



Purpose To distribute the attached Technical Note, "Understanding and Calculating Foregone Income."

Expiration Date. Effective upon receipt.

Explanation. This technical note is one of a series. It was developed to provide guidance to NRCS personnel in using and calculating foregone income appropriately and consistently throughout the agency in the conservation planning process. The most successful conservation plans address the landowner's/producer's resource concerns while maintaining farm or ranch viability. This technical note attempts to address one of the main economic considerations involved with implementing conservation practices and activities on agricultural lands: reduced revenue.

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ECONOMICS TECHNICAL NOTE

Understanding and Calculating Foregone Income

By

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NRCS assists land owners in managing natural resources on private land. Our core “product” is a conservation plan that provides a roadmap to address natural resource problems on private land. The most successful conservation plans address the landowner’s/producer’s resource concerns while maintaining farm or ranch viability. Therefore, it is the policy of the NRCS that economic principles are included in all planning and agency resource allocation activities (Title 200, General Manual, Part 400, Subpart A). This document is part of a series designed to assist in the development of those plans.

Guiding Principles in Calculating Foregone Income

Introduction

There are two main economic considerations involved with implementing conservation practices and activities on agricultural lands: *incurred costs* and *reduced revenue*. Incurred costs include those related to planning, design, materials, installation, labor, management, maintenance, and training. Reduced revenue is generated mainly from reduced production. This paper focuses on how to combine these concepts to produce an estimate of net income lost, or foregone income (FI). The end result is a quantifiable measure of the amount of lost income (if any) between a producer’s “baseline net income” and the reduced income as a result of the adoption of an approved conservation practice(s) (CP).

The “baseline net income” considers non-Federal-program-supported income and cost streams associated with crop and animal production over a defined historical period, say a 3- or 5-year period. It does not consider the impact of the CP on future expected income and cost streams. Although the calculation of FI is a straightforward application of economic principles, its appropriate application to NRCS programs requires judgment based on baseline “typical” production practices,

the motivation of CP adoption, and other factors influencing the producer's decision to depart from baseline conditions.

Note: Throughout the document, CP refers to conservation practices supported by NRCS to address targeted NRCS resource concerns.

Definition

Foregone income includes lost net income from a change in land use or land taken out of production, or the opportunity cost of accepting less farm income, with the aim of improving natural resource conditions for the landowner and the public at large. FI may be a one-time cost (such as deferred grazing during range or pasture establishment) or may also be an ongoing cost, such as an annual net income loss from crop production replaced by a conservation buffer.

FI represents the change in the producer's ability to generate income as a result of implementing conservation practices. When CPs are adopted, the "baseline net income" may be affected by a change in three key producer's economic concerns:

- (1) Gross revenue
- (2) Variable costs
- (3) Idling fixed resources

Gross revenue can change as a result from quantity and quality effects. Reduced crop or animal output can occur within less productive units being employed (crop acres or livestock stocking rates) as a result of the CP, such as in some conservation crop rotations.

CP adoption can also alter variable input use (such as fertilizer rates, or selecting different pest management practices), which can increase or decrease baseline production costs.

Although fixed costs may remain constant, CP adoption could idle fixed resources and reduce the producer's ability to generate income to off-set remaining cost obligations associated with those idled fixed assets, such as land costs.

General Rule

In cases when CPs affect livestock numbers or take land out of production, such as with the creation of grassed waterways, the FI calculation must consider the impact on the landowner's ability to generate revenue to offset fixed costs (even if those fixed costs are implicit, i.e., the producer owns the land outright). When CP adoption

does not involve taking land or AUMs out of production, FI is simply the difference in the change in the baseline net income resulting from adoption of the CP.

Special Considerations With Respect to Calculating Foregone Income

A. Purpose: FI calculations are only considered as a result of the adoption of a CP by the landowner, which must be associated with environmental benefits. Confusion can arise because changes in net return can result from a wide range of other factors influencing the landowner's land use and crop/livestock enterprise management strategies. These factors may include—

- (1) Economic decisions (higher expected prices for one crop over others).
- (2) Marketing decisions (shift away from conventional to organic production).
- (3) Strategic decisions (to participate in Government commodity programs to maintain production base for certain crops).
- (4) Best agronomic practices (to adopt crop rotations that maximize long-term production goals).
- (5) Compliance with environmental requirements (delayed harvesting to protect threatened and endangered species).
- (6) Other factors related to historical land stewardship decisions and “real-time” site-specific conditions.

Note: *The Farm Bill currently allows financial assistance payments for foregone income. However, financial assistance payments are a policy issue, not an economic issue, and should be deferred to program and policy leaders who must consider many other factors besides the economic ones presented in this paper.*

B. Extent of Disruption: In cases where the change in fixed costs are minor or involves a short amount of transition time, FI is calculated by simply comparing net returns between the “baseline net income” scenario and “post-CP adoption” scenario. However, in cases where the adoption of the CP involves a large piece of productive land, a significant change in machinery and other fixed inputs, and/or a lengthy period of implementation, FI may need to consider these fixed costs and the lost opportunity to produce income.

Note: *A main consideration with respect to this fixed cost question is: how fungible is the input – how easily can the input be transferred for use in another part of the operation? If an input cannot readily be transferred and used in another use in the operation, such as land taken out of production, it is fixed. If an input can be moved easily, it can be treated as a variable input.*

C. Nature of conservation practice with respect to “conversion” versus “enhancement” activities – When implementation of CPs alter current production systems (make a sharp departure from the “baseline net income”), FI is a valid concern. Such would be the case when wetlands are created or trees and shrubs are established, thereby diverting land from a commercially productive use. When the conservation activity is an enhancement that is mostly a management-intensive activity, it may not merit FI consideration. Such would be the case when non-farmed wetlands are enhanced or restored, or when working lands are managed more intensely with no or little negative impact on net income. If FI is to be considered in such cases, extra attention is needed to fully document and explain changes in gross revenue and variable costs.

D. Quality of Land Important – Crop and forage production budgets used to construct the “baseline net income” assume that the land is productive and employed fully in commercial pursuit. This may not be the case for some field border or riparian areas. In such cases, the “baseline net income” assumptions may lower gross revenue to reflect those more typical situations – say a 30-percent yield reduction for field borders – without any adjustments to variable costs.

E. Risk – The calculation of FI should not include elements of risk with the adoption of the approved CP. For example, FI may not be appropriate when yield risk to the landowner increases when nitrogen application is reduced as part of an approved crop management practice.

F. Other Considerations – The FI calculation must consider the impact of CP adoption on the producer to generate income (produce the original income to offset fixed costs associated with idled resources) as well as alter variable costs. In cases where the adoption of the CP reduces the landowner’s ability to earn sufficient revenue to offset their fixed costs associated with idled resources by the adoption of the CP, economic logic would support recognizing an estimate of the loss in net returns plus an estimate on the impact on the landowner’s ability to offset fixed costs in calculating FI. Failure to correctly estimate FI reduces the landowners’ tendency to adopt the CPs, lowering NRCS’s desired goals to achieve a high level of environmental benefits through voluntary landowners’ actions.

Examples of Foregone Income Calculations

While the previous discussion may seem complicated, most individuals can understand the concept of FI with a clear and concise way to apply this concept in real-world situations. The following three examples illustrate how FI is calculated involving conservation practices that include a structural change, a management change, and a vegetative change. Finally some additional information is provided on crop budgets and how they can be used to calculate FI.

Structural: The installation of a water and sediment control basin (WASCOB) takes land out of production during the growing season for an extended period of time, making it no longer available to a farm operating in a corn-soybean rotation. FI would be calculated on the area taken out of production by the WASCOB, plus the area of crops damaged or destroyed during the construction process. To calculate FI in this situation, one would need to know the average net income for the crop rotation and the total amount of area affected.

Net Income from Corn	\$400/Acre
Net Income from Soybeans	\$300/Acre
Net Income from Corn/Soybeans Rotation	$(\$400+\$300)/2 \text{ Years} = \$350/\text{Acre}$

Foregone income equals \$350 per acre times the number of acres impacted by this practice activity.

Management: The adoption of a conservation crop rotation practice, which moves an operation from a corn-soybean rotation to a corn-soybean-wheat rotation might be expected to lower average gross revenue. FI would be calculated on the difference in income for adopting the conservation crop rotation. To calculate FI, one would need to know the average net income for each of the crops, evaluate the rotations, and complete a net income change comparison.

Net Income from Corn	\$400/Acre
Net Income from Soybeans	\$300/Acre
Net Income from Wheat	\$200/Acre

Initial crop rotation corn/soybeans	$(\$400+\$300)/2 =$
\$350/Acre	
Conservation crop rotation corn/soybeans/wheat	$(\$400+\$300+\$200)/3 =$
\$300/Acre	

Initial rotation \$350 – conservation rotation \$300 = \$50/Acre FI

A good question would be, “what if the value does not decrease?” If the adoption of the conservation crop rotation does not result in a decrease in income, there would be no FI. For example, moving from corn-soybean to corn-alfalfa-alfalfa:

Net Income from corn	\$400/Acre
Net Income from Alfalfa, year 1	\$275/Acre
Net Income from alfalfa, year 2	\$375/Acre
Conservation rotation	$(\$400+\$275+\$375)/3 = \$350/\text{Acre}$

Initial rotation \$350/Acre – conservation rotation \$350/Acre = \$0 FI

Vegetative: The adoption of a deferred grazing program to address a resource

concern would be expected to lower gross revenue. FI would be calculated using the value per AUM (animal unit month), the number of AUMs produced per acre per year (stocking rate), and the percent of an AUM not grazed during the year.

AUM value	\$20
Stocking rate	2 AUM/Acre
Deferred loss	35%

$(\$20/\text{AUM} \times 0.35) = \7 FI per AUM of deferred grazing
 $\$7 \times 2 \text{AUMs/Acre} = \14 FI per acre

Crop Budgets - In most cases, the numbers and values that are used to calculate FI can be drawn from crop budgets. Sample crop budgets are shown below so one can see how the differences in fixed costs and operating (variable) costs are accounted for. There can be considerable variation in values from year to year. It is recommended that 5-year average prices, costs, and yields be used; when this information is not available, it is recommended that the best available data possible be used and assumptions be made transparent.

	<i>dollars per planted acre/year</i>		
Gross value of production (income)	<u>Soybeans</u>	<u>Corn</u>	<u>Wheat</u>
Yield	45 bu/Ac	170 bu/Ac	65 bu/Ac
Price	<u>\$10.00</u>	<u>\$4.00</u>	<u>\$6.00</u>
Total, gross value of production	\$450.00	\$680.00	\$390.00
Operating (variable) costs:			
Seed	72.00	126.68	56.53
Fertilizer	66.61	155.18	116.40
Chemicals	29.50	26.95	8.26
Custom operations	10.81	15.53	15.91
Fuel, lube, and electricity	16.87	27.76	20.95
Repairs	13.98	22.45	17.12
Purchased irrigation water	0.00	0.00	0.00
Interest on operating capital	0.27	0.17	0.24
Total, operating costs	\$210.04	\$374.72	\$235.41
Allocated (fixed) costs:			
Hired labor	1.61	2.64	2.75
Opportunity cost of unpaid labor	22.68	20.42	21.28
Capital recovery machinery & equip.	80.35	86.16	90.40
Opportunity cost of land (rental rate)	146.58	162.26	167.21
Taxes and insurance	7.57	8.18	8.54
General farm overhead	13.87	17.91	18.45
Total, allocated overhead	<u>272.66</u>	<u>297.57</u>	<u>308.63</u>
Total, costs listed	\$482.70	\$672.29	\$544.04
Value of production less total costs listed	-\$32.70	\$7.71	-\$154.04
Foregone income (Value of production less operating costs)	\$239.96	\$305.28	\$154.59

The value of production less operating costs from these budgets is commonly referred to as “net farm income” and for agency purposes in most cases can be used to represent the FI for that individual crop. If an acre of an individual crop or crop combination is taken completely out of production as a result of the practice implementation, FI would equal “net farm income” (from sample budget):

An acre of Corn is impacted \$305.28/Acre FI
An acre of Corn-Soybean Combination $(\$239.96 + \$305.28) / 2 = \$272.62/\text{Acre FI}$

If FI needs to be calculated for a crop rotation, one can add each individual crop’s annual “net farm income” and divide by the number of years of that crop in the rotation. FI is calculated below from the crop rotation net income (from sample budget):

Corn-Soybean Rotation $(\$239.96 + \$305.28) / 2 = \$272.62/\text{Acre}$
Corn-Soybean-Wheat Rotation $(\$239.96 + \$305.25 + \$154.59) / 3 =$
\$233.27/Acre
FI Calculated from Change in Rotation $(\$272.62 - \$233.72) = \$38.90/\text{Acre FI}$

Data Sources

The use of transparent and reliable data is important when developing FI estimates. National Agricultural Statistics Service data for yield and price information is a source of verifiable, production based information that is collected on a statewide and localized basis. This data is updated each year, and most crops have many years of data archived. The land-grant university extension services typically provide crop budgets for projected and actual production costs for the most common crops grown in their states. Another source of information is the Economic Research Service (ERS), which prepares crop budgets for the ERS crop reporting regions. Be aware that these budgets often cross State lines, and sometimes may not include all of a given State. It may be difficult to obtain crop budgets for specialty crops so use and document “the best data possible.” The use of anecdotal, “coffee shop,” and other unreliable data sources should be avoided.

This technical note is the result of multiple reviews and contributions of State, regional, and national agency economists, with special thanks to the contributions of Felix (Phil) Spinelli (retired NRCS economist).