Texas Tech University
BOX 4169 / LUBBOCK, TEXAS 79409 / (806) 742-2821
DEPARTMENT OF AGRICULTURAL ECONOMICS

March 27, 1978

Dr. William F. Lalor, Manager
Systems and Cost Engineering
Cotton Incorporated
4505 Creedmoor Road
Raleigh, North Carolina 27612

Dear Bill,

The enclosed proposal has been revised in line with our discussions. After talking to you on Thursday, we adjusted the budget to reduce costs the first seven months. It would be difficult to reduce it much further if we expect to accomplish our first objectives within the time limitations. Don Ethridge and Dale Shaw feel we have an opportunity to obtain useful results from their computer gin model. If we can use a full-time man equivalent on the project this summer and two one-third time positions this fall with a graduate student, I feel we can accomplish objective one and part of two and determine the optimum way to proceed on objective three.

We will need to work out a memorandum of agreement if this proposal is accepted. Please let me know as soon as a decision can be reached by your board so that we will know how to proceed. Time is running short if we are to begin by June 1st.

Sincerely,

James W. Graves
Professor and Interim Chairman

JWG:cp
Enclosure

Research Proposal

Department of Agricultural Economics, Texas Tech University, Lubbock, Texas 79409

Project Director: James W. Graves, Department Chairman

Title: The Cotton Ginning Industry-Structural Adjustments Over Time to Changes in Factor Price Relationships, Proposed Regulations and Technology.

Major Objectives:

1. To estimate the impact of changes in energy and other factor prices, of proposed EPA and OSHA regulations, and selected technologies on ginning costs.

2. To develop procedures to analyze the adjustment process in terms of expected firm accommodation to these changes.

3. Based on accomplishment of objective (2) and alternative assumptions as to the magnitude of selected external factors, to analyze their probable effect on the ginning industry, i.e., number of gins exiting the industry and number and size distribution of remaining gins and most probable technological configuration.

Significance of Research:

The number of active gins in the U.S. has declined steadily since 1900 such that currently there are less than 3000 active gins across the cotton belt. The decline in gin numbers has resulted from shifts in cotton production, changes in ginning technology, and changes in factor prices and transportation costs which have tended to favor larger gins. These factors continue to impact on the structure of the current industry. Energy shortages and rising energy costs are reflected directly in ginning costs and indirectly through their impact on cotton production. EPA and OSHA regulations, involving for the most part non-productive capital investments, are reflected directly in ginning costs and profitability. Adoption of new technologies of harvesting and storing seed cotton, although cost reducing, will impact unevenly in different gin situations and hence will influence management decisions as to expansion, merger and/or exit from the industry.

It is important that researchers and funding agencies know the impact of projected changes in these external factors on (1) individual ginning costs and profitability and (2) on the gins numbers, size distribution and technological configuration of the industry. This information can provide guidelines in allocating subsequent research efforts and funds to those problems which can be reasonably anticipated to arise in the future.

Prior and Current Research:

The literature on cotton ginning is replete with studies on the nature, costs and effects of adjustments required by changing technological and economic renditions. (1, 2, 4, 5, 6, 7, 10, 11, 22, 29, 33, 35, 36, 37, 38, 39, 42). A number of investigators have sought to determine the nature of the relationship between ginning costs and size of gin, between ginning costs with and without seed cotton and/or lint cotton storage (1, 9, 20, 21, 24, 25, 27, 31, 43), and between ginning costs and length of ginning season (5, 8, 12, 13). Still other investigators have taken a micro-analytic approach and examined the ginning operation with respect to power consumption, labor and other factor utilization by gin capacity at selected ginning volumes (3, 14, 16, 19, 32, 40, 41, 43, 44). Another group of studies have examined the impact of changes in seed cotton assembly technology on farm to gin costs (12, 17, 18, 23, 28, 30, 34, 41). A final group of studies have attempted to develop an optimum organization of ginning facilities for a given production area with a given production density and volume. (8, 9, 26). Optimality for the latter group has generally been defined in terms of a least cost organization of facilities. Little research effort has apparently been exerted directly to identify those characteristics which determine the viability of individual gins within a given production area or conversely to identify those characteristics which assure continued gin viability in a dynamic environment.

Plan of Work:

It is postulated that at any given time there exists an ideal (least cost) configuration of ginning facilities in terms of the existing distribution of cotton production, production density, assembly, transportation and ginning technology. As the number of gins continues to decline, a congruence between the ideal (least cost) situation and reality will, at least in the short run, occur only by chance. Furthermore, the process of industry accommodation to declining gin numbers is probably not a simple one since some gins exit, others expand capacity and still others merge into new organizations. The problem then is more than a simple decline in numbers, but a determination of future industry structure in terms of number, size distribution, probable location and technological configuration.

Researchers at this institution have available a gin model program which with appropriate modifications can be utilized to measure the impact on ginning costs of various technological innovations, changes in factor costs, i.e. energy and labor prices and the impact of non-productive capital expenditures such as might be required by EPA and OSHA regulations. With respect to objective 1, primary efforts will be directed towards quantifying the effects of probable OSHA and EPA regulations, modifying the ERS gin models in conformity with various proposed technologies and utilizing projected energy costs, and projected cotton production to generate a set of ginning costs which reflect the graduated and cumulative effect of the selected external factors. The process may be likened to the development of a series of scenarios envisaging the impact of single, double or multiple factor changes on ginning costs.

The first step in achieving objective 2 is to identify the key determinants for decisions by gin management(s) to cease operation, expand gin plant capacity, merge with other gin plants or firms, etc. Input from gin

industry sources -- people involved in the ginning process, such as gin managers, extension workers, ginning association officers, gin auditors, financial institutions, etc. -- will be the source of much of this information/insight. The next step is to identify quantifiable surrogates for the factors identified in step 1. General knowledge of the industry and economic theory/concepts will be necessary; while step 1 is essentially a process of describing the primary determinants of adjustments, step 2 is a process of quantifying those determinants. Step 3 involves the specification of those determinants (factors) in a logical cause-effect framework.

The procedure to achieve objective 3 is to combine impacts on gins generated by the gin model(s) and expected future scenarios of other potential variables such as cotton production by region with the cause-effect framework and thereby estimate impacts of selected external changes on the number, size, distribution, and location of gins. While the estimation of these types of impacts is the desired product of the entire effort, achievement of objective 3 is not feasible within a 7 month time period.

Qualifications of Research Cooperator:

Researchers at Texas Tech have been and continue to be involved in seeking solutions to the myriad of problems encountered as cotton moves from the farm to the utimate processor. Sandel and Smith in the Department of Industrial Engineering and Fowler in the Department of Agricultural Economics in a C.P.I. financed study analyzed the sequence of operations between farm and gin (45). This study was primarily responsible for turning industry attention to possible gains to be achieved by modifying traditional harvesting, seed cotton storage and transportation techniques.
Subsequent research by Smith, sponsored by Cotton Inc., concentrated on the development of alternative methods of handling seed cotton, i.e., ricked

cotton handling and storage (46). Fowler and Pruitt analyzed the cost of compressing cotton to alternative densities at gins (47). Chitwood and Owens of the department of agricultural economics analyzed costs of converting existing gins from flat bale to universal density (48). Fowler and Glass conducted a statistical analysis of the effects of volume and capacity on costs of ginning (49). Owens and Justis reported on industry characteristics, production, capacity and utilization of independent gins in Texas (50). The same authors subsequently reported on operating requirements, costs, revenues, and economic efficiency among independent gins (51). Cato and Owens investigated the economics of establishing a cotton mill industry on the Texas High Plains (60). This latter study estimated processing costs for selected cotton mills (5,000, 10,000 and 25,000 spindles) processing local cotton qualities through to gray cloth (60).

The establishment of an Economic Research Service Cooperative agreement in the Department of Agricultural Economics in 1975 gave further impetus to research in cotton problems at Texas Tech. This agreement provided for two full time researchers in cotton industry problems within the Department of Agricultural Economics. These researchers, Dr. Don Ethridge and Mr. Dale Shaw, have in a relatively short period of time made a substantial addition to the literature on cotton industry problems.

Shaw and Ghetti compared costs and breakeven volumes for universal density and modified flat bale presses (32). Shaw has been closely involved for a number of years in the Economic Research Service studies of ginning costs across the cotton belt (51, 52, 53, 54, 55, 56, 57, 58). Ethridge, Shaw and Mc Arthur have authored a series of working papers describing producting, practices, and resource situations in the southwestern and western parts of the cotton belt (61, 66, 63, 64, 65, 66). Ethridge, Shaw and Ross have analyzed the impact of instrument line values on cotton marketing (59).

The cotton ginning models developed by Shaw, Cleveland and Ghetti are envisioned as the mechanism for analyzing the impact of changes in production, technology, factor costs and administrative regulation which constitute a vital part of this proposal (objective 1) (31). These models have since undergone revision which makes them more amenable for use in this project (67, 68, 69). These models have been computerized and are available as software in the Texas Tech computer. Their availability obviates the necessity of developing a comparable mechanism for this project. Furthermore, the output from these models compliments the current research of Dr. Milton Smith of the Department of Industrial Engineering at Texas Tech, also sponsored by Cotton, Inc., which involves economic modeling of cotton harvesting, storage and handling. Texas Tech researchers are thus in a unique position to provide answers to a number of important questions with minimal-resource expenditure.

Initiation Date: June 1, 1978, Duration: 1 year and 7 months

Cooperative Support:

The Economics, Statistics and Cooperative Service, U.S.D.A. at Texas Tech will furnish support for this project in the person of Dr. Don Ethridge and Mr. Dale L. Shaw. They will make available to the project the computerized gin models.

Timetable:

Objective 1 should be accomplished by December 31, 1978 and data available for publication. The time frame for accomplishing objectives 2 and 3 is more uncertain and whether all of the resources tentatively scheduled for year two of the project will be required is unknown. It should be possible, however, to make a more definitive statement of project needs by the end of the current fiscal year.

Tentative Budget
Cotton Inc. - Research Proposal

Title: The Cotton Ginning Industry on the High Plains - Structural Adjustments to Changes in Factor Prices, Factor Price Relationships, Administrative Regulations and Technology Over Time

For the period June 1, 1978 through December 31, 1978

| | | |
|---|---|---|
| 1. | Project Director<br>James W. Graves, Department Chairman | $ -0- |
| 2. | Principle Investigators 1/<br>Thomas R. Owens<br>Mark L. Fowler | 14,241.00 |
| 3. | Cooperators<br>Don Etheridge<br>Dale Shaw | <br>-0-<br>-0- |
| 4. | Research Assistant 2/ | 1,500.00 |
| 5. | Student Assistants and Part-time Help | 500.00 |
| 6. | Fringe Benefits (12% of S & W) | 1,949.00 |
| 7. | Travel | 1,000.00 |
| 8. | Current Operating Expense 3/ | 500.00 |
| 9. | Capital Outlay | -0- |
| 10. | Publication Expenses | 200.00 |
| | Sub-total | 19,890.00 |
| 11. | Indirect Costs (20% of Direct Costs) | 3,978.00 |
| | Total | $23,868.00 |

1/ Two thirds full-time man equivalent over the period - allocation within the period will vary with project needs and other commitments.

2/ One half-time graduate assistant from September 1 - December 31, 1978.

3/ Includes computer time.

1979 Tentative Budget

Project Title: The Cotton Ginning Industry - Structural Adjustments to Changes in Factor Prices, Factor Price Relationships, Administrative Regulations and Technology Over Time

From January 1, 1979 to December 31, 1979

| | | | |
|---|---|---|---|
| 1. | Project Director<br>James W. Graves, Department Chairman | | $ -0- |
| 2. | Principle Investigators [1]<br>Thomas R. Owens<br>Mark Fowler | | 23,600.00 |
| 3. | Cooperators<br>Don Etheridge<br>Dale Shaw | | -0-<br>-0- |
| 4. | Research Assistants[2] | | 4,500.00 |
| 5. | Student Assistants and Part-time Help | | 800.00 |
| 6. | Fringe Benefits (12% of S&W) | | 3,468.00 |
| 7. | Travel | | 600.00 |
| 8. | Current Operating Expense[3] | | 1,000.00 |
| 9. | Capital Outlay | | -0- |
| 10. | Publication Expense | | 200.00 |
| | | Sub-total | 34,168.00 |
| 11. | Indirect Costs (20% of Direct Costs) | | 6,834.00 |
| | | Total | $41,002.00 |

[1] Two-thirds man equivalent for 9 months, one full-time equivalent for 3 summer months.

[2] One half-time graduate student for one year

[3] Includes computer time

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