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THE ECONOMICS OF CROP TERMINATION AND USE OF FIELD CLEANERS

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Abstract

This study addresses the economics of chemical crop termination and the use of field cleaners in cotton production in the Southern High Plains of Texas. Three years of data are used to evaluate chemical crop termination and to find out if the use of field cleaners would be profitable for producers in the Southern High Plains of Texas. Overall, it was found that if conditions are such that chemical crop termination can be conducted around the first week of October, so that harvest can start towards the end of the third week of October, then chemical crop termination practices should be utilized. Also, it was found that regardless of the use or not of chemical crop termination practices, the use of field cleaners would be a profitable practice for producers to use in the Texas High Plains.

Introduction

Utilization of sophisticated cotton harvesting practices or approaches can contribute to the enhancement of producers' revenues. This is because, in general, the earlier cotton harvesting takes place, the lower the potential losses would be due to weather related deterioration of the fiber in the field and producers would be able to market their cotton as early as possible in the marketing season. Evaluating particular harvesting dates and practices to use in order to maximize profits is the main focus of this study. This study was conducted in the Southern High Plains of Texas (SHPT). The SHPT comprises approximately 35,000 square miles, and is regarded as being a semi-arid environment in which agriculture thrives. The major crops grown in the SHPT include cotton, wheat, sorghum, corn and some vegetables (Segarra, et al.).

Agricultural production on the SHPT is large in scale. Farms are large in size averaging close to 1,000 acres (roughly three times the national average), these farms are highly mechanized, irrigation practices used are sophisticated, and there are considerable number of agriculturally related research programs that provide valuable information to agricultural producers. The South High Plains of Texas has climatic and physiographic advantages that facilitate efficient and productive production of agricultural commodities. The region has an average rainfall of about eighteen inches per year. Soils are generally well drained sandy clay loams, and the major topographical features are small streams or draws and playas or dry lakes (Lubbock Chamber of Commerce).

Cotton, the most important agricultural crop produced in the region, impacts the region's economy in a variety of ways. The success and value of any year's cotton crop have a ripple effect throughout many sectors of the local economy. Those sectors directly impacted include cotton gins, farm implement manufacturers and dealers, and seed, chemical and fertilizer companies. Also, the economic impacts of cotton production are strongly felt in the retailing, automotive, and consumer goods and service sectors (Lubbock Chamber of Commerce). Thus, maintaining high levels of production and quality of cotton is important to the region. Cotton lint quality characteristics have a direct impact on the price of cotton received by producers. Cotton lint quality is measured by color, trash content, strength, length and micronaire. As the quality of these cotton fiber characteristics improve, so does the price growers receive for their crop (Segarra, et al.) Therefore, the main objective of this study is to compare and contrast the profitability from the use of field cleaners and chemical crop termination practices versus conventional harvesting methods (left to freeze and without field cleaner). The comparisons to be made can be broken down into four harvesting practice possibilities: (1) Chemical Termination with Field Cleaner; (2) Left to Freeze with Field Cleaner; (3) Chemical Termination without Field Cleaner; and (4) Left to Freeze without Field Cleaner.

Total Revenue and Costs

The first step to evaluate the profitability of the four harvesting practice possibilities was to derive a daily estimate of cotton yields across the harvesting season per practice. As pointed out earlier, experiments comprising the four harvesting possibilities considered were established in Lubbock County in 2000, 2001, and 2002. Given the fact that we needed to forecast cotton yield and quality of cotton at different times within the harvesting season under the four harvesting possibilities considered, the experiments were set up so that for those using chemical termination harvesting could start as early as the middle of September and could extend as late as the middle of January. For those treatments in which the crop was left to freeze, the experiments were set up so that harvesting could start as soon as the crop was ready to harvest after freezing, around the second week of November, and it could be harvested as late as the middle of January. The overall purpose of these experiments was to find out what would happen to both yield and the qualities of cotton if harvesting was delayed along the harvesting season. Once information was generated from these experiments, cumulative rainfall from September 1 until the specific date in which harvesting took place was calculated and the following relationship was derived.

$$\underset{}{\text{Yield }(t)} = \underset{(17.37)}{667.74} - \underset{(2.80)}{73.15*Y2001} + \underset{(13.36)}{331.04*Y2002} - \underset{(1.89)}{8.06*R(t)} - \underset{(0.54)}{5.87*CT} - \underset{(2.05)}{19.67*FC}$$
$$R^2 = 0.8982$$

Where: Yield (t) represents the forecasted cotton yield at a given date (t) between September 1 and January 15; Y2001 and Y2002 are dummy variables for the 2001 and 2002 years, year 2000 being the base year; CT and FC are the dummy variables representing chemical termination and field cleaner usage taking on the values of their presence (value of “1”) or absence (value of “0”); and R (t) is a continuous variable representing rainfall in cm/day, cumulative in nature from September 1 to the specific date in which yield is desired to be forecasted. Cumulative rainfall variable was included in equation (1) because it was felt, and previous research (Segarra, et al.) has shown, that this variable can provide valuable information in terms of what the cotton yield losses could be as harvest is delayed within the harvesting season. The numbers below the parameters estimates in the equation represent the respective t values.

Using equation (1) and rainfall patterns for the September 1 to January 15 period, cotton yields were estimated for every day for the 2000, 2001, and 2002 harvesting seasons for the four harvesting possibilities considered. Once this was done, twelve daily yield series (corresponding to three years and four strategies) based on the presence/absence of the dummy variables in the equation.

The next step was to come up with a daily price estimate for cotton during the harvesting season. This was calculated using the loan based pricing system. These loan prices during the harvesting season were provided by Cooperative Extension in the Texas Agricultural Experiment Station in Lubbock, Texas. Combining the yield/day and loan based price/day data during the harvesting season; a daily total cotton lint revenue/acre during the harvesting season for each of the four harvesting practices for the three years were derived. Also, a corresponding daily seed revenue was added to the daily cotton lint revenue to calculate total revenue. The cottonseed prices used were the corresponding cotton seed prices for the 2000, 2001 and 2002 seasons.

On the cost side, the cost of production estimation was based on Texas Cooperative Extension’s cotton production budgets for sprinkler irrigated (heavy textured soils) in the SHPT for the three years considered (2000, 2001, 2002). The costs considered included: direct pre-harvest costs, the cost of harvest aid chemicals used for chemical termination (in the case of the left to freeze harvesting practices possibilities these costs were excluded), stripping and ginning, and field cleaner costs (included only in those cases in which field cleaners were used). It is important to highlight that some of these costs were dependent upon the seeded cotton yield (lint plus seed), thus, these will vary according to the level of production. Cottonseed yield was taken as a function of lint yield, cotton seed yield being equal to 1.6 times the cotton lint yield. Using this total yield (excluding trash), costs associated with stripping and ginning were calculated for all the three years. Field cleaner costs were calculated as a function of the lint yield. A rough estimate of the field cleaner cost in dollars/lb was $.0089, (Nelson, et al.). Combining all these costs, daily costs during the harvesting season for years 2000, 2001, and 2002 were calculated.

Profitability of Harvesting Practices

Once daily expected revenues and daily expected costs associated with each of the harvesting practices considered were calculated for the three years, a daily projected level of profit was derived for each year. Figures 1 to 3 present the daily estimated levels of profits across the harvesting season for the four harvesting practices considered for 2000, 2001, and 2002. The data depicted in those figures can be interpreted to represent what the associated level of profit in a per acre basis would be across the harvesting season if a specific harvesting practice would be used.

Figure 1. Expected Daily Profits/acre by Harvesting Practices:2000

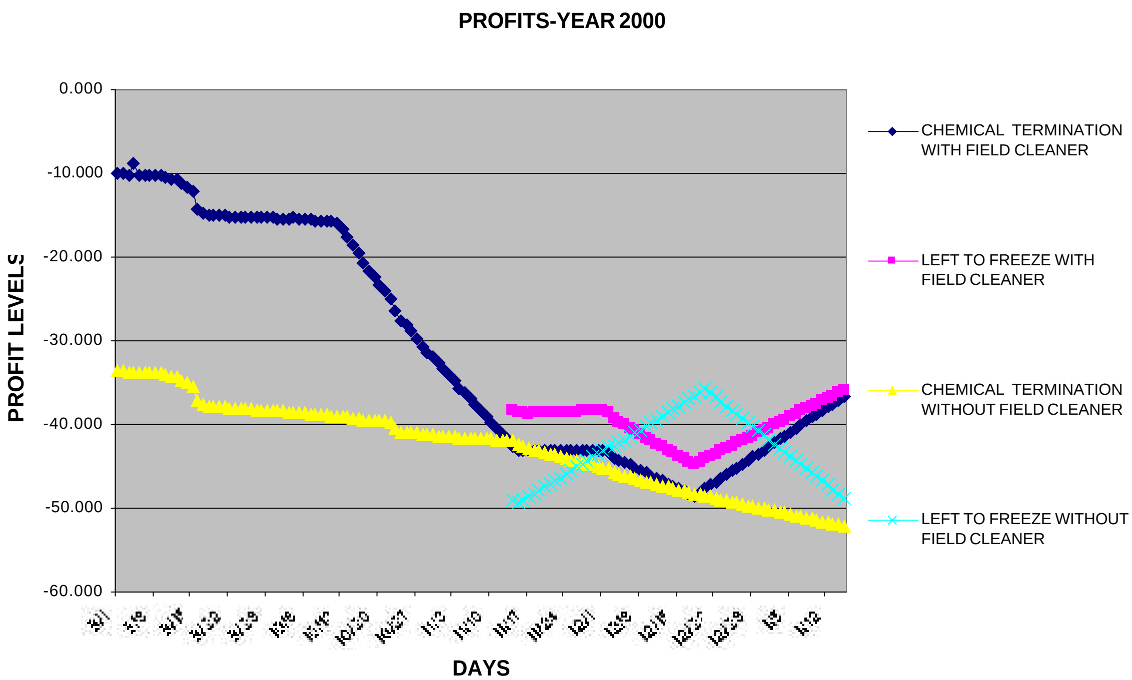


Figure 2. Expected Daily Profits/acre by Harvesting Practices:2001

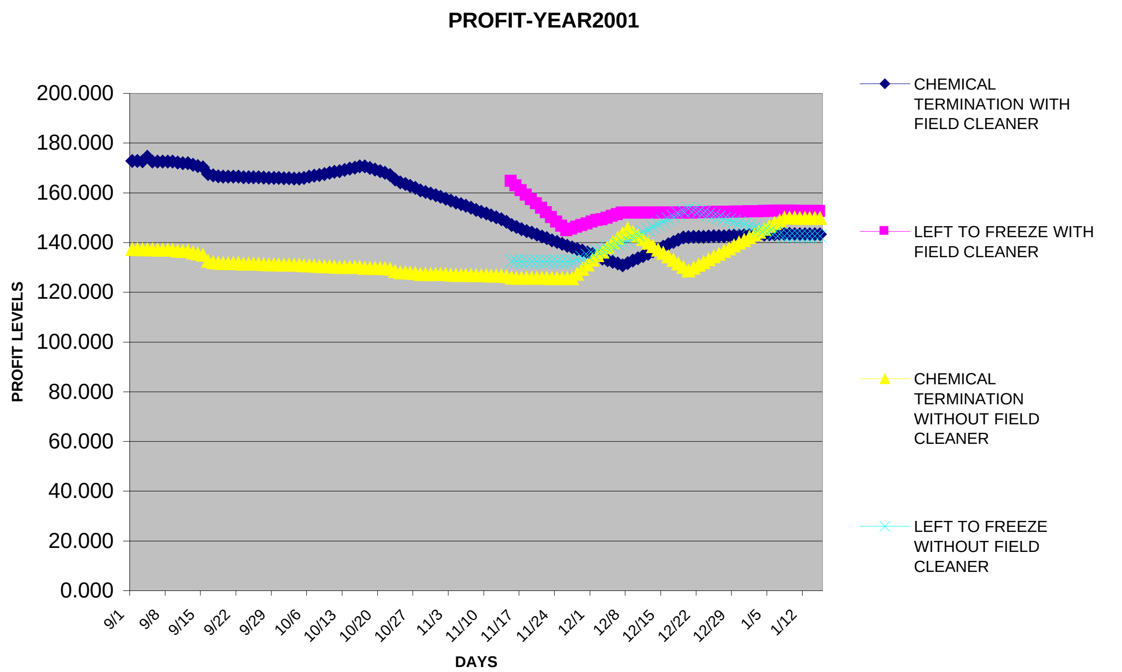
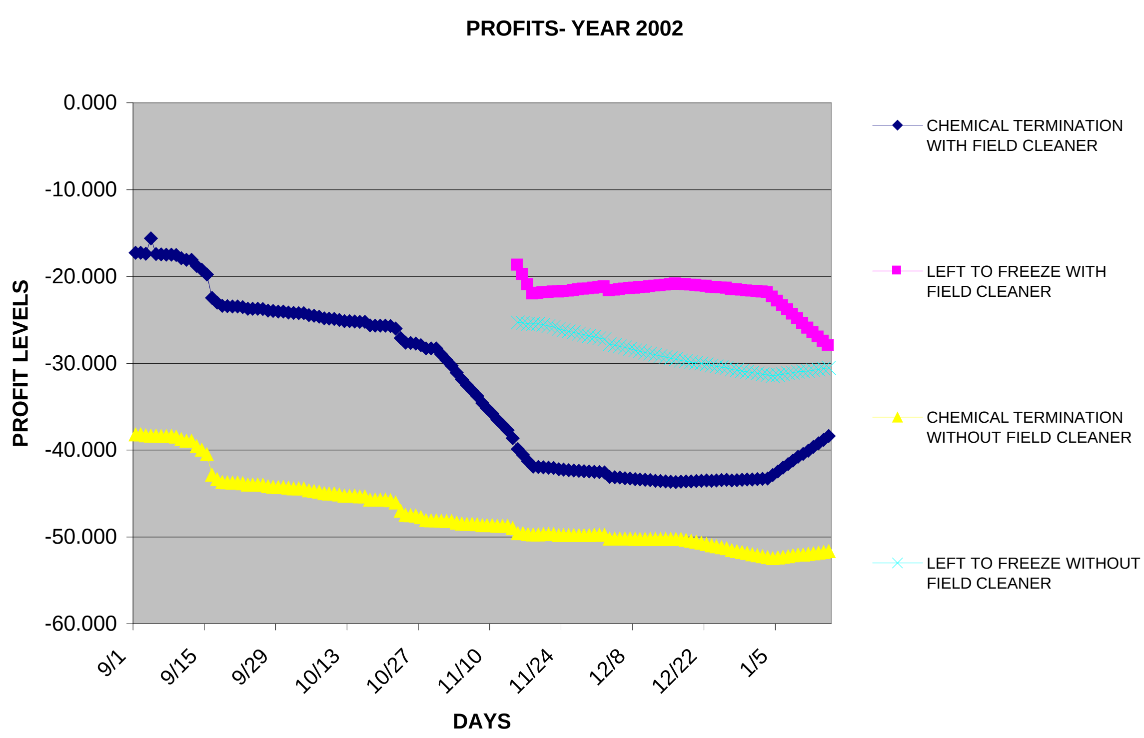


Figure 3. Expected Daily Profits/acre by Harvesting Practices:2002



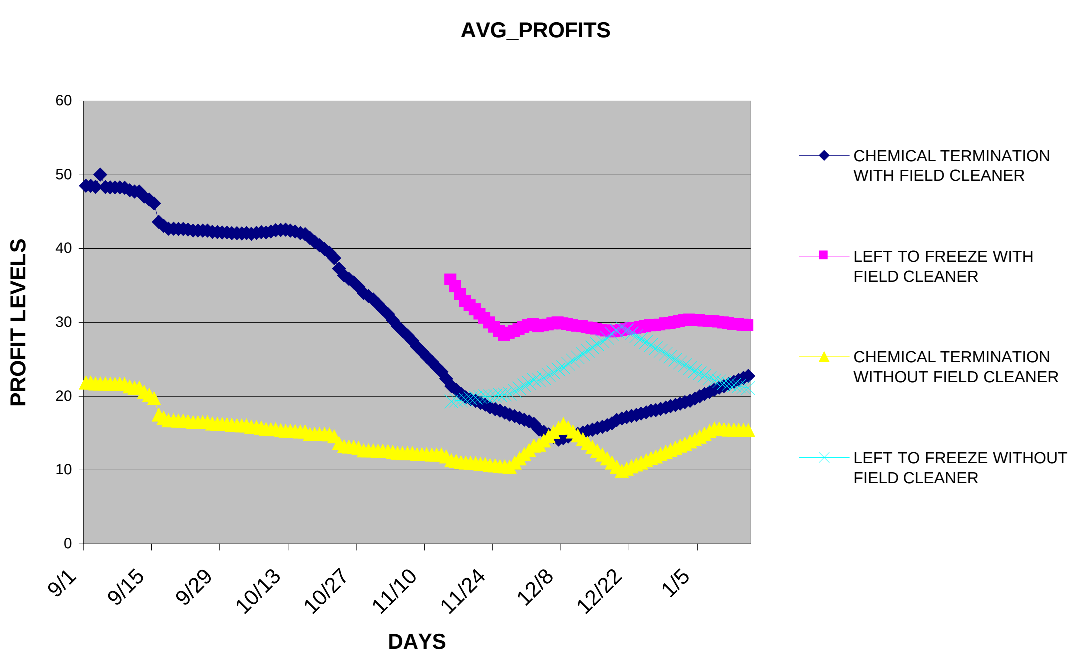
The first issue to notice in these figures is that the general trend of profits across the harvesting season implies that regardless of the harvesting practice used, profit would be expected to decline generally speaking as the harvesting season progresses. That is, the earlier cotton harvesting takes place, the higher the level of expected profit would be. The second issue to note in those figures is that regardless of the utilization or not of harvest aid chemicals, the utilization of field cleaners would be expected to result in higher profits than if they were not to be used.

Notice that the reporting of expected levels of profit under the left to freeze harvesting practices scenarios start roughly in the second week of November. This is due to the fact that the long term average freeze date in Lubbock County is November 1, and if cotton is left to freeze it would be approximately two weeks after that date that harvesting could begin to take place if this practice is followed.

It is important to note that when comparing the three years considered in this study, the expected levels of profits in the 2000 and 2002 harvesting seasons were significantly lower and negative when compared to those expected in the 2001 harvesting season. For this reason, it is important to average these three years. Figure 4 depicts the average expected levels of profits for the 2000, 2001, and 2002 harvesting seasons.

As can be seen in figure 4, the general trend of profits across the harvesting season again implies, in general, that regardless of the harvesting practice used, the earlier cotton is harvested the higher the expected level of profits would be. Second, the data depicted in figure 4 implies that when looking at the use of chemical termination or left to freeze harvesting practices, the use of field cleaners would generally result in higher expected levels of profits. Finally, when evaluating chemical termination, the results imply that if chemical termination can be done early enough, so that in the case in which a field cleaner would be used the crop could be harvested around the third week of October (which would imply the use of harvest aid chemicals towards the end of the first week of October), then chemical termination practices should be used. Notice that in the case that field cleaners would not be planned to be used, chemical termination would have to be applied significantly earlier, roughly one month earlier used (the first week of September) than if field cleaners would be planned to be used, so that the crop could be harvested by the second week of September.

Figure 4. Average Expected Daily Profits/acre by Harvesting Practices:2000,2001,2002



Conclusion

This study evaluates the profitability of using field cleaners and/or chemical termination practices versus conventional harvesting methods (left to freeze and/or without field cleaners) in cotton production in the Southern High Plains of Texas. Overall, it was found that: (1) regardless of the harvesting practice used, the earlier cotton is harvested the higher the expected level of profits would be; (2) when looking at the use of chemical termination or left to freeze harvesting practices, the use of field cleaners would generally result in higher expected levels of profits; (3) when evaluating chemical termination versus left to freeze practices, the results imply that if chemical termination can be done early enough (by the end of the first week in October if field cleaners are to be used or by the first week of September if field cleaners are not going to be used) then chemical termination practices should be used. Thus, based on the results obtained from the data analyzed, it seems that the optimal decision rule to follow with respect to cotton harvesting practices in the SHPT would be for cotton producers to adopt the use of field cleaners and depending on the year, if producers feel that their crop is mature enough in early October and if they estimate that they could get their crop out by the end of October, then it would be profitable for them to use harvest aid chemicals.

References

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