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ARE ADDED LAND AND NEW PRODUCER PROVISIONS IN CROP INSURANCE VULNERABLE TO ABUSE? IMPLICATIONS FOR INSURED TEXAS COTTON PRODUCERS

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Abstract

Reducing crop insurance program vulnerabilities is important to the welfare of Texas cotton producers because excessive losses due to the abuse of these vulnerabilities may result in crop insurance premium increases. This study analyzes the added land and new producer provisions in crop insurance and evaluates whether these provisions are vulnerable to abuse. The vulnerability of the added land and new producer provisions primarily stems from the informational advantage held by the producer with regards to the inherent productive capacity of his land. A descriptive analysis of data from insured Texas cotton producers showed statistically higher indemnity-to-premium (IP) ratios for producers utilizing the added land and new producer provisions, compared to producers using actual production history. This result suggests that the added land and new producer provisions are vulnerable to abuse and there is a need for policy makers to reassess these provisions. Several policy options are suggested in this paper to help ameliorate the vulnerability of the added land and new producer provisions.

Introduction

Since the early 1990s, the need to reduce fraud, waste, and abuse in the U.S. crop insurance program has been a recognized priority of the United States Congress, the United States Department of Agriculture (USDA), and the USDA's Risk Management Agency (RMA). Current estimates reveal that approximately 5% of all crop insurance claims may be associated with fraud, waste, and/or abuse (US GAO, 1999). The crop insurance industry defines *fraud* as a false representation of a matter of fact taken to generate economic gain. Crop insurance fraud is intentionally taking action to create a claim and may include padding or inflating claims, falsifying an insurance application, hiding production, or creating false claims. On the other hand, *abuse* takes place when an individual producer takes advantage of a special circumstance, errors, or loopholes inherent within the crop insurance policy. This definition of abuse is also commonly referred to as "program vulnerabilities" in the federal crop insurance program. Lastly, *waste* is defined as errors, usually unintentional, that are not discovered and, therefore, not corrected.

Given that abuse or "program vulnerability" is one of the major concerns with the federal crop insurance program, it is important to examine different crop insurance contract elements that may be vulnerable to abuse. There is a need to identify and analyze contract elements that are vulnerable to abuse in order to develop effective strategies for mitigating and managing the abuse. Identifying and improving crop insurance elements that are vulnerable to abuse can reduce taxpayer dollars that are wasted on excessive indemnity payments.

Analyzing and reducing program vulnerabilities is also important to the welfare of farmers in general because excessive losses due to these vulnerabilities may lead to increases in producer premiums in the long run. An increase in producer premium is a logical actuarial response to the excessive losses that, to the insurer, reflects a higher risk and a higher cost of insuring crop production. If government subsidies of these crop insurance premiums remain constant (or decrease) and excessive losses due to abuse continues, then the cost of insurance as a "safety-net" to the nation's crop producers is likely to dramatically increase. If producer premiums rise, then crop insurance may cease to be a viable risk management tool for some farmers. U.S. farmers will then choose other more viable risk management options for their enterprise. A reduction in "safety-net" options that farmers can viably pursue may cause structural changes that are likely to affect the competitiveness of U.S. agriculture. The actions of a few producers that take advantage of these program vulnerabilities may affect the ability of all other farmers to insure against risk. Overall, farmers will benefit from identifying and reducing program vulnerabilities because this endeavor assures that the safety-net structure in U.S. agriculture remains intact and U.S. farmers will remain competitive in the world market.

In 2001, Texas ranked second only to Kansas as the state with the most insurance policies sold (177,117 policies sold). Texas cotton producers, in particular, accounted for about half of all the cotton insurance policies sold in the U.S. in 2001 (USDA-RMA, 2002a). Furthermore, approximately 49% of all indemnities paid to U.S. cotton producers that year went to Texas cotton farmers (USDA-RMA, 2002a). These figures indicate that Texas cotton producers, who planted 6.0 million acres in 2001,

rely heavily on crop insurance as a risk management tool. Therefore, it is important to analyze crop insurance program vulnerabilities for this highly insured area because the abuse of these vulnerabilities may impact Texas cotton producers' ability to manage risk and survive in the very competitive cotton market.

Two contract elements that may be vulnerable to abuse in the crop insurance program are the added land and new producer provisions. There is anecdotal evidence that these provisions have been abused in the past (See USDA-RMA, 2002c for examples of these cases). These two provisions can serve as starting points for better understanding the incentives for abusing these crop insurance program vulnerabilities. The objective of this paper, therefore, is to analyze the added land and new producer provisions in crop insurance and assess the incentives that make it vulnerable to abuse. This paper proceeds as follows. The next section provides a background of how the added land and new producer provisions in crop insurance work. Section three discusses the economic incentives for abusing the added land and new producer provisions in the context of neoclassical economic theory. Section four provides some descriptive analysis about the indemnity-to-premium (IP) ratio of insured Texas cotton producers using the added land and new producer provisions. Conclusions and policy options implications for Texas producers and for U.S. agriculture, in general, are presented in the last section.

Background of the Added Land and New Producer Provisions

The procedures for computing approved actual production history (APH) in crop insurance have provisions that allow insurance providers to make special yield determinations for producers adding more land into production and for new producers planting an insured crop for the first time (USDA-RMA, 2002b). Depending on the facts available and circumstances, the added land and new producer provisions allow producers to use either transitional yields (T-yields) or yield histories from other farm units of the same crop, crop type, and practice to determine the yield guarantee for insurance.

Added Land

Added land is defined as cropland acreage (irrespective of crops) added to the insured person's farming operation within the county for the current crop year (USDA-RMA, 2002b). The appropriate APH yield determination for added land primarily depends on whether the land is being added as a separate optional/basic unit or the land is being added to an existing optional/basic unit.

Land being added as a separate basic unit uses the variable T-yields to determine the yield guarantee, if there are no verifiable production records from other existing units of the same crop, type, and practice to be planted on the added land. If land is being added as a separate optional unit, then either a variable T-yield is used or a simple average (SA) T-yield from the existing units is used. A SA T-yield is just the average yield of all the insured units of the crop, type, and practice to be planted on the added land. A variable T-yield is used for determining the yield guarantee of added land as a separate optional unit if a different crop, type, or practice is going to be used in the added land.

If land is being added to either an existing optional or basic unit, then the actual yield for that unit is used to determine the yield guarantee. This is assuming that the added land will be used for the same crop, type, and practice as in the existing unit. However, if a new crop, type, and practice will be planted on the added land and there are no production records for this crop, type, and practice, then variable T-yields is used to determine the yield guarantee.

Note that there are cropland acreage limitations to establish the total cropland acreage that may be added to the insured's farming operation (640 acres) or the percentage (50%) of cropland acreage that may be added to an existing basic or optional or added as a separate unit – without an RMA Regional Office (RO) underwriting review. This provision is normally called the "50/640" rule. If the cropland acreage is being added to an existing unit and the "50/640" rule is not exceeded, then the APH yields for the existing unit could be used to determine the guarantee. If the "50/640" rule is exceeded, then an RMA RO review is needed. On the other hand, if the cropland acreage is being added as a separate optional unit and the "50/640" rule is not exceeded, then the SA T-yield for the crop, type, and practice planted in other existing units can be used to determine the yield guarantee in the added land. A RMA RO underwriting review is needed if the producer wants to use the SA T-yield and the "50/640" rule is exceeded.

New Producer

A new producer is a person (or entity) who has not been "producing the crop" in the county for more than two APH crop years. The term "producing the crop" refers to an individual who is actively engaged in farming for a share of an insured crop's production in the county. The approved yield to determine the yield guarantee of a new insured producer depends on whether he has produced the crop in the county before or not. An entity that has produced the crop more than two years is not eligible to claim new producer status. If the producer has produced the crop for two years or less, then the new producer uses the combination of actual yields and 100 percent of the applicable variable T-yield for the crop. Actual yields would be used for the one or two years the producer planted the crop and variable T-yields are used for the remaining years when the crop was not planted. If the producer has not planted the crop before, then the applicable variable T-yields are used to determine the APH yields. Note, however, that producers who want to be classified as new producers, even though they have been pro-

ducing the crop for more than two years, can request the RMA RO to classify them as new producers if no production records are available for any of the land that the producer has planted.

Formation of a new entity (i.e. corporation, partnership, trust, etc.) comprised of one or more individuals do not automatically qualify the entity as a new producer. The individuals involved in the new entity must all have not previously planted the crop for more than two years, for the new entity to be classified as a new producer. Dissolution of an entity comprised of one or more individuals also does not automatically qualify the individual(s) involved in the entity as new producers. If the dissolved entity previously produced the crop in the county for more than two years then the individuals previously involved in the entity cannot claim new producer status.

Incentives for Abusing the Added Land and New Producer Provisions

Neoclassical economic theory suggests that a crop producer deciding to abuse the added land and new producer provisions of crop insurance will compare the magnitude of the potential utility gain from successful abuse with the costs of undertaking the abusive act plus the potential penalties if the abuse is detected. Given these costs and benefits, if the probability of successfully abusing the added land and new producer provision is sufficiently high to yield net utility gains in expectation, then a producer is likely to abuse these provisions (Becker, 1968; Allingham and Sandmo, 1972; Srinivasan, 1973). Therefore, the key to understanding the economic incentives for abusing the added land and new producer provisions in crop insurance contracts is to know its relative benefits and costs, the probability of detecting abuse, and the severity of penalty if the abuse is detected.

Both the added land and new producer provisions give the opportunity for insured producers to manipulate the approved APH yield that determines the yield guarantee in the crop insurance contract. This yield guarantee then determines when an indemnity is to be paid (the trigger) and also the magnitude of the indemnity that the insured will receive. The added land and new producer provisions can be used to increase the approved APH yield, in order to raise the yield guarantee and increase the likelihood of receiving an indemnity. If the yield guarantee is high, it is more likely that the actual harvested yields will be lower than the guarantee. This means that a loss has occurred and an indemnity payment can potentially be received. The ability to influence the likelihood of receiving indemnity payments and the magnitude of the indemnity payment is, therefore, the main benefit of abusing the added land and new producer provisions.

Added Land Provisions

For the added land provisions, the informational advantage held by the producer (also called asymmetric information) about the inherent productivity of the added land gives the insured an advantage to successfully abuse this provision. If the inherent productivity of the added land is low relative to the existing units and this is private information held by the insured, then the actual yields for this plot of land will more likely be lower than the SA T-yield. This means that the SA T-yield does not accurately reflect the inherent productivity of the added land and the yields that can be reasonably expected from this land. Thus losses will be triggered during the years when the added land provisions are used to determine the approved APH yields. If the inherent productivity of the added land is truly asymmetric information held by the insured, then variable T-yields may also not accurately reflect the "true" yield that can reasonably be expected. As with the SA T-yield, the variable T-yield will then be higher than what the true APH yield should be. This again would increase the likelihood of having a loss and an indemnity payment would potentially be triggered.

New Producer Provisions

Asymmetric information about the inherent productivity of the insured land also contributes to the vulnerability and abuse of the new producer provisions. If the variable T-yields does not reflect the true productivity of the new land to be used for production, then the likelihood of having a loss and triggering indemnity payments increase. In this case, a new producer that has not planted the crop before is set-up to potentially get excessive indemnity payments.

In contrast to a bona fide new producer, a producer with more than two years of production, but with some adverse yield history, may have an incentive to claim new producer status because this provision essentially eliminates submitting yield history and potentially increases insurance coverage, especially if the variable T-yield does not accurately portray the productive capability of the land. Asymmetric information about individuals operating the farm now plays a role in being able to successfully claim new producer status even if the producer has been producing the crop for more than two years. A producer with more than two years of history and with adverse yields can claim new producer status by dissolving the current entity and then forming a new entity where the principal producer would be a family member not listed or involved in the previous entity. The insurance policy of the new producer would be under the name of a son, daughter, or close relative not listed in the previous farming entity. If the variable T-yields are higher than the actual productive capacity of the land then the new entity under a new producer status is more likely to have a loss and potentially receive excessive indemnity payments.

Now let us consider the costs of abusing the added land and new producer provisions in crop insurance. The immediate primary costs incurred in abusing the added land provisions are the additional premium required for the additional insurance coverage for the added land and the transactions costs of adding the land. With regards to abusing the new producer provi-

sions, if the individual claiming new producer status is indeed qualified (i.e. produced the crop only two years or less), then the immediate additional costs are the premiums associated with the insurance coverage and the transactions cost. If the individual taking advantage of the new producer provision is a producer that has planted the crop for more than two years and uses a close relative's name for the new entity, then there is no additional premium cost because the premium would have to be similar to the premium from the previous entity. However, there may be transactions costs for establishing a new entity. In general, the immediate primary costs of abusing the added land and new producer provisions may be minimal relative to the potential benefits. However, the overall costs of abuse may increase depending on: (1) the insurer's probability of detecting the abuse, (2) the potential penalties the insurer may impose if abuse is detected, and, (3) the magnitude of the "moral" or ethical cost of abuse to the producer.

Detecting abuse of the added land and new producer provisions and imposing penalties if detected may be an extremely difficult task. For the added land provisions, for example, there is no need for RMA RO underwriting reviews if the added land do not exceed the "50/640" rule. The added land in this case is self-reported and review by the insurance provider is not required. The actual productivity of the land relative to the SA T-yields or variable T-yields will not be scrutinized to see whether these T-yields are truly reflective of the production capacity of the land. Abuse would then be difficult to detect in this case. Only producers exceeding the "50/640" rule are more likely to be detected if they are abusing the added land provisions due to the required underwriting review for this situation.

Detecting abuse of the new producer provisions may be more difficult than detecting abuse of the added land provisions. If the individual is truly a new producer (i.e. have not planted the crop before) and variable T-yields are not reflective of the productive capacity of the land, then detecting abuse in this case would be difficult because no RMA RO review would be needed. It is less difficult to detect abuses from new producers who have planted the crop two years or less because previous production records can be scrutinized to see whether variable T-yields are consistent with past actual yields. Producers who use names of close relatives to create a new entity would also be difficult to detect. Unless the new name has been reported in previous policies (i.e. as a significant beneficial interest holder (SBI)), there is no practical way to verify if the new name indeed participated in the operation of the farm before. Among the means to detect this abuse are through an in-depth investigation of the individual to include a review of his Farm Service Agency (FSA) records and from tips from other producers in the area.

Imposing penalties on producers who abuse the added land and new producer provision would also be extremely difficult. This is especially true for the case where a variable T-yield is used and this is not reflective of the actual productive capacity. This is an inherent loophole in the program due to the asymmetric information problem. Thus it would be hard to impose a penalty on producers taking advantage of an inherent loophole. The situation where new producers dissolve an entity and create a new one under another person's name, on the other hand, is a premeditated act to erase yield history and potentially receive higher indemnity payments. Penalties for this act, if proven, may then be any of the following: not receiving the indemnity, fines or restitutions, debarment from the crop insurance program and/or other government programs, criminal punishment (i.e. prison), and/or any combination of these penalties.

Another major factor that may affect the costs of abusing the added land and new producer provisions are the "moral" or ethical costs of abuse. This is perhaps one of the most important factors that deter producers from abusing loopholes in the crop insurance program or any government program. Holding other costs and benefits of abuse constant, if the individual moral cost of abuse is high then it is less likely for the individual to abuse the added land and new producer provisions. What factors may affect the magnitude of individual moral costs? Tennyson (1997) suggests that the moral cost of abusing insurance provisions is influenced by the acceptability of this behavior in the individual's social environment. For example, a less accepting attitude toward abuse by fellow cotton producers in an individual's area will increase the social stigma of abuse and, consequently, increase the moral costs of abuse. Conversely, if there were a culture of tolerance for abuse among insured producers then the moral costs of abuse would be low. Hence, farmer's associations and producer groups can play a role in providing an environment that could help to increase the moral costs of abuse.

In summary, the benefits of abusing the added land and new producer provisions may outweigh the immediate costs. The low probability of being detected and low probability of incurring a penalty if caught indicates that expected benefits from abusing the provisions would probably be enough to cover the expected costs. The key factor that allows producer to gain from abusing these provisions is the asymmetric information held by the producer with regards to the inherent productivity of the added or new land brought into production. However, moral costs may be able to deter the occurrence of abuse if the producer's social environment strongly discourages this type of behavior.

A Descriptive Analysis of Texas Cotton Insurance Data

If the added land and new producer provisions in crop insurance were vulnerable to abuse, then available crop insurance data would show a statistically higher indemnity-to-premium (IP) ratio for producers using the added land or new producer provisions (relative to the IP ratio of producers using actual yield history). However, a statistically higher IP ratio does not neces-

sarily mean that abuse is actually taking place. A higher IP ratio is only suggestive of the vulnerability of the added land and new producer provisions to abuse.

We use RMA's crop insurance data from reinsurance year (RY) 2001 to determine if the IP ratios of producers using the added land or the new producer provisions are statistically higher than the producers using actual production history. The data analysis is only for Texas cotton producers covered by the traditional Multi-Peril Crop Insurance (MPCI) and is based upon the RMA database update of April 15, 2002. The yield history data for 1997-2000 (reported in the yield records submitted in RY 2001) are used to determine if an individual unit used actual yield history or utilized the added land and new producer provisions. In particular, the four-year sequence of the reported "Yield Type" code in the period 1997-2000 are used as the primary indicator of how a particular producer is classified in RY 2001. Descriptions of the pertinent yield type codes are in Table 1.

Using the four-year yield type code sequence, an individual unit can be classified as utilizing: actual yields (ACT), added land provisions with SA T-yields (ALS), added land provisions with variable T-yields (ALV), and new producer provisions with variable T-yields (NP). In consultation with RMA personnel, a detailed set of rules for classifying individual units to the categories above was developed and is seen in Table 2. Once the insured units are classified, the premium and indemnity received for each category are aggregated at the county level and an IP ratio for the county is calculated. This aggregation was required since RMA does not allow public access to and public reporting of unit-level data or farm-level data due to its concern about privacy issues. Thus, county-level IP ratios of the added land categories (ALS and ALV) and the new producer category (NP) are compared to the corresponding county-level IP ratio of the actuals category (ACT) in the analysis. Descriptive statistics for the county-level IP ratios of the different categories being compared are reported in Table 3.

The first step in comparing the county-level IP ratios is to determine if the data sets being compared are normally distributed and have equal variances. This is to ascertain whether standard parametric procedures (e.g. t-tests) can be used for comparing the data sets. Statistical tests of normality (Shapiro and Wilk, 1965; Shapiro and Francia, 1972; D'Agostino, Balanger, and D'Agostino, Jr., 1990) and equality of variances (Levene, 1960; Brown and Forsythe, 1974; Caroll and Schneider, 1985; Snedcor and Cochran, 1989) suggests that the crop insurance data for the different categories above are non-normally distributed and have equal variances. In the interest of space the details of these tests are omitted here but are available from the authors upon request.

The non-normality of the data suggests that nonparametric techniques, which is free of distributional assumptions, would be the best way to test whether the county level IP ratios of the added land categories (ALS and ALV) and the new producer category (NP) are statistically different from the corresponding county-level IP ratio of the actuals category (ACT). The Wilcoxon-Mann-Whitney's (WMW) rank-sum test/median test and the Kolmogorov-Smirnov (KS) equality of distributions test are the nonparametric procedures used here.

The WMW test can show whether two independent samples are drawn from populations with the same distribution (Wilcoxon, 1945; Mann and Whitney, 1947). This test can be tailored to examine equality of two means or two medians when the normality assumptions are violated. If the distributions are not symmetrical (which is the case for the county-level IP data here), then testing for equality of medians is more appropriate (Sprent, 1993). The KS test, on the other hand, is used to test whether two independent distributions of continuous, unbinned numerical data are different (Kolmogorov, 1933; Smirnov, 1939; Conover, 1999). For example, the KS test can indicate whether the distribution of county-level IP ratios for the ALV category is different from the distribution of the ACT category. This means that hypotheses for the KS test are not rooted in a mean or median (as in the WMW test), which implies that a statistical difference between the distributions being compared may be due to a variety of reasons (i.e. difference in means, standard deviations, skewness, kurtosis, etc.). The KS test does not provide any insight as to what caused the difference in the distributions. The advantage of the KS test, on the other hand, is the fact that it does not impose normality and equality of variance assumptions for the test to be valid.

The WMW test indicates that the distributions of the county-level IP ratios of the ALV, ALS, and NP categories are statistically different from the corresponding county-level IP ratios of the ACT category (Table 4). Specifically, the medians of the ALV, ALS, and NP county-level IP ratios are statistically different from the county-level ratios of the ACT category, at the 5% level of significance. The WMW test gives us an indication whether the medians of two data sets are drawn from the same population (i.e. medians are statistically different). However, it does not give an estimate of the direction and magnitude of the difference. A nonparametric procedure that extends the WMW test and estimates the magnitude of the difference in medians is the Hodges-Lehmann (HL) procedure for estimating shift parameters (Hodges and Lehman, 1963). The HL procedure reveals that median county-level IP ratios of the ALV, ALS, and NP categories are statistically higher than the median county-level IP ratio of the corresponding ACT category (Table 4).

The KS tests further supports the findings from the WMW test (Table 5). The results from the KS directional hypotheses tests indicates that the distribution of the county-level IP ratio data from the ALV, ALS, and NP categories are statistically higher than the distribution of the county-level IP ratios from the ACT category (at the 5% level of significance). The dis-

tributions of ALV, ALS, and NP are, therefore, statistically different from the distribution coming from the corresponding ACT category.

The added land and the new producer provisions may be vulnerable to abuse since the results above show that the difference between the IP ratios of the added land and new producers are statistically higher than the IP ratios of the producers using actual production history. This means that the differences in IP ratios between producers using the added land/new producer provisions and producers using actual yield history seem to be a systematic phenomena, rather than random occurrences. Note, however, that the results of the descriptive analysis above are just suggestive of the vulnerability of the added land and new producer provisions. Nevertheless, the systematically higher IP ratios highlight the need for RMA to reassess the added land and new producer provisions. These results should also raise concerns to Texas cotton producers, in general, since they are the ones that will be adversely affected by potentially higher premiums in the future.

Conclusions and Policy Implications

This study analyzes the vulnerability of the added land and new producer provisions in crop insurance and evaluates the incentives that potentially make it vulnerable to abuse. The producer's potential benefits of abusing these provisions are likely to be higher than the potential costs because of the informational advantage held by the producer with regards to the inherent productivity of their land. This informational asymmetry makes the added land and new producer provisions vulnerable to abuse. A descriptive analysis of the IP ratios of Texas cotton producers utilizing the added land and new producer provisions indicate significantly higher IP ratios for these producers, relative to producers using actual production history. This result further supports the notion that the added land and new producer provisions may indeed be vulnerable to abuse.

The insights above indicate a need to re-examine the added land and new producer provisions and explore policy options that may help mitigate occurrences of abuse. Since the vulnerability of the added land and new producer provisions stems from the asymmetric information held by the producer, policymakers can reduce the vulnerability of these provisions by minimizing or eliminating this informational advantage. At the extreme, insurers, RMA, or other USDA agency can eliminate the informational asymmetry by reviewing all producers who want to add land and or claim new producer status (not just those producer exceeding the "50/640" rule). On-farm visits and review can also be undertaken for all these producers wanting to utilize the added land and new producer provisions. Note however, that this policy option may not be cost effective because of the immense amount of resources needed to implement this strategy.

Another policy option that may mitigate the incentives for abusing the added land and new producer provisions is to manipulate or improve the T-yields used for determining the approved APH yields in these cases. For producers to successfully benefit from abusing the added land and new producer provisions, the T-yields used to determine the yield guarantees should be significantly higher than what could be the actual harvested yield based on the productivity of the land. If the T-yields used are approximately the same as what the actual yields will be, then abuse of the added land and new producer provisions can be mitigated. Thus one option would be to regularly review and revise the variable T-yields used for yield determinations. Variable T-yields can be further refined by investigating or collecting farm level data to more accurately determine the "correct" variable T-yield. But this again may not be a very cost effective option.

Another way to manipulate T-yields to reduce the incentives for abusing the added land and new producer provision is to reduce the percentage of the allowed SA T-yield or variable T-yield that can be used to determine the yield guarantee. Instead of using 100 percent of the SA T-yield or the variable T-yield, policy makers can change this proportion to somewhere between 65 to 85 percent (either absolutely or by weighting actual yields higher than older T-yields in the yield record). Reducing this proportion would reduce the magnitude of the benefits from abuse and may reduce the incentives for abusing the provisions.

Adjusting the premium rates or premium subsidies for the added land and new producer provisions is another means for mitigating the incentives for abuse. If the premium rates are increased or the premium subsidies are reduced, the costs of abusing the added land and new producer provisions increases. This then reduces the incentives to abuse the provisions. Increasing the premium rates for added land and new producer provisions is akin to the experience rating system in automobile insurance. A producer that is adding land or claiming new producer status presumably has no experience planting the crop in the added/new land. Therefore, these producers should be charged a significantly higher premium because of their inexperience with the newly added land or the new crop. Premiums can then be reduced when the producer has built-up his four-year production history such that actual yields are used in determining the yield guarantee. As in the automobile insurance, new/young drivers are charged a higher premium than more experienced drivers.

There is one big drawback, however, with reducing applicable T-yields and increasing premium rates as policy options to reduce the vulnerability of the added land and new producer provisions. Using these options would likely reduce participation in the crop insurance program. This runs counter to the thrust of USDA to increase participation in the program and is

counter to planting flexibility because producers may be reluctant to change crop mixes and/or make acreage adjustments. Hence, more research is needed to further understand the practical applicability of these suggested policy options.

Based on our analysis of the incentives for abuse, another policy option to consider is further strengthening of compliance efforts to detect potential abuse of these provisions. If detection probabilities are increased then expected net utility gains from abuse would be decreased and, consequently, the probability of abuse would be lessened. RMA compliance may be able to strengthen its detection capabilities by using computer-assisted fraud detection techniques called data mining. Although these techniques are already being utilized by RMA, further research is still needed in this area to be able to more effectively uncover particular abuses tied to the added land and new producer provisions. Note that these computer-assisted techniques must always be reinforced by more in-depth investigations if abuse is indeed to be proven.

Another policy option that can help mitigate abuse is to simply provide more information to farm communities about the current compliance efforts and how farming communities can help in these efforts. The most recent RMA compliance report to congress already indicate that current compliance efforts (e.g. Fraud Hotline complaints and tips) have been able to detect abuses of the new producer provisions (USDA-RMA, 2002c). These types of compliance efforts would be strengthened if farming communities more readily report blatant cases of abuse by other producers. More of these abuses may potentially be reported if producers know that these abuses will adversely affect their future premiums and consequently the competitive position of their industry in the world market. RMA must then make clear to communities the adverse effects of these abuses, which may then encourage farmers to report abuses of the added land and new producer provisions.

Informing farming communities of the adverse effects of abusing the added land and new producer provisions also relates to the moral costs of abuse that we elucidated upon in our analysis above. If farmers are aware of the adverse effects of abusing the insurance program, then the community is less accepting of this type of behavior. Thus, moral costs to individuals contemplating abuse would be higher and the probability of being reported to RMA through the fraud hotlines may also be higher. For the case of Texas cotton, a less accepting attitude to abuse by Texas cotton producers may be the most important contribution they could make in the quest to mitigate abuse of the added land and new producer provisions in crop insurance. If Texas cotton farming communities were less tolerant to abuse, then the social stigma to potential abusers of these provisions would be higher. This leads to a potential decrease in the net utility gains from abuse and would potentially discourage the abuse of the added land and new producer provisions in crop insurance. With the reduction in abuse, the federal crop insurance program will remain a viable risk management tool for Texas cotton producers and will continue to assist in maintaining the competitiveness of the industry.

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References

Allingham, M.G. and A. Sandmo. 1972. “Income Tax Evasion: A Theoretical Analysis.” *J. of Public Econ.* 1: 323-338.

Becker, G.S. 1968. “Crime and Punishment: An Economic Approach.” *J. of Pol. Econ.* 77(1968):169-217.

Brown, M.B. and A.B. Forsythe. 1974. “Robust test for the equality of variances.” *J. of the Amer. Stat. Assoc.* 69: 364-367.

Caroll, R.J. and H. Schneider. 1985. “A note on Levene’s test for equality of variances.” *Statistics and Probability Letters.* 3(4): 191-194.

Conover, W.J. 1999. *Practical Nonparametric Statistics.* 3rd ed. John Wiley & Sons: New York.

D’Agostino, R.B., A. Balanger, and R.B. D’Agostino Jr. 1990. “A suggestion for using powerful and informative tests of normality.” *The Amer. Statistician.* 44(4): 316-321.

Hodges, J.L. and E.L. Lehmann. 1963. “Estimates of Locatioon based on Rank Tests.” *Ann. Of Math. Stat.*34(2): 598-611.

Kolmogorov, A.N. 1933. “Sulla determinazione empirica di una legge di distribuzione.” *Giornalle dell’ Istituto Italiano degli Attuari.* 4: 83-91.

Levene, H. 1960. “Robust Tests for Equality of Variances.” *In* I. Olkin (ed.) *Contributions to Probability and Statistics.* Stanford University Press: CA. 278-292.

Mann, H.B. and D.R. Whitney. 1947. "On a test of whether one of two random variables is stochastically larger than the other." *Ann. Of Math. Stat.* 18: 50-60.

Shapiro, S.S. and R.S. Francia. 1972. "An approximate analysis of variance test for normality." *J. of the Amer. Stat. Assoc.* 67: 215-116.

Shapiro, S.S. and M.B. Wilk. 1965. "An analysis of variance test for normality (complete samples)." *Biometrika*. 52:591-611.

Smirnov, N.V. 1939. "Estimate of deviation between empirical distribution functions in two independent samples." *Bulletin Moscow University.* 2(2): 3-16.

Snedcor, G.W. and W.G. Cochran. 1989. *Statistical Methods.* 8th ed. Iowa State University Press: Ames, IA.

Sprent, P. 1993. *Applied Nonparametric Statistical Methods.* 2nd ed. Chapman and Hall: London.

Srinivasan, T.N. 1973. "Tax Evasion: A Model" *J. of Public Econ.* 2:339-46.

Tennyson, S. 1997. "Economic Institutions and Individual Ethics: A Study of Consumer Attitudes Toward Insurance Fraud." *J. of Eco. Behavior and Org.* 32:247-265.

USDA-RMA. 2002a. *Summary of Business Data/Reports*. In the RMA website: http://www3.rma.usda.gov/apps/sob/. Last accessed: January 7, 2003.

USDA-RMA. 2002b. *2002 Crop Insurance Handbook.* FCIC 1801 (6-01), USDA: Washington, D.C.

USDA-RMA. 2002c. Risk Management Agency Program Complianceand Integrity Annual Report to Congress, June 2000 December 2001. USDA: Washington, D.C.

U.S. General Accounting Office (US GAO). 1999. Crop Insurance: USDA Needs a Better Estimate of Improper Payments to Strengthen Controls Over Claims. GAO/RCED 99-266, U.S. GAO: Washington, D.C.

Wilcoxon, F. 1945. "Individual comparisons by ranking methods." *Biometrics.* 1: 80-83.

Table 1. Yield type codes used for classifying insured units as: actual yields (ACT), added land using SA T-yields (ALS), added land using variable T-yields (ALV), and new producer using variable T-yields (NP).

Yield Type Code	Description
A	Actual Yield
C	Special yield for added land intended for a specific crop practice, type, and variety, using an approved APH yield from another existing (reference) unit for the same practice, type, and variety
E	80% of T-yield
H	Special T-yield for new producers
I	Special T-yield for new producers
L	Special yield for added land for a specific crop practice, type, and variety, using an approved APH yield from another existing (reference) unit for the same practice, type, and variety
N	90% of T-yield
S	65% of T-yield
T	100% of T-Yield used for added land for a specific crop practice, type, and variety, where there is no existing unit (for the same crop practice, type, and variety) that can be used to determine an APH yield.
Z	Zero acres planted (Land lay fallow)

Table 2. Criteria for classifying insured units as utilizing: actual yields (ACT), added land provisions with SA T-yields (ALS), added land provisions with variable T-yields (ALV), and new producer provisions with variable T-yields (NP).

Category	Criteria
Actual Yields (ACT)	Individual units with strictly 4 years of code A. (experienced producers)
Added land using SA T-yields (ALS) (With records for an existing or reference unit)	Individual units with at least one C or L in the 4 previous years. (C & L can only be combined with A, T, or Z)
Added land using variable T-yields (ALV) (Without reference units or with a separate database)	Individual units with at least one T, N, E, or S in the 4 previous years (T, N, E, or S can only be combined with A or Z).
New producer using variable T-yields (NP)	Individual units with at least one I or H in the 4 previous years. (I or H can only be combined with A, T, or Z)

Table 3. Descriptive statistics of county-level IP ratios for Texas Cotton, 2001.

A. Counties with cotton producers in the ALV and ACT Categories		
Statistic	**ALV**	**ACT**
No. of Counties	72	72
Mean	1.51	1.13
Median	1.44	0.84
Standard Deviation	1.03	0.94
Skewness	1.28	1.51
Kurtosis	5.58	5.62
B. Counties with cotton producers in the ALS and ACT Categories		
Statistic	**ALS**	**ACT**
No. of Counties	17	17
Mean	2.25	1.18
Median	2.31	0.68
Standard Deviation	1.41	1.19
Skewness	0.10	1.67
Kurtosis	2.62	5.13
C. Counties with cotton producers in the NP and ACT Categories		
Statistic	**NP**	**ACT**
No. of Counties	65	65
Mean	2.31	1.15
Median	2.02	0.84
Standard Deviation	1.38	0.98
Skewness	1.55	1.58
Kurtosis	6.11	5.54

Table 4. Wilcoxon-Mann-Whitney Tests and Hodges-Lehmann Shift Parameter Estimates.

Wilcoxon-Mann-Whitney (WMW) Test Statistics		
Categories Compared	**z-statistic (p-value)[1]**	**Pearson Chi-square (p-value)[1]**
ALV vs. ACT	2.56 (0.010)*	7.11 (0.008)*
ALS vs. ACT	2.54 (0.011)*	5.76 (0.016)*
NP vs. ACT	5.89 (<0.001)*	29.57 (<0.001)*
Hodges-Lehmann Shift Parameter Estimates		
Categories Compared	**Point estimate of shift[2]**	**95% Confidence Interval[2]**
ALV vs. ACT	0.38	[0.09, 0.68]
ALS vs. ACT	1.32	[0.27, 1.93]
NP vs. ACT	1.05	[0.74, 1.38]

[1] Figures in parentheses are the corresponding p-values; p-values with * means that the equality of medians or distributions are rejected at the 5% level of significance.

[2]The shift parameter is the estimated difference between Category 1 and Category 2 values (e.g. in the case of ALV vs. ACT, the shift parameter = ALV – ACT).

Table 5. Two-sample Kolmogorov-Smirnov Test for Equality of Distributions.

Categories Compared/Null Hypothesis Alternative Hypothesis	**Kolmogorov-Smirnov *D* statistic**	**p-value[1]**
ALV vs. ACT/(Ho: ALV = ACT)		
Ha: ALV > ACT	-0.264	0.007*
ALS vs. ACT/(Ho: ALS = ACT)		
Ha: ALS > ACT	-0.529	0.009*
NP vs. ACT/(Ho: NP = ACT)		
Ha: NP > ACT	-0.477	<0.001*

[1] P-values with * indicate that the null hypothesis (Ho) is rejected at the 5% level of significance (i.e. the difference between distributions is statistically significant).