope	USGS	Map	1:24,000	2M	Once	On Demand	
Aspect	USGS	Map	1:24,000	2M	Once	On Demand	
Elevation	USGS	Map	1:24,000	2M	Once	On Demand	

Rating	Frequency
1	daily to weekly
2	monthly
3	one shot
3.5	two to ten years
4	annually
5	bi-annually
6	quarterly.

This scale relates to LANDSAT data characteristics. Those data needs which cannot be met by LANDSAT were given a lower rating, whereas the higher ratings imply that LANDSAT can satisfy the frequency-of-acquisition specification. Considering future improvements in LANDSAT data acquisition, we decided that the best frequency-of-update for LANDSAT was quarterly. This decision was based upon weather conditions affecting acquisition and processing time, and the eighteen-day period of satellite orbit. More frequent data needs LANDSAT can not satisfy, and less frequent needs do not make full use of the satellite's capability.

Table 4.3 shows examples of a task-data needs matrix with LANDSAT frequency-of-update suitability ratings indicated. We produced analyses (not shown) similarly rating the data items' other specifications (resolution, format, information content, etc.).

The final step in determining which tasks best fit LANDSAT was to rank them according to the average suitability of their data items to LANDSAT. This ranking resulted in our identifying twelve ideas for new, LANDSAT-based forestry businesses. Finally, through conversations with forestry experts, we ranked the twelve ideas in terms of commercial feasibility (Table 4.4).

Table 4.3: Example Task/Data Need LANDSAT Suitability Ratings

Data Needs \ Tasks	Forest Inventory	Reforestation	Private Forestry Improvement	Harvest Scheduling and Method	Timber Stand Improvement	Forest Conversion	Disease and Pest Detection	Fire Potential	Distinguish Forest Industry	Run Nursery Program	Fire Detection/ Fighting	Fire Damage Survey	Land Capacity	Erosion Protection	Soil Moisture Availability	Potential Cropping Scheme	Soil Fertility Assessment	
Cover Type Identification	3	3	3	3	4	3	3	4	5	3	3	3	3	0	0	3.5	3.5	
Forest Location	5	3	5	5	4	5	5	6	5	3	1					3		
Stand Area	3	3	5	3	5	5	6	5				3				3		
Stand Size																		
Stand Composition	3	3	5		5	3	3	3			1	3				3		
Stand Condition	4	4	4		4	4	5	4			1	3				3.5		
Ownership Class	4	3	4		4	4				3.5		4				3.5		
Amount Harvest	6	6	4	6	6	3										1		
Stand Maturity	3.5		3.5	3.5	3.5	3.5	3.5	3.5			3	3.5				3.5		
Sight Index	3.5	3.5	3.5	3.5	3.5	3	4		3.5			3.5				3.5		
Timber Volume Estimate	3.5		3.5	3.5	3.5	3	3.5		3.5			3				3.5		
Stand Density	3.5		3.5	3.5	3.5	3	4	4			3.5	3				3.5		
Location of Harvest	4		4	4		4			5	4						3.5		
Successional Stages	3						3.5	4				3				3.5		
Seed Source		3								3		3				3		
# Seedlings Planted		3								6								
Regeneration Potential		3								3.5		3						
Use of Tree		4							4	3.5								
Land Use Trends			3.5	3.5					3.5	3.5								
Activity Spectrum			3.5															
Travel Time				3.5				3.5			4					4		
Recreational Use Intensity				3.5	3.5									3.5				
Practice Required					4													
Site Preparation Needs					3.5							3				3.5		
Converstion Method						3										3		
Slope	3						3	3	3	3	3	3		3		3	3	
Aspect																		
Elevation	3	3						3	3	3		3		3		3	3	
Amount of Fuel Build-Up								4			4	3						
Location of Industry									5							4		
Size of Industry									5									
# of Persons Employed									4									
Presence of Air and Water Pollution									6									
Type of Industry									4									
Location of Fire											3	3						
Wind Direction											1							
Wind Speed											1							
Humidity											1							

Table 4.4: Potential New Businesses in Forestry: Commercial Feasibility Ranking

Most Commercially Feasible New Firms

1. Private Forest Management
2. Turnkey LANDSAT Processing Systems
3. Disease and Pest Control
4. Reforestation Information
5. Fire Hazard Potential
6. Land Capacity Assessment

New Firms Less Commercially Feasible

1. Nursery Program
2. Forest Inventory
3. Potential Cropping Scheme
4. Fire Damage Survey
5. Harvest Scheduling
6. Timber Stand Improvement

The first part of this chapter considers idea #1 (Private Forest Management) in detail. The next section briefly discusses some of the other ideas listed in Table 4.4.

4.5.2 Additional Ideas for New Businesses in Forestry

4.5.2.1 Turnkey LANDSAT Processing Systems for Industry and Government

Private firms and government employ remote sensing techniques for forestry. Large lumber companies are buying their own computer systems, and both government and industry are researching the effectiveness of a LANDSAT-based CGIS.

The primary area for commercial applications of a new firm would be in the research, development, and sale of new computer-aided forestry management systems, including the necessary hardware and software. Some companies are already meeting this need. However, business is slowed by the fact that some customers are unsure of the efficiency of these yet unproven methods. Demand will surely increase once the firm proves these methods efficient.

4.5.2.2 Fire Hazard Assessment

Predicting moisture levels from snow fall and detecting fuel buildup, as the result of dried pulp or brush, makes the long-term prediction of potential fire hazards in wooded areas a feasible application of LANDSAT and CGIS's. If potential fire hazards are identified soon enough, plan-nning of preventative measures and fire fighting strategies can occur in time.

For example, California has problems with flammable creosote brush buildup. The state is putting much effort into clearing the brush on a

two to three year cycle. LANDSAT can be applied to identifying concentrations of the plant.*

A new firm could develop a CGIS to analyze moisture levels from data on current weather and the previous winter's snow fall and dead tree and scrub buildup. As a result, fuel can be removed before the damage begins. Land classification, accessibility information, and topography data on large regions, obtainable from LANDSAT images or topographical maps, would be useful in planning optimal fire escape roads, fire attack plans, and safety precautions. Mathematical models of these plans could be simulated and computer tested. Staff would consist of biologists, meteorologists, forest fire experts, and an expert computer analyst of which interpreting and processing imagery would be one of his qualifications.

Potential users of this service are private land owners, forest companies, fire departments, and state and federal government. The information collected on dead trees could be sold to government and researchers to plan fire hazard management. Firewood companies would be interested in location and ownership of dead tree stands. Due to the slow time lapse of trees dying, forested areas could be monitored with LANDSAT annually, and every five years an in-depth study using lower altitude aircraft and fieldwork could be done. This is under the assumption that a service of this type would only be feasible for large geographical areas in order to make use of LANDSAT from year to year. A fire damage assessment service could also be offered by the new firm without significant investment.

---

*Tim Hays, Acting Director, CA Environmental Data Center.

4.5.2.3 Reforestation Information Service

Reforestation includes preparing an area for use, analysis of vegetation types, and appropriate planting. An information system containing the amount of trees recently cut, land classification, and appropriate seedling types would be beneficial to the independent tree grower and may help predict demand for certain seedling types. This information could be obtained from local mills, commercial foresters, state or federal foresters, and LANDSAT.

The market may be limited to small land holders and Christmas tree farmers; the larger foresters and government do their own analysis. The most feasible product would be information developed from a software package, oriented towards the tree farmers, for depiction, extraction, and correlation of LANDSAT and ground truth data with regard to tree types to be planted. Training on how to use the software packages on a time sharing system would be necessary for the tree growers to understand how it works. Ideally the software package could be used by private seedling companies that compete on a multi-state level. This idea may be more feasible to implement as part of our private forestry management service than alone.

4.5.2.4 Other Ideas

Many firms already supply land capacity assessment. The new opportunity here may be in using LANDSAT data to cut costs.

A centralized insect and disease control firm would be beneficial. Detection of vegetation stress from LANDSAT imagery has been proven technologically feasible. LANDSAT could help detect insect infestation and monitor the conditions. Disease and insect infestation occurs most heavily in the southern U.S., which may therefore be the best market.

Large lumber companies employ experts in disease and insect infestation. Small landowners can not afford to control infestation through spraying, and local foresters provide them free advice on these problems. Therefore, the only potential customers for a new firm may be large non-commercial woodlot owners, government, and researchers.

5. THE INSULATING/ROOFING BROKERAGE AND OTHER URBAN-ORIENTED FIRMS

5.1 INTRODUCTION

Ideas for urban-oriented, remote-sensing or CGIS-based firms we considered were:

1. A broker for insulating/roofing contractors which uses infrared imagery both to identify potential customers and as a sales tool.
2. A firm to develop a transportation planning system that geocodes transportation zones and merges this data with census data.
3. Similar firms to develop and maintain an information system based on digitized census data and additional information in one of the following application areas.
    a. Urban redevelopment
    b. Municipal planning
    c. Urban economics/Retail sales
    d. Educational Planning.

Of these three ideas, the first is most promising. In the sections immediately following, we describe the technology and selling scheme, survey the market, and assess the financial aspects of this idea.

We used a systematic scheme to develop these and other ideas for urban information services. Of all the ideas we generated, the three listed were equally exciting initially. However, as problems with the 1980 Census came to light, and as we investigated urban finances, we became less enthusiastic about Census-based businesses selling primarily to local government. Idea #1 then appeared to have two key advantages; it derived its information primarily from remote sensing and it operated fully in the private sector.

Unlike the ideas for new businesses described in Chapters 3 and 4, the insulating/roofing brokerage can make no use of LANDSAT in its current form. The business is based on thermal imagery that can resolve details of heat loss in rooftops of residences. This capability is beyond the foreseeable ability of satellite-based remote sensing.

Despite this fact, this report presents this and one other idea based on remote sensing or CGIS technology that allow no immediate role for satellite imagery. Our justification for looking beyond current satellite applications stems from a belief in the natural inclination of businesses to diversify. Any successful business, in seeking to grow, will seek new markets that best make use of its existing skills and resources. Thus, encouraging CGIS or aircraft remote sensing-based businesses with good commercial potential plants the seed for future commercial satellite uses as that technology improves and the business grows.

For this reason, and to illustrate the scope of the commercial potential of remote sensing/CGIS technology in market sectors in which satellite technology does not yet fit, we present the ideas for new businesses described in Chapter 5 and 6. These ideas are "extras", in addition to the three required in our contract, but their potential merits inclusion.

5.2 OVERVIEW OF THE INSULATING/ROOFING BROKERAGE

5.2.1 Brief Description of the Service

The Insulating/Roofing (I/R) Agency both serves building owners and benefits contractors. Essentially a brokerage, the Agency obtains aerial thermography, analyzes individual housing units, and approaches those owners whose units need insulation improvement. The sales force attempts to convince potential customers to purchase insulation or roofing from one of the contractors which the company represents. In exchange, the customer gets a free home energy audit based on the thermographic data. Moreover, for a fee the consumer who chooses not to employ the services of one of the contractors represented can also obtain the energy audit.

The consumer gets a significant degree of choice; he will be able to select from among many contractors represented. The brokerage supplies facts on each company to assist in the decision.

Each contractor represented should meet a minimum standard of quality to assure the consumer of a job well done. Contractors who object to being represented along with competitors might be offered exclusive representation under the condition that the contractor bear full costs. The sharing option lowers costs for each company involved, and as a result, should be more popular.

The Agency could be compensated in various ways. Initially the firm could require an initiation fee from each contractor it represents. From that point on, a percentage of the gross sales could go to the firm for each contract they sell. For small sales, the firm could assess a flat fee.

In effect, the brokerage firm's services are "free" to consumers who contract with one of the companies represented. Instead, the consumer pays

his chosen contracting company for any building improvements done. The cost of the brokerage firm's services is actually incurred by the contractor, but realistically, the contractor will probably pass on at least a portion of this cost directly to the consumer.

The firm would buy aerial photographic and image-processing services. Although the firm could maintain its own infrared equipment, it may not be profitable to do so, especially initially. A company performing aerial photography would fly the designated area twice, for daytime photos and for nighttime infrared thermography.

Our brokerage firm could perform computerized analysis for the home energy audits. The company will maintain a headquarters where all technical analyses will be carried out, and a sales force to contact contractors and residents. Feasibly, the permanent headquarters could be located anywhere. Customers could be scattered across the country.

Companies that slightly resemble ours exist. They aerially photograph urban areas using infrared sensors and sell this data in various forms to public entities (city and county governments and public utilities). The salient distinction that makes our idea new is that our firm sells to the private commercial sector (the insulating and roofing contractors) rather than the public sector. The next subsection describes the activities of some of these existing companies.

5.2.2. Examples of Related Private Sector and Goverment Activities

Our contacts in local government informed us of area activities related to our idea. In December 1978, St. Clair County, Illinois, used Community Development funds to support infrared sensing of the county. The contractor for the photography, Texas Instruments Corporation (TI), took two nights to cover the county sections. Aerial infrared

is most effective when taken (1) during winter months when there is very little if any snow cover at a temperature of at least 20°F or below, and (2) during late nights to minimize effects of solar heat.

The "thermograms" (infrared photos pinpointing high heat areas) received from TI measure 14 by 22 inches with a range of 30 to 40 homes per print (scale: 1 inch = 400 feet). The heat loss through roofs, some walls, and even big picture windows is shown in white on the thermotrams, whereas black indicates cold areas. Figure 5.1, from TI promotional literature, illustrates an example.

St. Clair County officials took charge of analyzing and distributing the data. They advertized in newspapers and radio and used governmental outreach offices. Overall, they received between a 40-50% response from county residents, most of whom stopped at the Home Builders Association booth at the county fair grounds where the thermograms were being shown. The residents enthusiastically viewed their houses and compared them to neighbors' homes. Individuals typically spent at least 15 minutes carefully examining the photos. County officials reported an apparent increase in the insulating and roofing contracting business as a result although no statistics were acquired.

Because the thermogram survey was supported entirely by public funds, no contractors had access to the photos. The total cost to St. Clair County amounted to approximately $30,000, charged by TI on a square mile basis. Jim Evans at TI stated that the price varies from about $200 - 400 per square mile, depnding on (1) the distance they must fly from their home base in Dallas and (2) the size of the site being photographed.

TI, which handles about 90% of all infrared photographic surveys nationally (amounting to 80% internationally), has flown a total of

Figure 5.1: Example Thermogram from Texas Instruments Literature.

approximately 8000 square miles with only two small- to-medium-sized planes. TI does not very actively market this service. They publicize it through word of mouth, U.S. governmental publications, and letters to energy agencies. Government agencies are the dominant users -- the "small users" that have been able to afford TI's service to pinpoint their building improvement needs have been those companies located close to Dallas.

Another company, operating in Austin, Texas, Energy Measures Corporation (EMC), offers services similar to some we have described. An excerpt from EMC's brochure describes their business*:

> In order to conserve our energy resources we need to know where they are being wasted.
>
> ENERGY MEASURES CORPORATION will accurately, scientifically, and efficiently pinpoint sources in your community of energy wasted through heat loss. Since 1975 EMC has been launching energy conservation programs in communities of all sizes in both the public and private sectors. Some of our clients have included the United States Department of Energy, Texas Department of Community Affairs, Gulf State Utilities Corporation, the cities of Houston, Fort Worth, Garland, and others. ENERGY MEASURES CORPORATION will offer your community the following services:
>
> 1. Using sophisticated scientific equipment we will conduct aerial photographic and thermal infrared surveys in order to detect and accurately measure heat-loss from homes and businesses in your community.
>
> 2. EMC will provide the basis for an audit of heat-loss from every building enclosure. We will work through your local goverment to privide each homeowner with energy-efficiency ratings of every building visible in our multi-format aerial surveys.
>
> 3. EMC will train your community employees in all facets of the heat-loss inventory program and we will assist in establishing Energy Conservation Centers where homeowners can come for detailed advice and counsel.

---

*Promotional literature, Energy Measures Corporation, Austin, Texas.

As is the case with TI, however, EMC sells primarily to government. Contractors cannot individually afford the cost of gathering the thermogram data, and because they have not paid for it, they often have no access to it, as happened in St. Clair County. Therefore, our brokerage business, which directly serves contractors, is a unique and new idea.

5.3. DATA ACQUISITION AND ANALYSIS FOR THE INSULATING/ROOFING BROKERAGE

5.3.1. Acquiring Aerial IR Photography

As we stated earlier, this function is probably best contracted to companies already in the business. Two examples are Daedalus Enterprises, Inc. or Texas Instruments of Dallas. The photography requires a daytime and nighttime pass.

5.3.2. The Role of Satellites

Satellite thermal imagery will continue to suffer from very poor resolution for years, making it inappropriate for this application. LANDSAT 3's thermal sensors, which could resolve 240 meters, worked only briefly after launch, and then not well, according to Dr. Stan Fredan of NASA. The Heat Capacity Mapping Mission has only 500m resolution. LANDSAT D's thematic mapper may achieve 120 meter spatial resolution, and 1/2°C temperature resolution, according to Dr. V. Salmonson of NASA. This spatial resolution might enable identification of concentrations of industry, but it certainly will not be able to detail heat losses on individual homes.

5.3.3. Computerized Data Analysis: Home Energy Audits

To understand what is involved in producing the home energy audit, it is useful to review current related activities. The Department of Energy (DOE) offers individualized energy audits through its Residential Conservation

Service (RCS) Program. The audits involve detailed benefit/cost analysis of energy saving measures for residential housing. Supervised and operated by public utility professionals, this costly program depends on visual evaluations of houses to estimate energy consumption and predict "effective" conservation measures. At times, this procedure is supplemented with an optional pre-audit questionnaire. Due to the limitations of visual evaluations, RCS audits can be inaccurate.

A private company, Energy Conservation Consultants, Inc., occasionally performs individualized homeowner energy audits. They use handheld infrared equipment to pinpoint poorly-insulated parts of the house. This method achieves greater accuracy, but cost per home must be high for this labor-intensive scheme.

Energy Measures Corporation (EMC) is well-known for providing programs sponsored by the governments. We propose to model the energy audit service offered by our firm after EMC's.

The EMC technique begins by interpreting the thermal imagery to produce a computerized audit for each individual building unit. This multi-step interpretation process involves (1) assigning corresponding street addresses to all structures shown in the thermograms, (2) scoring the image of each structure along three dimensions (roofs, walls, and windows), and (3) storing the data on the Agency's computerized geographic information system (CGIS):*

1. Assigning Addresses.

The flight line is overlayed on an urban block map. Then individual structures on each IR image can be coded to their corresponding addresses.

---

*EMC Training Manual for Interactive Energy Audits, EMC, Austin, Texas, March 1980.

2. Interpreting the Image.

"Different intensities in radiant energy, such as apparent heat loss from roof and wall surfaces, appear on the photographic image as various shades of gray," reports EMC. In other words, the various shades of gray shown on the IR images represent varying surface temperatures. Warm surfaces appear lighter than surfaces having lower temperatures (for a "positive" image). The surrounding ground (out to about six feet) along the perimeter of a structure should also be analyzed for reflected heat loss from walls and windows. Typically lighter, triangular-shaped, "spiked" areas signify escaping heat through windows, whereas light areas less broadly defined indicate heat loss through walls.

Each IR slide is compared to a multi-level photographic gray scale. Once a structural survace's gray tone (along with variations) are identified, the structure can then be assigned to its corresponding heat loss zone.

Meteorological conditions existing during an IR flyover affect temperature measurements of ground structures, so updated gray scales must be prepared with each flight. These ground controls maintain data on prevailing temperature, wind direction and velocity for this purpose. Flyovers typically are run when meteorological effects are minimum (on cold, clear, windless nights).

The firm should develop a mathematical model to analyze the energy loss data. EMC has published an explanation of the algorithm they used.* The heat loss data derived from this algorithm can be combined with the geocoded address map of step one and stored on the firm's CGIS. Once this

---

*Underwood, S.A., A.G. Houston, and W.R. Hazard, "Performance Evaluation-Estimates of Structural Heat Loss from Interpretation of Aerial Thermography," EMC, Austin, Texas, January 1980.

is done, the computer can print a complete audit for each household once owner's structural data is acquired. Structural data typically includes the number and type of windows, what the walls are made of, extent of ground cover around the house, etc. Figure 5.2 is a sample of an EMC energy audit produced on their Apple Computer System.

To offer verification of the brokerage firm's claim that insulation improvements are needed, selling procedures could include a pre-analysis developed to show a building's consumption rate along with other pertinent heat loss conditions. Such enticement can only promote sales!

Figure 5.2: Sample EMC Energy Audit.

```
INTERACTIVE HEAT LOSS/GAIN ANALYSIS
(EXISTING HOME - GAS FURNACE)
RESIDENT
         ------------------------------
ADDRESS
         ------------------------------
PREPARED BY          DATE
            ------       -------------
-----------------------------------------
-----------------------------------------
ESTIMATED ANNUAL ROOF/CEILING LOSS
CURRENT R-VALUE: R-7  RECOMMENDED: R-30
   AMOUNT OF WINTER BTU LOSS: 25874,000
   AMOUNT OF SUMMER BTU LOSS: 7762,000
   COST OF WINTER LOSS: $94
   COST OF SUMMER LOSS: $73
      * GAS RATE - $0.28 PER THERM
      * ELECTRIC RATE $0.061 PER KWH
      * AS COMPARED TO R-30
-----------------------------------------
COST/BENEFIT ANALYSIS (ROOF/CEILING)
COST OF INSULATION TO R-30
   ROCKWOOL INSULATION:   $693
   FIBERGLASS INSULATION: $501
   CELLULOSE INSULATION:  $588
PAYBACK PERIOD:
   ROCKWOOL:   5 YEARS
   FIBERGLASS: 3 YEARS
   CELLULOSE:  4 YEARS
      * NOT INCLUDING INTEREST ON LOANS
-----------------------------------------
-----------------------------------------
ESTIMATEDANNUAL WALL LOSS
CURRENT R-VALUE: R-10  RECOMMENDED: R-11
   AMOUNT OF WINTER BTU LOSS: 3045,000
   AMOUNT OF SUMMER BTU LOSS: 913,000
   COST OF WINTER LOSS: $11
   COST OR SUMMER LOSS: $9
      * GAS RATE - $0.28 PER THERM
      * ELECTRIC RATE $0.061 PER KWH
      * AS COMPARED TO R-11
-----------------------------------------
COST/BENEFIT ANALYSIS (WALLS)
COST OF BLOWN FIBERGLASS TO R-11:  $997
 PAYBACK PERIOD:  50 YEARS
      * NOT INCLUDING INTEREST ON LOANS
-----------------------------------------
ESTIMATED ANNUAL GLASS LOSS
   AMOUNT OF WINTER BTU LOSS: 29543,000
   AMOUNT OF SUMMER BTU LOSS: 8862,000
   COST OF WINTER LOSS: $108
   COST OF SUMMER LOSS: $83
      * GAS RATE - $0.28 PER THERM
      * ELECTRIC RATE $0.061 PER KWH
      * AS COMPARED TO STORM WINDOWS
-----------------------------------------
COST/BENEFIT ANALYSIS (WINDOWS)
COST OF:
   ACRYLIC COVERING: $333
   STORM WINDOWS:    $1056
```

Figure 5.2: Sample EMC Energy Audit.

```
----------------------------------------
COST/BENEFIT ANALYSIS (WALLS)
COST OF BLOWN FIBERGLASS TO R-11: $997
 PAYBACK PERIOD: 50 YEARS
      * NOT INCLUDING INTEREST ON LOANS
----------------------------------------
ESTIMATED ANNUAL GLASS LOSS
   AMOUNT OF WINTER BTU LOSS: 29543,000
   AMOUNT OF SUMMER BTU LOSS: 8862,000
   COST OF WINTER LOSS: $108
   COST OF SUMMER LOSS: $63
      * GAS RATE - $0.28 PER THERM
      * ELECTRIC RATE $0.061 PER KWH
      * AS COMPARED TO STORM WINDOWS
----------------------------------------
COST/BENEFIT ANALYSIS (WINDOWS)
COST OF:
   ACRYLIC COVERING: $333
   STORM WINDOWS:    $1056
PAYBACK PERIOD OF:
   ACRYLIC COVERING: 2 YEARS
   STORM WINDOWS:    6 YEARS
      * NOT INCLUDING INTEREST ON LOANS
----------------------------------------
----------------------------------------
ESTIMATED ANNUAL COLD AIR IN FILTRATION
WINTER AIR INFILTRATION: 25704,000 BTU
   COST OF RE-HEATING: $94
COST OF WEATHERSTRIPPING: $86
PAYBACK PERIOD OF 1 YEARS
      * GAS RATE - $0.28 PER THERM
      * NOT INCLUDING INTEREST ON LOANS
----------------------------------------
SUMMER SHADING ANALYSIS
ANNUAL EXPECTED SAVINGS:
   100% WALL SHADING:
        BTU SAVING:   1565,000
        DOLLAR SAVING: $15
   100% EXTERNAL WINDOW SHADING:
        BTU SAVING:   7026,000
        DOLLAR SAVING: $66
   100% INTERNAL WINDOW SHADING:
        BTU SAVING:   3100,000
        DOLLAR SAVING: $29
   100% EXT. AND INT. WINDOW SHADING:
        BTU SAVING:   8584,000
        DOLLAR SAVING: $81
      * ELECTRIC RATE $0.061 PER KWH
----------------------------------------
----------------------------------------
COMMUNITY DEVELOPMENT OFFICE
CITY OF ST. JOSEPH, MISSOURI
          BY
ENERGY MEASURES CORPORATION
----------------------------------------
```

5.4 THE MARKET SURVEY

5.4.1 Introduction

Insulation and roofing contractors make up the market for this firm. We carried out a telephone survey of these contractors to validate our idea. One of the first contractors interviewed was the President of the Insulation Contractors Association of America and owner of a company in St. Charles, Missouri, a St. Louis suburb. He directed us to contractors across the nation. In all twenty contracting companies were contacted by telephone. Eighteen responded, one had no time to discuss the matter, and one no longer existed.

We prepared a telephone survey form, reproduced on the following pages, to guarantee that all companies interviewed would be asked the same questions in the same order and in a similar manner in order to establish a consistent, unbiased routine. The contact was the proprietor, President or some comparably high-ranking official.

5.4.2 Structure of the Survey

The interview began with descriptive information on the company, including gross sales, when offered. Then Section I established the respondent's knowledge of IR imagery to give the interviewer an indication as to how much background information need be presented. We informed each interviewee as needed. The second question (Section II) verified an interest in the type of information the proposed business would provide. Section III explained the business idea briefly, emphasizing that the proposal is theoretically a brokerage or marketing service. Once the interviewee grasped the concept, he was asked directly, "Would you be interested in having your company represented?" If yes, we attempted to

ROOFING/INSULATING CONTRACTORS TELEPHONE SURVEY

Company Name: _____

Address: _____ Phone: _____

Services: Roofing _____ Insulating _____

Other _____

Size: (Annual Gross Sales) _____

Service Area: City _____ County _____

Other _____

* * * * * *

I. PREVIOUS KNOWLEDGE

Are you familiar with (St. Clair County) infrared heat loss survey?

Yes ___ No ___

II. INTEREST IN INFRARED

Would your company be interested in knowing which houses and other buildings in your area need roofing/insulating repairs or improvements (such as extent and type of needed improvements)?

Yes ___ No ___

III. CONSIDERATION OF ASVT/WILLINGNESS TO PAY

(a) Describe "Broker" Idea — Contract with people who need home improvements. (Comment: Business has increased tremendously as a result of infrared photography — yours should too!)

(b) Would you be interested in having your company represented?

Yes ___ No ___

for a percent of the gross sales received from a contract accepted through the ASVT	Yes___	No___	How much?___
for a flat fee?	Yes___	No___	How much?___

(c) Explanation: _____

_____

_____

IV. MARKETING EFFORTS

(a) What advertising do you currently do?

Yellow Pages: _____ Mailings: _____

Newspapers:
Regularly _____ Solicitation:
Telephone: _____

Occasionally _____ Door-to-door: _____

Magazines: _____ Fairs: _____

Radio: _____ Paraphernalia: _____
(pens, T-shirts; etc.)

TV: _____

Referrals: _____ Billboards: _____

Other: _____

(b) What allotment do you make for marketing expenditures?

_____

_____

(c) Are you satisfied with your marketing efforts? Yes___ No ___

Any strengths or weaknesses? _____

_____

_____

V. SALES – PER CUSTOMER BASIS

Can you possibly give me an idea what is the average range of sales you receive per customer?

_____

_____

_____

VI. OPINION

Does this (ASVT) idea appeal to you? Yes ___ No ___

Comments: _____

Thank you very much!

Notes: _____

determine willingness to pay: on a percentage basis, flat fee, or a combination thereof, and how much. Any explanation was noted.

Section IV concerns the contracting company's current marketing efforts. The purpose of this question set is to obtain indications of a company's willingness to employ advertising modes, the allotment they designated for marketing expenditures, and their satisfaction with their current methods. Current contractor marketing policies are the competition our firm faces.

Since the willingness to pay question (Section III, Part B) offers a percentage option based on gross sales, we included a question (Section V) on the amount of sales received on the average per customer.

The final question summarized the interview: "Does this business idea appeal to you?"

5.4.3 Results of the Survey

5.4.3.1 Description of Respondents

Companies interviewed are primarily insulation contractors - only 28%* offer a combination of insulating and roofing services and one company (6%) is solely roofing. Other services offered include windows, siding, remodeling, fireproofing and solar installation, among other such sundries. Their annual gross sales range from just under $100,000 through at least 16 million dollars (18% non replies) with 39% of our sample considering themselves "small", 17% "medium", and 44% "large". Figure 5.3 displays respondent's annual gross sales.

---

*Percentages based on 18 total completed responses.

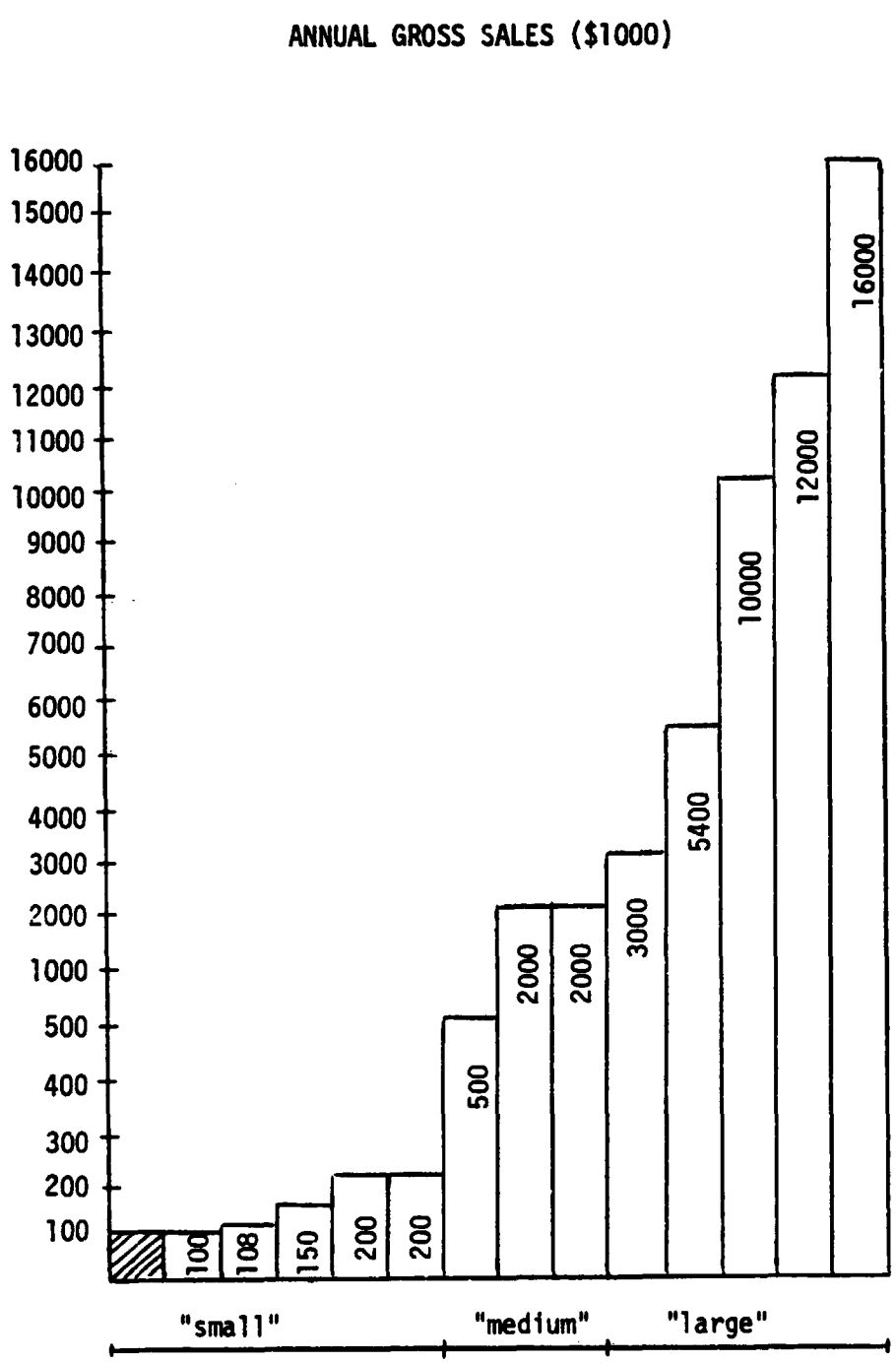


Figure 5.3. Respondents' Annual Gross Sales

Small to medium companies typically service from one to four counties. Multi-million dollar companies service such large areas that they designate their geographical regions as "the west", "the east coast", "the New England states". The sample includes a variety of both large and small contracting companies experienced in both insulation and roofing and covers the country: east to west, and north to south.

5.4.3.2 Previous Knowledge (Section I)

Eighty-four percent of the companies are familiar with the process of using infrared aerial photography to obtain heat loss statistics of area buildings.

5.4.3.3 Interest in Thermogram Data (Section II)

Sixteen of the eighteen companies replied that they would be interested in knowing which buildings in their area need roofing/insulating repairs or improvements. One of the uninterested companies "already has plenty of business and has no need for more." The other company is a "Home Improvement Company" and does not do "roofing jobs only."

5.4.3.4 Consideration of ASVT/Willingness to Pay (Section III)

After hearing the description of the "broker idea," 94% of the companies said they would be interested in having their company represented. The only company unwilling to be represented was the one claiming such a thriving business that "no marketing services are required", although the interviewee did grant that "others might want to be represented" and as such acknowledged the idea's potential. The Home Improvement Company that does "some roofing but no insulating whotsoever" did express interest in being represented insofar as the contracts they would acquire through

the Agency would include home improvement work with the roofing repair. These two companies would not specify willingness to pay.

Of the remaining 16 companies, 15 (94%) are willing to pay a percent of the gross sales received from contracts accepted through the Agency, ranging from 1-2% through 20-25% with a mean of 9.71%. Figure 5.4 illustrates the response to this query. The flat fee option is popular, too, in the form of an initial charge to the contracting companies for including the company name on the lists of contractors represented. 75% of the companies are in favor of this "initiation fee" with 42% of this subgroup willing to pay $100, 17% willing to pay less than $100 and 8% greater than $100 (33% no replies). Apparently, this combination is the most appealing.

The one company that opposes a percentage basis is in favor of paying a straight fee for each contract received through the brokerage. Payments would exceed $100; however, no specific dollar figure was cited because it "depends on the size" of the contract. Only three of sixteen (19%) rejected the flat fee form of payment altogether.

A variety of comments and explanations enhanced this interview segment:

- "A percentage basis is best."
- "A referral system we have previously used charged us 10% of sales - that's a good figure."
- "This service is valuable to us only if we are offered an exclusive commitment for our region ... a service for which we are willing to pay!!"
- "I feel I am unqualified to estimate 'how much' ..."
- "This marketing service certainly can't hurt - it should help!"

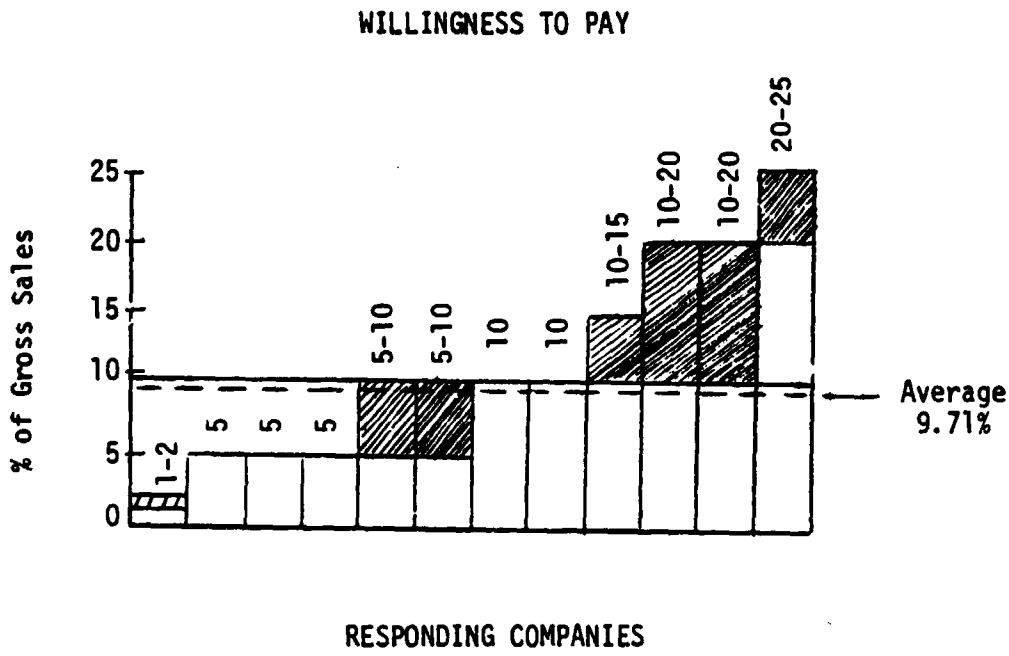


Figure 5.4. Willingness to Pay for the Brokerage Service as A Percentage of Gross Sales

A good suggestion that came out of the interview is the idea to charge a minimal fee for all contracts under a given amount, for example $40. for contracts under $200. All contracts exceeding this given amount would be paid as a percentage of the gross sales.

5.4.3.5 Current Marketing Schemes (Section IV)

What advertising are these companies involved in? You name it; they do it! The Yellow Pages is the most popular with 89% of interviewees. Surprisingly enough, most of these companies are dissatisfied with the Yellow Pages, finding it "not effective." As a result, they have turned to:

- newspaper advertisements (regularly: 44%, occasionally: 11%)
- radio (22%)
- television (22%)
- magazines (17%)
- mailings (17%)
- telephone solicitation (17%)
- fairs (17%)
- pens, T-shirts, etc. (17%)
- door-to-door solication (11%)
- civil organizations (e.g., Better Business Bureau, etc.) (6%)

Apparently, all of the contractors rely on referrals, although only 56% actually specified this as an advertising mode.

Figure 5.5 illustrates annual marketing expenditures, both as a percentage of annual gross sales for the last tax year, and as a total dollar expenditure. Percentages range from 0.024 (representing a $2400 expenditure) to 10 (representing a $1.6 million expenditure); dollar figures from

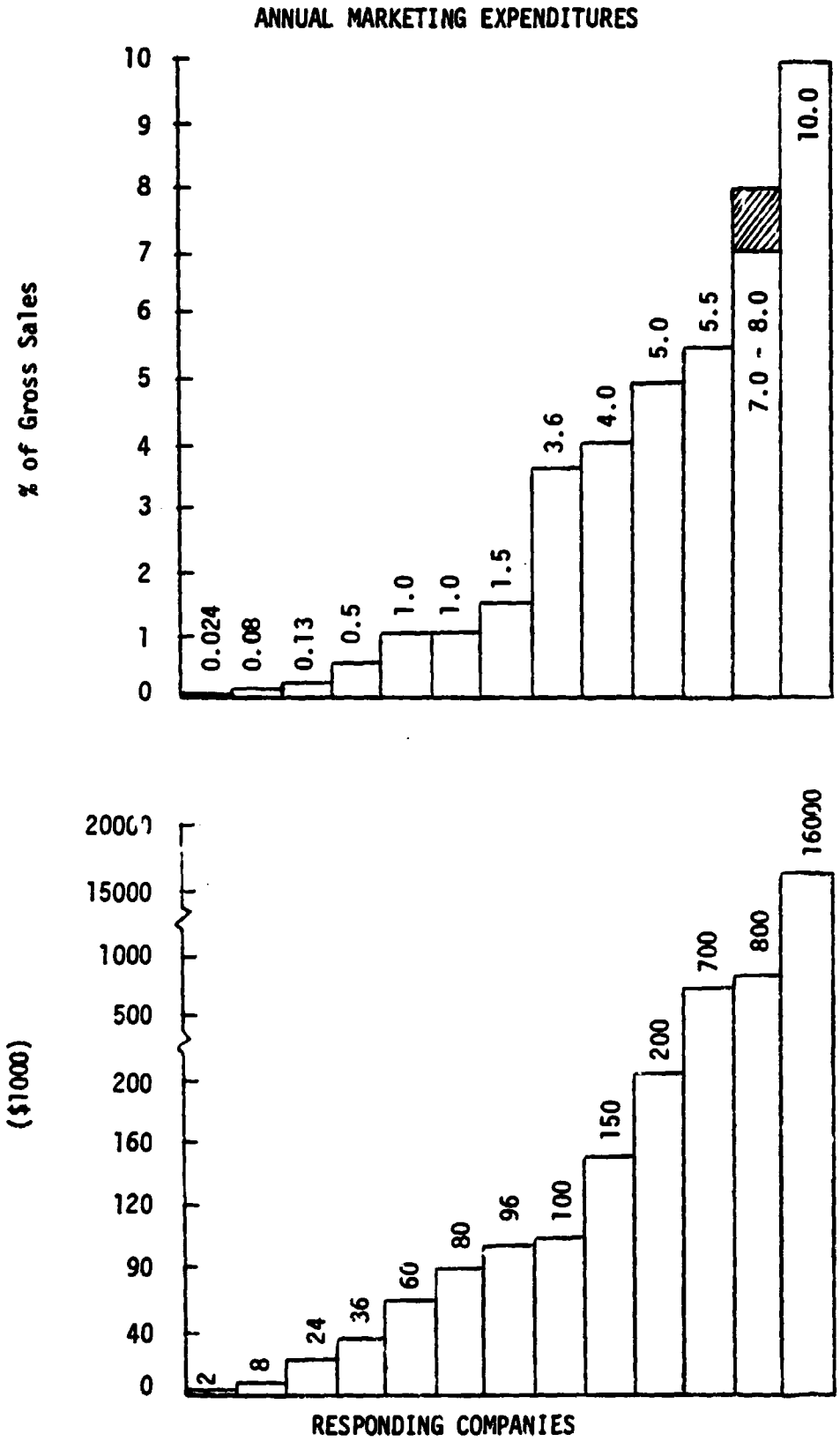


Figure 5.5. Current Annual Marketing Expenditures of Insulation/Roofing Contracts

$200 (representing 0.13% expenditure) to $1.6 million (the 10% expenditure). Companies openly answered this question to the best of their ability.

Those interviewed are on the whole satisfied with their marketing efforts. They often experience dissatisfaction with one form of advertising or another, and thus depend on several types to do the job. Some do claim though that they need to improve their marketing efforts and are "always looking for something better!"

5.4.3.6 Sales - Per Customer Basis (Section V)

Average range of sales per customer varied. For those companies involved in insulation only, their per customer sales range on an average from $200 to about $1600 (average approximately $700).

Those contractors doing both insulation and roofing work report an average range of almost $400 to $7500 (average = $2500); roofing materials cost more.

Based on these figures our brokerage firm could possibly expect to receive per customer (using a 10% average "Percent of Sales Basis"):

Insulation: $20 to 160 ($70)

Insulation/Roofing: $40 to 750 ($250).

5.4.3.7 Respondents' Opinion of the Brokerage Idea (Section VI)

The telephone survey yielded an unamimous opinion: the proposed Agency appeals to all company representatives interviewed. Comments include:

- "When will it be available?"
- "It should be successful. Fall is the best season."
- "The success of this idea will depend on the public."
- "People are more energy conscious now than ever before - they should give business a boost."
- "Be careful when approaching the public - don't pressure!"
- "Good potential; we definitely would consider it.
- "We're always interested in getting more business."
- "Anything that means more money."
- "I'm not real excited about it, but I'd try it."
- "Need more information ..."
- It's workable. You need to try it out.
- It could be successful.
- The cost might be a limiting factor ...
- Are there regional limitations?
- "Sounds good to me!!"
- It would benefit in the long run.
- "It's a viable selling tool - a good idea!!"

The most noteworthy response came from a holding company, the Gulf Atlantic Corporation of Alabama. This company owns many insulation firms and a company called Energy Conservation Management, Inc., an energy conservation consulting firm (see literature in Appendix D). NASA may want contact with this company as a serious candidate for experimentally operating this ASVT; they are very interested in carrying it through.

5.5 FINANCES

This financial analysis cites basic costs and income sources. Resources did not permit carrying out a full profitability analysis.

5.5.1 Costs

According to suppliers, the cost for the aerial thermography is about \$250./mi^2. Assuming an average 50 mi^2 survey area, total data cost is \$12,500. (Note: buying an IR scanner costs about \$280,000. Plane rental is \$200. to \$300. per night. Pilot and other staff may cost \$900./survey. A small brokerage business will prefer to contract for the data).

Film processing costs add to those from data gathering. EMC quotes \$2./print or \$1./slide. This cost is about \$5. to \$7./mi^2 for slides of sufficient quality to identify customers. Printed blowups of individual dwellings cost about \$2./customer.

We assume initially that the firm's staff can be small: an analyst to interpret thermograms and an administrative/sales person. Secretarial and computer programming help might be contracted. Thus total salaries might be in the \$40,000 - \$60,000 per year range initially. An Apple computer for energy audits may cost \$5,000; programming an additional \$5,000.

Small office facilities, 500 sq. ft. or, so may suffice. Rental may cost about \$3,000./yr. Miscellaneous office equipment may add another \$5,000. in initial investment.

Assume for calculation's sake that the business forms for one year solely for the purpose of surveying one town the size of St. Joseph, MO.

and selling its brokerage service. This municipality has about 28,000 households and covers less than 50 mi^2. Then cost totals for forming the business carrying out the survey, buying and programming the computer, and selling the brokerage's services could be:

Salaries	$60,000.	
Data	$12,500.	
Film Processing	$ 350.	+ $2/customer
Computer	$ 5,000.	
Programming	$ 5,000.	
Office	$ 3,000	
Office Equip. & Miscellaneous	$ 5,000.	
TOTAL	$90,350.	+ $2/customer

5.5.2 Income

Initial income comes from the $100. (see Section 5.4) initiation fee from represented contractors. If fifteen companies sign up, proceeds from the fee are $1500.

The market survey determined that the income received per customer may average about $70 for basic insulation contracts and $250 for more involved insulation roofing contracts. Based on the statistics of EMC's program initiated in St. Joseph, Missouri in February, 1980, nearly half of the households in an urban area respond to the availability of the IR energy audits. Of that estimated half, approximately 72% of these respondents resolve to carry out a weatherization project in accordance with the recommendations of the Agency's energy audit.* Thus, 36% of

*"Background Data," EMC Corp., Austin, Texas, May 30, 1980.

households may do some weatherization. If half of this number weatherize in the first year, our customer base is 18%. In St. Joseph, MO. with 28000 households, total return realized equals (28000 x 18%) @ $70 ea. = $352,800.

A percentage of those contracts may involve major roofing repairs, yielding an average return of $250 for the brokerage. For the purposes of this report, let us assume that 10% of all contracts will realize a $250 average return - the remaining 90% realize the $70 average return. Hence, an estimated total return from standard contracts for an area of 2800 units is:

10% of (28000 x 18%)	@ $250 =	$126,000
90% of (28000 x 18%)	@ 70 =	$317,520
		$443,520

5.5.3 Potential Revenue - Conclusions

Comparing this estimated revenue to costs of $90,350. + $2/customer or about $100,000 shows the potential for profit in the first year of operation for our firm. Of course, both cost and income estimates may be inaccurate. For this reason we recommend that a detailed, multi-year financial analysis like that of Chapter 3 be done for this business idea. If results appear as promising as for this quick analysis, we recommend that the insulation/roofing brokerage idea be pursued in a NASA ASVT.

6. CONSUMER INFORMATION SERVICES

6.1 INTRODUCTION

This project's progress report (June 15, 1980) outlines numerous ideas for consumer information services based on LANDSAT, CGIS, or the two technologies combined. Two ideas found to be commercially most promising are:

1. An expanded housebuyer's and realtor's information service.
2. A travel information service.

In addition, the TV food price forecast idea, a consumer service, appears in the previous chapter.

This section briefly describes the two ideas listed. Time constraints limited us to investigating only the first in detail. The rest of the chapter describes that investigation.

6.1.1 Expanded Homebuyer's Information Service (Brief Introduction)

Currently, home shoppers are provided only with broad geographic information and house-specific information about neighborhoods they are considering. Additional information about neighborhood demographics and the area's essential services is not usually readily available. CGIS's producing data in two possible formats are proposed to provide this expanded information service to real estate sellers and buyers.

This idea makes little use of LANDSAT in its present form. We include it nevertheless as one of the "extra" ideas beyond the three our contract requires because a commercially viable, CGIS-based business will, in seeking to grow, naturally consider expanding into supplying LANDSAT-based services. A business operating an up-to-date,

computerized demographic/geographic data base in a municipality will have the resources and the technical expertise needed to expand into LANDSAT use.

6.1.2 Travel Information Service (Brief Introduction)

Although the travel service was not developed because of time constraints, it has potential as a commercial venture. The business would develop and market geographic information systems to optimize travel arrangements by comparing various commercial carriers and private auto transportation. This comparison is often difficult to make, so the service should be viable.

6.2 HOMEBUYER AND REALTOR INFORMATION SERVICE

6.2.1 Design of the Service

In searching for a new home, whether to buy or rent, it generally is not easy to find information about one's potential future neighborhood or about the available services close to the neighborhood. When a shopper is considering four or five different homes it is impractical and often impossible, given the usual time constraints, to conduct a personal investigation of each neighborhood. Because the investment involved in buying a house is often the largest in a person's life and because it affects years of family life, buying a home without more complete information involves considerable risk. This information is not available from the current multiple listing service as can be seen in the following illustrations, Figure 6.1 and Figure 6.2.

Our goal was to develop a more informed basis from which a home-shopper could make a decision about a house. Summarizing and making available information such as the presence of children in specific age brackets or the average age in a neighborhood would help provide this informed basis for decision. Information such as this is available but is not organized by neighborhood nor is it readily available to shoppers.

In the following sections we first establish and define the areas of information available and needed by realtors and home buyers and then propose ways to meet those needs. The two formats we have developed to provide easy access to this information are an expansion of current real estate agency-based services and an annual publication service.

ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH

MULTI-LIST/McGRAW-HILL

*Add	30 QUEENSBROOK			Zip 63132	Rms 7	*Br 3	*B 2	*$ 69,500	
Prop Type	res.	Style	ranch	Remarks	Exc. condition-near monsan				
Construct	brick	Architecture			to-private cul-de-sac. Backs to				
Age(Apx)	20 Yrs Old	Drapes	custom		common ground. Ladue schools, new				
Taxes C&C	589.19 Yr	Carpets	yes		roof, guttering, c/a, shades etc.				
Possession	ueg.	Strm Windo	some		Ladue schools, some wallpaper **				
Basement	full/p/f	Fireplace		Map Loc	S17-24		*Area	27	
Heat Type	gas f/a	AirCond: C ☒ ew ___ W ☐		Directions	Olive to 1 blk N. on War-				
Wtr/Htr	40gal	Dishwasher ☒ EV	Disposal ☒		son to E. on Kingsbrook to end.				
Gar/Cpt	1car o/s	Range: Bi ☐ Gs ☐ Elec ☒		Subdiv.	Kingsbrook Acres		SubAssmt	$75.	
Priv Sch		Fencing Y ☐		LR	15'3x15'5	lv	1Br	11'4x13'10	lv
Sch Dist	Ladue	Sewer ☒	Septic ☐	DR	10'10x11'10		2Br	10'3x12'3	
Elem Sch	OldBonhomme	Gas ☒	Water ☒	Kit	13'6x13'8		3Br	9'6x9'6	
Jr / Sr Hi	Ladue	Sign Y ☒ NO		FR	9'9x27'2		4Br	eat-in kit. nt	
LotSz Apx	110x141 appx	KEY-call 1st		Baths: Full	1 ½ 1		5Br	Entry 4'8x12	
Lender	Type	Rate	Term	Owner	Gubin-call 1st		Ph	994-0069	
*# 78281	Ln.Bal.$	PITI$		Agent	Sissie Freeman		Ph	569-0746	
Sell: FHA ☐ VA ☐ CV ☐ AS ☐ OMC ☐		C 6½% L55 S45		Broker	GUNDAKER BH/G		Ph	878-9820	

PURCHASERS ARE CAUTIONED NOT TO RELY UPON THE INFORMATION CONTAINED HEREON BUT TO VERIFY ALL INFORMATION TO THEIR OWN SATISFACTION.

professional landscaping. Common ground behind.

Figure 6.1. Example of Information from Realtors' Multiple Listing Service

```
.....ST LOUIS MULTIPLE LISTING SER.....
ADD: 7553     SHAFTSBURY       ZIP:        #68423  RMS: 3 BR:1 B:1      $26,000
PROPERTY TYPE:RES              STYLE:BUNG   LF:RES  REMARKS:SPOTLESSLY CLEAN,HARD
CONSTRUCTION :BR             ARCHITECT:     AR:26      WOOD FLOORS.LEVEL YARD,WITH
AGE(APX): 30.0                 DRAPES :     ST:A       OPEN FEELING.BUS 1 BLOCK.
TAXES(C&C):79:480              CARPETS:    VOL:0-26
POSSESSION:IMMEDIATE         STRM WIND:Y    PG:  463
BASEMENT: :FL                FIREPLACE:              MAP LOC:0 17-25            :02
HEAT:GA,FA                   AIR COND :              DIRECT :N.HANLEY PAST SCHOOL)
WATER HTR:GAS                  DW/DISP:                 TO SHAFTSBURY(LIGHT)LEFT.
GAR/CRPT:     :                RANGE:       SUBDV:17.5X11.6      SUB ASMT:$
PRIVATE SCH:CHRIST KIN         FENCING:Y      LR : :              1BR: :11X11.3
SCHOOL DIST:UNIV.CITY          SEW/SEP:SEW    DR : :              2BR: :
ELEMENTARY :                 UTILITIES:6      KIT: :12X9.3        3BR: :
JR/SR HIGH :                     SIGN :       FR : :              4BR: :
LOT SIZE:75X125OPEN              ACRES:       BA: F:1   H:        5BR: :
LENDER:          TYPE:       %        TRM:     OWNER :                   PH:
LOAN BAL:                     PMT:     $        AGENT :MARGARET           PH:849-1730
TRMS:CV                 C:       /     ID:00054  BROKER:ANN NOONAN INC    PH:962-8040
```

Figure 6.2. Example of Information from Realtors' Multiple Listing Service

6.2.2 Existing Information Sources

We hypothesized that expanding the information services a real estate agency could provide would help the homebuyer and make the agency's job easier. Surveys and interviews of realtors revealed that additional information is needed in two categories. The first is the need for more information on the demographic characteristics of the neighborhoods. A neighborhood is generally considered to be the area within a one mile radius of a home. Information on the vital services of an area is the second request. Information on vital services within two miles of a house was found to be important to home buyers.

In selecting the information to include we chose data that could not be readily obtained elsewhere, that would be objective, would not antagonize anyone, and would not serve to hurt a neighborhood. All the data is commercially available but has never been compiled for realtors before.

The demographic data is available from the U.S. Dept. of Commerce, Bureau of the Census. To facilitate handling of the data we propose the purchasing of summary report packages from firms that specialize in demographic statistics. The firm we found to provide the information at the lowest price was National Decision Systems of San Diego, California. To provide computer compatible tapes (CCT) for St. Louis would cost $1,000. Their prices are computed for our specific summary package of information as follows:

Cities with populations between	Cost
50,000 and 5,000,000	$ 600
500,000 and 1,000,000	$ 900
1 million and 2 million	$1000
2 million and 5 million	$1500

Figure 6.3 is a summary report of the information package we requested. More detailed information from this source appears in Appendix B.

Data on vital services is available in St. Louis from the University Business Development Center (UBDC) at the University of Missouri in St. Louis. The UBDC is a consortium of the U.S. Small Business Administration, Dunn and Bradstreet, and the University of Missouri. They categorize all small businesses by type and location. Since "small business" includes firms with up to $7 million in gross sales, almost all stores and commercial services in a neighborhood are listed. This makes it possible to list businesses such as food stores, medical offices, and recreational facilities for any zip code region, which is approximately a two mile radius. The cost of our zip code-specific data on computer compatible tape would be about $700 for St. Louis. Figure 6.4 is a sample of the request form for such information.

6.2.3 Surveys of Realtors' and Customers' Information Needs

A preliminary survey of fifteen St. Louis real estate agencies helped establish the needed information categories. This revealed an increasing interest in investment-related information by shoppers. It also showed a strong interest in information about the living environment around a house.

From this information the second survey was developed. A sample questionnaire is found on the following pages. This was sent to 90 real estate agencies, about 25% of the agencies in St. Louis. 21% of the surveys were returned.

POP FACTS
ABC COMPANY
WESTHEIMER ROAD AND WEST LOOP 610
HOUSTON, TEXAS

PREPARED BY NATIONAL DECISION SYSTEMS! 714-235-0930 6/ 3/80

DESCRIPTION	1.0 MILE RADIUS	3.0 MILE RADIUS	5.0 MILE RADIUS
POPULATION			
1980	8581	173702	430118
1970	6608	116738	339315
1960	4154	81460	251388
GROWTH 70-80	29.86%	48.80%	26.76%
ETHNIC GROUP			
WHITE	92.25%	90.10%	84.34%
BLACK	0.94%	1.44%	6.21%
SPANISH AMERICAN	6.13%	7.66%	8.53%
OTHER	0.68%	0.81%	0.92%
SEX DISTRIBUTION			
MALE	45.91%	46.70%	47.61%
FEMALE	54.09%	53.30%	52.39%
HOUSEHOLDS	4061	73423	164756
OWNER	27.53%	36.18%	41.98%
RENTER	72.47%	63.82%	58.02%
PERSONS/HOUSEHOLD	2.11	2.34	2.58
OCCUPIED UNITS	4061	73423	164756
SINGLE	33.61%	45.77%	52.58%
MULTIPLE	65.94%	54.01%	46.59%
MOBILE HOME	0.45%	0.23%	0.83%
S/M RATIO	0.51	0.85	1.13
AVERAGE AGE	36.33	34.08	32.72
MEDIAN AGE	31.97	29.37	28.76
1980 FAMILY INCOMES			
$50,000 OR MORE	23.91%	20.73%	20.31%
$35,000 - $49,999	14.05%	16.83%	16.68%
$25,000 - $34,999	15.20%	20.22%	19.61%
$15,000 - $24,999	24.46%	21.29%	19.95%
$7,500 - $14,999	12.74%	12.76%	14.29%
LESS THAN $7,500	9.63%	8.17%	9.17%
1969 AVERAGE INCOME	$18644	$15558	$13390
1980 AVERAGE INCOME	$33009	$32927	$31601
1969 MEDIAN INCOME	$15108	$13012	$11706
1980 MEDIAN INCOME	$27187	$28996	$28975
SITE REFERENCE DATA			
SITE #	1		
HORIZONTAL LOCATION	30.8		
VERTICAL LOCATION	529.1		

Figure 6.3. Example Summary Information from a Firm Specializing in Demographic Statistics

DUN & BRADSTREET REQUEST FORM

The Business Development Center

University of Missouri-St. Louis
8001 Natural Bridge Road
St. Louis, Missouri 63121
Telephone: (314) 553-5821

JOB REQUESTED BY:_____ DATE:_____

CLIENT NAME:_____ PHONE: ( )_____

BUSINESS NAME:_____

ADDRESS:_____ STATE:_____ZIP_____

CLIENT NUMBER:_____

I. TYPE OF OUTPUT REQUESTED (check) _____PRINTOUT

_____LABELS (____GUM OR ___CHESIRE)

II. VARIABLES NEEDED (check):

___ Duns Number	___ Principal Officer & Title	___ Minor SIC
___ County Code	___ Business Description	___ Secondary Name
___ Business Name	___ Year Started	___ Headquarters State
___ Street Address	___ D & B Credit Rating	___ Headquarters City
___ City Name	___ Sales (000)	___ Status Indicator
___ State Abbreviation	___ Employees	___ Subsidiary Indicator
___ Zip Code	___ Total Employees	___ Manufacturing Indicator
___ Phone	___ Major SIC	___ Transaction date

III. TYPE OF BUSINESS/INDUSTRY ON WHICH INFORMATION IS NEEDED:

IF SIC CODES ARE AVAILABLE PLEASE SPECIFY:

IV. MARKET AREA IN WHICH INFORMATION IS NEEDED. SPECIFY ZIP CODES, COUNTY CODES OR, IF UNAVAILABLE, GENERAL AREA:

OTHER INFORMATION DESIRED:

CONSULTANT NAME:_____HOURS WORKED:_____DATE COMPLETED:_____

Figure 6.4. Example of a Vital Services Information Request Form

--- HOUSING INFORMATION SURVEY ---

The following information is currently available, we are attempting to determine which items are the most important to home buyers. Please grade each information request on a scale of one to five as to the level of importance your client would place on having these additional facts while shopping for a property. Check appropriate areas.

Information available for the INDIVIDAUL NEIGHBORHOOD of listed house. Number of...

	VERY IMPORTANT 5	4	3	2	NOT IMPORTANT 1
single family homes & average price					
condominiums & average price					
townhouses & average price					
rental units					
houses sold per year					
people carpooling					
churches & synagoges					
housing code restrictions					
average size of area house lots					
mean & medium age of homeowners					
mean & medium age of children					
mean & medium income of neighbors					
amount of children per household					
other_____					

Information available for a TWO MILE RADIUS of listed house. Number of ...

	5	4	3	2	1
shopping centers					
food stores					
restaurants					
fast-food restaurants					
gas & service stations					
medical offices					
veterinary hospitals					
emergency rooms & hospitals					
mass transit connections					
accesses to highways					
community services (libraries, etc)					

Information available for a
TWO MILE RADIUS
of listed house. Number of...

	VERY IMPORTANT 5	4	3	2	NOT IMPORTANT 1
outdoor rec facilities - public					
- private					
indoor rec facilities - public					
- private					
% of tax base supported by area property taxes					
unemployment rate					
other _____					
would you be interested in projected growth figures on:					
a] future population					
b] expected commercial growth					
c] other _____					

1] Are you satisfied with the quality and quantity of information you currently have available for clients?

very satisfied /__10__/__9__/__8__/__7__/__6__/__5__/__4__/__3__/__2__/__1__/ not satisfied

2] Do clients ever have trouble choosing between houses because of their lack of information about each property?

not troubled /__10__/__9__/__8__/__7__/__6__/__5__/__4__/__3__/__2__/__1__/ very troubled

3] In comparison to the costs of your offices' current information services (ie, Multi-List & etc), would the information that you valued from the preceeding pages be worth paying extra for?__yes __no.

If yes, 0 - 10% more__, 11-25% more__, 26-50% more__, 76-100% more__.

4] Do you feel the home shopper should pay for this additional information? __yes __no.

5] Do you feel that this data will give your firm a competitive advantage?
___yes ___no

Explain.....

6] What information that you marked as important could possibly antagonize residents of a particular area?

7] Would you expect that this system could help attract more customers to your office? __yes __no

If yes, about how many per month?

8] Do you feel that this system would attract new speculators and/or investors into the housing market or into your office (now that they can evaluate property in areas previously unknown to them)?
___yes ___no

If yes, about how many per month?

9] Briefly list some of your general comments about the survey and the proposed expanded data base on your business.

10] Does your office use a computerized listing service now? ___yes ___no. Which service?

11] Approximately how many houses (properties) does your office sell in an average month?

12] How many agents operateout of your office (both full time and ~~part-time~~)?

Thank you for your cooperation and time.

6.2 4 Interpretation of Survey Results

6.2.4.1 Information Needs

The survey showed that 46% of agents would pay extra for additional data. The survey listed information feasible to provide and asked them to grade "the level of importance your client would place on having these additional facts while shopping for a property." The full survey response is detailed in Appendix B. The text to follow summarizes it.

The survey's first category -- additional information available for the individual neighborhood within a 1 mile radius of the listed house -- the following items were chosen by the majority as important:

single family homes and average price
condominiums and average price
townhouses and average price
rental units
churches and synagogues
average size of area house lot
mean and median age of homeowners
mean and median age of children
mean and median income of neighbors
number of children per household

6.2.4.2 Information on the Neighborhood

Of the thirty-one additional facts feasible to provide, a majority of the agents chose twenty-five items to be added to their existing data base. Each item was graded on a scale of one to five, with five the highest. If any item averaged three or better it was included. No "other" responses were reported.

Shoppers try to select a neighborhood in which the other families are similar to theirs with children the same age. They are also concerned with how a particular house compares with the others. If a house is larger and more expensive than the rest, there is the concern that it

will not resell for as much because of the tendancy of the neighborhood price range to draw prices toward a neighborhood mean.

Homebuyers are also becoming aware of the impact the number of rental units nearby has on the value of a house, so many people wanted to know how many rental units were in a neighborhood. A similar concern was expressed for the impact of townhouses and condominiums on property values.

6.2.4.3 Information on the Zip Code Region

The survey's second category of additional data needed concerns the presence of vital services and facilities within a two mile radius -- about one zip code region -- of the listed house. Items chosen here as important are as follows:

shopping centers
food stores
restaurants
medical offices
emergency rooms and hospitals
mass transit connections
access to highways
community services (libraries, etc.)
outdoor recreational facilities - public
outdoor recreational facilities - private
indoor recreational facilities - public
indoor recreational facilities - private
percent of tax base support by area
property taxes
future population
expected commercial growth.

This second area of information illustrates the same concerns as the first for security and comfort. While homeowners want to know about convenient food stores, medical offices, and highways, they also want to know about how large it will or will not grow. If the tax base is very heavily supported by property taxes, then more growth of the area

government will translate out to the homeowner in higher property taxes. High taxes in an area can keep a lot of home buyers out as well as drain ones' income.

6.2.4.4 Willingness to Pay

With the establishment of the additional information needs it is also necessary to determine how much demand for providing that information there is and at what price. The survey revealed that on a scale of one to ten the average response was 6.6 (with ten the most satisfaction), to the question "are you satisfied with the quality and quantity of information you currently have available for clients." Typically, realtors want more and better data. Forty-six percent will pay more for this data. Almost 40% of all agents felt that the addition of this information would attract more customers to their office (question #7). In addition, when asked if this information were added to what you now have "would you attract more speculators and/or investors into the housing market," 50% responded positively.

In order for any office to pick up an added expense there has to be some reward. Realtors felt that if they had this information for each property they could attract more investors into the housing market or into their office now that the investor can evaluate property in areas previously unknown to them. Since the average office commission on a sale is 3% and the average house in St. Louis sells for $73,000, one additional sale per month would mean additional commissions averaging $2,190 per month or $26,280 per year.

Offices that already have a computer system pay about $200 per month for all their data. This includes multi-list books and one of the two

interactive computer system on the market. 37.5% of the respondents use these systems now, and competition should cause this number to grow. Of the offices with computer systems 33% would pay $20 per month for the new system. For offices that do not have computers, their monthly information charge is about $30. Of these offices, 53% would pay for the new system and would pay between $3 and $10 per month. From these figures we can determine a marketable price for the new system that will attract almost half of the 400 real estate offices in St. Louis.

6.2.5 Service Design #1: Expanded Agency Based Information Service Design Based on Survey Data

The real estate data expansion program can be approached from two different routes. The first idea is to add the new data to the existing data bases which realtors now use. For St. Louis there are two competitive -- but relatively equal -- interactive computer systems for home listings.

The example in Figure 6.2 is a program from the McGraw-Hill Multi-List System. The system rents to real estate offices for $170 per month and allows a shopper to search for a house using as many as thirty constraints; such as number of rooms, price, location, etc. Currently about 37% of all area offices have one of the two systems on the market. Demographic and information on vital services could be added to either system as an additional interactive part. Although a new independent company could provide this service, it would also fit in well as an addition to the information system of a company such as McGraw-Hill.

The estimated costs for such a service appears in Table 6.1

Table 6.1 Costs of Expanded Real Estate Agency Information Service

Data Costs:

National Decision Systems	$1,000.
University Business Development Center - University of Missouri	$ 700.
Miscellaneous	$ 300.
	$2,000
Set Up Costs (First Year)	5,000
TOTAL	$7,000
Number of Subscribing Offices	÷ 200
	$ 35 per year
	÷ 12 months
	$ 3 per month

6.2.6 Service Design #2: Real Estate Publication

A second alternative would be to provide a magazine, printed yearly, containing all the neighborhood data and sold on newstands. The advantages of this system are that a home shopper could screen neighborhoods in advance of a trip across town. It would also be available to renters who are looking for a new dwelling. Existing real estate information firms could offer this magazine as a new service.

A sample page of a possible format for the magazine is in Figure 6.5. The sample page does not include possibly controversial information about local schools, such as racial mix or average test scores. Addresses of the schools in the area (both public and private) could be provided with the names and phone numbers of school personnel who could provide more detailed information to prospective home buyers.

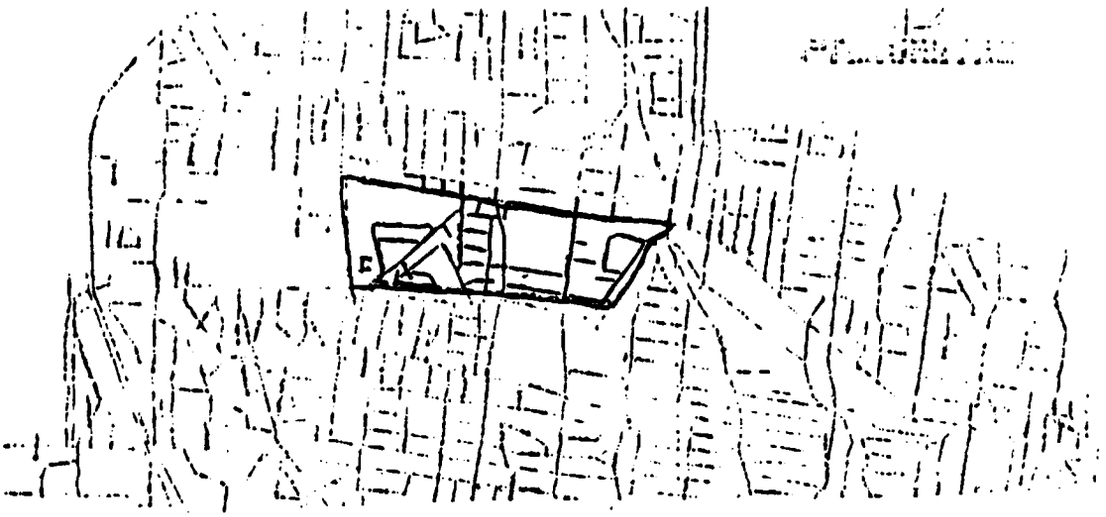
Our study of costs suggests that the reatil cost of the magazine should be about $4.00. These figures are based on:

Data processing costs	2,000[1]
Printing (100 pages)	8,000[2]
Typesetting	350
Paste-Up	75
Administration	5,000
Marketing	0[3]
	15,375
	10,000 issues
	$1.54 per copy
	x 35% profit
	$2.00 wholesale price
	$4.00 newstand price

[1]All prices are based on actual bids by national firms, in the summer of 1980.

[2]Printing costs set on 10,000 copies. 7,000 copies would cost $6,300 and 5,000 copies would cost $5,000.

[3]Local firms such as ARA Periodical Service said they would distribute such a magazine to the 1,100 stores they service for a 50% discount (i.e., a wholesale cost of $2.00 per copy).



Location: #26 on master grid (inside cover)

City: University City

County: St. Louis

School District: University City

Square Miles: 2.8

1970 Population: 750

1980 Population: 790

1990 Projected Population: 800

# of Single Family Homes: 175

# of Condominiums: 20

# of Rentals: 30

Houses Sold Per Year: 14

Churches: 2

Mean Age of Homeowner: 40

Average Age of Children: 12*

# of Children Per Household: 2

TWO MILE RADIUS

Shopping Centers: 3

Food Stores: 10

Restaurants: 25

Fast Food: 10

Gas Stations: 19

Medical Offices: 45

Vets: 3

Hospitals: 5

Mass Transit Connections: 7

Access to Highway: 3

Community Services: 5

Outdoor Recreation (Private):

Outdoor Recreation (Public):

Indoor Recreation (Private):

Indoor Recreation (Public):

% of Tax Base Supported by Property Taxes:

Unemployment:

Figure 6.5. Example of Proposed Realty Magazine Format

We chose a 10,000 first printing to save on costs. We also feel we can sell this quantity since there are 8,000 home sales per year and about 20,000 apartment rentals. If the magazine sells to 35% of the people moving each year we would sell all 10,000 copies for a new profit (before taxes) of $4,600, or a 30% return on investment.

Another possible way to finance the magazine would be to sell advertising space. A natural advertiser would be real estate offices, but the range of other companies that would be attracted to this magazine is quite extensive. As renters would also be interested in this publication, apartment complexes would be potential advertisers. Shopping centers, convenience stores and restaurants are other examples of possible advertisers. The ability to sell ad space in this publication would provide the firm with the option of lowering the price -- or even making it free -- or using the additional revenue to enhance the data base.

6.2.7 Real Estate Information Service: Summary and Conclusions

St. Louis real estate offices were the respondents to our survey, but the information needs they cite accurately represent those of new homebuyers or renters, we believe. Half of the respondents said they would pay for the new data before we were able to specify a price. The $3/month or $4/magazine prices are so low that we expect better penetration.

Even with a penetration of only 35% of homebuyers and renters, the realty magazine offers a 30% return on investment. The information service for realtors, which costs about $3/month to provide, can garner up to $20/month per customer. Thus both the computerized multi-list data expansion program and the magazine are commercially feasible.

Future market surveys should question home shoppers and home owners. We surveyed only realtors because we felt they would have a good idea of what home shoppers would want and whether they are satisfied with the informationthey now received, but we still feel a survey of the "man-on-the-street" would be valuable. Such a survey could determine willingness to pay and whether customers would prefer a magazine to getting data from a realtor's computer system.

Finally, it is important to note that no new market will have to be created. Our proposals simply expand the information available to an existing market.

APPENDICES

APPENDIX A

Supporting Information for the Site Evaluation Study

This appendix contains detailed response data received from the site evaluation survey. These results provided the basis for the site evaluation service described in Chapter 3.

Figure A.1 is a copy of a completed survey questionnaire. A tally of all 38 received responses, broken down by question, appears in Table A.1. A key to interpreting the abbreviations used in Table A.1 follows.

Table A.2 presents statistics computed from the total collection of responses. These figures, however, averaged out the different viewpoints and priorities of the responding companies. Variences in the statistics occur especially among categories of firms, for example, machinery producers vs. crop transporters. Table A.3 highlights the differing viewpoints evident in responses to question 6 (What information do you consider to be the most important in evaluating a new facility site?).

Two survey questions, five and six, solicited additional comments from the respondents. Tables A.4 and A.5 reproduce these comments.

Co. #16 Response received 7-25-80

Agri Business Site Evaluation Services Questionnaire

1. What activity area(s) best characterize your company?

____ seed production or supply.

____ crop production.

X chemical production or supply. (Fertilizers + Pesticides)

____ machinery production or supply.

____ crop storage.

____ crop transportation.

____ crop buying or trading.

____ crop insurance or finance.

____ food processing.

____ processed food distribution.

2. Please indicate your company's gross revenues (sales) last year by checking the appropriate range: (all figures in thousands)

☐ less than or equal to $1,000

☐ greater than 1,000 but less than or equal to $ 100,000

☒ greater than 100,000 but less than or equal to $ 500,000

☐ greater than 500,000 but less than or equal to $1,000,000

☐ greater than 1,000,000

Figure A.1. Copy of A Completed Site Evaluation Survey Questionnaire

3A. Does your company employ outside services for site evaluation (location assessment)?

☐ Yes

If yes, please ≈ $ amount of services purchased:

$_____

☒ No

If no, do you perform site evaluations in-house?

☒ Yes ☐ No

If yes, ≈ what % of staff time spent in planning is spent on site evaluation?

Less than 10%

note from author: follow up call provided more specific % figures for some respondents

B. Do you employ or do you purchase services that employ remote sensing data (aircraft or satellite photography) insite evaluation?

☐ Yes ☒ No

4A. Are you currently satisfied with the information content of site evaluation work done by and/or for your company?

Please place check at appropriate level of satisfaction:

10	9	8	7	6	5	4	3	2	1
			X						

Very satisfied

Not satisfied at all

8. Has your opinion on the value of site evaluations changed over time?

☐ Yes ☒ No

If yes, please indicate the direction and strength of your change in opinion below:

direction of change:

☐ toward becoming more valuable ☐ toward becoming less valuable

strength of change:

/10/9/8/7/6/5/4/3/2/1

Very strong slight

5. What are the strengths or weaknesses of site evaluation work done currently? (e.g. accuracy or lack of, proper criteria or lack of, information on local agricultural, economic, and competitor trends or lack of, conciseness and clarity of format in presentation of conclusions or lack of, etc.)

Strengths:	Weaknesses:
(1) Good feel for How it fits our needs.	(1) Sometimes miss important alternatives
(2) Experience in Picking good locations	(2) Regulatory Requirements occasionally overlooked
(3) Cost Effective	(3) TENDENCY to underestimate our EXPANSION Needs

6. What information do you consider to be the most important in evaluating a new facility site? Please indicate relative importance on the scale beside each type of information:

	very important				of no consequence
	5	4	3	2	1
1) Raw materials costs as they are affected by location:	X				
2) In-plant handling, processing and storage costs as they are affected by location:	X				
3) Historical raw material production figures by county as provided by U.S.D.A.:					X
4) All distribution costs as affected by location:	X				
5) Clarity of format in presentation of results of location assessment to management.			X		
6) Attention to existing patterns of competition in area:					
a) for procurement of raw materials:			X		
b) for sales distribution of final product:	X				
7) Attention to area's potential for producing other crops than those currently grown:					X
8) Ability to produce accurate and unbiased information as to field location, acreage, and type of crop unaffected by political boundaries:			X		

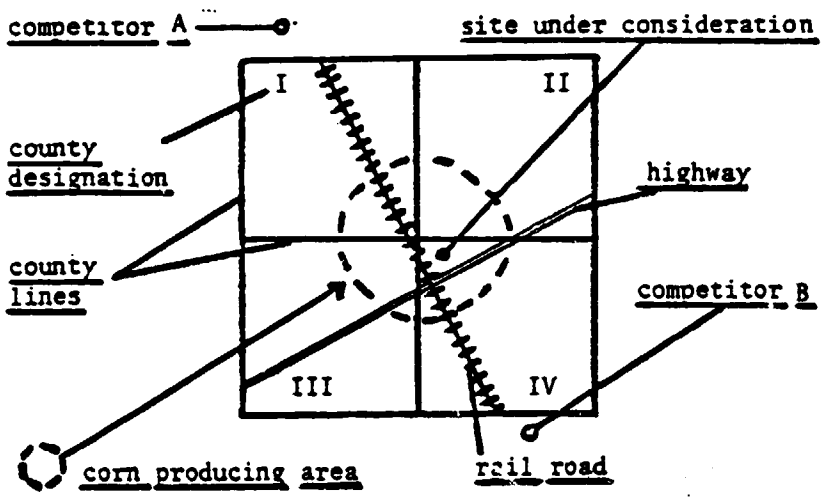
	very important				of no consequence
9) A statistical and/or graphic representation of agriculturally-related trends over time in the area (i.e., crop patterns, density of crop types or homogeneity of crop types, rate of urbanization, etc.):	5	4	X 3	2	1
10) Other - please specify: WATER TRANSPORTATION. STORAGE + HANDLING AT POINTS TRANSFER	X 5	4	3	2	1
11) Other - please specify: _____ _____ _____	5	4	3	2	1
12) Other - please specify: _____ _____ _____	5	4	3	2	1

7) A Hypothetical New System for Location Assessment in Agribusiness

Remote sensing by LANDSAT can provide information about the Earth's surface relating to field location, crop type, and acreage. It is unbiased in that it is not limited to data by a political division such as a county and thus may more precisely delineate the producing area for a particular crop across various county lines. For example, data as provided by the USDA by county may be presented as follows:

County	Corn Production
I	xx bushels
II	xx bushels
III	xx bushels
IV	xx bushels

In contrast, using LANDSAT imagery with a political map overlay, the following presentation may be provided which would seem to substantially increase the significance of the above data:



Would it not make a difference to a planner considering building a facility serving the corn growers of the area if the corn producing fields were scattered over the four counties - thus substantially increasing the likelihood that business would be lost to competitors A and B - or if the producing area were concentrated around the area convenient to the intersection - thus minimizing the likely effect of competitors A and B? The USDA information cannot address this problem by itself.

Through use of the additional input described above, this system could do the following:

1) assess any current facility location relative to the current crop patterns and related trends over time in the area to a) foresee potential obsolescence before it is reflected on the bottom line, b) foresee future capacity requirement increases vs present constraints at the location, or c) help uncover the reason behind a particular facility's decline in profits and its potential for conversion to another profit-optimizing use. 2) The new system could analyze an area for the optimal location of a new facility - even one for which the raw material production does not yet exist in the area - by processing such data as the suitability of the area by soil type, slope, and climatology along with previously mentioned data related to current land use and planting trends and any other information of interest in the specific case.

Please assume further that this system would be provided and/or supported by highly skilled specialists in your area of interest (i.e., grain storage, farm equipment, food processing, etc.) and could

provide supporting documentation for the related decision analysis parameters in an easy to understand format:

A) Would you expect this system to be better overall than your current location assessment system or service?

Please check appropriate degree:

much better than current / 10 / 9 / 8 / 7 / 6 / X / 4 / 3 / 2 / 1 / same as current

B) Would you expect to pay more or the same amount for this system as compared to your present costs for location assessment?

much more / X / 9 / 8 / 7 / 6 / 5 / 4 / 3 / 2 / 1 / same amount

C) If a system such as this could provide you with better information than you now use, how much more, if any, would you be willing to pay than your current costs for location assessment?

at least 100% more	50-90% more	X 20-40% more	10-19% more	5-10% more	1-4% more	same

KEY TO DATA

sdpr - Seed production - the constant development of new high yield, disease and pest resistant strains of crop varieties is vital in keeping the American farm enormously productive.

crpr - Crop production - those companies (usually cooperatives which include farmer-owners) that engage in the actual growing of agricultural products. These companies are usually also involved in crop storage or other crop-production related activity.

Mcpr - Machinery production - the production of farm implements of any kind -- tractors, combines, etc.

CRST - Crop Storage - the storage of crops after harvest but before distribution for final processing. Grain elevators are examples.

crtr - Crop transportation - the transportation of the unprocessed or processed agricultural product from any one point to another.

crbt - Crop buying or trading. These services are usually performed in conjunction with crop storage and/or transportation services -- often for export. Approximately one third of U.S. agricultural production is exported.

crif - Crop insurance or finance - this area which would include government agencies as well as private insurance brokers insuring against disastrous crops or financing any agribusiness project produced only one respondent in the survey and results in this area are ignored.

fdps - Food processing - the processing of the raw materials from farm production (i.e., corn, wheat) into retail goods such as cereals, bread, yogurt, etc.

fdds - Food distribution - the distribution of the processed food to the retailer's shelf. The large grocery store chains are good examples of food distributers.

Reading the General Table of Responses

- In columns where only 0 or 1 are present, such as in Specialty Area responses, a "0" is a negative response and a "1" is a positive response. This also applies to three A, three A prime: "Do you perform site evaluations in house" and four B.

- For questions with scales of one-ten or one-five, the responses were taken from the box marked. Examples are four A, four B prime: "strength of change", and all answers the questions 6(1) - 6 (9) and 7 (a) and (b).

- For question 7 (c), the "same" response was given a "0" and "at least 100% more" was given a "7".

Table A.1: Tally of Survey Responses

Respondent Assigned Co. #	Specialty Area (see key to data)										size of company																
	sd pr	cr pr	ch pr	ma pr	cr st	cr tr	cr bt	cr if	fd ps	fd ds		Three A	Three A prime	Four A	Four B	Four B prime	Six 1	Six 2	Six 3	Six 4	Six 5	Six 6(a)	Six 6(b)	Six 7	Six 8	Six 9	Seven (a)	Seven (b)	Seven (7)
1	0	0	0	0	0	0	0	0	1	0	5	0	1	9	1	8	5	5	1	5	5	3	4	3	5	2	2	9	1
3	0	0	0	0	1	0	1	0	0	0	2						4	3	4	3						5	6	7	1
4	0	0	0	0	0	0	0	0	1	0	2	1		10	0		3	5	1	5	3	5	5	2	2	3	4	3	3
5	1	0	1	0	1	0	1	0	0	0	2	0	1	7	1	9	5	5	3	4	4	4	5	2	4	5	6	4	4
6	0	0	0	1	0	0	0	0	0	0	5	0	0																
7	0	0	0	0	0	0	0	0	1	0	5	0	1	10	0		5	5	4	5	5	5	3	4	3		1	1	1
8	1	1	1	0	1	0	1	0	0	0	5	0	1	10	0														
9	0	0	1	0	0	0	1	0	0	0	5	0	1	9	1	5	4	2	1	4	1	2	4	2	4		2	2	2
10	0	0	0	0	1	1	1	1	1	0	3	0	1	6	1	7	5	3	3	5	2	5	4	2	2	2	8	7	5
11	0	0	0	0	1	1	1	0	1	0	5	0	1	7	0	4	4	2	4	2	4	3	4	3	4		3	1	3
12	0	0	0	1	0	0	0	0	0	0	2	0	1	8	1	5	2	3	1	4	3	2	5	5	3	3	5	6	5
13	0	0	1	0	0	0	0	0	0	0	2	0	1	10	0		5	4	4	5	3	3	3	1	3	5	10	7	4
14	1	1	1	0	1	0	0	0	0	0	2	0	1	7	0		4	4	2	4	2	4	5	4	3	3	7	5	4
15	0	0	0	0	0	0	0	0	1	0	5	0	1	8	0		4	4	2	4	4	4	4	4	3	3	5	3	3
16	0	0	1	0	0	0	0	0	0	0	3	0	1	7	0		5	5	0	5	3	3	5	0	3	3	5	10	5
17	0	0	0	0	1	0	0	0	0	0	2	0	1	10	0		3	3	1	3	3	3	5	5	5	4	1	1	
18	0	0	0	0	0	0	0	0	0	3	0	0																	
19	0	0	0	0	0	0	0	0	1	1	3	1	1																
20	0	0	1	0	0	0	0	0	0	0	5	0	1	8	1	6	4	1	1	4		1	4	4	1	3	3	8	1
21	0	0	0	0	0	0	0	0	1	0	5	0	1	9	0		5	4	4	5	5	4	4				1		
22	0	0	1	0	0	0	0	0	0	0	5	0	1	6	1	6	5	2	2	4	4	4	4	2	2	3	8	8	2
23	1	0	1	0	1	1	1	0	1	0	4	0	1	7	0		3	4	4	5	2	4	4	2	2	2	8	9	6
24	0	0	0	0	0	0	0	0	1	0	5	0	1	7	0		3	5	1	5	3	1	5	1	1	1	1	2	3
25	0	0	0	0	0	0	0	0	1	0	5	0	1	8	1	7	5	5	1	5	4	5	5	3	2	3	1	7	3
26	0	0	0	1	0	0	0	0	0	0	5	0	1	5	1	5	1	1	3	3	3	1	5	2	3	5	10	10	7
27	1	1	1	0	1	1	1	0	1	1	5	1	1	9	0		3	3	4	5	5	4	5	4	3	6	5	5	4
28	0	0	1	0	1	1	1	0	0	0	5	0	1	7	1		3	4	4	3	4	4	4	3	2	3			
29	0	0	1	0	0	1	0	0	0	0	5	1	1																
30	0	0	0	0	0	0	1	0	1	1	2	0	1				4	3		5			5	1					
31	0	0	0	1	0	0	0	0	0	0	5	0	0																
32	1	0	1	0	0	0	0	0	0	0	3	0	1																
33	0	0	0	0	0	0	1	0	1	0	5	0	0	8	1	8	5	3	3	5	3	5	2	2	3	4	3	5	
34	0	0	0	0	1	0	1	0	0	0	3	0	1	8	1	9	3	3	5	4	5	4	4	5	5	4	6	6	5
35	0	0	0	1	0	1	0	0	0	0	5	0	1		1	6	1	1	4	2	4	1	5			4	1	1	2
36	1	1	1	0	1	0	1	0	0	0	2	0	1	4	1	5	4	4	2	3	4	5	5	5	5	5	8	7	4
37	0	0	0	1	0	0	0	0	0	0	5	1		9	0		4	1	3	5	2	1	1	1	1	2			
38	0	0	0	1	0	0	0	0	0	0	5	0	1	8	1	7	5	4	3	5	3	3	5	3	4	2	8	5	4
39	0	0	0	1	0	0	0	0	0	0	5	0	1	7	0		3	4	2	4	5	3	4	3	3	2	2	3	3

Note: The respondent company assigned the number 2 was a blank response. Further blank responses were not assigned company numbers.

Table A.2: Overall Response Statistics

Variable	N	Mean	Standard Deviation
SDPR	38	0.18	
CRPR	38	0.10	
CHPR	38	0.34	
MAPR	38	0.23	
CRST	38	0.31	
CRTR	38	0.15	
CRBT	38	0.28	
CRIF	38	0.02	
FDPS	38	0.36	
FDDS	38	0.07	
SIZE	38	3.94	1.31
THREEA	38	0.13	
THRAPR	34	0.91	
FOURA	30	7.90	1.51
FOURB	31	.48	
FOURB PR	14	6.64	1.44
SIXONE	32	3.87	1.15
SIXTWO	32	3.50	1.29
SIXTHR	31	2.58	1.28
SIXFOR	32	4.28	0.85
SIXFIV	29	3.48	1.15
SIXSXA	30	3.30	1.36
SIXSXB	31	4.16	1.00
SIXSVN	29	2.82	1.31
SIXATE	28	3.03	1.20
SIXNYN	29	3.34	1.14
SEVENA	29	4.58	2.86
SEVENB	28	5.10	2.93
SEVENC	25	3.40	1.60

Table A.3: Highlights of Group Differences for Mean Values in Question 6

Question	Mean Calculation
six one	Would have been substantially higher and not the machinery producer group given it much lower ratings than other groups.
six two	As above.
*six three	Much higher than the low indicated mean for crop transportation and crop buying and trading.
six four	Uniformly high.
six five	Uniform among groups.
six six A	Extremely low response from machinery producers or would have been substantially higher.
six six B	Uniformly high.
*six seven	Scored extremely highly among crop producers - 4.33 - as opposed to overall mean score of 2.83. Also higher among seed producers, crop storage and crop transportation than overall mean might indicate.
six eight	Scored higher among seed producers, crop producers, and crop buyers and traders than overall mean (3.03) may indicate - it stored a mean of 3.51 among these groups.
*six nine	As above. The mean of 4.11 among these groups is much higher than the overall mean of 3.34.

Table A.4: Question 5 Responses (What are the strengths and weaknesses of site evaluation work done currently)

(Numbers indicate more than one virtually identical response for that item)

Strengths		Weaknesses
- knowledge of service area	3	- assumed ability to change produce lines
- competition analysis (format for decision)	2	- overly subjective
- good presentations	2	- historical rather than future orientation
- knowledge of people in area	2	- long time component in developing
- cost effective	2	- lack of economic data
- locating in relation to sources of raw materials and market		- weak criteria
- good on agricultural trends		- depth (lack of?)
- involvement and commitment		- long-range accuracy
- low cost		- personal involvement
- we work with the company franchises and the information is very good		- "competition"
- good feel for how it fits our needs		- "handling"
- experience in picking good locations		- it [information from franchises] is aimed strictly at their product
- short term people who know present facilities can better plan location of new facilities		- sometimes miss important alternatives
- (good) agricultural data available now		- regulatory requirements occassionally overlooked
- preserve options with attention to transportation system: water vs. rail vs. pipeline vs. truck		- tendency to underestimate our expansion needs
- check off lists		- bias in evaluation
- analysis done to locate new facilities		- lack of expertise technically
		- measuring competition strengths
		- rail oriented, with an uncertain future

Table A.4: Question 5 Responses (What are the strengths and weaknesses of site evaluation work done currently) (continued)

Strengths	Weaknesses
- discussion with growers	- transportation costs increasing rapidly
- knowledge of grower economics	- in depth evaluation of all the variable factors which affect cost (long term as well as short term)
- distribution cost evaluation	- instability in agricultural situations (related to) continual government regulations and programs both state and federal
	- losing sight of long-range objectives. Short term considerations control
	- evaluation of future markets which determine size of future crops
	- possible variations of annual weather patterns

Table A.5: Question 6 Responses (What other information is important in evaluating a new facility site?)

Other Information	Rating
- (assess to) water transportation	
- storage and handling at point of transfer	5,5 (two responses)
- transportation facilities and services	4,4 (two responses)
- highways - traffic flow	4
- people local management	5
- local trading patterns of farmers: how far will they travel for machinery?	4
- manpower	5
- political climate	5
- outlook for railroads (continuity of operation)	5
- long-range economic outlook for crop in area	5
- competitive situation	4
- availability of storage - dry or liquid	4

APPENDIX B

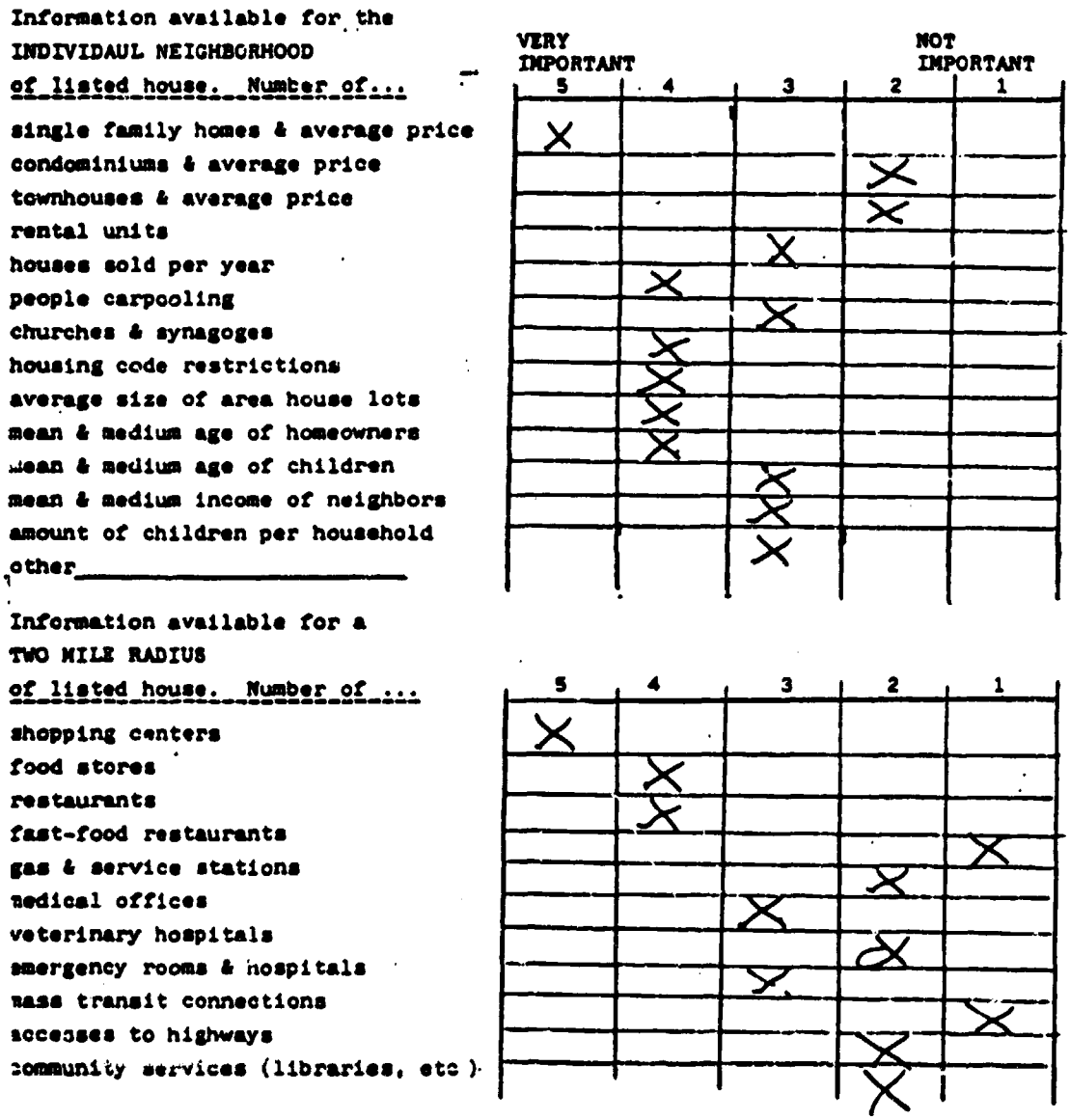
Data from the Homebuyers' Information Service Market Survey

This appendix augments the Expanded Homebuyers' Information Service section of Chapter 6. The questionnaire in Figure B.1 provided the basis for that section's conclusions. Details of the responses appear in the three tables. Tables B.1 and B.2 show how the respondents ranked the importance of the neighborhood information items listed at the beginning of the questionnaire. Table B.3 summarizes the replies to the remaining questions.

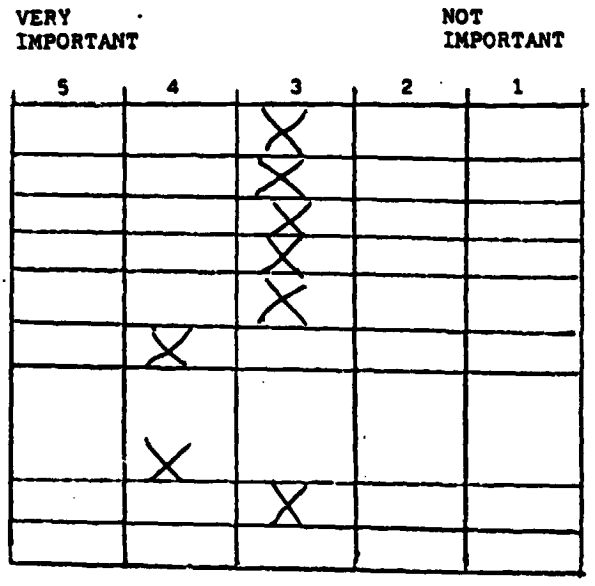
Figure B.1. Real Estate Survey Questionnaire

--- HOUSING INFORMATION SURVEY ---

The following information is currently available, we are attempting to determine which items are the most important to home buyers. Please grade each information request on a scale of one to five as to the level of importance your client would place on having these additional facts while shopping for a property. Check appropriate areas.



Information available for a
TWO MILE RADIUS
of listed house. Number of...



would you be interested in projected growth figures on:

a] future population

b] expected commercial growth

c] other _____

1] Are you satisfied with the quality and quantity of information you currently have available for clients?

very satisfied /__/__/__/__/__/__/X/__/__/__/__/__/ not satisfied
10 9 8 7 6 5 4 3 2 1

2] Do clients ever have trouble choosing between houses because of their lack of information about each property?

not troubled /__/__/__/__/__/X/__/__/__/__/__/ very troubled
10 9 8 7 6 5 4 3 2 1

3] In comparison to the costs of your offices' current information services (ie, Multi-List & etc), would the information that you valued from the preceeding pages be worth paying extra for? X yes __no.

If yes, 0 - 10% more__, 11-25% more X, 26-50% more__, 76-100% more__.

4] Do you feel the home shopper should pay for this additional information? __yes X no.

5] Do you feel that this data will give your firm a competitive advantage?
X yes __no

Explain.....

M.L.S. is a strong item so as to be aware of all Property for sale

C-3

6] What information that you marked as important could possibly antagonize residents of a particular area?
none that I'm aware of.

7] Would you expect that this system could help attract more customers to your office? X yes __no

If yes, about how many per month? 1 or more

8] Do you feel that this system would attract new speculators and/or investors into the housing market or into your office (now that they can evaluate property in areas previously unknown to them)?
X yes __no

If yes, about how many per month? no estimate

9] Briefly list some of your general comments about the survey and the proposed expanded data base on your business. The more knowledge available the better for all concerned

10] Does your office use a computerized listing service now? __yes X no.
Which service?

11] Approxiamtely how many houses (properties) does your office sell in an average month?
10

12] How many agents operateout of your office (both full time and part-time)?
15

Thank you for your cooperation and time.

Table B.1: Responses Concerning Individual Neighborhood Information Value

Information Item	Number of Responses				
	Very Important				Not Important
Single Family Homes	11	5	1	1	1
Condominiums	7	7	3	2	0
Townhouses	6	6	5	3	0
Rental Units	4	3	6	5	2
Houses sold per year	3	1	6	1	7
People Carpooling	1	2	3	3	9
Churches and Synagoges	3	8	3	0	5
Housing Code Restrictions	3	1	3	1	1
Average Lot Size	1	6	8	1	1
Age of Children	3	5	6	4	3
Age of Homeowners	3	6	5	2	2
Income of Neighbors	2	4	6	4	1
Children per Household	0	3	2	0	1

Table B.2: Responses Concerning Two Mile Radius Information Value

Information Item	Number of Responses				
	Very Important				Not Important
Shopping Centers	8	5	2	3	1
Food Stores	8	6	1	3	1
Restaurants	2	7	6	3	3
Fast-Food Restaurants	2	3	7	3	4
Gas Stations	2	5	5	5	2
Medical Offices	2	6	5	4	3
Veterinary Hospitals	1	2	9	3	3
Hospitals	3	9	2	4	0
Mass Transit Connections	1	6	3	0	1
Highway Access	5	4	0	1	0
Community Services	3	4	4	3	1
Public Outdoor Recreation	4	6	3	2	2
Private Outdoor Recreation	2	5	2	3	0
Public Indoor Recreation	4	6	5	2	1
Private Indoor Recreation	2	5	3	2	0
% Tax Base Supported by Property Taxes	4	4	4	1	5
Unemployment Rate	2	2	3	5	5
Future Projected Population	5	6	2	0	1
Expected Commercial Growth	5	4	4	0	0

Table B.3: Overall Response Statistics

Question	N	Mean	Standard Deviation
1	24	6.6	1.76
2	24	7.2	2.08
3	24	.46	.51
3'	24	.67	.96
4	24	.21	.41
5	24	.46	.51
7	24	.37	.49
7'	24	.63	.87
8	24	.50	.51
8'	24	.71	.81
10	24	.38	.49
11	24	21.6	20.7
12	24	24.5	20.4

Key to Data

Positive responses were coded as "1".
Negative responses were coded as "0".

Question 3 coded the ranges of values so that "0-10%" was a "1", and "76-100%" was coded as a "4".

Questions 7' and 8' used the coding:

Number of New Customers	Code
None	0
Uncertain	1
1-2	2
3-5	3
6 or more	4

APPENDIX C

Supporting Information for the Forestry Study

This appendix begins with a cross-reference list, Table C.1, of currently active forestry organizations and the services they provide. Table C.2 is an example of agency offerings from the Illinois Division of Forestry.

A forestry questionnaire, reproduced in Figure C.1 and discussed in Chapter 4, surveyed woodlot owners to determine the utilization of current forestry services. The questionnaire also asked about satisfaction with those services and needed additional aids. Table C.3 is a summary of the survey responses. Table C.4 presents more detail by reproducing the replies concerning "strengths" and "weaknesses" as seen by the respondents.

Figure C.1. Forestry Survey Questionnaire

QUESTIONNAIRE

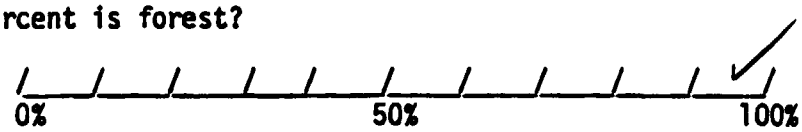
1. How much land do you hold in REYNOLDS county?

___ 1-10 acres ___ 11-20 acres ___ 21-50 acres ___ 51-100 acres

___ 100-200 acres ___ 201-500 acres ✓ over 500 acres

2. How long have you owned this land? 5-15 years

3. What percent is forest?



4. How far do you live from your holding(s)? 120 miles (approximately)

5. Do you have holdings elsewhere? ✓ yes ___ no

6. Do you receive any income (money made without subtracting expenses) from your land during the course of an average year?

✓ yes ___ no *(NOTE: All information will be kept anonymous)*

If yes, how much? ___ 0-$200 ✓ $201-$500 ___ $501-$1000

___ $1001-$5000 ___ over $5001

7. How many times in a year do you visit your land? 1-5 times

8. How much is your land worth per acre today?

✓ 500 or less ___ 501-650 ___ 651-800 ___ 801-950

___ 951-1000 ___ over 1,000

(If you do not know please list the cost of purchase per acre and check here _____).

9. Do you use an agency to improve your land, profit, or both? (e.g., state foresters, tree farm association, commercial consultants, etc.)

✓ yes ___ no

****

IF <u>YES</u> PLEASE GO TO QUESTION 18. *IF <u>NO</u> PLEASE CONTINUE.*

****

10. Have you ever considered doing something to improve the woodland on your property and/or planting trees to convert fields to make money?

___ yes ___ no

11. If yes what? _____

_____

_____

_____

12. Have you ever obtained information or services from the following groups? (Check more than one if appropriate):

___ American Forest Institute
___ National Forest Service
___ State Forest Service
___ Other (please specify) _____
___ Other (please specify) _____
___ Other (please specify) _____

13. If you have obtained information please rate their :

service? /___/___/___/___/___/___/___/___/___/___/___/

usefulness? /___/___/___/___/___/___/___/___/___/___/___/

0 5 10
poor average excellent

14. What are their major strengths and weaknesses?

Strengths	Weaknesses
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

15. Would you use a service which could provide information on how to improve your land and it's value, increase profits from your land, and advise on free governmental services and matching funds?

___ yes ___ no

16. How much would you be willing to pay for this service?

_____% (in percentage of possible money to be made)

17. Consider a service to manage your lot which could perform selective cutting, selling wood, planting, fire control, etc. You would regulate all activity and receive a yearly report on the condition of your land.

Would you use such a service? ___ yes ___ no
If yes, how much would you be willing to pay? _____

****

THANK YOU FOR YOUR TIME. PLEASE RETURN THE QUESTIONNAIRE

****

18. What system did you use? (check more than one if appropriate)

___ a) American Tree Farm
___ b) State Forester
___ c) National Forest Service
___ d) Matching Funds
___ e) Other (please specify) _____

19. Please rate your satisfaction with these group(s).

a) /___/___/___/___/___/
b) /___/___/___/___/___/
c) /___/___/___/___/___/
high low

d) /___/___/___/___/___/
e) /___/___/___/___/___/
high low

20. What are their major strengths and weaknesses?

Group	Strengths	Weaknesses
a	Information	
b	help - seasonal advice	none
	Constant help	
d	makes FST possible	counts as current income and income tax - not capitalgl

21. Consider a service which could do an indepth analysis of your property holdings using information about your county and state. Information would include market characteristics, government programs and services, commercial services, local land and forest conditions, and others. Using this information this service would consult and handle business transactions, recommend management techniques and other similar services to help increase land values and profits from the land. This service would have experts in forestry, economics, and law on it's staff. Would you be interested in a service such as this?

✓ yes ___ no

22. If yes how much would you be willing to pay?

_____% (in percentage of money mad.) impossible to say but not

23. Are there any services that were not mentioned that you would like to have?

I own about 2000 acres. I intend to make some money - and leave the land better than I got it to my children

24. Would you use a service which could supply you with interpreted data from aerial and satellite imagery about information and conditions about your land, county, and state?

✓ yes ___ no

How much would you pay? _____% (in percent of money made) See above

****

THANK YOU FOR YOUR TIME. PLEASE RETURN THE QUESTIONNAIRE

****

Table C.1: Cross-Reference List of Current Organizations and Their Services

	State Foresters	U.S. Forestry Dept.	ASCS	Tree Farm Program	Industry	Consultant Forester	Logging Company
Inventory	X					X	
Management Recommendation	X				X	X	
Physical Demonstrations	X						
Monitoring Harvests	X					X	
Monitoring thinning	X					X	
Consulting	X				X	X	
Literature: Contracts	X						
Private Entrepreneur	X						
New Technology				X			
Present Services	X	X	X	X			
Market	X		X				
Arrange Contracts						X	
Price Estimates						X	
Fire	X	X			X		
Insect and Disease	X	X			X		
Salivaculture					X	X	
Cost Sharing Programs			X				
Management Certifaction				X			
Leasing Property		X			X		
Clearcut							X
Thin							X
Work with ASCS	X	X					
Work with Treefarm	X				X		
Free	X	X	X	X	X		
Charge						X	X

I-22

Table C.2

Good

Services Available from Illinois Division of Forestry
(Department of Conservation)

Upon direct request, a technical and experienced forester can provide any and all of the following services. This is done in cooperation with the United States Forest Service as part of several federal-aid programs. All work can only be done within the limitations of physical capabilities and established priorities.

A. To Rural Landowners (and tenants)

1. Make woodland inventories which tell
   - a. Quantity of timber present (board feet) G, R, M
   - b. Quality of timber present
   - c. Growth rate and future yields
   - d. Allowable present and future harvests
   - e. Present and future values

2. Provide proper woodland management recommendations (often as a written plan) which include
   - a. Complete description and condition of timberland
   - b. Inventory data
   - c. Proper marketing and harvesting procedures for mature trees
   - d. Tips for improving productivity
     - i - eliminate livestock
     - ii - keep out fires
     - iii - timber stand improvement work
   - e. Any necessary insect and disease control measures
   - f. Additional practices beneficial to wildlife, soil conservation, recreation, etc.

3. Physically assist in conducting proper timber harvests by
   - a. Selecting, marking (with paint), and measuring "ripe" trees throughout the woodland
   - b. Providing a listing of these marked trees and their volumes
   - c. Assisting in securing proper market outlets
   - d. Giving any other desired technical advice and guidance
     - i - timber sale contracts
     - ii - timber products crop reports
     - iii - other

4. Provide complete advice and service for rural reforestation projects (including Xmas Trees) such as:
   - a. Providing and completing necessary forms and literature
   - b. Species recommendations and planting patterns
   - c. Demonstration of physical mechanics of planting
     - i - hand tools
     - ii - tree-planting machines
   - d. Plantation management
     - i - pruning and shearing
     - ii - thinning
     - iii - other
   - e. Harvesting of production

5. Source of miscellaneous forestry information regarding such subjects as
   - a. Native timber usage
   - b. Wood working
   - c. Posts and timber treating
   - d. Weed, brush, and undesirable tree control

Table C.2 (continued)

e. Other multiple land use values such as
   i - recreation
   ii - hunting and fishing
   iii - environmental improvement
f. Other

B. To Communities (working with local government units only)

Note: "Services guide":

Small towns (5000 people or less)	all of services #1 & #2
Small cities (5000 - 20,000 population)	limited amount of #1 & #2
Large cities (20,000 or more people)	general counsel only
Service #3	available to all

1. Conduct (or help set up) a survey telling:
   a. nature and condition of existing trees
      1. species present
      2. age
      3. distribution pattern
   b. "Critical" problem areas
      1. eroded lands
      2. treeless sectors
      3. environmental troubles

2. Provide general recommendations and guidance for:
   a. existing trees
      1. eradication or improvement
      2. guide of costs involved
      3. listing of available, reputable arborists (to do the work)
      4. follow-up reviews and consultations
   b. new plantings
      1. layout and arrangements
      2. species recommendations (for specific site and environmental conditions)
      3. proper planting procedures
      4. care and maintenance advice
      5. listing of sources (and cost guide) for plant materials
   c. Additional help
      1. available public funds and programs
      2. local community group participation
      3. I & E materials (films; literature, etc.)

3. Service specific problems and requests; such as:
   a. pollution damage
   b. arbitrate (and counsel) on minimum acceptable tree work standards
   c. catastrophe damage reviews
      1. loss estimates
      2. salvage possibilities
   d. insects and/or disease
   e. latest tree cures and tree care techniques
   f. problem area treatments
      1. city dumps and junk yards
      2. screenings
      3. hazards
   g. marketing (chips, logs, etc.)

Table C.2 (continued)

C. To Forest Products Operators & Industries

1. Administer Timber Buyers Licensing Act
   a. Assures payment for timber
   b. Better industry data
      i - location
      ii - resource requirements
      iii - products produced
   c. Upgrade industry
      i - minimize "fly-by-nighters"

2. Encourage and improve market outlets
   a. Forest Resource data
   b. Coordinate and assist other data procurement

3. Marketing newsletter (quarterly)
   a. Facilitates products, services, and equipment and transactions
   b. Current news items

4. Available timber for commercial harvesting (via Newsletter and individual contacts)
   a. Species present
   b. Quantity available
   c. Other characteristics

5. Improve mill operations by encouraging
   a. Proper tree-cutting practices
      i - recognize and separating products
      ii - knowing specifications
      iii - correct equipment
   b. Better manufacturing techniques
      i - improved plant layout
      ii - cutting for grade and exact specifications
      iii - fuller-use of raw materials (less waste)
      iv - seasoning and handling
   c. Improved and additional secondary market outlets

6. Other assistance
   a. Provide direct liaison with government and other agencies
   b. Encourage use of wood and wood products
   c. Provide I & E materials (films, Literature, Speeches, etc.)

D. To others:

1. Provide forestry information and programs to interested groups and individuals
   a. Civic organizations
   b. Rural agricultural groups
   c. Youth clubs

2. Provide general educational and informational forestry material for meetings, demonstrations, radio, newspaper, and similar media of publicity

Table C.2 (continued)

3. Cooperated closely by providing forestry services as part of allied agencies and programs such as
   a. Soil Conservation Service (usually defined in written memorandum of understanding between county SC District and Division of Forestry
   b. United States Forest Service
      i - research studies
   c. Agricultural Conservation Program (Help formulate and conduct forestry phases of this program)
   d. Extension Service (work hand in hand with Farm Advisers and forestry extension personnel in promoting demonstrations, etc.)
   e. Industrial and civic organizations (promote good forestry practices wherever and whenever possible)
      i - American Forest Products Industries (Tree Farm Program)
      ii - Illinois Technical Forestry Association
      iii - Sportsmen's groups

Table C.3: Talley of Forestry Survey Responses

Response No.	Question Number																					
	1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	15	16	17A	17B	18	19	21	22	24
1	5	10	10	0	0	1	5	365	6	0	0						0						
2	6	3	22	60	0	1	5	20	6	0	1	1			1	3	1	3					
3	6	124	35	45	1	1	3		6	0	0		SF	6	1		1						
4	6	19	40	1	1	1	5	365	6	1									SF	3	1	6	0
5	5	20	10	60	1	1	5	4	6	0	0				1	10	1						
6	6	10	10	0	0	0		365	6	1									SF	2	0		0
7	6	100	20	2	0	0		365	2	1									SF	5	0		0
8	6	10	10	1	0	1	5	365	6	0	0				0								
9	4	20	40	280	0	0		2	4	0	0				0		0						
10	3	3	100	35	0	0		40	3	0	0				0		0						
11	3	6	80	45	0	1	1	6	4	0	1	1			1	50	1						
12	5	20	30	3	0	1	4	200	6	0	0				0		0						
13	6	25	2	2	0	1	5	365	6	0	0				1								1
14	5	5	8	45	0	1	4	8	4	0	1	1											
15	3	10	50	15	0	0		50	1	0	0				1		0						
16	5	20	20	2	0	1	5	10	6	0	0				0						0		0
17	2	6	100	12	1	0		5	1	0	1	1	SF	2	1	15	1	15					
18	7	4	15	15	1	1	5	3	6	0	0	1					1						
19	3	11	100	45	1	0		35	1	0	0										0		
20	6	25	10	0	1	1		365	6	0	0				0		0						
21	7	41	20	1	0	1	5	10	6	1									SF	5	1	0	1
22	3	20	100	0	0	0		365	1	0	1	1			1						1		0
23	1	34	0	0	0	0		265	6	0	0				0		0						
24	7	10	100	120	1	1	2	5	1	1									ATF SF MF	5	1		25
25	3	47	60	0	0	0		365	1	0	0				0		0				0		0
26	5	7	50	5	1	0		5	2	0	0				1	33	1	33					
27	6	50	100	76	1	1	3	5	6	1									SF TSI	5	1		1
28	3	15	90	600	1	0		1	1	0	1	1	All	8	1	10	1	10	SF MF FC	2	1	15	15
29	3	10	100	300	1	0		1	1	0	1	1	SF	9	1		1	15					
30	5	19	60	0	0	0		365	1	0	1	1			1		1				1		1
31	5	18	50	0	0	0		365		1									SF	3	1	0	0
32	7	8	50	0	1	0		365	1	0	0		SF	8	1	50	1	*			1	50	50
33	4	15	30	0	0	1	2	365	3	0	0				1		0						
34	7	32	80	100	0	1	3	12	1	0	0		SF	2	1	25	1	25	SF	4	1	25	25
35	6	3	90	125	1	0		4	1	0	1	1	SF	10	1	10	1	10					
36	5	65	50	130	1	0		2	5	0	1	1	SF	10	1		0						
37	7	20	100	125	1	1		50		1									FC SF	5	0		0
38	1	9	100	1500	1	0		10	2	0					1	50	1						
39	6	10	100	35	1	0		5	1	1	0		SF	6	1								
40	5	27	90	100	1	0		50	1	0	1	1	SF	6	1		1						
41	3	28	90	370	1	0		1	1	0	1	1			1								

Key to Data

SF - State Forester
MF - Matching Funds
ATF - American Tree Farm
TSI - Timber Stand Improvement
FC - Forest Cropland

"0" - Negative response
"1" - Postive Response

Numerals for questions 1, 6, and 8 indicate which range of values was selected. For example, "1-10 acres" is coded as a 1, "over 500 acres" is coded as a 7.

Table C.4: Answers to Question 20 (What are strengths and weaknesses of current services?)

Strengths		Weaknesses	
- Expert advice		- Poor management and supervision	2
- Good service		- Wasted money	
- Information		- Too much work for one agency	
- Personal advice	2	- Counts as taxable income (matching funds)	2
- Response	2	- No follow-up	
- Fire Control		- Not enough concern	

APPENDIX D

Energy Conservation Management, Inc. (EMC) Promotional Literature

The Gulf Atlantic Corporation, owner of EMC, Inc., expressed great interest in the insulation/roofing brokerage idea of Chapter 6. This company has most of the elements of such a business already in place. They thought it a fine idea and are willing to test it.

CASE HISTORY.

Burger King
Airport Blvd.
Mobile, Alabama

I. FACILITY DETAIL — EXISTING.

A. Seating capacity 82.
B. Bryant heating and air units, two 5 ton kitchen, two 5 ton dining area.
C. One walk-in cooler 2.5 tons; two smaller coolers, .5 ton each.
D. Water heated with gas.

II. MODIFICATIONS AND ADDITIONS TO INCREASE ENERGY EFFICIENCY.

A. Heat reclaim system was installed on walk-in cooler refrigeration unit.
B. Air conditioning and heating economizers were installed on air handling systems.
C. Outside air ventilation system was installed in grill area.
D. Control system installed to optimize utilization of all air conditioning and heating systems, coolers and interior and exterior lighting.

III. INSTALLATION SCHEDULE AND RESULTS.

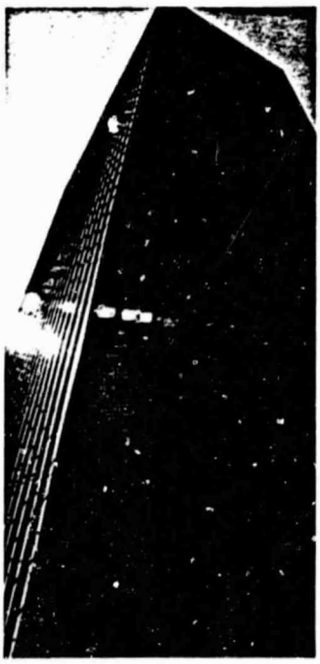
A. Heat reclaim system was completed in July, 1978. Our calculation shows a savings of 10.36% (original projected savings annually was 8.5%).
B. Air conditioning economizer system was completed in July, 1978. Our calculation shows a savings of 3.6% (original projected savings annually was 4.1%).
C. Outside air ventilation was completed in July, 1978. Our calculation shows a savings of 3.4% (original projected savings annually was 4.0%).
D. Control system was put into 100% operation in July, 1978. Installation began in March, 1978 — Unit was a prototype, and problems getting parts were significant. Our calculation shows a savings of 12.85% (original projected savings annually was 10%).

IV. PROJECTED PAYOUT ON ALL COSTS ASSOCIATED WITH THE ABOVE INSTALLATION IS 3.0 YEARS AT TODAY'S RATES.

ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH

ENERGY CONSERVATION MANAGEMENT is a Mobile based firm specializing in providing "TOTAL" energy management for commercial, institutional and industrial facilities.
The company founders, an HVAC contractor, an insulation contractor and a consulting engineer, felt that no specific company was offering clients a "TURN-KEY" energy management program. With energy costs rising in the immediate future, the need for a firm such as Energy Conservation Management was well justified.

Energy Conservation Management, and affiliates in other states, offers clients consultation, design support services, "TURN-KEY" installations, continued maintenance service and guaranteed energy savings.
Energy Conservation Management is completely independent, with no specific product affiliations to bias judgment. We are therefore free to develop innovative approaches and techniques to achieve effective utilization of energy.



OUR "TOTAL" ENERGY MANAGEMENT SYSTEMS INCLUDE:

- Demand and load controllers that reduce peak KW demand and KWH consumption.
- Heat reclaim systems which recapture waste heat from compressors, motors or boilers and utilize this heat for space, water or process needs.
- Lighting modifications.
- Insulation of facilities which have little or no R value.
- HVAC systems alteration using enthalpy control, dampers and ventilation.
- Capacitor installation for facilities that pay penalties for low power factor.

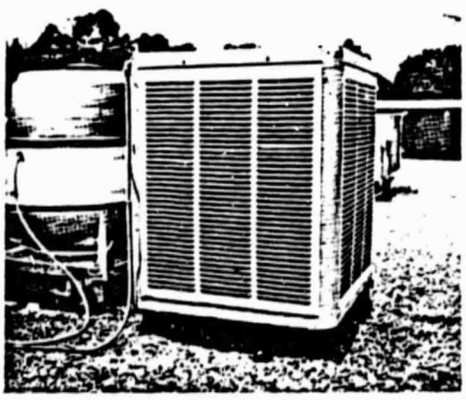
ENERGY CONSERVATION MANAGEMENT OFFERS PROSPECTS:

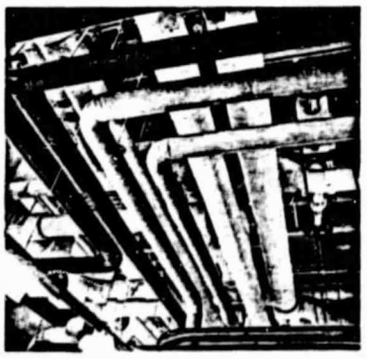
- Energy audits or load surveys of their facilities.
- Custom designed energy management systems to fit their specific needs.
- Utility rate and cost analysis with calculated ROI or payback on applied projects.
- "Turn-Key" installation and training of personnel in the operations of the energy management systems.
- Equipment warranties and extended maintenance programs.
- Alternatives for financing.

Our staff members represent 50 years experience in the following fields:

- Electrical Engineering
- Mechanical Engineering
- Electronic Engineering
- Architectural Engineering

In any facility, an effective low energy level must be integrated with comfort and operating standards.
To attain this goal with economic effectiveness requires technical skills, cost control, quality construction and scheduled maintenance. The people at Energy Conservation Management can provide this complete package of services for your new installation or upgrade and maintain your existing facilities.





ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH