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Tobacco Farmer Interest and Success in Income Diversification

Robert H. Beach, Alison Snow Jones, and Janet A. Tooze

As farm income from tobacco production has declined in recent years, there has been increasing interest in identifying alternative sources of income for tobacco farmers in the southern United States The recent termination of the tobacco quota program has accelerated the exit of tobacco farmers and has heightened concern regarding the availability of substitutes for tobacco production. In this study, we examine factors influencing tobacco farmers' attempts to identify profitable alternatives to tobacco, their off-farm employment behavior, and changes in acres of tobacco cultivated using survey data collected from a panel of North Carolina tobacco farmers combined with market data.

Key Words: diversification, farm programs, farmer survey, quota buyout, tobacco

JEL Classifications: C33, Q12, Q18

Major structural changes have occurred in the U.S. tobacco market in recent years, including increased production costs, a rapid rise in the proportion of tobacco grown under contract with manufacturers, sharp reductions in tobacco marketing quotas that reflect declining demand for domestic tobacco, and, most recently, termination of the tobacco marketing quota system and price support program in October 2004. As the number of tobacco farms and revenues from tobacco have declined, there has been increased interest in identifying alternative sources of income, particularly for tobacco-dependent communities where the impacts of these changes on local economies is expected to be significant (Gale; Gale, Foreman, and Capehart; Hull; President's Commission). Tobacco is grown in over 500 U.S. counties in 23 states, but production is concentrated in the southeastern states of North Carolina, Kentucky, Virginia, Tennessee, South Carolina, and Georgia (USDA, NASS 2004).

In this study, we examine the impact of farm, household, and market characteristics on farmer interest and success in shifting to nontobacco sources of income using a panel of North Carolina tobacco farmers surveyed in 1997, 1999, 2001, and 2004. Data were first collected prior to major changes in the tobacco market that have taken place since 1997 and encompass events such as the approval of the Master Settlement Agreement (MSA) between the large tobacco companies and the attorneys general of 46 states in 1998, Phase II compensatory payments to tobacco growers, increasing use of imported tobacco, huge reductions in tobacco quotas, rapid growth in contracting, and serious discussion regarding a tobacco buyout (the 2004 survey

Robert H. Beach is senior research economist, Food and Agricultural Policy Research Program, RTI International and adjunct assistant professor, Department of Agricultural and Resource Economics, North Carolina State University. Alison Snow Jones is associate professor and Janet A. Tooze is assistant professor, Department of Public Health Sciences, Wake Forest University School of Medicine, Winston-Salem, NC.

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took place prior to approval of the buyout bill).

This unique longitudinal data set was combined with local market data to evaluate the influence of farmer preferences, resource endowments, market incentives, risk, and biophysical factors on tobacco farmers' attempts to identify viable nontobacco income sources, including actively seeking to identify alternative agricultural commodities or working off farm, on their ability to increase the profitability of nontobacco components of their operations through value-added processing or other activities, and on whether they continue to grow tobacco and, if so, the number of acres allotted to tobacco cultivation. This research contributes empirical findings to the public dialogue concerning the ability of tobacco farmers and tobacco-dependent communities to adjust to the major structural changes taking place in this market.

Background

Demand for domestic tobacco has declined substantially in recent years because of reduced U.S. cigarette consumption as well as increasing reliance of domestic cigarette manufacturers on lower-cost imported tobacco. Associated reductions in tobacco quota increased grower interest in a quota buyout, which had already been under serious consideration for some time (Brown, Snell, and Tiller). The recent removal of tobacco quotas and the federal tobacco price support program has brought U.S. tobacco prices closer to world prices, making domestic tobacco more competitive in global markets. In addition, it allows geographic relocation of tobacco production (prior to the tobacco quota buyout, quotas could not be transferred across county lines, except for burley tobacco in Tennessee).

These changes are expected to speed the transition to fewer, larger farms, a trend that has taken place throughout agriculture but that had been slowed in tobacco by the quota program. Many smaller and older tobacco farmers are likely to exit the market following the buyout (Tiller 2003b), and there may be some overall reallocation of flue-cured tobacco production toward the high-yield regions of eastern North and South Carolina and southern Georgia (Gale, Foreman, and Capehart). However, the end of the tobacco quota program is expected to accelerate the exit of tobacco farmers even in North Carolina, which accounts for approximately 40% of national production and is particularly well suited for growing tobacco.

Under the Fair and Equitable Tobacco Reform Provisions of the American Jobs Creation Act of 2004, which ended the tobacco quota system and federal price supports, tobacco farmers and quota holders will receive buyout payments for 10 years (2005–2014). An influx of buyout funds into tobacco-dependent communities could provide an opportunity for investment in new enterprises, but it has proven difficult in the past to identify sufficiently profitable on-farm alternatives to tobacco. Altman et al. reported that in a survey of tobacco farmers throughout the southern United States, 78% of flue-cured tobacco farmers and 69% of burley tobacco farmers identified lower profits associated with alternative crops as a barrier to substitution of other crops for tobacco. Our surveys of North Carolina flue-cured tobacco farmers revealed an even higher proportion (87%) identifying lower profitability of alternative crops as a barrier. Unfortunately, buyout payments are not likely to provide the average tobacco farmer with sufficient capital to surmount these barriers. The large total amounts paid under the terms of the buyout belie the disproportionate share that has been and will be paid to the largest enterprises. The top 20% of payment recipients will receive an estimated 80% of the total payments (Environmental Working Group), with roughly 270 people in North Carolina receiving at least $1 million (Collins 2004a,b). Median payout will be less than $15,000 annually for 10 years.

Besides profitability and availability of capital, there are many other factors that influence farmers' desire to cultivate alternative crops or identify other sources of income. In general, farmers are more likely to seek alternatives if they face higher risks to net farm income, have smaller expected reductions

in net income from shifting some of their production into alternative crops, and are relatively risk averse and wish to diversify their sources of income to reduce income variability. A number of studies have found demographic factors such as age, number of household members, education, experience, net worth, and presence of small children as well as farm characteristics such as farm size, seasonality of farm labor requirements, and proximity to urban areas as relevant to both on-farm crop or commodity mix and off-farm labor supply decisions (Goodwin and Mishra; Mishra, El-Osta, and Sandretto).

One of the most important ways that farm households reduce income risk in developed countries is by working off farm, which is quite common among farm households in the United States. In 2003, 68% of family farms had either the primary operator (23.6%) or their spouse (12.8%) or both (31.6%) working off farm, and 88.8% of total farm household income came from nonfarm sources (Hoppe and Banker). Among large and very large commercial farm operators, however, 60% to 80% of total income is derived from farming. Because of household time constraints, working off farm has implications for farm productivity and technology adoption. For instance, Goodwin and Mishra find that working more hours off farm decreases farm efficiency. Fernandez-Cornejo, Hendricks, and Mishra found that off-farm employment creates incentives for adoption of production technologies that reduce managerial time required for farm operators.

For tobacco, the quota program and price supports reduced the risks of tobacco production and maintained relatively high returns for decades up until the last several years of its existence. This reduced incentives for tobacco farmers to explore production of alternative agricultural commodities or work off farm compared with farmers producing other commodities. Serious discussion of a tobacco quota buyout came out of the MSA legislation (Tiller 2003a). In 1997, Senators John McCain and Harold Ford proposed compensation to quota holders and farmers along with modification of the existing quota program (Capehart). In 1998, Senator Richard Luger added a proposal to end the quota program to a pending tobacco bill (Senate Agriculture Committee). The actual buyout legislation did not pass into law until October 2004, and there was considerable uncertainty over that period regarding the likelihood of its passage (Capehart). However, it is likely that legislative activity aimed at a buyout encouraged many tobacco farmers to anticipate receipt of future buyout payments.

In the interim, tobacco quota reductions from 1999 to 2004 resulted in sharply reduced production, and farmers simultaneously experienced declining per acre returns to tobacco farming (Foreman 2005). The reduction in returns was largely due to higher prices for leasing the smaller quantity of available tobacco quota as well as rapid increases in other production costs. As returns to tobacco fall, we would expect farmers to respond by reducing tobacco acreage, increasing efforts to identify nontobacco alternatives, and spending more time working off farm, other things being equal. However, this effect may have been constrained by farmer expectations of a future quota buyout, which could have induced farmers to continue producing more tobacco than they otherwise would have. We expect the effect of any buyout expectations on farmer behavior to vary depending on how accurately farmers assessed the present value of uncertain future buyout payments.

We conjectured that better-educated farmers would more accurately estimate the present-day value of hypothetical future buyout payments, incorporating both their own subjective rate of time preference and the risk that a buyout will not occur. Less well educated farmers may tend to view future buyout payments in nominal terms (Shafir, Diamond, and Tversky) and weight the hypothetical future buyout gain more heavily than any ongoing declines in profits associated with continued tobacco production (Kahneman and Tversky; Tversky and Kahneman). In addition, more educated, entrepreneurial, and efficient farmers are more likely to be able to successfully diversify their income on farm and/or off farm. Consequently, we expect

these farmers to be more active in seeking nontobacco alternative sources of income and to be more likely to reduce tobacco acreage in accordance with their more accurate assessment of the present value of tobacco production with the potential future buyout and higher opportunity costs.

With the recent elimination of the tobacco quota system, many farm families are at risk for reduced income. Many are multigenerational farm families who now confront strong pressure to identify profitable, sustainable nontobacco alternatives. In the remainder of this article, we explain our methodology, describe the data used, present the results of our analyses, and discuss the implications of our findings. We are particularly interested in determining the extent to which farmers were actively seeking to identify nontobacco income substitutes, the extent to which they were able to increase profits for nontobacco crops, whether the farmers or their spouses work off farm, and the degree to which they decreased acres allotted to tobacco cultivation. To the extent that the most efficient, entrepreneurial, and well capitalized farmers were more likely to begin diversifying their income prior to the buyout, those who did not may face especially difficult adjustments with the end of the quota system.

Methodology

According to the agricultural household model (e.g., Singh, Squire, and Strauss), farm households maximize expected utility using their endowments of family labor, land, and land quality to produce a combination of outputs in each time period subject to standard time and budget constraints as well as the technological constraints imposed by the farmer's production function. Prices and yields are stochastic, and agricultural household utility depends not only on the expected level of consumption but also on its variance. Utility also depends on the time available for leisure and household characteristics.

In this study, we focus on the allocation of land to tobacco and the allocation of household labor to actively seeking or improving profits from alternative farm commodities and toward off-farm labor. Major decisions each farmer faces at the beginning of a season are the total area to plant and the fraction of planted area to allocate to each product. Farmers can respond to changes in incentives by bringing new plots into production or leaving plots fallow, adjusting labor and other input use by commodity, and adjusting land allocation. For instance, land area allocated to tobacco is expected to be an increasing function of expected own-price and expected marginal yield and a decreasing function of input costs. In addition, farm households decide how to allocate their own time between on-farm and off-farm work as well as leisure time. To maximize utility in the absence of uncertainty, households allocate time to farm labor until the marginal returns to farm labor are just equal to the off-farm wage.[1] However, when the income risk of working off farm is less than working on farm, a risk-averse household will allocate more of its labor to off-farm work to reduce income variability, even though expected consumption is lower (Bardhan and Udry).

Our dependent variables are allocation of land to tobacco (*ACRESGROWN*) and binary indicators of whether a farmer is actively searching for viable on-farm alternatives to tobacco (*ACTIVE*), whether the farmer has successfully identified ways to increase profits in nontobacco enterprises (*INCPROFIT*), whether the farm household has off-farm income (*OFFFARM*), and whether the primary farm operator has paid off-farm employment (*OWNOFF*). We categorize key factors expected to influence tobacco acreage and labor allocation decisions into five categories (household-specific characteristics [*HH*], resource endowments [*ENDOW*], market incentives [*MARKET*], risk and uncertainty [*RISK*], and government policy [*POLICY*]). These

[1] If the household devotes no time to off-farm employment, this implies that the off-farm wage rate does not exceed the shadow price of time spent farming, and households will allocate hours to on-farm work until the expected marginal utility of on-farm labor is equal to the shadow price of leisure.

factors are expected to affect each of our dependent variables. Thus, reduced-form equations for the management decisions modeled are

$$ACRESGROWN = ACRESGROWN(HH, ENDOW, MARKET, RISK, POLICY) \quad (1)$$

$$ACTIVE = ACTIVE(HH, ENDOW, MARKET, RISK, POLICY) \quad (2)$$

$$INCPROFIT = INCPROFIT(HH, ENDOW, MARKET, RISK, POLICY) \quad (3)$$

$$OFFFARM = OFFFARM(HH, ENDOW, MARKET, RISK, POLICY) \quad (4)$$

$$OWNOFF = OWNOFF(HH, ENDOW, MARKET, RISK, POLICY). \quad (5)$$

Each category of explanatory factors is described here along with the specific variables included within each for our empirical analysis. The primary data source for this article is a panel of 1,236 North Carolina tobacco farmers. The panel was drawn from 14 of the 15 highest-producing counties for flue-cured tobacco in the state and surveyed in 1997, 1999, 2001, and 2004 to date. Some of the questions in each of these surveys asked farmers for information about the previous 2 years. Thus, we have observations for selected variables (e.g., tobacco acreage) for up to 8 years. However, there has been substantial attrition over time, with 535 farmers who continue to have tobacco-related income responding to the 2004 survey. These data were combined with secondary data on average county wages and crop prices and yields.

Household-Specific Characteristics

Household preferences are proxied using demographic and other variables expected to influence farm household preferences and managerial ability. The variables used in the empirical analysis are age of the primary farm operator (*AGE*), age squared (*AGESQ*), dummy variables for primary operator gender (*MALE*), race (*WHITE*), educational attainment (less than high school [*ED_LTHS*], high school graduate [*ED_HS*], some college [*ED_SOMECOLL*], and college graduate [*ED_COLLGRAD*]), and tobacco use (*USETOBACCO*). We also included four dummy variables that indicated farmer perceptions that the following were barriers to them in reallocating farm output away from tobacco toward nontobacco commodities: unavailability of low-interest loans or grants for new business ventures (*BARR_LOANS*), personal lack of interest in growing or raising products other than tobacco (*BARR_INTEREST*), need for additional skills to grow or raise something other than tobacco (*BARR_SKILLS*), and a perception that nothing else was as profitable as tobacco (*BARR_PROFIT*).

In addition, dummy variables were included indicating whether the household was in a county where tobacco growers received targeted information regarding opportunities to produce nontobacco commodities from the Rural Advancement Foundation International and other partners. This information was provided between 1997 and 2001 in seven randomly selected counties chosen from the 14 largest flue-cured tobacco producing counties in North Carolina. Separate dummy variables were included to capture effects that occurred during the program (1997–2001) and postprogram to capture residual effects (*TX_DUR* and *TX_POST*, respectively).

Resource Endowments

These factors include the resources available to the landowner and include land, labor, and other assets. The labor variables used to represent these characteristics include dummy variables for whether the primary operator is married (*MARRIED*) and whether they have children (*CHILD*). Both were included to proxy additional household time endowment because data on the number of members of each household and their ages were not collected. Total acreage that is owned (*TOTALLAND*) is a measure of available land and is also a proxy for wealth. Total acreage data were collected only in the 2004 survey

and were assumed to be constant across the survey period.

Market Incentives

Variables included in this category include those explicitly related to exogenous economic determinants of decisions, such as prices, availability of markets, and infrastructure. We used future harvest period tobacco prices to represent tobacco price expectations (Foreman 2005). Because of a lack of cross-sectional price variation, we substituted expected revenue per acre (*ER_TOB*) for prices, calculated by multiplying the expected price by the yield reported by the survey respondents. For those that did not report their yield ($N = 62$), we used the average yield for respondents from that county. For expected returns to other crops (*ER_CROPS*), we used projected prices for corn and soybeans and actual future prices for cotton (USDA does not project prices for cotton) from various issues of the USDA publication *World Agricultural Supply and Demand Estimates* (USDA NASS 2005) and multiplied each by the county-level average yield over the past decade. Expected revenue for other crops was estimated at the county level because there were insufficient farm-specific data to estimate expected revenue by farm. We used factor analysis to construct an index for expected revenue from other crops often grown by North Carolina tobacco farmers.

Because there are likely to be more opportunities for marketing specialty agricultural products in areas close to urban centers, we included a dummy variable for farms located in urban counties or counties adjacent to urban counties (*URBAN*).[2] To proxy off-farm job opportunities, we used the average wage per job for each county for each year (*OFFFARM*), downloaded from the BEA Regional Economic Accounts (Bureau of Economic Analysis).[3] One of the most important input costs for tobacco growers is the price of leasing quota (*P_LEASE*). We used lease prices reported by survey respondents for 2002 and 2003 and scaled them back to earlier years based on the national cost for land and quota divided by the average yield (Foreman 2005). This assumes that all lease rates were changing at the same rate while maintaining their distribution across particular farms over time because we did not have farm-specific estimates of lease prices for earlier years. For households that did not report a lease price (most of whom reported that they did not lease from or to others), we used the average of reported lease prices per pound for their county to represent the lease price that would have been available to them had they chosen to enter the quota lease market.

Risk and Uncertainty

These variables reflect the risk and uncertainty in the market and institutional environment under which decisions are made, primarily yield and price variability. Farmer response to variability in farm profit will depend on farmer risk preferences. For risk-neutral farmers, positive price and yield shocks will increase total acreage planted and acreage allocation toward commodities with positive shocks even if there are increases in income variance. However, risk-averse farmers will demonstrate unambiguously negative responses to an increase in the variance of commodity price or yield. In addition, increasing variability of yields and/or prices is expected to increase the amount of time allocated to off-farm work for risk-averse farmers. Cross-price

[2] In addition, to providing greater opportunities for on-farm diversification into specialty crops, urban areas also tend to have greater job opportunities. Thus, *URBAN* may reflect both of these effects, which confounds the interpretation.

[3] The Bureau of Economic Analysis calculates this value on the basis of estimates of total wage and salary disbursements and total employment by county, with adjustments to Bureau of Labor Statistics data to account for gaps in data coverage. Regressions were also estimated using the average county manufacturing wage, the average county retail services wage, the average county construction wage, or the county unemployment rate. The results of using these alternative measures of off-farm opportunities do not differ substantially from those reported here in either magnitude or significance.

and cross-yield effects are typically negative because acreage in one crop is generally a substitute for acreage in another crop, although there may be complementarities due to rotation patterns.

Prices at harvest are unknown when acreage allocation decisions are made (though input prices are observed). However, there has been relatively little variation in the tobacco price in recent years, large part because of the programs in place to stabilize it. In addition, there is no cross-sectional variation in our data. For this reason, we only included measures of yield risk in the empirical model. Yield uncertainty depends on the characteristics of the land and labor endowments as well as external events such as weather, disease, and insect infestation. Tobacco yield risk was represented by a county-level value for tobacco yield variance from 1960 to 2003 (*YRISK_TOB*). To represent yield risk associated with alternative crops, a county-level index of yield variance was constructed using average yield data for cotton, corn, and soybeans from 1960 to 2003 (*YRISK_OTHCROPS*).

Government Policy

In addition to the variables described previously, there are a number of existing or potential government policies that could influence landowner decisions. These policies could enter through adjustments to expected prices (e.g., due to price supports), price variability (e.g., through price supports or crop insurance), or through dummy variables representing the presence of a policy. Of course, the most important policy that may have affected decisions regarding tobacco production over this time period is the tobacco quota program. Because all these policies are implemented at the national or market level, the only variation in them is over time. For this reason, we use year-specific binary variables to capture changes in quota and other policies. Individual year binary indicators are used for the *ACRESGROWN* regression because tobacco acreage was collected for two different years in each of the four surveys, whereas binary indicators for each survey year were used in the probit regressions of diversification activities because data for those dependent variables were collected for only a single year in each survey.

Model Estimation and Results

Table 1 summarizes the data used for this analysis. Farmers were predominantly white (94%) and male (92%) with just over 50% having a high school diploma or less. Most are married (87%) and have at least one child (92%). Almost 68% of farm households indicated active attempts to diversify on farm with nontobacco sources of income, 45% reported identifying ways to increase their profits on at least one crop other than tobacco, and just over 51% of farm households had off-farm income, with 19% of farm operators and about 50% of their spouses (for those that had spouses) working off farm. Farm operator age averaged just over 50 years. Average farm size is around 293 acres, while average area of tobacco grown is about 56 acres over the whole sample period.

Largely because of changes in quota, average tobacco acreage in our sample increased from 60 acres in 1995 to almost 72 acres in 1997 before beginning a steady decline to just over 42 acres in 2003. However, some farmers increased their acreage despite the quota reductions by buying or leasing additional quota from others. Out of 535 tobacco farmers continuing to have tobacco-related income who remained enrolled in our study, 71 (13%) increased their acreage by 10% or more between 1995 and 2003. There were 209 growers (39%), on the other hand, who decreased acreage grown by more than 44% (the percentage reduction in total flue-cured tobacco quota) between 1995 and 2003.

The tobacco acreage decision has two parts: (1) the decision to grow tobacco or not (e.g., some of the farmers in the sample lease their entire quota to others in some years and report zero acres of tobacco grown) and (2) the decision of how many acres of tobacco to grow conditional on growing tobacco. Thus, tobacco acreage grown (*ACRESGROWN*) was modeled using a two-part random effects model

Table 1. Descriptive Statistics for Variables Used in Estimation

Variable	*N*	Mean	Standard Deviation	Minimum	Maximum
ACRESGROWN	3,910	55.70	61.32	0	760
ACTIVE	1,922	0.6764	0.4679	0	1
INCPROFIT	1,477	0.4543	0.4980	0	1
OFFFARM	1,974	0.5147	0.4998	0	1
OWNOFF	1,973	0.1946	0.3960	0	1
AGE	1,997	53.07	11.98	19	92
AGESQ	1,997	2,959.68	1,311.65	361	8,464
MALE	2,012	0.9230	0.2667	0	1
WHITE	1,989	0.9412	0.2353	0	1
ED_LTHS	1,978	0.1319	0.3385	0	1
ED_HS	1,978	0.4146	0.4927	0	1
ED_SOMECOLL	1,978	0.2381	0.4260	0	1
ED_COLLGRAD	1,978	0.2154	0.4111	0	1
TOBACCO	1,919	0.4075	0.4914	0	1
BARR_LOANS	1,720	0.7145	0.4518	0	1
BARR_INTEREST	1,948	0.3368	0.4727	0	1
BARR_SKILLS	1,930	0.5332	0.4990	0	1
BARR_PROFIT	1,949	0.9040	0.2946	0	1
TX_DUR	4,028	0.1686	0.3744	0	1
TX_POST	4,028	0.1276	0.3337	0	1
MARRIED	1,917	0.8659	0.3408	0	1
CHILD	1,957	0.9152	0.2786	0	1
TOTALLAND	4,008	292.72	537.17	0	4,000
ER_TOB	4,028	4,396.17	1,005.16	1,295.7	8,644.62
ER_OTHCROPS	4,028	1.7420	1	0	3.6790
OFFWAGE	4,028	13.06	1.714	10.02	19.03
URBAN	4,028	0.3739	0.4839	0	1
P_LEASE	3,988	0.4874	0.2180	0.1469	2.6
YRISK_TOB	4,028	191.97	22.16	151.63	230.36
YRISK_OTHCROPS	4,028	1.9055	1	0	3.4760

Note: Data for *TOTALLAND* and *P_LEASE* were collected only in the 2004 survey but were used to extrapolate values for previous years. *TOTALLAND* for a given farm household was assumed to be constant over time, whereas *P_LEASE* was scaled to other years based on the relative national average tobacco quota lease price.

with a first-stage logit model for the decision to grow tobacco and a second-stage lognormal model for acreage grown (Tooze, Grunwald, and Jones). The model was fit both with and without correlated random effects between the two equations. Robust standard errors and regression techniques that incorporated within-farmer correlation resulting from repeated observations were employed in all regression analyses (Newey and West; Royall; Tooze, Grunwald, and Jones; White; Zeger and Liang).

After dropping observations with incomplete data, we used 3,484 observations in the equation for the decision to grow. Because the second part of the model is applied only to those that had nonzero acreage, the number of observations used in that part is reduced to 3,324. The model with correlated random effects was found to provide a better fit than the uncorrelated model based on likelihood ratio test and the Akaike Information Criterion. The correlation between the equations (ρ) can be calculated as

$$\rho = \frac{\rho\sigma_1\sigma_2}{\sqrt{\sigma_1^2\sigma_2^2}}, \tag{6}$$

where $\rho\sigma_1\sigma_2$ is the estimated covariance

between the two equations and σ_1^2 and σ_2^2 are the variance of the random effect for the occurrence (decision to grow) and intensity (acres grown) equations, respectively. Each of these parameters are statistically significantly different from zero ($p < 0.0001$), indicating that the random effects are significant and that the probability of nonzero tobacco acreage grown and the distribution of nonzero acreage are correlated with each other. For this model, the correlation was estimated to be 0.5.

Parameter estimates from the two-part random effects model with correlated random effects are shown in Table 2. Note that the variables that are significant in explaining these two decisions differ. The first-stage probability of continuing to grow tobacco rather than lease all owned quota to other farmers is significantly lower for farmers with college degrees, as expected. Interestingly, higher expected tobacco revenue was also associated with a lower probability of growing tobacco. This suggests that more efficient tobacco farmers are actually more likely to stop growing tobacco themselves and lease out their entire quota. These growers may have more productive land and better management skills, making them more likely to produce alternative commodities profitably.[4] As tobacco quota lease rates increased, these growers may then have been more likely to decide to lease out their quota and switch to alternative commodities.[5]

Farmers who indicated a lack of interest in diversification into nontobacco agricultural products or who reported that no other agricultural products were as profitable as tobacco were indeed more likely to continue growing tobacco. We also found that those who lived in counties with greater variability in tobacco yields were more likely to continue growing tobacco, which may indicate that there are greater returns to tobacco production experience in areas with more variable yields. It is also possible that counties with more variable tobacco yields have greater barriers to growing other crops on that land, such as poor soil and climate conditions.

The second part of the two-part models indicates that for farmers in the sample who grew tobacco, exogenous changes in quota were important determinants of acres grown. The time dummies are large and statistically significant, with positive effects from 1996 to 1998 and negative effects from 1999 onward reflecting changes in quota levels over time. Coefficients estimated for household-specific characteristics indicate the significance of these factors as determinants of tobacco acreage grown.[6] Tobacco acreage increases with age but at a decreasing rate. Households with white males as the primary operator (about 87% of survey respondents) have significantly larger tobacco acreage than those headed by women or minorities. Households that indicated a need for additional skills before they could diversify into nontobacco alternative as a barrier to diversification had significantly more tobacco acreage. Conditional on choosing to grow tobacco, indicating a lack of interest in diversifying into products other than tobacco or a lack of other agricultural products that were as profitable as tobacco did not have a significant impact on tobacco acreage grown.

We found that the program to provide information on alternative crop opportunities in treatment counties achieved borderline statistical significance and reduced the probability of growing tobacco in the first step equation with a lagged effect ($p < 0.11$ for *TX_POST*). However, the program impact

[4] We thank an anonymous reviewer for making this observation.

[5] One caveat is that we do not have data on farm-level production costs and that only the 2004 survey collected data on tobacco yields. Thus, it is also possible that our constructed measure of expected revenue is not a good reflection of expected profits (e.g., production costs are higher on farms with higher expected revenue due to more intensive input use).

[6] As pointed out by an anonymous reviewer, given the relatively homogeneous population of tobacco farmers, the effects of demographic variables may be less important in providing information about which farmers will diversify than in demonstrating the potential impedance to market signals presented by the large block of older farmers who may be relatively uninterested in diversification away from tobacco.

Table 2. Two-Part Model of Tobacco-Growing Decision with Correlated Random Effects

	Decision to Grow	*ACRESGROWN* Intensity
AGE	−0.016	0.035***
	(0.010)	(0.010)
AGESQ	−0.000	−0.000***
	(0.001)	(0.000)
MALE	0.555	0.451***
	(0.639)	(0.085)
WHITE	0.631	0.403**
	(0.944)	(0.177)
ED_HS	−1.104	0.028
	(0.738)	(0.072)
ED_SOMECOLL	−1.081	0.018
	(0.803)	(0.077)
ED_COLLGRAD	−1.576*	−0.043
	(0.811)	(0.084)
USETOBACCO	−0.685*	−0.031
	(0.374)	(0.029)
BARR_NOINTEREST	1.167***	0.031
	(0.350)	(0.019)
BARR_SKILLS	0.221	0.055***
	(0.316)	(0.019)
BARR_PROFIT	1.277**	0.005
	(0.429)	(0.029)
TX_DUR	0.052	0.106***
	(0.588)	(0.032)
TX_POST	−0.763	0.073**
	(0.477)	(0.037)
MARRIED	1.073**	0.062
	(0.529)	(0.053)
CHILDREN	0.755	0.004
	(0.632)	(0.059)
TOTALLAND	0.000	0.001***
	(0.000)	(0.000)
ER_TOB	−0.001**	−0.000
	(0.000)	(0.000)
ER_OTHCROPS	−0.166	−0.394***
	(1.782)	(0.126)
OFFWAGE	−0.130	−0.021
	(0.130)	(0.017)
URBAN	−0.750	−0.215*
	(0.899)	(0.123)
P_LEASE	0.647	−0.103
	(1.056)	(0.115)
YRISK_TOB	0.022**	0.002
	(0.011)	(0.002)
YRISK_OTHCROPS	0.093	0.058
	(0.358)	(0.052)
1996	2.476	0.545***
	(2.321)	(0.142)
1997	0.518	0.416***
	(1.334)	(0.082)
1998	−0.262	0.073*
	(0.848)	(0.041)
1999	−1.539	−0.405***
	(1.449)	(0.104)
2000	−2.344	−0.806***
	(2.467)	(0.180)
2002	−3.568	−1.006***
	(3.220)	(0.237)
2003	−3.521	−0.832***
	(2.204)	(0.165)
Constant	7.110	2.868***
	(5.619)	(0.595)
σ_1^2	8.623***	
	(1.575)	
σ_e^2		0.145***
		(0.004)
σ_2^2		0.736***
		(0.048)
$\rho\sigma^1\sigma^2$		1.258***
		(0.226)
Observations	3,484	3,324

Note: Standard errors are in parentheses. Superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Education level of less than high school (*ED_LTHS*) is the omitted education category dummy variable, and 1995 is the omitted time dummy variable (2001 is not included because no data were collected for that year).

was positive on tobacco acreage both during the program and after the program ended. This may be partly due to program effects that improved awareness of changing market conditions and that may have increased expectations of a buyout. Since expectations of a buyout provided incentives to continue growing tobacco in order to receive buyout payments, it is possible that farmers who received program information about changes taking place in tobacco markets and the need to identify nontobacco income alternatives made rational decisions to grow more tobacco in the short run to acquire capital needed for long-run adjustments in response to the anticipated market changes.

Other than total land owned, which has a positive effect on tobacco acreage grown, coefficients of variables used to represent household resource endowments are not significant. While larger land endowments are expected to reduce barriers and provide greater opportunities for pursuing nontobacco crops and commodities, the positive sign suggests that there may be increasing returns to scale that create incentives for specialization in tobacco. Alternatively, it could reflect a variant of the putty-clay model of capital equipment in which larger tobacco farms own more equipment that is not easily substituted or adapted to other crops, thus reducing incentives to alter their output and technology (Johansen). Because of their greater resources, these farms may also be able to maintain substantial tobacco production while simultaneously exploring alternative income opportunities.

Although the sign on expected tobacco revenue per acre is not significant, this could be due to reductions in price incentives that result from existence of government price support programs as well as expectations that there would be a buyout that would provide compensation for both quota holders and growers. Now that the tobacco quota has been removed, it is expected that the sign on this variable will become positive for future years. Coefficients for expected revenue from other crops and being located in an urban area are statistically significant and show the anticipated negative effects. The tobacco lease price and average off-farm wages for the county where the farm household is located also have the expected negative sign but are not significant.

Regression analyses of efforts to identify or improve profitability of alternative crops and off-farm labor decisions used generalized estimating equations with a probit link. Dependent variables were binary indicators that the farmer is actively searching for ways to identify nontobacco alternatives (*ACTIVE*), that farmers indicated success in finding ways to increase profits in nontobacco enterprises (*INCPROFIT*), that the farm household has off-farm income (*OFFFARM*), and that the farm operator works a paid off-farm job (*OWNOFF*). As in the two-part model described previously, robust standard errors and regression techniques that incorporated within-farmer correlation resulting from repeated observations were employed.

Tables 3 and 4 summarize the estimation results and the corresponding marginal effects of probit models of effort and success in shifting to nontobacco output as well as participation in off-farm work.[7] Our results show that whether a farm household is actively attempting to identify opportunities for nontobacco income sources (*ACTIVE*) is most strongly correlated with higher education (high school graduate or above). The probability that a household is actively seeking to diversify is about 15 to 17 percentage points higher for those with at least a high school diploma relative to those that did not finish high school at the data means. This finding supports our conjecture that education is associated with managerial acumen. It is also consistent with our conjecture that farmers looking to shift production away from tobacco during this time period were more entrepreneurial and had better alternative opportunities than their less educated counterparts. White males are significantly less likely to show interest in nontobacco alternatives. Not surprisingly, households that indicated lack of interest in nontobacco alternatives were also less likely to report actively seeking them, but other reported barriers were not significant. Being married is positively correlated with interest in identifying nontobacco alternatives. This is consistent with greater household time resources reducing information search costs. The only variable related to economic incentives that was significant was the tobacco lease price, which revealed the expected effect that households facing higher quota lease rates are

[7] Attrition-weighted regressions were also estimated to account for possible bias introduced by nonrandom dropout (Fitzgerald, Gottschalk, and Moffitt; Little and Rubin). Results were similar to those presented here and are available from the authors on request.

Table 3. Probit Regressions of Tobacco Farmer Diversification Activities

	ACTIVE	*INCPROFIT*	*OFFFARM*	*OWNOFF*
AGE	−9.03e-3	2.68e-2	0.122***	0.159***
	(2.67e-2)	(2.66e-2)	(0.030)	(0.051)
AGESQ	8.26e-5	−3.22e-4	−1.43e-3***	−0.1.57e-3***
	(2.47e-4)	(2.46e-4)	(2.89e-4)	(4.46e-4)
MALE	−0.538***	6.37e-3	0.157	−0.566**
	(0.181)	(0.186)	(0.184)	(0.237)
WHITE	−0.383*	−0.339	−0.464**	−0.072
	(0.197)	(0.234)	(0.231)	(0.263)
ED_HS	0.478***	−0.059	0.300*	0.433*
	(0.147)	(0.148)	(0.159)	(0.237)
ED_SOMECOLL	0.451***	−0.074	0.644***	0.790***
	(0.155)	(0.165)	(0.171)	(0.238)
ED_COLLGRAD	0.517***	0.072	0.529***	0.811***
	(0.163)	(0.166)	(0.180)	(0.234)
USETOBACCO	0.060	−0.112	0.018	−0.099
	(0.077)	(0.091)	(0.074)	(0.095)
BARR_LOANS	0.038	0.011	0.052	0.129*
	(0.073)	(0.086)	(0.070)	(0.075)
BARR_INTEREST	−0.168**	−0.099	−0.011	−0.077
	(0.076)	(0.083)	(0.063)	(0.065)
BARR_SKILLS	−1.48e-3	−0.032	0.103*	0.051
	(6.85e-3)	(0.075)	(0.059)	(0.065)
BARR_PROFIT	0.110	0.021	0.049	−0.010
	(0.123)	(0.137)	(0.099)	(0.123)
TX_DUR	0.184*	0.209	0.099	0.131
	(0.108)	(0.129)	(0.098)	(0.099)
TX_POST	−0.027	0.103	0.143	−0.014
	(0.139)	(0.154)	(0.130)	(0.138)
MARRIED	0.291**	0.014	0.757***	−0.302*
	(0.135)	(0.132)	(0.181)	(0.159)
CHILDREN	−0.045	0.107	0.002	0.063
	(0.145)	(0.169)	(0.156)	(0.207)
TOTALLAND	1.17e-4	1.84e-4**	−9.75e-5	−3.02e-4**
	(8.47e-5)	(7.88e-5)	(1.02e-4)	(1.54e-4)
ER_TOB	5.36e-6	−3.98e-5	−4.27e-5	−2.97e-5
	(4.38e-5)	(4.88e-5)	(5.26e-5)	(5.86e-5)
ER_OTHCROPS	0.207	0.338	−0.291	0.016
	(0.287)	(0.305)	(0.320)	(0.326)
OFFWAGE	0.024	−0.015	4.40e-3	0.103***
	(0.027)	(0.031)	(3.04e-2)	(0.036)
URBAN	−0.068	−0.204	−0.151	0.339
	(0.180)	(0.198)	(0.214)	(0.221)
P_LEASE	0.347*	−0.142	0.318	0.221
	(0.208)	(0.224)	(0.216)	(0.272)
YRISK_TOB	−3.04e-3	4.35e-3*	−0.001	−8.24e-3***
	(2.16e-3)	(2.38e-3)	(0.003)	(2.96e-3)
YRISK_OTHCROPS	0.067	0.151**	0.126	0.017
	(0.069)	(0.075)	(0.080)	(0.095)
SYR99	0.433	−0.070	−0.327	−0.143
	(0.278)	(0.296)	(0.309)	(0.321)
SYR01	0.749	0.490	−0.812	−0.098

Table 3. (Continued)

	ACTIVE	*INCPROFIT*	*OFFFARM*	*OWNOFF*
	(0.708)	(0.752)	(0.800)	(0.821)
SYR04	0.665	0.133	−0.869	−0.054
	(0.669)	(0.707)	(0.756)	(0.780)
Constant	−0.108	−1.788	−2.061	−4.391**
	(1.312)	(1.451)	(1.450)	(1.956)
Observations	1,510	1,185	1,548	1,548

Note: Standard errors are in parentheses. Superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

more likely to attempt to identify nontobacco alternatives.

The treatment effect for *ACTIVE* is positive and borderline statistically significant as expected during the period when the education program was in place. However, the effect is not significant in later years, suggesting that time and competing incentives may have helped to attenuate program effects. The year-specific binary indicators show that interest in nontobacco alternatives has increased relative to 1997 across all observations but not very strongly. The slight elevation in 2001, though not statistically significant, may reflect increased interest following the MSA in 1998 that raised cigarette prices and reduced demand for tobacco products. That interest may have been dampened by Phase II payments and increased talk of a buyout, which would have increased farmers' incentives to continue to grow tobacco in order to receive buyout funds. This could explain why efforts to identify nontobacco alternatives are not more strongly related to economic incentives in our results.

The second column of Table 3 contains coefficient estimates for the probability of success in identifying ways to increase profitability of alternative agricultural products through additional processing or marketing activities (*INCPROFIT*). There are few significant variables in this regression, suggesting that success in finding ways to increase profits on nontobacco alternatives is not systematically related to many of the variables in our model. Total acres owned is a positive predictor of alternative product profitability, which is consistent with greater resources aiding farmers in making profitable investments. In addition, higher yield risk for both tobacco and other crops is found to increase the probability of finding ways to increase profits. This may result because those with higher yield risks also have higher incentives for reducing those risks through new or innovative production practices or marketing arrangements. The treatment effect during the period when the educational program was in place has borderline statistical significance ($p < 0.105$) but is not close to significance in post program years.

The finding of few significant variables could also be due to inconsistencies in self-reported success in identifying ways to increase profits, especially if households with different characteristics are systematically using different definitions of "success" or "profit." More educated, higher-income households may require higher returns in order to consider an alternative enterprise successful since they will tend to have higher opportunity costs for their time. If respondents' responses reflect variations in the value of their own time, it could dampen differentiation in success, especially for more educated households that would be expected *a priori* to have greater probability of increasing profits on alternative agricultural products through innovation.

In the *OFFFARM* regression, we find age and age squared to be significant determinants of whether the household derives income from off-farm sources, as expected. Also as expected, higher educational attainment of the primary operator is strongly correlated with higher probability having off-farm income,

Table 4. Marginal Effects of Explanatory Variables on Diversification Activities

	ACTIVE	*INCPROFIT*	*OFFFARM*	*OWNOFF*
AGE	−3.21e-3	1.06e-2	0.049***	0.040***
	(9.52e-3)	(1.05e-2)	(0.012)	(0.013)
AGESQ	2.94e-5	−1.28e-4	−5.70e-4***	−3.99e-4***
	(8.78e-5)	(9.77e-5)	(1.15e-4)	(1.11e-4)
MALE	−0.166***	2.52e-3	0.062	−0.175**
	(0.046)	(7.37e-2)	(0.073)	(0.083)
WHITE	−0.123**	−0.134	−0.178**	−0.019
	(0.056)	(0.091)	(0.083)	(0.071)
ED_HS	0.165***	−0.023	0.119*	0.113*
	(0.049)	(0.059)	(0.063)	(0.063)
ED_SOMECOLL	0.150***	−0.024	0.247***	0.236***
	(0.048)	(0.065)	(0.061)	(0.078)
ED_COLLGRAD	0.169***	0.028	0.205***	0.245***
	(0.048)	(0.066)	(0.067)	(0.078)
USETOBACCO	0.021	−0.044	7.31e-3	−0.025
	(0.027)	(0.036)	(2.96e-2)	(0.024)
BARR_LOANS	0.014	4.17e-3	0.021	0.032*
	(0.026)	(3.42e-2)	(0.028)	(0.018)
BARR_INTEREST	−0.060**	−0.039	−4.52e-3	−0.019
	(0.028)	(0.033)	(2.51e-2)	(0.016)
BARR_SKILLS	−5.25e-4	−0.013	0.041*	0.013
	(2.44e-2)	(0.030)	(0.023)	(0.017)
BARR_PROFIT	0.040	8.35e-3	0.019	−2.57e-3
	(0.045)	(5.40e-2)	(0.040)	(3.13e-2)
TX_DUR	0.064*	0.083	0.040	0.034
	(0.036)	(0.051)	(0.039)	(0.027)
TX_POST	−0.010	0.041	0.057	−3.55e-3
	(0.050)	(0.061)	(0.051)	(3.48e-2)
MARRIED	0.108**	5.68e-3	0.287***	−0.085*
	(0.052)	(5.22e-2)	(0.060)	(0.048)
CHILDREN	−0.016	0.042	5.99e-4	0.016
	(0.051)	(0.066)	(6.22e-2)	(0.050)
TOTALLAND	4.16e-5	7.29e-5**	−3.89e-5	−7.65e-5**
	(3.02e-5)	(3.12e-5)	(4.05e-5)	(3.89e-5)
ER_TOB	1.91e-6	−1.58e-5	−1.70e-5	−7.53e-6
	(1.56e-5)	(1.94e-5)	(2.10e-5)	(1.49e-5)
ER_OTHCROPS	0.074	0.134	−0.116	3.99e-3
	(0.102)	(0.121)	(0.128)	(0.083)
OFFWAGE	8.69e-3	−6.07e-3	1.75e-3	0.026***
	(9.65e-3)	(1.23e-2)	(1.21e-2)	(0.009)
URBAN	−0.024	−0.080	−0.060	0.090
	(0.065)	(0.078)	(0.085)	(0.061)
P_LEASE	0.123*	−0.056	0.127	0.056
	(0.074)	(0.089)	(0.086)	(0.069)
YRISK_TOB	−1.08e-3	1.72e-3*	−5.74e-4	−2.09e-3***
	(7.68e-4)	(9.45e-4)	(1.03e-3)	(7.44e-4)
YRISK_OTHCROPS	0.024	0.060**	0.050	4.33e-3
	(0.025)	(0.030)	(0.032)	(0.024)
SYR99	0.147*	−0.028	−0.130	−0.035
	(0.085)	(0.117)	(0.121)	(0.076)
SYR01	0.234	0.194	−0.310	−0.024

Table 4. (Continued)

	ACTIVE	*INCPROFIT*	*OFFFARM*	*OWNOFF*
	(0.187)	(0.290)	(0.279)	(0.198)
SYR04	0.214	0.053	−0.332	−0.014
	(0.190)	(0.281)	(0.262)	(0.930)
Observations	1,510	1,185	1,548	1,548

Note: Standard errors are in parentheses. Superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

with larger effects for farmers with some college or who are college graduates than for those who are high school graduates. Being married has a positive effect on the probability of off-farm income, which is consistent with our finding that the spouses of farm operators are more often the source of off-farm household income than are the operators themselves. None of the economic variables is statistically significant in this regression, but households that indicated a need for more skills before they could successfully switch to nontobacco outputs were more likely to have off-farm income. This may reflect trade-offs between investment in developing farm managerial skills and off-farm employment. Working off farm reduces time available for on-farm managerial effort and encourages adoption of convenient crops and production technologies that reduce managerial time requirements (Fernandez-Cornejo, Hendricks, and Mishra; Smith).

Similar to the *OFFFARM* model, the *OWNOFF* model results show age and age squared to be important determinants of whether farm operators choose to work off farm. Male farm operators are less likely to work off farm, as are operators who are married. As was seen with *OFFFARM*, education has a strong positive effect on the farm owner/operator participating in off-farm work. Farm operators owning larger plots of land are also less likely to work off farm, as are farmers with higher tobacco yield variability, which may indicate that there are higher returns to farm managerial skill for larger farms and/or for farms located in regions where yields are more variable and therefore a higher off-farm reservation wage. In addition, operators who identified access to loans as a barrier to growing nontobacco crops were more likely to work off farm, suggesting that they might be working off farm to accumulate capital. It may also be that working off farm has limited their interest in nontobacco crops to those with low managerial input technologies and that may have substantial capital requirements. As expected, an increase in county average hourly wage increases the probability of owner off-farm employment. The marginal effect of a $1.00 increase in hourly wage is a 3% increase in the probability of working off farm.

Discussion and Conclusions

Changes taking place in tobacco markets have increased tobacco farmer interest in identifying nontobacco alternatives and alternative income sources. In early 2004, about a third of our tobacco-growing survey respondents indicated they would stop growing tobacco if there were a quota buyout. Our findings suggest that farmers' decisions about tobacco acreage have been shaped in expected ways by the expected revenue associated with substitute crops, self-identified barriers to cultivating nontobacco alternatives, location within an urban county, and annual changes in tobacco quotas. In addition, household and farmer characteristics are significant determinants of efforts to shift to nontobacco enterprises. The most consistent and important of these is farmer education, which predicts reduced probability of growing tobacco and increased probability of working off farm and attempting to identify nontobacco alternatives. This is consistent with our conjecture that farmers who are better educated would be among the first to explore alternative nontobacco enterprises because education proxies entrepreneurial acumen as well as

increasing the set of alternative opportunities these farmers confront. It may also be that better-educated farmers perceived the discounted value of uncertain future tobacco buyout payments more accurately and began shifting resources away from tobacco production as market returns declined.

During the period of this study, there was relatively little change in tobacco prices, but there were substantial increases in tobacco quota lease rates as quotas were reduced (Snell). Lease rates were a major input cost and had a large effect on expected net returns. For this reason, we conjectured that rising lease rates might play a larger role in farmers' decision making than the other market variables included. The results from the *ACTIVE* regression are consistent with this conjecture, although the effect is not seen in the other regressions. Interestingly, expected tobacco revenue per acre actually had a negative effect on the probability of continuing to grow tobacco rather than lease quota to others, which is consistent with these farmers having more productive inputs and management/entrepreneurial skills transferable to alternative activities.

Not surprisingly, we found that self-reported barriers affect farmers' decision making. Clearly, farmers with no interest in nontobacco alternatives or who believed that nothing is more profitable than tobacco were more likely to grow tobacco. The proportion of tobacco farmers in our study who reported no interest in growing other crops in 1997 (37%) had declined to 30% by 2004, suggesting that market forces may have become more salient. Farmers in this group were less well educated. We conjecture that the lack of interest reflects limited opportunity sets for alternative enterprises, either because off-farm work is not available at their educational level or because their productivity in other enterprises would be lower than in tobacco growing. Our 2003 survey sample had 51.8% of tobacco farms reporting off-farm work by either the primary operator (7.0%) or their spouse (30.9%) or both (13.8%), all lower than the percentages working off farm for farm households overall. Needing additional skills to grow other crops had a positive effect on both acres of tobacco grown and on the probability of having off-farm income. These findings document the importance of helping at least some tobacco farmers to acquire the skills necessary to transition to other crops.

The results confirm that prior to the 2004 tobacco quota buyout, some North Carolina farm households wished to shift output away from tobacco and to identify other sources of income. Increased interest in altering crop mix and income sources is consistent with market changes such as declining domestic tobacco consumption and increased foreign competition, sharp reductions in the tobacco quota, and the expected end of the tobacco price support system. The confounding influence of the impending tobacco quota buyout, which created incentives to grow tobacco in order to qualify for buyout payments, could account for the relatively small part that economic variables appear to play in predicting successful identification of profitable alternatives and increasing farm operators' off-farm work. However, other factors almost certainly played a role in dampening farmer response to economic incentives. All 14 counties in this study have been designated as "economically distressed and/or tobacco dependent" by the Golden Leaf Foundation, a North Carolina grant-making organization that disburses MSA funds for economic development in such counties (Golden LEAF Foundation). The North Carolina Center for Economic Development reports that between 2000 and 2003, there were more than 70,000 layoffs in rural North Carolina counties, while more than 190 textile and apparel mills closed. During that same period, North Carolina moved from the 12th-lowest unemployment rate in the United States to the fifth highest in 2002 with rural counties hardest hit (North Carolina Rural Economic Development Center). These statistics suggest that opportunities for off-farm employment, particularly among less well educated farmers in economically depressed counties, may have been significantly restricted. In addition, farm income from tobacco declined by 31% between 2001 and 2002 because of drought and

disease (Foreman 2004). Depressed economic circumstances in rural counties may also have translated into reduced demand for produce and other farm products, at least in local markets, further reducing profitability of nontobacco alternatives.

Researchers, agricultural development policymakers, and public health advocates have been working for decades to encourage development of value-added and specialty products that would enable farms to shift away from tobacco while maintaining or increasing their profitability. The results presented here provide some evidence that these efforts, coupled with rapidly changing market incentives, have borne some fruit. However, our results suggest that success in reducing tobacco dependence was likely concentrated among those farmers with more resources and managerial and entrepreneurial skills. An interesting question is whether some of these farmers may actually increase their tobacco production now that the quota system has been removed and they can more readily take advantage of economies of scale. Those who are less well educated and who have access to fewer resources are at risk and have fewer options. They may have been slower to explore alternatives to prepare for post buyout conditions and will likely find it more difficult to compete in a freer tobacco market. The challenge for them and for policymakers will be to find sufficient sustainable sources of income.

Individual small and midsized tobacco farmers are unlikely to realize large-enough payments from the tobacco quota buyout to provide the resources necessary to retool and develop the new skills necessary to make this transition. Tobacco-growing states typically devote MSA funds to aid farmers in transitioning out of tobacco. Those funds could help to supplement buyout payments and facilitate shifts to nontobacco alternatives, but these funds have tended to shift away from agricultural initiatives over time (Jones et al.). Further, postbuyout research is needed to sharpen estimates of tobacco farmers' responsiveness to economic incentives now that the quota system has been dismantled. The answers to these questions may well determine the future of small to medium-sized tobacco-dependent family farm enterprises and their communities.

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