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Farm Savings Accounts for Specialty Crop Growers

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EXECUTIVE SUMMARY

A study was conducted to examine the potential benefits of establishing government subsidized farm savings accounts for specialty crop growers. The primary goal of the project was to determine whether farm savings accounts would provide specialty crop growers with a useful tool for managing financial risk. The project examined how various features of the farm savings account proposals ultimately impacted the benefits that specialty crop growers would receive from the accounts.

Two specific types of farm savings accounts, counter-cyclical farm savings (CC) accounts and farm and ranch risk management (FARRM) accounts, were evaluated. Both accounts require that the farmer deposit funds into the account. The study evaluated the eligibility of specialty crop growers to contribute and withdraw funds from CC and FARRM accounts as well as how the use of the accounts would impact farm income variability.

Under the counter-cyclical savings accounts program, eligibility is based upon gross income, the government would match the farmer's deposit up to $5,000, and farmers could withdraw when gross income fell below a specified trigger level. For FARRM accounts, eligibility to participate was based upon positive net income and deposits were not matched, but rather were tax deferred. Withdrawals from the accounts were evaluated using various historical gross income trigger levels.

The study used data collected by Lake Erie Grape Farm Cost Study (LEGFCS) to analyze the proposed farm saving account programs (White and Shaffer). The five year panel data set contains the financial records of 32 grape farms that had completed the survey for each of the years 2000 to 2004. These farms specialize in the production of native variety grapes (Concord and Niagara) which are used for juice. The data collection was based upon tax information on the growers' 1040 Schedule F. The data are not necessarily representative of all types of specialty crop production or of the "average"

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specialty crop operation. However, the data should illustrate the relative income variability faced by a type of specialty crop growers and potential for farm savings accounts in addressing this variability.

The study produced a number of findings that illustrate some of the potential benefits and challenges of developing a farm savings account program for specialty crop growers. Within the sample of farmers considered the positive net income contribution requirement for FARRM accounts was more restrictive than the $50,000 gross income requirement for CC accounts. Additionally, because the benefits of the FARRM account are based on tax deferral, fewer farms would have incentives to participate as opposed to CC accounts. Based on farm income alone nearly half of the farms in the study were in the 10% or lower marginal federal income tax bracket. Similarly, larger and more profitable farms would receive the greatest benefits from the FARRM account program.

On average, the size of farmer deposits to both types of accounts were similar, but when the government match is considered, the average CC account balance was larger than the average FARRM account balance. The ability of farms to make withdrawals from the account is very dependent upon the nature of the withdrawal provisions. For instance, if withdrawal triggers are not indexed to allow for growth, few farms will be able to make withdrawals. Restrictive withdrawal rules will significantly reduce the appeal of the accounts as a risk management tool.

The accounts showed promise in their ability to reduce income variability. However, restrictions on the size of deposits will limit the accounts' ability to completely mitigate income variability. Many farms will still experience considerable income variability. The accounts also appear unable to handle yearly back-to-back adverse financial outcomes. Unless larger subsidies are offered, savings account programs are unlikely to provide a complete risk management solution for specialty crop growers. Additionally, for widest appeal the program should combine both government deposit matching and tax deferral of deposits.

INTRODUCTION – FARM SAVINGS ACCOUNTS

Managing the financial risk associated with farming is a central concern for farmers. Farm revenue insurance products have shown promise in helping farmers manage income risk and comprise an important component of the federal farm safety net. However, there is evidence that specialty crop growers are not completely satisfied with the risk protection provided by existing crop insurance policies (White, Uva, and Cheng, 2003). Farm savings accounts are a related product that may have considerable appeal to specialty crop growers.

Farm savings accounts are based upon the idea of providing producers financial incentives to set aside funds in high income years for use in low income years. Like revenue insurance products, most farm savings account proposals rely upon tax records to determine eligibility for contributions and withdrawals from the accounts. Unlike revenue insurance products, the producer does not pay a premium, but rather places funds in a deposit account. These funds remain the property of the producer. Additionally, deposits to the account may be tax deferred, and/or matched by a deposit from the government. Although the cost of a savings account program will depend upon the specific design, farm savings accounts may also appeal to policy makers because the cost to the federal government is likely to be relatively low compared to direct subsidy programs and emergency financial assistance.

A variety of farm savings accounts proposals have been advanced in the United States and in other countries[1]. The general idea behind farm savings accounts is to provide farmers incentives to save funds in high income years for use in low income years. The most commonly suggested incentives include tax deferral and/or a government matching deposit. Proposals for matching deposits often contain provisions that limit withdrawals from the accounts to years in which income falls below a specified trigger level.

The research project evaluated two specific proposals, counter-cyclical farm savings (CC) accounts and farm and ranch risk management (FARRM) accounts. Both proposals require that the farmer deposit funds into the account. Under the counter-cyclical savings accounts program, eligibility is based upon gross income, the government would match the farmer's deposit up to $5,000, and farmers could withdraw when gross income fell below a specified trigger level. For FARRM accounts, eligibility to participate was based upon positive net income and deposits were not matched, but rather were tax deferred. Withdrawals from the accounts were evaluated using various historical gross income trigger levels.

[1] Edelman, Monke, and Durst; Monke and Durst; and Ellinger and Gloy provide a discussion and analysis of the various types of farm savings account proposals. Makki and Somwaru describe farm savings account experiences in Canada and Australia.

Data Used in the Analysis of FARRM and CC Accounts

This study used the data collected by Lake Erie Grape Farm Cost Study (LEGFCS) to analyze the proposed farm saving account programs. The analyses focused on two specific savings account proposals. The proposals considered are often referred to as farm and ranch risk management accounts (FARRM) and counter cyclical savings accounts (CC). The data set contains grape farms that had completed the survey for each of the years 2000 to 2004. The five-year panel contains the financial records of 32 grape farms. The data collection was based upon tax information from growers' IRS Form 1040, Schedule F information (White and Shaffer, 2003). Because the implementation of both FARRM and CC account proposals would rely upon tax information, the present study considers the variability in measures of taxable income. These measures do not necessarily reflect the actual or accrual profitability of the farms under consideration.

Two measures of farm income were calculated to assess several aspects of the proposed farm savings account programs. An important difference between FARRM and CC accounts is that they are based on different measures of income to determine eligibility. FARRM accounts are driven by a measure of net income, while CC accounts are driven by a measure of gross farm income.

Similarly, the benefits for the programs differ. The main benefit from FARRM accounts is tax deferral and possible tax exemption, while CC accounts provide farmers a matching government deposit. Finally, the ability to withdraw funds is different for the accounts. Withdrawal from FARRM accounts is not restricted, while withdrawal from CC accounts is subject to shortfalls from a gross income target. Each of these issues is examined for both of the accounts. Therefore, the analysis focuses on addressing four broad questions. Specifically, we analyze:

1) variability in the measure of net farm income (FARRM) and variability in the measure of gross farm income (CC),
2) the ability of farmers to contribute to FARRM and CC accounts; and,
3) withdrawals from and benefits obtained by contributing to FARRM and CC accounts;
4) the impacts of the FARRM and CC accounts on shortfalls and income stabilization

The report proceeds by first analyzing FARRM accounts, then CC accounts are considered. The analysis of each account begins by describing the proposal. Then the variability of the appropriate income measure is described, gross income for FARRM and net income for CC accounts. Based on the assumptions about eligibility the analysis considers how frequently farms would be eligible to make deposits and the magnitude of the deposits for which producers are eligible. Because the benefits of FARRM are tied to tax deferral the FARRM analysis considers the income tax liability of the farms in the study. Then, the study examines the extent to which farmers are eligible to make withdrawals from the accounts and the extent to which the available account balances would cover the needed withdrawals. Each section concludes by examining the impact of the accounts on farm income variability.

FARRM Accounts

The FARRM account proposal uses tax deferral as an incentive for farmer saving. Although a variety of proposals have surfaced, the analyses in this report follow the basic idea that FARRM accounts would allow farmers to take a Federal income tax deduction for a deposit of up to 20 percent of eligible farm income. Eligible farm income is defined as taxable net farm income from Schedule F of IRS Form 1040 (Durst, 2004). The measure of *net income* used in the analysis is calculated as:

(1) *net income = Schedule F gross farm income - Schedule F farm expenses*

with

Schedule F gross farm income = cash receipts from the sale of farm products
Schedule F farm expenses = cash expenses + depreciation

In order to understand the potential benefit of FARRM accounts, it is important to examine the net income variability faced by farmers. The descriptive statistics for net income provide a straightforward examination of net income fluctuations. Table 1 presents the summary of net income among Lake Erie grape growers between 2000 and 2004. There is a substantial amount of net income variability over the five-year period. The average net income ranges from $14,125 to $20,657. For the panel, the standard deviation of net income is greater than the mean, indicating a wide dispersion in the amount of variability experienced by these farms. The standard deviation as a measure of volatility implies that the year-to–year net income variability at the individual farm level could be even greater than the variability shown by a group of farms. There are several factors that might cause variation in net income from year to year. These would include price changes (both input and output), variation in production levels, and changes in farm size.

Table 1. Descriptive Statistics of Net Income by Year, 32 Grape Farms in Lake Erie Region.

Year	Mean	Std. Deviation	Minimum	Maximum
2000	$14,125	$28,486	($44,275)	$75,795
2001	$18,965	$23,980	($49,079)	$60,978
2002	$17,929	$27,663	($53,662)	$74,359
2003	$20,657	$41,934	($54,757)	$139,671
2004	$15,148	$24,041	($40,750)	$53,950
Total	$17,365	$29,680	($54,757)	$139,671

FARRM Accounts: Eligibility, Deposits, and Participation Incentives

The analysis of FARRM accounts considered whether farmers would be eligible to place deposits in the account, the magnitude of eligible deposits, and producers' incentives for making deposits.

Eligibility

The eligibility to make a deposit to a FARRM account is dependent upon the farm having a positive net income. That is,

(2) Eligible to contribute to a FARRM account, if net income > 0

The first step in the analysis was to examine how frequently individual farms would be able to contribute over the 5-year period. Two farms were never eligible for the FARRM program due to having negative net income for 5 consecutive years. That is, 93.8% of farms are eligible to establish FARRM accounts. Because these farms were not able to establish an account over the 5-year period, the subsequent FARRM account analyses exclude these farms. The results in Table 2 show the percent of farms able to make up to 5 contributions to a FARRM account. Thirty-seven percent of farms would be eligible to contribute for the entire period. The results also indicate that many growers would find years when they are unable to contribute to a FARRM account. This would suggest that they would want to withdraw income from the accounts in these years to offset the low net income.

Table 2. Percent of Farms with Net Income Enabling them to Contribute to FARRM Accounts, 30 Grape Farms in Lake Erie Region, 2000-2004.

Number of Years Qualified to Contribute	% of Farms
1	3.3
2	10.0
3	26.7
4	23.3
5	36.7

The proportion of farms with a positive net income to be eligible for FARRM accounts also varies by year (Table 3). The smallest proportion of farms would qualify in 2003 when only 63 percent of farms had a positive net income. The results would suggest that in any given year we would expect nearly 75% of the farmers to be eligible to make a contribution.

Although well over half of the farms would be eligible to contribute to a FARRM account every year, it is important to remember that many farms will show a positive net income and still pay no taxes because of standard or itemized deductions and personal exemptions. Thus, those farms with the low-income levels would have little incentive to contribute to FARRM accounts. The issues of tax deferral and tax deduction will be examined separately in the section of analyzing grower participation incentives. When calculating potential deposits to the accounts, this issue is not considered. Rather, the analysis considers whether growers would have positive net income to be eligible to contribute to FARRM accounts assuming that non-farm income would exactly offset the standard deductions available to the farm in the analyses of FARRM accounts.

Deposits to FARRM Accounts

The next step in the analysis was to calculate the amount of funds eligible for deposit. Eligible growers were assumed to contribute 20 percent of their net income to the FARRM accounts. That is for any given year *i* the deposit was calculated according to (3),

(3) deposit $_i$ *= 20% * net income* $_i$ *, if eligible to contribute in year i.*

There is some incentive to make such a deposit because the contribution can be withdrawn at any time and it allows the grower to defer the tax for a minimum of one year. For example, a grower could make a deposit in December of year 1, or likely up to April 15 of year 2, and then withdraw the funds early in year 2. Federal income taxes are then deferred for a year and, if the funds must be borrowed, only a few days of interest are incurred to obtain use of the funds. Additionally, the deposited funds are eligible to earn interest making the net cost relatively small. Deferral opens the possibility that the grower could reduce the tax rate (possibly to zero) on some of the deposited funds, if their taxable income fell in the subsequent year(s). However, the estimates of deposits clearly overstate what might realistically be deposited since we assume that growers will participate fully if eligible and ignore the issue of tax deduction.

Under the 20% contribution rule, average annual deposits to FARRM accounts ranged from $3,951 to $5,519 (Table 3). As expected, the average deposits from year-to-year closely follow the average net income of the farms for that year. Also, a typical farm would annually contribute slightly over $4,500 to the account over a 5-year period. Depending upon the tax bracket this would result in a small amount of tax deferral. The final balances in the account will depend upon the amount of the deposits that are withdrawn in any given year.

Table 3. Percent of Farms with Income Enabling them to Contribute to FARRM Accounts and Deposit Summary of FARRM Accounts per Year, 30 Grape Farms in Lake Erie Region.

	Eligible	Deposit			
Year	% of Farms	Mean	Std. Dev.	Minimum	Maximum
2000	73.3	$3,951	$4,635	$0	$15,159
2001	86.7	$4,476	$4,041	$0	$12,196
2002	80.0	$4,606	$4,337	$0	$14,872
2003	63.3	$5,519	$7,477	$0	$27,934
2004	76.7	$4,078	$3,557	$0	$10,790
All Year	76.0	$4,526	$4,967	$0	$27,934

Participation Incentives for FARRM Accounts

There are two important financial incentives to encourage FARRM account participation. The most basic benefit obtained by contributing to the account is the deferral of tax liability for one year or more. The ability to defer taxes to a tax year in which the farm is in a lower tax bracket would result in lower taxes, creating an incentive for contribution to a FARRM account. For instance, a farmer could contribute to a FARRM account in a year in which the income would be taxed at the 27% marginal tax bracket and then withdraw the funds in a year where they find themselves in a lower tax bracket (Table 4). Unless the tax rate on the funds in the year they are removed is less than in the year of the deposit, the advantage is the deferral of taxes. The deferral of taxes allows the farmer to invest the deferred taxes and earn interest income (which is taxable).

Table 4. The Marginal Tax Brackets of Taxable Income.

Marginal Tax Brackets	Income
0%	$0
10%	$12,000
15%	$46,700
27%	$112,850
30%	$171,950
35%	$307,050
38.60%	>$307,050

The marginal tax bracket and a farmer's movement among the various brackets play critical roles in determining the ultimate value of FARRM accounts. The greatest benefit obtained from FARRM accounts occurs when farmers can contribute in years with a high tax liability and withdraw in years with a reduced tax liability. Although many of the farmers have a positive net income, the standard deduction will allow many of the farms to avoid tax liability. Growers whose net income is low are unlikely to pay income taxes, thereby reducing the incentive for participation.

In order to assess the tax situation, the grower's marginal tax bracket was determined with and without deposits to FARRM accounts and with and without standard deductions. The analysis assumes the standard deduction for a married couple filing jointly ($7,850) and two personal exemptions ($6,000) for a total deduction from net taxable farm income of $13,850. This results in 4 possible scenarios. The analysis does not consider any income other than farm income and makes no allowances for deductions for state income tax or self-employment taxes or other credits.

Table 5 shows the percent of growers in various tax brackets under the four combinations of taxable net income with/without deductions and with/without deposits to FARRM accounts. The table allows on to assess how the deductions might impact farmers' incentives to make deposits. The key to this analysis is to consider the change in the percent of growers that would be eligible to contribute to FARRM accounts if taxable net income is reduced by the amount of the standard deduction. In order to make this calculation one can compare the percent of growers in the zero marginal tax bracket under the case without deposits/without deduction (column 3) and the percent in the zero bracket without deposit/with deduction (column 5) in Table 5. After applying the deductions, the number of farms that would be eligible for FARRM accounts falls by 23.3 percentage points on average. This is a substantial decrease in the number of farmers that would receive any benefits from the accounts.

Table 5 also allows one to begin to assess the movement in tax brackets caused by contributions to FARRM accounts. In the cases without deductions and exemptions (columns 3 & 4), the contributions to FARRM accounts cause small proportions of the farmers to switch income tax brackets. For instance, no farms are found in the 30% bracket after the deposits and fewer are in the 27% bracket, with slightly more farmers in the 10% and 15% brackets. In the scenarios that consider deductions and exemptions (column 5 & 6), the contributions to FARRM accounts also cause relatively small proportions of the farmers to switch income tax brackets. Incorporating the deductions and exemptions with the FARRM accounts results in fewer farms with a tax liability. However, most of the shifts in income tax brackets occur from the highest tax bracket through the lowest. Generally speaking, no matter whether tax deduction is subtracted or not, as a result of contributions to FARRM accounts, the farms initially found in the higher brackets are more likely to switch the tax brackets than farms initially found in lower tax brackets.

An analysis was also conducted to determine the percent of farms that switched tax brackets as a result of their contribution to a FARRM account. The analysis considers both the case where standard deductions were allowed and the case where they were ignored. Table 6 presents this analysis for each year of the study. For instance, the second column of Table 6 shows that in the year 2002, by making a deposit to the account 13.3 percent of the farms would benefit from a lower tax bracket if standard deductions are not considered. When the standard deduction was considered, making a deposit would cause 30 percent of the farms switch to a lower bracket. Overall, the average proportions of farms switching income tax bracket over the entire period are 13.3% when the deductions are ignored and 20% when the deductions are considered (Table 6).

The number of times that making a deposit would cause a farm switch tax brackets was also calculated. Table 7 shows these frequencies for the case where the standard deduction is considered and when it is ignored. These results further illustrate the findings previously presented in Table 5. Specifically, that making a FARRM deposit would not result in a great deal of tax bracket shifting. For instance, 50 percent of the farms would never switch tax brackets with a deposit under the no standard deduction assumption. The percentage benefiting slightly increases when standard deductions are considered.

Table 5. Percent of Farms in Various Tax Brackets Assuming Taxable Net Income with / without Deductions and with / without Maximum Contribution to FARRM Accounts, 30 Grape Farms, 2000-2004.

		Taxable Net Income			
Year	Marginal Tax Brackets	No Deposit No Deductions	With Deposit[A] No Deductions	No Deposit With Deductions[B]	With Deposit With Deductions
2000	0%	26.7	26.7	60.0	63.3
	10%	30.0	36.7	3.3	6.7
	15%	26.7	30.0	30.0	26.7
	27%	16.7	6.7	6.7	3.3
2001	0%	13.3	13.3	40.0	46.7
	10%	26.7	30.0	20.0	23.3
	15%	43.3	50.0	33.3	30.0
	27%	16.7	6.7	6.7	-
2002	0%	20.0	20.0	40.0	53.3
	10%	13.3	23.3	20.0	16.7
	15%	53.3	46.7	33.3	30.0
	27%	13.3	10.0	6.7	-
2003	0%	36.7	36.7	50.0	53.3
	10%	10.0	13.3	16.7	20.0
	15%	30.0	26.7	10.0	13.3
	27%	20.0	23.3	20.0	13.3
	30%	3.3	-	3.3	-
2004	0%	23.3	23.3	46.7	46.7
	10%	20.0	23.3	13.3	23.3
	15%	43.3	53.3	40.0	30.0
	27%	13.3	-	-	-
Total	0%	24.0	24.0	47.3	52.7
	10%	20.0	25.3	14.7	18.0
	15%	39.3	41.3	29.3	26.0
	27%	16.0	9.3	8.0	3.3
	30%	0.7	-	0.7	-

[A] The net taxable income is deducted by the amount of grower's contributions to FARRM accounts

[B] The analysis assumes that net taxable farm income is subtracted by the amount of the standard deduction for married filing jointly of $7,850 and two personal exemptions ($6,000 total).

Table 6. Percent of Farms Changing Income Tax Brackets as a Result of a Contribution to FARRM Accounts, by Year, 30 Grape Farms in Lake Erie Region.

	Subtract Deductions from Farm Income	
Year	No	Yes
2000	16.7	13.3
2001	13.3	23.3
2002	13.3	30.0
2003	6.7	23.3
2004	16.7	10.0
All Period	13.3	20.0

Table 7. Number of Years that Farms Switched Income Tax Brackets as a Result of Contributions to FARRM Accounts, 30 Grape Farms in Lake Erie Region, 2000-2004.

Number of Years Income Tax	Subtract Deductions from Farm Income	
Basket Change	No	Yes
0	50.0	43.3
1	36.7	30.0
2	10.0	13.3
3	3.3	10.0
4	-	3.3
5	-	-

FARRM Accounts: Withdrawals and Benefits

In order to estimate withdrawals from FARRM accounts and the benefits obtained by depositing funds in the accounts one must make additional assumptions. In doing so it is useful to examine the possible motivations and benefits that might accrue by contributing to FARRM accounts. The most basic benefit obtained by contributing to the account is the deferral of tax liability for one year or more. Because the farmer must eventually withdraw the funds, the contribution is a deferral unless the contribution is withdrawn when the farmer is in a lower tax bracket resulting in taxation at a lower rate, possibly zero. The deferral of taxes allows the farmer to invest funds and earn interest income. The benefit of investing these funds can be expressed as:

$$(4)\ benefit_i = (balance_{i-1} + deposit_i) * (t_i)(r)(1 - t_i)$$

where $benefit_i$ is the net benefit in year i of deferring taxes on the amount available to withdraw in the account in year i, $(balance_{i-1} + deposit_i)$, t_i is the marginal tax rate in year i, and r is the rate of return earned on the deferred taxes. The benefit arises from the farmer's use of funds that would otherwise be paid to the government. This amount is the balance plus the deposit multiplied by the marginal tax rate. The analysis assumes that these funds are invested at rate r, and that earnings on those funds are distributed and taxed. Thus, the ulimate benefit is the earnings times 1 minus the marginal tax rate. The cumulative balance in the account was estimated by adding the maximum contribution in any year i to previous year's balance and subtracting any withdrawals from the account.

(5) $balance_i = balance_{i-1} + deposit_i - withdrawal_i$

Therefore in order to estimate the benefit in any given year it was necessary to estimate the withdrawals from the accounts. Although withdrawals from FARRM accounts would be at the farmer's discretion, the relationship in equations (6)-(9) was used to estimate withdrawals from the accounts. We assume that withdrawals were made when current year income was less than 90% (or 80%) of the income target. In this case, the farmer would withdraw enough funds from the accounts to increase income to the 90% (or 80%) level of the target. The withdrawal was the lesser of the balance in the account in the previous period plus the deposit in the current year and the need for funds. The need for funds to be withdrawn from the account is given by (7), where the parameter, ϕ was assumed to be equal to 0.9 or 0.8 to represent the level of income target. The measure of income target in equation (8) was defined to represent a 5-year rolling average of income. Equation (9) defines income as either gross or net income. Under this mechanism farmers would use the accounts to smooth their income. The rules of withdrawal based on income targets can be summarized by (6).

$$(6)\ withdrawal_i = \begin{cases} Min\left[need_i, balance_{i-1} + deposit_i\right] & , \quad if \quad need_i > 0 \\ 0 & , \quad otherwise \end{cases},$$

(7) $need_i = Max\left[(\phi * target_i - income_i), 0\right], \quad \phi$=0.9 or 0.8

$$(8)\ target_{1999+j} = \frac{\sum_{i=j}^{4+j} income_{1994+i}}{5} \qquad j = 1,2,3,4,5$$

(9) $income \subset \{gross\ Income,\ net\ Income\}$

The study period covers the years 2000 to 2004, but the calculation of the target income requires data for the period of 1995 to 1999. This data was available for most of the farms in the panel. In situations where it was missing it was estimated from the relationship between the farms average returns and the group returns. The exact estimation procedure follows that described in Gloy, LaDue and Cuykendall.

Durst (2004) points out the implications of utilizing a tax-based measure of income for major farm savings account proposals. Normally farmers use cash accounting instead of accrual accounting for tax purpose. This flexibility with regard to the timing of income recognition as well as other tax rules especially related to the recovery of capital investments can have a substantial influence on the level and variability of both gross and net farm income. Farmers can accelerate or defer income or expenses to smooth income and avoid potentially higher marginal income tax rates that could apply under the progressive income tax system. This would reduce farm income variability. Thus, the assumptions of withdrawal based on Federal income tax data, especially if the criteria are based on net farm income rather than gross receipts, may not be a good indicator of the need to withdraw funds from the account. Therefore, to estimate the need to withdrawal effectively, the measures of income target were constructed for both gross income and net income. Gross income was the estimate of the gross schedule F income.

Two measures of income with another design parameter, ϕ in equation (7) provide four scenarios of withdrawal as well as benefit of tax deferral for the analysis of FARRM accounts. The four scenarios can be denoted as 90_net (ϕ=.9, income=*net income*), 80_net (ϕ=.8, income = *net income*), 90_gross (ϕ=.9, income = *gross income*), and 80_gross (ϕ=.8, income =*gross income*). For example, under scenario 90_net, the amount of withdrawal from the account made in year 2003 could be calculated by (10).

$$(10)\ 90\_net_{2003} = \left(0.9 * \frac{\sum_{i=1}^{5} (net\ \ income)_{1997+i}}{5}\right) - (net\ Income)_{2003}$$

There is another serious concern for farms that are experiencing growth in revenues over time. To recognize the growth of farm business, using the five-year rolling average gross income as the income target might not represent the most scale of the farm business and therefore understate growers' effective need. Considering this situation, we use the indexing calculation developed for the Adjusted Gross Revenue (AGR) Crop Insurance Programs to obtain another measure of income target[2]. This indexed income target is calculated by the index times the 5- year rolling average income target if the farm qualifies for indexing (11). The farm qualifies for indexing, if at least one of the two most recent years of gross income is greater than 5-year average gross income, in which case the income target may be adjusted upward (12). If the farm does not qualify for indexing, the income target remains 5-year rolling average gross income.

[2] A description of AGR and the income indexing procedure can be found on the USDA, Risk Management Agency website, RMA (http://www.rma.usda.gov/) or is available from the authors.

$$(11)\ index\ target_{1999+j}\begin{cases} = index * \dfrac{\sum_{i=j}^{4+j}(gross\ \ income)_{1994+i}}{5} & j=1,2,3,4,5 \quad if \quad qualify \\ = \dfrac{\sum_{i=j}^{4+j}(gross\ \ income)_{1994+i}}{5} & j=1,2,3,4,5 \quad otherwise \end{cases}$$

(12) *qualify in any given year (1999+j), iff*

$$(gross\ income_{1999+j}\ or\ gross\ income_{1998+j}) > \frac{\sum_{i=j}^{4+j}(gross\ \ income)_{1994+i}}{5} \quad j=1,2,3,4,5$$

where *index is calculated as follows: 1)*Divide each year's income by the preceding year's income = factor, which is no less than .800 and no greater than 1.200. 2) Take average of total factors = factor average. 3) Take fourth power of factor average = index. By using the indexed income target in (11) to recognize the growth of farm business, we add two more scenarios of withdrawal as well as benefit in the analysis. These two scenarios will be denoted as 90_index, given ϕ=0.9, income= gross income, and the index target and 80_index, given ϕ=.8, income= gross income, and the index target.

Under scenario 90_index, if a grower qualifies for the indexed income target, the amount of withdrawal from the account made in year 2003 is calculated according to:

$$(13)\ 90\_index_{2003} = 0.9 * index * \frac{\sum_{i=1}^{5}(gross\ \ income)_{1997+i}}{5} - (gross\ Income)_{2003}$$

Withdrawals and Benefits of Tax Deferral

Given two measures of income (net income and gross income), the level of income target (90% and 80%) and the indexed income target, six scenarios were analyzed to estimate withdrawals and benefits for FARRM accounts. Withdrawals from the accounts were estimated assuming that when income in the current year is less than 90% (or 80%) level of the income target, farmers have the need ($need_i$ *in equation (7) > 0*) to withdraw funds to smooth income.

Table 8 shows the percent of growers having the need to withdraw funds from FARRM accounts by year. Because the 90% level of income target is higher than 80% level of income target, growers will withdraw funds more frequently under a 90% target. The only question is how many growers would benefit from a higher net income target. The results suggest that under a net income target the frequency that growers have the need to withdraw is not substantially greater than the 80 percent target. Over the entire period, the average number of farms with a positive need was only 4.7 percentage points greater with a 90% net income target than with an 80% net income target.

Table 8. Percent of Farms Qualifying to Make Withdrawals from FARRM Accounts Under Various Income Targets, 30 Grape Farms in Lake Erie Region.

	Withdrawal Scenarios					
Year	90_net	80_net	90_gross	80_gross	90_index	80_index
2000	50.0%	46.7%	3.3%	3.3%	63.3%	53.3%
2001	43.3%	43.3%	10.0%	23.3%	53.3%	30.0%
2002	40.0%	36.7%	30.0%	13.3%	53.3%	33.3%
2003	50.0%	46.7%	30.0%	6.7%	46.7%	33.3%
2004	56.7%	43.3%	30.0%	-	46.7%	6.7%
Entire Period	48.0%	43.3%	20.7%	9.3%	52.7%	31.3%

The results also indicate that using gross income to set the target would be the most restrictive rule for estimating farmer's annual need to withdraw from FARRM account. Under an 80% gross income target, on average only 9.3 percent were eligible to make a withdrawal. After indexing gross income to reflect growth in the farm business, the proportion of farmers with a need for withdrawals increases to 52.7% and 31.3%.

Table 9 shows how frequently individual farms had the need to withdraw from the accounts over the five-year period. This data indicates that the net and gross indexed income triggers produce similar results, but that the non-indexed gross income targets results in many farmers being unable to make withdrawals from the accounts. For instance, using a 80% gross income trigger 63.3% of the growers would be unable to make a withdrawal from the account.

Table 9. Percent of Farms Having the Need to Withdraw Funds from FARRM Accounts, 30 Grape Farms in Lake Erie Region, 2000-2004.

Number of years with the need to withdraw funds	Withdrawal Scenarios					
	90_net	80_net	90_gross	80_gross	90_index	80_index
0 yr	10.0	13.3	43.3	63.3	3.3	16.7
1 yr	16.7	20.0	23.3	30.0	20.0	30.0
2 yrs	20.0	23.3	20.0	3.3	10.0	40.0
3 yrs	33.3	26.7	13.3	3.3	50.0	6.7
4 yrs	16.7	13.3	-	-	10.0	6.7
5 yrs	3.3	3.3	-	-	6.7	-

The average withdrawals required to bring income back to the target vary considerably under the six scenarios (Table 10). The range of average withdrawal over the entire period is from $670 under the scenario 80_gross to $3,060 under the scenario 90_index. Given the nature of taxable farm income, it is actually difficult to decide which income target trigger would be the most meaningful for estimating withdrawals. Furthermore, withdrawals from the funds would be at the farmer's discretion. However, these six scenarios would provide the estimates of withdrawal that are necessary to estimate the balances in the accounts and the benefits of tax deferral.

Table 10. Average Withdrawals from FARRM Accounts, 30 Grape Farms in Lake Erie Region.

	Withdrawal Scenarios					
Year	90_net	80_net	90_gross	80_gross	90_index	80_index
2000	$471	$239	$0	$0	$2,498	$2,026
2001	$3,219	$2,085	$412	$29	$3,172	$1,090
2002	$3,124	$3,222	$2,724	$2,424	$2,493	$2,002
2003	$1,835	$2,506	$2,692	$679	$4,257	$2,657
2004	$4,469	$3,916	$1,663	$216	$3,032	$216
Entire Period	$2,624	$2,394	$1,498	$670	$3,090	$1,598

Equation (4) was used to calculate the potential earnings on the funds given the estimates of balance in the accounts, the estimates of deposit to the accounts, the income tax brackets, and an interest rate of 5%. The after-tax earnings on these funds are a net benefit to the farm. Table 11 shows the average benefits over the 5-year period obtained by the farmers under the six scenarios. The average benefits obtained through the tax deferral are quite small and less than $100 under any scenario.

Furthermore, those estimates would overstate the benefits received by investing deferred taxes in any given year, because it does not consider any opportunity costs for the funds. For instance, if the farm could pay down debt with these funds, the benefits would likely be negative unless the rate of return in the account, *r*, is quite high. The results may imply that the benefits from the deferred taxes would not stimulate the grower participation for the FARRM account programs if bonus interest rates are not offered.

Table 11. Summary of Annual and Cumulative Tax Deferral Benefits from FARRM Accounts, 30 Grape Farms in Lake Erie Region.

Benefit Scenarios	Mean	Median	Std. Dev
90_net	$68.5	$29.6	$101.0
80_net	$73.0	$31.4	$106.0
90_gross	$82.8	$39.8	$121.0
80_gross	$86.0	$41.5	$123.0
90_index	$57.6	$25.5	$98.0
80_index	$71.2	$33.2	$111.0

When one considers the final balances remaining in the accounts it is obvious that the amounts of final balances would be negatively related with the amounts of withdrawal under the six scenarios. In the scenarios of 90_gross and 80_gross, FARRM accounts could offer the ability to build a sizeable self-insurance safety net over a period of several years. This is understandable as there were few withdrawals from the accounts in these two scenarios (Table 12).

Table 12. Summary of Final Balances in FARRM Accounts, 30 Grape Farms in Lake Erie Region.

Balance Scenarios	Mean	Median	Std. Dev.	Maximum	Minimum
90_net	$9,512	$3,660	$14,012	$52,776	$0
80_net	$10,663	$3,660	$15,116	$57,542	$0
90_gross	$15,934	$8,308	$17,275	$57,773	$0
80_gross	$19,282	$12,266	$17,928	$57,773	$0
90_index	$7,199	$2,556	$11,392	$54,265	$0
80_index	$14,639	$7,684	$16,298	$57,773	$0

FARRM Accounts: Income Shortfalls and Stabilization

While some farms could build positive account balances, a significant number of farms that experienced a drop in income sufficient to trigger a withdrawal would not have a large enough account balance to bring their income back to the target level. Analyses were conducted to determine if the balances in the FARMM accounts were sufficient to overcome major fluctuations in farm income. The amount by which the need for the withdrawal exceeded the balance was calculated according to (14).

(14) $shortfall_i = need_i - balance_{i-1} + deposit_i$, *if* $need_i > 0$ *and* $shortfall_i > 0$
$= 0$, *otherwise*

If the amount of funds in the account is not sufficient to fund the need, this grower would experience a shortfall (i.e. $shortfall_i > 0$), and this grower's annual balance would become zero. The zero balance would leave the grower with no risk protection going forward. An indicator variable was created to count the frequencies of the shortfall (zero balance) for each of the four scenarios. This variable was recorded as a one if the shortfall is greater than zero and a zero otherwise.

Table 13 shows the percent of farms that experience a shortfall per year. The frequencies of shortfalls under the six scenarios are highly correlated with the frequencies of having the need to withdraw funds from FARRM accounts shown in Table 8. Because there are fewer withdrawals with a gross income target the frequencies of shortfalls in the scenarios of 90_gross and 80_gross are substantially less than the other four scenarios.

Table 13. Percent of Farms Experiencing Shortfall, 30 Grape Farms in Lake Erie Region.

	Shortfall Scenarios					
Year	90_net	80_net	90_gross	80_gross	90_index	80_index
2000	43%	43%	3%	-	67%	50%
2001	27%	23%	7%	7%	43%	17%
2002	33%	23%	23%	13%	47%	30%
2003	50%	47%	20%	10%	43%	17%
2004	33%	33%	13%	3%	23%	3%
Entire period	37%	34%	13%	7%	45%	23%

Table 14 shows the conditional average shortfall calculated as $E\left[shortfall_i \middle| shortfall_i > 0\right]$, which indicates the average amount of insufficient funds after making a withdrawal when a shortfall occurs. The average shortfalls over the entire period are substantial, ranging from $17,862 to $29,344. The scenarios of 90_net and 80_net have the lowest average shortfalls over the entire period. The conditional average shortfalls vary by year as well as by the scenarios, because large amounts of shortfall occurred for some of individual farms in a year or in a scenario. For example, the scenarios of 90_gross and 80_gross had only 2 growers (7%) experiencing the shortfalls in 2001, but had substantially larger average shortfalls ($41,680 and $31,102) than the other four scenarios.

Table 14. Average Annual Shortfall[a], 30 Grape Farms in Lake Erie Region.

	Shortfall Scenarios					
Year	90_net	80_net	90_gross	80_gross	90_index	80_index
2000	$19,741	$18,086	$5,102	-	$42,075	$27,336
2001	$10,928	$9,980	$41,680	$31,102	$18,149	$22,081
2002	$17,904	$18,978	$23,019	$18,682	$27,463	$18,658
2003	$20,247	$17,893	$21,200	$20,002	$31,768	$38,963
2004	$17,347	$14,663	$16,659	$33,977	$13,017	$33,977
Entire period	$17,862	$16,372	$22,171	$23,092	$29,344	$26,205

[a]The shortfall is the amount by which the need for a withdrawal exceeds the available account balance.

The extent to which the FARRM account was capable of providing stabilization was assessed by comparing the shortfalls from the income target for farmers with and without FARRM accounts. The amount of shortfall with the existence of a FARRM account has been defined as (14). We assume that without a FARRM account, farmers would experience shortfalls when income is less than 80% level or 90% level of the target. That is, the need defined as (7) is greater than zero when a shortfall occurs. Therefore, the amount of shortfall without the existence of a FARRM account is defined as (15).

$$(15)\ Shortfall\_base_i = need_i, \ if\ need_i > 0$$
$$= 0, \ otherwise$$

Table 15 shows the average shortfalls, number of farms experiencing shortfalls, standard deviation of the shortfalls, and the maximum shortfalls with and without the existence of FARRM accounts. To compare the shortfalls with and without FARRM accounts, we calculate the change on descriptive statistics of shortfalls while FARRM accounts exist. Those changes can be interpreted as the effect of FARRM accounts on income stabilization.

Under the six scenarios, the FARRM accounts reduced 19% to 34% of the average shortfall over the entire period, 18% to 39% of number of farms experiencing shortfalls, and 5% to 14% of standard deviation of shortfall over the entire period. The small degree of change on the standard deviation is undesirable, because it may imply that FARRM accounts reduced a very limited amount of variation in shortfalls across farms. Also, scenario 90_index had the least changes on those statistics compared to other three scenarios. This implies that using 90% indexed gross income target to set the withdrawal restriction could be too strict to show the effect of CC accounts on the income stabilization. It may also imply that 90% indexed gross income target overstates growers' needs for income smoothing.

Table 15. Summary of the Shortfall with and without FARRM Accounts, 30 Grape Farms in Lake Erie Region, Continues.

	Shortfall Scenarios with / without FARRM Accounts*																	
Year	90_net _FARRM	90_net _base	**Change**	80_net _FARRM	80_net _base	**Change**	90_G _FARRM	90_G_ base	**Change**	80_G _FARRM	80_G _base	**Change**	90_I _FARRM	90_I _base	**Change**	80_I _FARRM	80_I _base	**Change**
									Mean									
2000	8,554	9,025	**-5%**	7,837	8,076	**-3%**	170	170	**0%**	0	0	**-**	28,050	30,591	**-8%**	13,668	15,694	**-13%**
2001	2,914	6,176	**-53%**	2,329	4,456	**-48%**	2,779	3,233	**-14%**	2,073	2,145	**-3%**	7,865	11,079	**-29%**	3,680	4,813	**-24%**
2002	5,968	9,092	**-34%**	4,428	7,650	**-42%**	5,371	8,129	**-34%**	2,491	4,915	**-49%**	12,816	15,344	**-16%**	5,597	7,600	**-26%**
2003	10,123	12,023	**-16%**	8,350	10,921	**-24%**	4,240	6,932	**-39%**	2,000	2,679	**-25%**	13,766	18,023	**-24%**	6,494	9,151	**-29%**
2004	5,782	10,252	**-44%**	4,888	8,804	**-44%**	2,221	3,884	**-43%**	1,133	1,348	**-16%**	3,037	6,069	**-50%**	1,133	1,348	**-16%**
Total	6,668	9,313	**-28%**	5,566	7,981	**-30%**	2,956	4,470	**-34%**	1,539	2,218	**-31%**	13,107	16,221	**-19%**	6,114	7,721	**-21%**
									Number of Farms Experiencing Shortfalls (Shortfall >0)									
2000	13	15	**-13%**	13	14	**-7%**	1	1	**0%**	0	0	**-**	20	20	**0%**	15	16	**-6%**
2001	8	14	**-43%**	7	14	**-50%**	2	4	**-50%**	2	2	**0%**	13	17	**-24%**	5	10	**-50%**
2002	10	12	**-17%**	7	11	**-36%**	7	10	**-30%**	4	7	**-43%**	14	17	**-18%**	9	10	**-10%**
2003	15	16	**-6%**	14	15	**-7%**	6	9	**-33%**	3	4	**-25%**	13	14	**-7%**	5	10	**-50%**
2004	10	17	**-41%**	10	13	**-23%**	4	9	**-56%**	1	2	**-50%**	7	14	**-50%**	1	2	**-50%**
Total	56	74	**-24%**	51	67	**-24%**	20	33	**-39%**	10	15	**-33%**	67	82	**-18%**	35	48	**-27%**
									Standard Deviation									
2000	18,401	18,384	**0%**	17,014	17,054	**0%**	931	931	**0%**	0	0	**-**	35,589	37,434	**-5%**	21,854	24,029	**-9%**
2001	6,376	9,118	**-30%**	5,270	7,370	**-28%**	14,506	14,714	**-1%**	11,023	11,183	**-1%**	22,090	22,758	**-3%**	17,579	17,565	**0%**
2002	15,264	16,965	**-10%**	13,647	15,320	**-11%**	14,448	18,606	**-22%**	8,668	12,261	**-29%**	21,792	22,894	**-5%**	12,807	14,549	**-12%**
2003	19,474	20,400	**-5%**	16,868	19,023	**-11%**	12,727	14,160	**-10%**	7,890	8,830	**-11%**	29,513	32,338	**-9%**	17,303	19,828	**-13%**
2004	11,863	16,330	**-27%**	10,420	14,698	**-29%**	9,575	10,562	**-9%**	6,203	6,275	**-1%**	10,245	11,896	**-14%**	6,203	6,275	**-1%**
Total	15,053	16,569	**-9%**	13,400	15,157	**-12%**	11,589	13,358	**-13%**	7,660	8,893	**-14%**	26,361	27,840	**-5%**	16,387	17,914	**-9%**

Table 15. Continued.

Maximum												
2000	87,206	87,206	79,691	79,691	5,102	5,102	-	-	130,564	145,723	83,987	99,146
2001	24,596	36,905	19,837	32,147	79,491	80,362	60,408	61,279	119,920	119,920	96,442	96,442
2002	76,266	76,266	71,779	71,779	66,878	73,473	44,504	51,099	69,365	73,473	46,991	51,098
2003	77,708	77,708	75,158	75,158	62,108	62,108	41,858	41,858	139,530	148,653	74,928	84,051
2004	41,436	54,715	38,783	50,263	52,234	52,234	33,977	33,977	52,234	52,234	33,977	33,977
Total	87,206	87,206	79,691	79,691	79,491	80,362	60,408	61,279	139,530	148,653	96,442	99,146

* Scenario 90_gross, 80_gross, 90_index, and 80_index are abbreviated as 90_G, 80_G, 90_I, and 80_I

Counter Cyclical Savings Accounts

Counter-cyclical (CC) savings accounts have been proposed as an alternative to FARRM accounts. Several features of the counter-cyclical savings account proposal differ from the FARRM account proposal. First, gross income is used to determine eligibility for CC accounts. Second, deposits to the account are matched up to the lesser of 2% of a gross income target or $5,000. Third, the withdrawal of funds is limited to instances when gross income falls below a trigger point and can only be used to increase gross income to the trigger level.

The CC account proposal would utilize a tax-based measure of gross income for purposes of eligibility and determining the amount of the matching deposit from the government. The measure of gross income used in the analysis is defined as:

(16) gross income = *IRS Form 1040 Schedule F income*
= *cash receipts from the sale of farm products*

CC Accounts: Analysis of Gross Income Variability

Since the CC proposal would base contributions and withdrawals on gross income, the variability in gross income will determine grower participation. The variation in gross income was assessed by examining the distribution of IRS Form 1040 Schedule F gross income (Table 16). The average gross income increased steadily over time. The relative variability in gross income is less in the case of net income. For the case of net income, the standard deviation was greater than the mean, while here the standard deviation is much less than the mean but sizable nonetheless. It is also useful to note that the correspondence between gross and net income is not perfect. For instance, net income fell substantially from 2003 to 2004 (27%), while gross income increased modestly at the same period.

Table 16. Descriptive Statistics for Schedule F Gross Income by Year, 32 Grape Farms in Lake Erie Region.

Year	Mean	Std. Dev	Minimum	Maximum
2000	$152,973	$97,492	$12,709	$401,831
2001	$157,796	$110,679	$12,362	$430,782
2002	$159,527	$121,766	$12,537	$537,476
2003	$161,828	$113,883	$15,194	$432,762
2004	$176,779	$139,871	$11,595	$546,251

CC Accounts: Eligibility and Participation Incentives

The eligibility question is slightly different for the case of Counter-Cyclical accounts as opposed to FARRM accounts. Farmers can establish a farm counter-cyclical savings account as long as average gross income exceeds $50,000 over the last five years. That is,

(17) *Eligible in year (1999+ i), if* $\frac{\sum_{j=i}^{i+4}(gross\quad income)_{1994+i}}{5} > \$50{,}000,\ i = 1,2,3,4,5$

Five growers in the sample were never eligible to make a contribution to CC accounts in the 5-year period. That is, 84.3% of farms were eligible to establish CC accounts. Therefore, there are 27 farms included in the analysis of CC accounts. One farm was eligible to make a contribution on three occasions while the rest of farms (96.3%) were eligible to make a contribution up to 5 times (Table 17). Also, 100% of farmers were eligible to make contributions to the accounts from 2002-2004, while one farm was not eligible to make a contribution in 2000 and 2001 (Table 18).

Table 17. Percent of Farms with Income Enabling them to Contribute to CC Accounts, 27 Grape Farms in Lake Erie Region, 2000-2004.

Number of Years Qualified to Contribute	% of Farms
1	-
2	-
3	3.7
4	-
5	96.3

Deposits to CC Accounts

Farmers are allowed to contribution any amount they desire to a CC account. The government would provide a matching deposit. However, the matching deposit would be limited to 2 percent of gross income of the producer and could not exceed $5,000 for any applicable year. Funds deposited to the account could earn interest at the market rate. Since earnings on these accounts are distributed and taxed annually, farmers have little incentive to put money in CC accounts that is not matched by the government. The funds could be invested in other accounts with fewer restrictions on withdrawal. In the analysis that follows, it is assumed that farmers will only contribute enough funds to maximize the potential government matching deposit. Specifically, the deposit was defined according to (18).

(18) $deposit_i = Min\ [0.02(gross\ income)_i, 5000]$ *in any given year i*

Table 18 presents the average deposits. These deposits can also be interpreted as the average government matching costs. The farms were able to contribute around $3,200 per year. The amounts of average contribution did not vary considerably over time. The average contribution allows one to determine the extent to which the farmer was able to take full advantage of the maximum government matching deposit of $5,000. As analyzed, growers with the financial means or cash flow who wished to contribute the full $5,000 were only allowed to do so if the applicable gross income measure was at least $250,000. Growers with less gross income were only allowed to contribute 2% of their gross income. The analysis shows that on average, 21% of farms in the entire period could contribute $5,000 to take full advantage of the maximum government matching deposit.

Table 18. Percent of Farms Eligible to Contribute to CC Accounts and Deposit Summary of CC Accounts per Year, 27 Grape Farms in Lake Erie Region.

	Eligible	Deposit			
Year	% of Farms	Mean	Std. Dev.	Minimum	Maximum
2000	96.3	$3,252	$1,449	$0	$5,000
2001	96.3	$3,237	$1,545	$0	$5,000
2002	100	$3,189	$1,439	$995	$5,000
2003	100	$3,252	$1,377	$1,334	$5,000
2004	100	$3,274	$1,315	$1,188	$5,000
All Year	98.5	$3,241	$1,406	$0	$5,000

Participation Incentives

Counter-Cyclical accounts do not rely upon tax incentives and do not provide interest rate bonuses to encourage grower participation. The government's promise to match deposits provides the economic incentive for contribution to a CC account. Once deposited to the CC account, funds could be withdrawn only if gross income for the current year dropped below the income target. The amount that could be withdrawn from the account is limited to the amount needed to increase current gross income up to the income target.

Restrictions on access to the funds would most likely make growers contribute only enough funds to be eligible for the full government matching deposit. Although the return to a dollar eligible for matching and deposited in the account is 100% (through the matching government deposit), in the cases of short cash flows, the restriction on withdrawal would make growers deposit less than the estimates in Table 18. Specifically, this is a serious concern for farms that are experiencing growth in revenues over time. If these funds cannot be accessed in times of need they are likely less valuable to the farmer.

CC Accounts: Withdrawals and Benefits

Unlike FARRM accounts, the funds deposited in a CC account cannot be withdrawn at the producer's discretion. Instead, the funds can only be withdrawn when gross income falls below 80 % or 90% level of income target. The analysis in the section and next section focuses on estimating how frequently farmers can withdraw funds from CC accounts under two measures income target levels, how many dollars they would need to withdraw in order to increase their income to the target level, and how many dollars they have available in the CC accounts.

Before presenting the results it is useful to present the assumptions and methods used to calculate the need for withdrawals and actual withdrawals. First, the analysis presented assumes that farmers can make a deposit and withdrawal in the same period. In other words, the farmer could place a deposit in the account to be matched in the current year. If the current year income is less than 80% or 90% of the target, the farmer could also withdraw enough funds from the account to increase income to the 80% or 90% level. The matching government contribution makes it attractive for farmers to contribute and withdraw in the same year. The need for funds to be withdrawn from the accounts is given by (19).

$$(19)\quad need_i = Max\left[(\phi * target_i - gross\ \ income_i), 0\right], \quad \phi = 0.9 \text{ or } 0.8$$

where *target* is the income target generated by one of the measures defined by equations (20)-(22). The measure of income target in equation (20) was defined to represent a 5-year rolling average of gross income.

$$(20)\quad target_{1999+j} = \frac{\sum_{i=j}^{4+j} gross\ \ income_{1994+i}}{5} \qquad j = 1,2,3,4,5$$

To recognize the growth of farm business, using the five-year rolling average income as the income target might not represent the most recent gross income and therefore understate growers' effective need. As with the FARRM account case the indexing procedure used with the Adjusted Gross Revenue (AGR) Crop Insurance Program was used to index gross income[3]. This indexed income target is calculated according to the procedure described in the FARRM account section (page 13-14).

Withdrawals in any period are chosen to satisfy the need for income given that the most that can be withdrawn is the sum of the previous periods balance and the total deposits (government and farmer) in the current period (21).

[3] A description of AGR and the income indexing procedure can be found on the USDA, Risk Management Agency website, RMA (http://www.rma.usda.gov/) or is available from the authors.

$$(21)\ withdrawal_i = \begin{cases} Min[need_i, balance_{i-1} + 2 * deposit_i] & , \quad if \quad need_i > 0 \\ 0 & , \quad otherwise \end{cases}$$

Finally, the balance in the account at the end of each period is determined by (22).

$$(22)\ balance_i = balance_{i-1} + 2 * deposit_i - withdrawal_i$$

Regarding certain design parameters for the effective CC programs, the measures of income target were constructed for both gross income and indexed gross income. Two measures of income target plus another parameter, ϕ in equation (19) assumed equal to 0.9 or 0.8 to represent the level of income target, provide the four scenarios for the analysis of CC accounts. Four scenarios can be denoted as 90_gross (ϕ=.9, *target)*, 80_gross (ϕ *=.8, target*), 90_index (ϕ *=0.9, index target*), and 80_index (ϕ *=.8, index target)*.

Results of Withdrawals and Benefits

We first examine how frequently growers would be eligible to withdraw deposited funds from the account. An indicator variable was created for each of the four scenarios. This variable was recorded as a one if the farmer would be eligible to withdraw funds from the account and a zero otherwise. The analysis shows that the frequencies eligible to withdraw funds depends critically on the measures of income target and ϕ used to calculate the need.

Table 19 shows the percent of growers eligible to withdraw funds from the CC accounts by year. Table 20 shows how frequently individual farms were eligible to withdraw from the accounts over the five-year period. Since the 90% income target is higher than the 80% income target, growers would have the need to withdraw funds more frequently under the scenarios with a 90% target.

Table 19. Percent of Farms Eligible to Withdraw Funds from CC Accounts, 27 Grape Farms in Lake Erie Region.

	Withdrawal Scenarios			
Year	90_gross	80_gross	90_index	80_index
2000	3.7	0.0	63.0	51.9
2001	7.4	3.7	48.1	25.9
2002	29.6	22.2	55.6	33.3
2003	33.3	14.8	51.9	37.0
2004	25.9	3.7	44.4	3.7
Entire Period	20.0	8.9	52.6	30.4

Using indexed gross income trigger increased the likelihood of withdrawals from the accounts. For instance, the 90_index and 80_index scenarios produced frequencies eligible to withdraw funds more than 2 times higher than those in the scenarios 90_gross and 80_gross (Table 19). Also, the indexed targets substantially reduced the number of growers that were unable to make withdrawals from the accounts (Table 20).

Table 20. Percent of Farms Eligible to Withdraw Funds from CC Accounts, 27 Grape Farms in Lake Erie Region, 2000-2004.

Number of years eligible to withdrawing funds	Withdrawal Scenarios			
	90_gross	80_gross	90_index	80_index
0 yr	44.4	63.0	-	14.8
1 yr	22.2	33.3	22.2	33.3
2 yrs	22.2	-	14.8	40.7
3 yrs	11.1	3.7	48.1	7.4
4 yrs	-	-	7.4	3.7
5 yrs	-	-	7.4	-

The average withdrawals in the scenario 90_index and 80_index are around 2 times greater than those in the scenarios 90_gross and 80_gross (Table 21). The average withdrawal for the entire period in the scenario 90_index, $4,486 was even higher than the average deposit for the entire period, $3,241 meaning that the farms would be able to withdraw some of the government's matching deposits (Table 18 & 21).

Table 21. Average Withdrawals from CC Accounts, 27 Grape Farms in Lake Erie Region.

	Withdrawal Scenarios			
Year	90_gross	80_gross	90_index	80_index
2000	$189	$0	$4,381	$3,386
2001	$822	$440	$3,036	$1,536
2002	$3,486	$3,073	$4,623	$3,400
2003	$4,498	$1,338	$6,584	$5,226
2004	$2,084	$166	$3,807	$166
Entire Period	$2,216	$1,003	$4,486	$2,743

When one considers the average final balances remaining in the accounts it is obvious that most growers except those under scenario 90_index are able to build sizable account balances over a 5- year period. This is understandable as there were few withdrawals from the accounts. Furthermore, in the scenarios of 90_gross and 80_gross, there were several farms that did not withdraw any funds from the accounts and built balances up to $50,000 that reflected the maximum contributions and government matches (Table 22).

Table 22. Summary of Final Balances in CC Accounts, 27 Grape Farms in Lake Erie Region.

Balance Scenarios	Mean	Median	Std. Dev.	Maximum	Minimum
90_gross	$21,330	$17,084	$17,856	$50,000	$0
80_gross	$27,392	$22,877	$16,748	$50,000	$0
90_index	$9,978	$7,702	$9,905	$40,000	$0
80_index	$18,695	$15,950	$13,662	$49,411	$0

CC Accounts: Income Shortfalls and Stabilization

While some farms could build positive account balances, a significant number of farms that experienced a drop in income would not have a large enough balance to return income to the target level. To examine if growers build sufficient account balances to insure against variability in farm income, we first calculate the amount of shortfall for CC accounts, which is defined by (23).

(23) $shortfall_i = need_i - balance_{i-1} + 2 * deposit_i$, *if* $need_i > 0$ *and* $shortfall_i > 0$

$= 0$, *otherwise*

As with the case of FARRM accounts, the shortfall reflects the situation where the balance in the account is insufficient to allow the grower to increase income to the target level. An indicator variable was created to count the frequencies of the shortfall (zero balance) for each of the four scenarios. This variable was recorded as a one if the shortfall is greater than zero and a zero otherwise.

Table 23 shows that the percent of growers with shortfall for each year of the study. The frequencies of shortfall under the four scenarios are highly correlated with the frequencies eligible to withdraw funds from CC accounts shown in Table 19. Using indexing gross income as withdrawal trigger would significantly increase the frequencies of shortfalls as well as the frequencies of withdrawal. The frequencies of the shortfall in the scenarios of 90_gross and 80_gross are substantially less than the scenarios of 90_index and 80_index.

Over the entire period 41.5% of times growers in the scenario 90_index had shortfalls for, while only 10.4% of growers in the scenario 90_gross experienced a shortfall. Table 24 shows the conditional average shortfall calculated as $E\left[shortfall_i \middle| shortfall_i > 0\right]$, which indicates the average amount of insufficient funds after withdrawing from the accounts when a shortfall occurs. The average shortfalls over the entire period range from $22,965 (scenario 80_gross) to $31,668 (scenarios 90_index). The conditional average shortfalls vary by year as well as by the scenarios because large amounts of shortfall occurred for some of individual farms in a year or in a scenario. For example, the scenarios of 90_gross and 80_gross had one grower (3.7%) experiencing the shortfall in 2001, but this grower also caused the highest average shortfalls, $68,477 in scenario 90_gross and $49,395 in the scenario 80_gross across the four scenarios during the entire period.

Table 23. Percent of Farms Experiencing Shortfall, 27 Grape Farms in Lake Erie Region.

	Shortfall Scenarios			
Year	90_gross	80_gross	90_index	80_index
2000	-	-	63.0	40.7
2001	3.7	3.7	40.7	11.1
2002	22.2	14.8	40.7	22.2
2003	14.8	7.4	44.4	18.5
2004	11.1	3.7	18.5	3.7
Entire period	10.4	5.9	41.5	19.3

Table 24. Average Annual Shortfall, 27 Grape Farms in Lake Erie Region.

	Shortfall Scenarios			
Year	90_gross	80_gross	90_index	80_index
2000	-	-	$46,080	$33,883
2001	$68,477	$49,395	$21,046	$30,722
2002	$23,574	$15,142	$29,742	$22,049
2003	$21,623	$22,129	$30,244	$26,683
2004	$16,493	$29,494	$13,693	$29,494
Entire period	$24,707	$22,965	$31,668	$29,234

To examine the impact of the CC accounts on the stabilization of grower incomes, we estimate and compare the shortfall with and without CC accounts under the four scenarios. The amount of shortfall with the existence of a CC account has been defined as (23). We assume that without a CC account, farmers would experience shortfalls when gross income is less than 80% level or 90% level of the target. That is, the need defined as (19) is greater than zero when a shortfall occurs. The amount of shortfall without the existence of a CC account is defined as (24).

$$(24)\ Shortfall\_base_i = need_i, \ if\ need_i > 0$$
$$= 0, \ otherwise$$

Table 25 shows the average shortfall, number of farms experiencing shortfalls (shortfall >0), standard deviation of shortfall, and the maximum shortfall with and without the existence of CC accounts. To compare the shortfalls with and without CC accounts, we calculate the change of the average shortfall, standard deviation of shortfall, and number of farms experiencing shortfalls when the CC accounts exist. Those changes can be interpreted as the degrees of income stabilization. Under the four scenarios, the CC accounts reduced 25% to 46% of the average shortfall, 23% to 48% of number of farms experiencing shortfalls, and 13% to 30% of standard deviation of shortfall over the entire period.

Table 25. Summary of the Shortfall with and without CC Accounts, 27 Grape Farms in Lake Erie Region, Continued.

	Shortfall Scenarios with / without FARRM Accounts											
Year	90_gross _cc	90_gross _base	**Change**	80_gross _cc	80_gross _base	**Change**	90_Index _cc	90_Index _base	**Change**	80_Index _cc	80_Index _base	**Change**
						Mean						
2000	-	$189	**-100**	-	-	**-**	$29,013	$33,394	**-13**	$13,804	$17,191	**-20**
2001	$2,536	$3,358	**-24**	$1,829	$2,270	**-19**	$8,574	$11,611	**-26**	$3,414	$4,950	**-31**
2002	$5,239	$8,724	**-40**	$2,243	$5,317	**-58**	$12,117	$16,740	**-28**	$4,900	$8,299	**-41**
2003	$3,203	$7,702	**-58**	$1,639	$2,977	**-45**	$13,442	$20,026	**-33**	$4,941	$10,168	**-51**
2004	$1,833	$3,917	**-53**	$1,092	$1,258	**-13**	$2,536	$6,343	**-60**	$1,092	$1,258	**-13**
Total	$2,562	$4,778	**-46**	$1,361	$2,364	**-42**	$13,136	$17,623	**-25**	$5,630	$8,373	**-33**
						Number of Farms Experiencing Shortfalls (Shortfall >0)						
2000	-	1	**-100**	-	-	**-**	17	17	**0**	11	14	**-21**
2001	1	2	**-50**	1	1	**0**	11	14	**-21**	3	8	**-63**
2002	6	8	**-25**	4	6	**-33**	11	15	**-27**	6	9	**-33**
2003	4	9	**-56**	2	4	**-50**	12	14	**-14**	5	10	**-50**
2004	3	7	**-57**	1	1	**0**	5	12	**-58**	1	1	**0**
Total	14	27	**-48**	8	12	**-33**	56	72	**-22**	26	42	**-38**
						Standard Deviation						
2000	-	$982	**-100**	-	-	**-**	$35,369	$38,481	**-8**	$21,867	$24,909	**-12**
2001	$13,178	$15,516	**-15**	$9,506	$11,793	**-19**	$22,655	$23,941	**-5**	$16,633	$18,514	**-10**
2002	$12,799	$19,525	**-34**	$6,445	$12,869	**-50**	$20,804	$23,731	**-12**	$10,385	$15,186	**-32**
2003	$11,466	$14,747	**-22**	$7,212	$9,276	**-22**	$24,952	$33,538	**-26**	$12,547	$20,683	**-39**
2004	$9,181	$11,045	**-17**	$5,676	$6,539	**-13**	$9,588	$12,436	**-23**		$6,539	**-13**
Total	$10,503	$14,014	**-25**	$6,522	$9,344	**-30**	$25,353	$28,990	**-13**	$14,933	$18,757	**-20**

Table 25. Continued.

	Maximum							
2000		$5,102			$135,723	$145,723	$89,146	$99,146
2001	$68,477	$80,362	$49,395	$61,279	$116,265	$119,920	$86,501	$96,442
2002	$51,161	$73,473	$28,787	$51,099	$62,300	$73,473	$34,210	$51,098
2003	$57,302	$62,108	$37,053	$41,858	$108,653	$148,653	$44,051	$84,051
2004	$47,751	$52,234	$29,494	$33,977	$47,751	$52,234	$29,494	$33,977
Total	$68,477	$80,362	$49,395	$61,279	$135,723	$148,653	$89,146	$99,146

Conclusions

The research project evaluated two specific farm savings account proposals, counter-cyclical farm savings (CC) accounts and farm and ranch risk management (FARRM) accounts. Both proposals require that the farmer deposit funds into the account. Under the counter-cyclical savings accounts program, eligibility is based upon gross income, the government would match the farmer's deposit up to $5,000, and farmers could withdraw when gross income fell below a specified trigger level. For FARRM accounts, eligibility to participate was based upon having positive net income and deposits were not matched, but rather were tax deferred. Withdrawals from the accounts were evaluated using various historical gross and net income trigger levels. The objectives of study were to assess the ability of growers to contribute to the accounts, the ability of growers to withdraw funds from the accounts, and the ability of the accounts to reduce income variability.

The findings suggested that the eligibility rules for the proposed CC accounts are not restrictive as most farms would be eligible to make a contribution every year. The positive net income eligibility criterion for FARRM accounts is much more restrictive and will significantly reduce the number of farms eligible to contribute to savings accounts. Specifically, the study found that 90% of the farms would be eligible to contribute to CC accounts in all five years of the study. This is not surprising because eligibility only required 1040 Schedule F gross income in excess of $50,000. Eligibility to make deposits to FARRM accounts was noticeably lower as this program required the farm to have positive 1040 Schedule F net income. In the case of FARRM accounts only 36% of the farms would be eligible to make deposits in all 5 years. However, all of the farms were eligible to contribute to FARRM accounts in at least one year and 87% were eligible to make deposits in three of the five years.

The study also examined the magnitude of deposits to the accounts. The average annual farmer contribution to CC accounts was $3,042. Based on a maximum deposit rate of 2% of gross income, many of the specialty crop farms in this study were unable to take advantage of the full $5,000 government match. In other words, many had sales less than $250,000. The analysis shows that on average, 21% of farms in the entire period could contribute $5,000 to take full advantage of the maximum government matching deposit. The average deposit over the period was $3,042. With the government match this would result in an average annual deposit to the account of $6,084.

Unlike CC accounts, where every contribution is matched up to $5,000, many farms have little incentive to participate in FARRM accounts because the incentives are based completely on tax deferral. Based on farm income alone, nearly half of the farms are in 10% or lower marginal federal income tax bracket. There are two important financial incentives to encourage farmer participation in FARRM accounts. The most basic benefit is the deferral of tax liability for one year or more. The ability to defer taxes to a tax year in which the farm is in a lower tax bracket would result in lower taxes, creating an incentive for contribution to a FARRM account. For instance, a farmer could contribute to a FARRM account in a year in which the income would be taxed at the 27% marginal tax bracket and then withdraw the funds in a year where they find themselves in a lower tax bracket. Second, the farmer is able to invest the deferred taxes, earning interest on the balances. The results of the study show that this benefit is quite small on average due to relatively small balances and low interest rates.

The marginal tax bracket plays a critical role in determining the value of FARRM accounts. Larger and more profitable farms will receive the greatest benefits from the FARRM account program because these farms are more likely to be in higher marginal tax brackets. The greatest benefit obtained from FARRM accounts occurs when farmers can contribute in years with a high tax liability and withdraw in years with a reduced tax liability. Although most farmers have a positive net income, many face a relatively low marginal tax rate. Based only on farm income, 24% would typically be found with a 0% marginal tax rate, meaning that they would owe no federal income tax, and 20% would find themselves in the 10% marginal tax bracket. This would significantly reduce their incentive for participation in the program. On the other hand 16% of the farms generated farm income that would place them in the 27% federal tax bracket. These farms would have a much greater incentive to participate in the program. This structure makes the program of much more value to large and profitable farms.

Farms were allowed to place up to 20% of 1040 Schedule F Net farm income into FARRM accounts, without regard to their current tax bracket. Under this assumption, the average FARRM account deposit was $4,526. When the government match is considered, the average CC account balance was larger than the average FARRM account balance. However, as modeled, the FARRM account balances are more variable and large farms are able to place considerably more funds in FARRM accounts than in CC accounts. The average amount of funds deposited by the farmer was greater under FARRM accounts than for CC accounts. Here, the average annual deposit was $4,526. Because the farmer's deposit was not matched, the total amount placed in the account was generally lower for FARRM accounts than for CC accounts.

While the FARRM account proposal allows farmers to make withdrawals at their discretion, the CC account proposal places conditions on when the farmer can make a withdrawal. These withdrawal provisions on the accounts are critical. If withdrawal triggers are not indexed to allow for growth, few farms will be able to make withdrawals. Restrictive withdrawal rules will significantly reduce the appeal of the accounts as a risk management tool. The results of the study indicate that this is a critical feature of the CC program. Higher gross income withdrawal triggers increase the likelihood that a farm can make a withdrawal. For instance, an 80% gross income trigger would typically allow 8% of the farms to make a withdrawal in a given year and a 90% trigger would allow 20% to make a withdrawal. Additionally, indexing the gross income trigger to adjust for changes in farm size allows more farms to make withdrawals. Here, 30% of the farms would be able to make a withdrawal under an 80% indexed gross income trigger and 52% would be able to make a withdrawal under a 90% indexed gross income trigger.

The analysis of the FARRM account program included a comparison of withdrawals under both gross and net income triggers. The use of a net income trigger versus a gross income trigger does not appear to significantly alter the likelihood of making a withdrawal. As a result, a gross income trigger is likely preferred because it is more easily indexed than a net income trigger. When a 90% indexed gross income trigger was used, slightly over half the farms were able to make a withdrawal. A 90% net income trigger resulted in 48% of the farms being able to make a withdrawal.

The ability of the accounts to manage income variability was assessed by comparing the amount by which income fell short of the gross or net income trigger level with and without the accounts. Farm savings accounts show some promise in addressing income variability, but restrictions on the size of the deposits limits their ability to completely mitigate income variability. Many farms will still experience considerable income variability. The accounts also appear unable to handle back-to-back adverse financial outcomes.

While some farms could build positive account balances over the 5 years of the study, a significant number of farms that experienced a drop in income sufficient to trigger a withdrawal did not have a large enough account balance to resolve their income shortfall. Under a 90% indexed income withdrawal trigger, nearly 40% of the farms would be unable to completely manage their income shortfall with the CC savings account. Additionally, the resulting zero balance in the savings account would leave these growers with little financial protection for the next year. Still, the CC accounts reduced the typical shortfall from the income trigger by 25 to 46%, which shows considerable promise in managing income risk. Similar results were found for the FARRM accounts, although the reduction in income was slightly smaller due to smaller account balances.

Although many farms did not have sufficient funds to manage their income risk, many finished the five year study period with positive account balances. Including the government match, the average ending balance in the CC accounts with a 90% indexed income withdrawal trigger was $9,425. The ending balance in the FARRM accounts with a 90% indexed gross income withdrawal trigger was $7,199.

While the savings accounts were able to reduce income variability, the funds in the accounts were often insufficient to completely mitigate income variability. Unless larger subsidies are offered, savings account programs are unlikely to provide a complete risk management solution for specialty crop growers. Additionally, for widest appeal the program should combine both government deposit matching and tax deferral of deposits.

While the tax deferral benefits of the FARRM account will appeal to high income farms, the relatively small amount government matching for CC accounts will provide little income protection for larger farms. The most useful program would likely combine both tax deferral and government matching of deposits. This would broaden the appeal of the accounts and make them a more viable risk management tool for larger farms.

The accounts will provide little protection in successive low-income years. This is a critical concern because agriculture often undergoes multiple year price cycles. In this situation additional emergency government deposits to the accounts would likely be necessary to reduce income shortfalls. In fact, the juice grape industry experienced three consecutive years of declining prices in 2002-2004 and although data are not available for 2005 it is unlikely that prices increased significantly. Finally, the analysis assumed that farmers would have the available cash flow to invest in the accounts. Unless the farmers postpone investment or use additional debt, many would be unable to fully fund the accounts. These concerns aside, the accounts show promise in providing a component of a comprehensive farm income safety net.

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