Commodity Costs and Returns Estimation Handbook

A Report of the AAEA Task Force on Commodity Costs and Returns

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CHAPTER 3

REVENUES AND GOVERNMENT PROGRAMS PARTICIPATION

INTRODUCTION

This chapter discusses issues, procedures, and recommendations for calculating the return elements of cost and return (CAR) estimates. Returns consist of revenues from the sale of agricultural products, government program receipts, and other miscellaneous revenues. The issues are discussed within four major sections: (1) Outputs of Production, (2) Pricing of Outputs, (3) Government Program Receipts, and (4) Miscellaneous Revenues.

In principle, revenue is simply price received multiplied by the quantity for the output of a farming activity, i.e.,

$$R = PQ, \tag{3.1}$$

where R is estimated revenue, P is the price of the commodity produced, and Q is the quantity of the commodity produced. In reality, estimating revenue is much more complex when the wide range of commodity production systems and marketing alternatives associated with agricultural production is considered. For example, accounting for joint or by-products, variations in product quality, and government policy toward agriculture are some of the sources of complexity.

When multiple products and other complexities are introduced, the revenue equation becomes

$$R = \sum_j P_j Q_j + VBP + GP + ARV \tag{3.2}$$

where P_j is the price for the quality differentiated commodity j, Q_j is the quantity of commodity j, VBP is the value of salable joint or by-products, GP are direct government payments, and ARV are associated revenues such as patronage rebates and dividends, crop insurance receipts, and market pool returns spread over time.

Prices and quantities used in revenue calculations are influenced by such factors as the quality or quantity of output, the location and timing of sale or production, and the structure of the market. These components should be specified with as much detail as possible.

> **Example:** The price used in a revenue equation should correspond to the yield/quality component. For example, it should be clear whether the wheat price used in the CAR estimate is for a particular class of wheat or for an average of all classes. The CAR should specify whether the price for hard red spring wheat is for 12% or 14% protein. And the CAR should clarify whether the yield is the field run or paid yield.

Chapter 3. Revenues and Government Programs Participation

An underlying consideration in developing revenues for CAR estimates is that there should be correspondence between the revenues and costs as well as between the price and yield used to generate the revenues. Correspondence must occur in at least three ways. First, prices for produced commodities must correspond to the time and location at which either ownership of the commodities is transferred from the grower or the commodity is used in another enterprise. Second, the units of the prices and yields must correspond. For example, if vegetables are harvested and marketed on a per box basis, then prices should also be on a per box basis. Third, prices must reflect, in so far as possible, the quality of the commodity sold. For example, cotton grown in California is on average of higher quality than cotton grown in the nation as a whole. Thus, cotton prices should be used which reflect the higher quality of production.

It is important to specify the point in the production-marketing process at which quantities and prices are determined. Typically, CAR estimates are prepared for the production process, but the point at which production ends and marketing begins is not always obvious. For many farmers, marketing begins at the point a commodity moves into on-farm or off-farm storage. In some situations, the product may be produced in one calendar year and stored into the next calendar year, with the costs of storage and sale being the only costs incurred after harvest. Alternatively, some other demarcation line between the production stage and the marketing stage may be defined. Some commodities may be priced standing (e.g., alfalfa hay or timber sold on the stump), but others may be priced on a consumer-ready basis. Some commodities may be field packed and others shed packed leading to different yields and prices. For these commodities, "value added" is a part of the production process (e.g., field boxing of lettuce and onions). A stage wherein an actual price and quantity exists should be chosen as the demarcation line between the production and the marketing stages. In any case, the additional functions that must be performed to maintain the correspondence between the cost side and the revenue side of the budget must be included in the CAR estimate.

> ***The Task Force recommends that commodity yields and prices be estimated at the end of the production period, or the point in the production-marketing process at which the commodity leaves the ownership of the grower, whichever is more appropriate for the purpose of the analysis. If an alternative point is chosen, it is essential that the point be specified clearly, that the time period represented by costs matches the time period reflected in returns, and that all values be adjusted to this reference time point.***

The revenue calculations in equations 3.1 and 3.2 are for a single enterprise or production activity, e.g., growing corn or feeding hogs. The calculations may account for multiple outputs and multiple qualities. The costs and revenues of such activities can be calculated for the farm or ranch as a whole or they can be calculated for some technical unit of production, e.g., acre, head, or some other appropriate base. Traditionally, CAR estimates for agricultural activities have been prepared per unit of land (acre or hectare) or animal units (head or pound) while other nonagricultural production activities are estimated per unit of labor and/or capital. The discussions throughout this section refer to CAR estimates for a technical production unit. Each component of the revenue equation is examined in the following sections.

OUTPUTS OF PRODUCTION

Output is measured in physical production or output units as the quantity of a commodity produced over the production period (i.e., bushels, pounds, hundredweight, tons, head, liters, kilograms, etc.) and is

a function of the physical and financial resources available to producers and the decisions made by producers as to how to combine these resources. Cost and return estimates should specify the quantity and quality of available resources (for projected CAR) or the actual resources used (for historical CAR). Several issues that arise in the calculation of output for CAR estimates are listed below.

- The technical production unit must be appropriately identified for the production activity.
- The location and regional aggregation in determining the quantity of output produced by a production activity must be considered.
- Quality and quality aggregation should be accounted for if commodities are differentiated on the basis of grade.
- The role of input and management levels in determining outputs should be identified.
- Differences in output under alternative production activities (technical differences) should be recognized.
- Relationships between commodity output or yields and commodity prices should be stated.
- Uncertainty should be addressed in estimating output measures.
- Jointness in output may exist and should be handled appropriately.
- Alternative data sources should be incorporated, if appropriate.

Each issue is discussed briefly in the following paragraphs.

Technical Production Unit

Revenue in a CAR estimate is calculated on a technical production unit basis. For crops, this production unit is generally per unit of land (i.e., acre or hectare) and for livestock, the standard unit is generally per head. However, the issue is not always clear. For example, should crop CAR estimates be defined in terms of an acre of land or a ton of output? Should feeding enterprise CAR estimates be based on head of feeder animals purchased or head of market animals sold? One point is clear: the relative costs and returns in the estimate should not be affected by the selection of the basic unit. For example, if the cost of feeder animals equals 40% of the income from a feeding enterprise, it will remain 40% of income regardless of whether the production unit is 100 pounds of animal sold or per head sold.

The basic technical production unit selected usually represents a major resource constraint managers face in planning the business. Choosing a common resource as the basis for the technical production unit facilitates the comparison of costs and returns across alternative enterprises. For example, a manager planning crop production must allocate land among the crops to be produced, making acre or hectare a reasonable basic technical production unit to use for planning. By comparing CARs per acre of different crops, the manager can make an economic choice. In this example, a unit of one of the inputs, land, has been selected as the basic unit. For livestock feeding operations, capacity may be measured in terms of the number of head of finishing livestock that can be handled in the manager's facilities. In "all in, all out" facilities, that capacity is defined by the number of market weight animals that the facilities can accommodate. Costs and returns may be measured in terms of head sold in this case. In the case of a cattle feedlot, a manager may consider the returns per year from finishing yearling cattle versus feeder calves in a lot with fixed capacity.

Ideally, CAR estimates for a commodity should be easily comparable to prices quoted for that commodity. For example, if live hog prices are quoted in dollars per hundred pounds liveweight, then the weight of hogs purchased and sold by the enterprise should be listed on the CAR estimate in hundred pounds liveweight.

As described previously, the output per technical production unit (acre or head) is called yield whether discussing crops or livestock. The specification of the technical production unit affects both costs and revenues. Therefore, it is important that the technical production unit used as the basis for CARs be identified clearly. For crops, this means indicating whether the acre is a "planted acre" or a "harvested acre."

The Task Force recommends that CAR estimates for crops be done on a planted acre basis. Keeping revenue and cost calculations on a planted acre basis incorporates acreage not in production, but needed for that particular production system.

Example: Government policy in the United States has often required set-aside acreage for certain farm program crops in the U.S. The cost of maintaining set-aside acreage should be proportionally allocated to the planted acre. Thus a farmer producing corn who sets aside 10% of the base acreage to qualify for government program participation would have a technical unit or "planted acre" that is composed of 1.0 acre of corn and 0.11 acre of set aside. The proportion that is planted and the proportion set aside should be clearly specified. Yields are calculated on a planted acre basis.

Example: The summer fallow acreage in a winter wheat–spring barley–summer fallow rotation changes the basis of the production activity. For crop rotations that include summer fallow, the cost of summer fallow is allocated to the crop or crops actually planted. Costs may be allocated equally to each crop or allocated on the basis of value with the crop receiving the majority of the benefit having a higher pro-rata share. In either case, it is important to document the assumption. Yields are again calculated on a planted acre basis.

For perennial crops like orchards and vineyards with long nonproductive establishment periods, the CAR estimate should indicate the basis on which the acre is defined—preproduction acre, a partially producing acre, a fully productive acre—or some other basis.

A similar situation exists for many types of livestock production. Cost and return estimates can be prepared for a specified segment of the production cycle, or they may represent the entire cycle averaged across the herd.

Example: The technical production unit for the dairy herd can be a cow in the herd including the raising of replacement heifers. Alternatively, the cost of raising dairy heifer replacements can be separated from the dairy production CAR estimate. In this case, the cow in the herd and the replacement heifer (ready to enter the herd) may be the technical production units for the two CAR estimates.

Example: An area that generates some confusion is livestock grazing where output is often based on a per head or per pound basis, i.e., 50 calves are sold at $100 per calf although

many costs are calculated on an Animal Unit Month (AUM) basis.[1] Cost and return estimates can be reconciled on either basis. Again, it is important to document the procedure used.

Yield: Quantity, Quality, and Aggregation

Yield is measured in quantitative amounts and qualitative characteristics. It is particularly important to note the qualitative characteristics that influence the market price of the product. Yield has both an expected component and a variable or stochastic component.

The expected component of quantitative yield can be estimated as an average using historic production records for the farm or region for which the CAR estimate is being determined. The level of enterprise definition, described previously, is essential in the final determination of such a yield estimate.

For enterprises new to the farm or area, estimates can be made by examining the records of similar farms in the area or by using research data. In both cases, care must be taken to estimate yields appropriate to the levels of planned inputs and adjusted for potential changes in growing conditions.

The expected component of the qualitative characteristics of yield can also be estimated from historic records as the average for the farm or area as appropriate for the level of inputs used in the production process. Consideration of the qualitative characteristics of yield varies among commodities. Quality-differentiated yield is of particular importance in cotton, malt barley, seed crops, livestock, vegetables, and fruit production. Clear specification of yield quality should accompany CAR estimates because yield quality affects a commodity's marketability and, therefore, its ultimate price.

Published yield information is often aggregated across all qualities. Such aggregations are, in many cases, sufficient if they correspond to the aggregation of prices for which the commodity is sold. For some commodities, differences in quality pricing are established from a fixed schedule. However, variations from the schedule may exist if supply and demand imbalances exist at specific qualities.

The Role of Inputs and Management Levels

Production yield should be consistent with production technologies in the area for which the estimate is being made and for the levels of input being used. If an average technology and management set is assumed for the CAR estimate, an average output level may be appropriate, especially in examining historic CAR estimates. However, the level of assumed inputs (which defines the technology/management mix) also affects the level and quality of the output. Again, it is important to document the assumptions in the notes to the CAR estimates. In many cases it is appropriate to prepare alternative estimates of CARs based on different input and corresponding output levels. For example, it may be appropriate to prepare a projected

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[1]An Animal Unit Month is the forage required to sustain one mature cow and suckling calf or equivalent for one month. See Table 4.1 for animal unit equivalents for animals of different sizes and species.

cost of production and revenue based on shallow sloping soils with one level of fertilization and a different projected set of CARs based on bottom land with an alternative level of fertilization and expected yield.

Production Systems

Factors that affect production should be identified clearly. This generally means being as specific as possible when identifying the commodities produced and the production practices used by an enterprise. Any factor that allows the commodity to be differentiated according to price should be included. This includes such factors as class, variety, grade, and location. Projected CAR estimates are often made using alternative technologies for which different sets of inputs are considered. These estimates are based on projected or hypothesized production systems. In such cases, yield calculations may be based on research information and yields obtained with related production systems. Yields are usually estimated by adjusting existing information to reflect the changes in technologies. Care should be taken to identify the data used and the adjustments made.

Relationships Between Commodity Yields and Commodity Prices

In some situations, crop yield and quality are highly related to output price, i.e., if prices are low, yields also are low; and if prices are high, yields are high (and the average quality of the harvest is usually lower). This relationship is particularly evident for fresh vegetables or fruit which is priced on a daily basis. As total supplies become low and prices for the commodity rise, growers harvest more of the produce and a larger proportion of the produce is of lesser quality.

> **Example:** The price of fresh packed lettuce is highly volatile in most growing seasons. In the short term, a supply shortage created by bad weather or insect outbreaks causes a rapid increase in price. Responding to the price increase growers harvest as much lettuce as possible. When prices are low, growers harvest the quantity necessary to meet contracted obligations but they tend to harvest the crop more slowly in an effort to maximize net revenue.

In preparing historical CAR estimates it is important to use yields and prices that are mutually compatible. For example, if the majority of the crop from a given farm or region was sold during a period of high seasonal prices and low seasonal quality, an annual season average price would not be appropriate. In preparing projected estimates, yield assumptions should be consistent with assumed prices. For example, in preparing long-run cost projections based on assumed technological progress and yield enhancements, the potential impact on market prices should be acknowledged in projecting associated revenues.

Yield Quantity and Quality Variability

"Unexpected events," such as drought, timely rains, pest infestations, diseases and other events also influence (positively or negatively) both quantity and quality of yield. Thus, actual or observed yield varies in both quantity and quality. Producers plan for and attempt to control the expected component of production, while the stochastic component results from situations or events over which producers have little or no control. For many CAR uses, estimates of revenue variability may be important.

In addition to the point estimate describing yield in terms of both quantity and quality, the variability of each should also be recognized. Variability estimates can be derived by using standard statistical procedures, if time series of historic data or cross-sectional experimental data are available. Alternatively, subjective estimates can be elicited from producers when relevant historical data are not available. The end-use of the CAR estimate and the available data determine which procedures are appropriate.

One method of dealing with both yield and price variability is to include a sensitivity analysis of changes to price and yield in the CAR estimate. Simply combining the measures of yield and price variability to determine extreme ranges of possible revenue should be avoided and appropriate statistical procedures that consider the correlation of yield and price should be used. (For a more complete discussion of these issues, see Boehlje and Eidman: Ch. 11.)

Harvested Yield and Marketable Yield

For products that are stored on the farm, there may be storage losses so that the yield harvested is not equal to the yield actually marketed. Bushels of corn after drying may be less than bushels of corn before drying. Another example is kiwi where the fruit is repacked throughout the year in storage and the shrink increases over time. Thus the harvest cost is for a yield higher than the marketed yield. For fresh market fruit, the farmer may pay to harvest all of the fruit, but only market that portion of the fruit that makes grade. Also, the units of measure are often different for harvest and sale. For example, for oranges, the contract harvest is for 500 pound boxes. The oranges are sorted and 70% go into 37.5 pound boxes for sale and the rest go to juice. The price received for juice is per pound, the price for oranges is per 37.5 pound box and the harvest cost is per 500 pound box. Such differences must be carefully noted and accounted for in preparing estimates.

Multiproduct Production and Joint Products

In many agricultural production activities, more than one product or commodity is produced. Jointness refers to the technical interdependence between several outputs from the same production activity. This interdependence is commonly classified for a single allocable factor as complementary, competing, or independent, depending on the change in marginal productivity[2] with a change in the alternative products. The interdependence between outputs is complementary when increasing the output of one product increases the output of the other product(s); it is competitive when increasing the output of one of two or more products decreases the output of the other(s); or the interdependence is supplementary, or the products are independent, when increasing the output of one product has no effect on the output of the other product(s). The competitive case is probably the most common.

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[2]With a single allocable factor, technical interdependence between two products is commonly described in terms of a shift in marginal productivity. However, description of product interrelationships with two or more allocable factors is not possible because the signs of the relevant partial derivatives may differ. Technical product interdependence can be classified for the multiproduct case from the multiproduct cost function. Two products are said to be competitive, independent (supplementary), or complementary, if the marginal cost of producing one product is increased, unchanged, or decreased, respectively, as the level of the other product is increased. See Beattie and Taylor, pp. 209-210, for a more complete discussion.

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With many multiple output technologies, one of the products is often considered primary with the other products considered either secondary or by-products. All products are included in the revenue calculation unless they are not to be marketed. For most cases, yield and price estimates can be made independently for each commodity and estimated revenues simply added together. In some cases, where one or more commodities are not directly marketed or for which yields are not directly estimated, additional consideration must be used.

In computing costs of production per output unit as compared to production unit, there is often some question as to how to handle the revenue from secondary products. A classic example is the cost of producing a cwt of milk. Because the dairy enterprise also produces calves and cull cows, the question arises as to whether these revenues should be netted out in estimating the cost of milk per cwt. In the dairy farm example from Chapter 13 (Table 13.3), the total cost per dairy cow is $2,686.80. This dairy cow produces 216 cwt of milk per year. This gives a cost per cwt of $13.04. The dairy cow also produces bull and heifer calves with gross returns of $51.00 and $61.20 respectively. If these other revenues are subtracted from total costs (ignoring implicit interest for now), the net cost of the milk is $2,574.6. This gives a price per cwt of $11.92 (2,574.6/216). This is a difference of $1.12 per cwt. This difference may be important for dairy policy. While one estimate or the other may be more appropriate in a given situation, it is important for the analyst to make clear exactly how the cost per cwt or bushel was computed. Numerous cases like this arise in practical estimation situations. Four more are discussed here.

Example: Barley produces both grain and straw. The straw may or may not be a marketable product. The CAR estimate may be for barley grain only, or it may be for barley grain and straw. To achieve correspondence between revenues and costs, if the straw revenue is included, all costs associated with preparing the straw for sale should also be included in the CAR. In computing a cost per bushel for barley, one must decide whether to subtract the straw revenue from the total per acre cost of production. If such an adjustment is made, then the cost of barley production depends on the price of straw.

Example: Two products can be identified in the production of cotton. Cotton lint and cottonseed (joint products) are considered primary and secondary complementary products, respectively. They cannot be produced separately although the proportions can change slightly depending on growing conditions and the variety of cotton produced. In such a case a cost per pound of cotton lint cannot be estimated independent of the quantity, quality and price of cotton seed produced.

Example: Three products can be identified in the production of apples. Fresh apples, apple sauce and apple juice can all be produced from trees in the same operation. The proportion of apples going to a given use may change depending on prices, yields, weather conditions, and product quality. If apples from a given portion of the operation all go to one use and the costs of production can be segregated, it may be possible to divide the enterprise.

Example: A product like alfalfa which has multiple harvests within a given production year may vary in quality and thus price between harvests. These differences should be accounted for in estimating revenues. Similarly a larger yield may lead to higher harvesting or hauling costs.

Although allocating revenues among joint products is rather straightforward, allocating costs is not always as simple. The allocation of cost to joint products is discussed in Chapter 4; a general discussion of joint products is contained in Chapter 9.

Data Sources for Determining Yields

Four basic sources of data are available to estimate yields for CARs. These are farm-level data; survey data collected at the county, state, or federal level; technical research data; and forecast models.

Farm-Level Data

Farm-level data on yield can be obtained from the farmer's memory and/or record keeping system. Of course, the accuracy of estimates is improved as verification of data increases. Another popular source of data is record keeping systems maintained by some universities and record keeping associations for improving farmer decision making. These records provide substantial information on individual farms, including yields and aggregation of farm data to regional or state levels. Variability measures are often made from historic time series data or from data from numerous farms in cross-section.

State/Federal Data

The National Agricultural Statistics Survey (NASS) and the Economic Research Service (ERS) of the United States Department of Agriculture (USDA) conduct large probability surveys to obtain yield and production levels, as well as other data, for most agricultural commodities. NASS maintains state offices and the state–federal offices conduct periodic (typically quarterly, but the frequency varies somewhat by the crop, livestock, or poultry enterprise and its importance in the state) surveys to obtain data on the number of units (acres, head, etc.) produced and the yield per unit. These data provide average yields at the state and county levels for many commodities. These statistics are rarely available at levels of aggregation below the county level. ERS conducts the Agricultural Resource Management Study (ARMS) (formerly called the Farm Cost and Return Survey) for several commodities each year, with the commodities surveyed varying from year to year. The ARMS, discussed further in Chapter 12, develops yield data for producing regions that cross state lines. It also provides average yields by state when the sample size permits.

Other federal, state, and local agencies provide data on agricultural production activities. For example, both the U.S. Bureau of Reclamation and numerous irrigation districts make estimates of production and yields for irrigation districts in the western states. Quality data are often available from other federal sources such as the Agricultural Marketing Service and individual state inspection services.

Marketing Associations, Cooperatives, and Private Dealers

Like farm-level data, the yield data from marketing associations and cooperatives may offer a measure of actual performance of a farm or a group of farmers. Private dealers and even specialized media sources may be a source of specific data. For example, cut-out data on a particular cross-breed of cattle may only be available from packers, producer marketing associations, order buyers or specialized farm newspapers.

Researchers, Forecasters, and Forecast Models

Technically-based research by universities, federal and state agencies, and private firms also provides important data for developing yield estimates. These data are especially useful for making estimates under alternative assumptions for planning and policy analysis. Such data are usually based on controlled field trials with fixed inputs and management that must be carefully examined when preparing the CAR estimate. Average yields and variability are commonly computed by the originating researchers.

Historical yield data often are extended into the future using various types of forecast models that range from simple trend analysis to econometric estimation. These data are also important in projecting the revenue for CAR estimates used for planning and policy analysis purposes. Such projections often provide a range of confidence for the forecast as a measure of potential variability. Which of these sources is appropriate depends on the expected use of the CAR. The data source used to derive the yield component should be specified in all CAR estimates. Any adjustments made to the data set should also be mentioned.

> **Example:** If the projected CAR is based on a five-year average yield for a given county where a severe drought reduced yields in the third year, that year might be removed if the probability of another serious drought is considered to be much less than 0.20. If this adjustment is made, it should be noted in the printed CAR estimate.

Recommendations for Estimating Outputs

> ***The Task Force recommends that yield estimates for CAR calculations include all commodities produced and should include for each commodity the following components:***
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> 1. ***a description of the CAR assumptions and data sources that affect yields;***
> 2. ***an estimate of the expected quantitative yield and an estimate of the variability of that yield;***
> 3. ***an estimate of the expected qualitative yield and an estimate of the variability of that yield; and***
> 4. ***an estimate of the marketable portion of the yield.***

Methods of measuring yield vary with the intended use of the data. At the appropriate level of aggregation, all four sources can be used to prepare projected CARs. Yields for joint products can usually be made independently. Historical CARs can be based on farm level survey data to obtain the actual yield for the historic period. Variability can be presented in the form of ranges, coefficients of variation, sensitivity analysis, and so forth. For example, a soybean CAR estimate could include net returns for low, medium, and high yields based on historic data available on yields given alternative weather patterns.

PRICING OF OUTPUT

The price must correspond to the quality and other characteristics of the product in order to calculate revenue correctly. There are several dimensions to this correspondence: the time frame for commodity sales,

the quality of the commodity sold, the regional differentiation of the product, and the location of the sales transaction. Price should also reflect the traditional or expected marketing practice for the commodity.

Costs and revenues should be compared in a common time frame to be valid. **The end of the production period is the recommended time period to compare all costs and revenues.** However, many commodities are harvested over several months and have no single harvest month. The appropriate method of compounding/discounting revenues to a common point in time is discussed in Chapter 2. The recommendation to adjust all revenues to a given harvest month or end of the year does *not* imply that a harvest month or end of year price should always be used. The price at which the product was sold (or is expected to be sold), adjusted to a common time point, is the appropriate price.

The market price of many commodities is determined by their intrinsic quality or grade. Price differences are observed in markets in the form of penalties or premiums received for different qualities of the commodity. In addition, some commodities receive a premium because they can be differentiated from similar commodities according to variety, the location in which they are grown, or, in some cases, by the technology used to produce a commodity.

> **Example:** Idaho potatoes and Washington apples are examples of regionally differentiated commodities. Organically produced commodities often receive a price premium.

Output prices should reflect market prices expected (for projected CAR) or actually received (for historic CAR) whether the products are sold in a market, transferred internally within the farm, or transferred to a landlord as share rent. Generally, CAR estimates should have a single price for each part of the output marketed in a different way or at a different point in time.

Selecting the Point in Time for Pricing the Commodity

It is important to specify the point in the production-marketing process at which the commodity is priced. This should be consistent with the point at which the marketable yield is determined. If value is added during a storage or packing process, the additional functions that must be performed to maintain the correspondence between the cost side and the revenue side of the budget must be included in the CAR estimate.

> **Examples:** Cotton is ginned as a part of the production process and is marketed as bales of lint and tons of cottonseed after ginning. In contrast, some vegetable and fruit farms utilize "U-pick" activities on the farm to sell products. Production on such farms is completed at the incidence of harvest by a nonpaid consumer/harvester who would remove the commodity from the farm. A consistent way to price the commodity in both cases is to record the price received when the grower sells the commodity.

As mentioned in the introduction to this chapter, the Task Force recommends that commodities be priced at the end of the production period, or the point in the production-marketing process at which the commodity leaves the ownership of the grower, whichever is more appropriate for the purpose of the analysis. The method and data used for such pricing depend to a great extent on the quality, the region, the season, and the timing of the assumed transaction. A brief description of each of these components follows.

Regional Prices

State or regional price estimates for many commodities on a historic basis are available from NASS and various state Agricultural Statistics Services. These data are aggregations (averages) derived from data initially observed by exact location and quality. The pricing method, observation period, and accuracy of estimate are usually discussed in the publication presenting the price series. Usually, obtaining prices differentiated by region, quality, or timing simply requires selecting the appropriate estimate from published series. If circumstances unique to the CAR estimate do not allow published price series to be used, weighted average prices over the expected qualities, times, or markets can be used to derive single prices.

Quality Differentials

Published price series are often aggregated over many different qualities of the commodity and many different times of delivery. Many CAR estimates are prepared for quality differentiated commodities, requiring a quality-specific price. Data for such differentiation must be found from sources other than the NASS series.

> **Example:** California cotton is recognized in all domestic and international markets to be, on the average, of higher grades and staples than cotton from the High Plains growing areas of Texas and Oklahoma. When developing a CAR for California cotton production, a California aggregation should include a weighting of prices at these higher qualities.

Seasonal Price

Many commodities have a seasonal price pattern. This seasonal pattern should be considered in developing appropriate prices for the month during which the commodity is sold by the grower. Special marketing arrangements may mandate a seasonal marketing pattern, requiring that a different price be estimated for each month in which some of the commodity is used. The appropriate storage and marketing costs should be included in the cost portion of the CAR estimate for the seasonal marketing pattern.

Identifying the precise point in time at which the commodity is priced may be particularly important for some perishable commodities. Growers in various regions of the world compete for markets based on seasonal prices of fresh commodities. Marketing windows are sought and utilized actively in production planning. Harvest times are critical for the economic success of such activities.

> **Example:** Fresh iceberg lettuce is grown in the winter in Southern California and Arizona when other parts of the country are unable to grow fresh produce because of adverse climate. Hence, it often commands a substantial premium price. Profits are often made and lost in windows of opportunity as small as one week.

The aggregation of prices over various time periods should be appropriate to the CAR being estimated. The potential for variable prices should also be noted in a CAR estimate. Fresh commodity prices can vary widely from week to week, day to day, and even within one day.

Multiproduct Production and Joint Products

Commodities that are usually produced as joint products should be priced as separate commodities when it is feasible to do so.

Examples:
1. Cotton and cottonseed.
2. Wheat, which is typically grazed as pasture during part of the year in the central and southern Plains.
3. Wheat or barley in the Northeast, for which straw is a joint product whose value may approach that of the grain harvested.

Representing the output of these enterprises as multiple products with separate prices may enhance comparisons across regions and understanding of the CAR by the intended audience. If the analysis focuses on interregional comparisons of a specific commodity, joint products that are unique to each region are priced and subtracted out to leave comparable per unit prices and net costs.

Examples: Comparing CAR estimates for grains across the country might require that the revenue and cost of straw or grazing be estimated and subtracted from the total activity revenues and costs to give an estimate that represents only the revenues and costs for grain.

Thin Markets

Markets are considered to be thin when there are relatively few transactions per unit of time. Examples include markets for pasture, niche products, new products, and residual markets or markets for distressed supplies of products. Small changes in the quantity supplied can result in large changes in price—prices can be very low if supplies are plentiful or very high if supplies are short relative to demand.

The Task Force recommends that if the commodity traded in a thin market is a secondary commodity, intermediate product, or joint product of the farm or enterprise, a multiyear average price to smooth out large systematic fluctuations in the price be used.

The Task Force recommends that if the commodity for which a farm-level projected CAR estimate is being prepared is the primary commodity of the farm or enterprise, and it is traded in a thin market, estimates over a range of low to high prices be prepared.

Example: If dairy farms in an area sell hay in years favorable for hay making and purchase hay in years of short supply, the profitability of the alfalfa and dairy enterprises is made more volatile by the swings in the market price of hay. Because haying conditions affect all farms in a local area, the price of hay is likely to be high when farms need to purchase and low when farms have hay to sell. As discussed in more detail in Chapter 2 in the section entitled Valuing Produced Expendables and the Capital Services of Owned Capital, the hay enterprise should be credited with the net price received from selling hay off of the farm, including the low price when excess hay is actually available for sale. The dairy enterprise should be charged the net cost of having hay of comparable quality delivered to the farm.

Thus, both the dairy and the hay enterprises will be influenced by the volatility of hay prices.

Nontraded Commodities and Commodities Utilized on the Farm

Some intermediate products produced on the farm and joint products of an enterprise may be utilized on the farm. Some of these products may not normally be traded. Corn silage and manure are two examples of non-traded products; others include straw and nonstandard feeds in feedlots. The corn grower who feeds hogs is one example of a traded product that is often used on the farm. What is the value of the corn fed to the hogs? There are two options: (1) use the market selling price net of selling costs, or (2) use the cost of purchasing corn and having it delivered to the farm. As mentioned in Chapter 2 and here stated as a recommendation, the preferred approach is the second one.

> ***In the case of factors produced and utilized on the farm, the Task Force recommends using the cost of purchasing the factor from off-farm as the cost of the factor to the utilizing enterprise because this reflects the opportunity cost of the factor to the utilizing enterprise.***

The disadvantage of the second approach is that a farm producing corn that is fed to hogs has a net selling price for corn grown, a margin for marketing the corn to the hog enterprise (or a return to vertical integration), and a (possibly) higher price of corn charged for corn consumed by the hogs. However, this approach sends the appropriate signals concerning profitability of resource use in both enterprises. Furthermore, it requires the most easily collected price data for aggregate CAR estimates. **An alternative and commonly used approach is to use the net selling price of corn for all of the corn produced on the farm that is used by livestock on the farm. This approach credits any profit from vertical integration to the livestock enterprise.** Chapter 4 contains further discussion of purchased and farm-raised inputs.

For nontraded commodities, the production costs of the intermediate product or the private treaty prices and conditions for the joint products constitute the only estimates of the opportunity cost or value of these items. General issues involving joint costs are discussed further in Chapter 9.

Marketing Rights

Marketing rights, often established by federal marketing orders, define the quantity, quality, and timing of the sale of the commodity. This relationship creates several interesting issues within itself. First, for some commodities the mix of joint products is determined by shipping quotas that are related to commodity prices and expected supply and demand for the commodity. Second, the final yields of the specific salable commodities are determined by the price. Third, obtaining access to the marketing order (the right to produce and market) may need to be purchased. The first two issues are discussed here; the cost side is discussed in Chapter 9.

> **Example:** Navel oranges, through the navel orange marketing order, are subject to market prorates, shipping holidays, and control of the flow of product to market. Fresh packed oranges and juicy oranges are marketed in separate areas, with the portion of any farmer's oranges going to fresh pack strictly determined by the market administrator. If fresh quotas

are low, then so is fresh yield. The remainder of the production goes into process production increasing the juice and/or industrial use yields.

Example: Some grains produced in the Prairie Provinces of Canada are subject to Canadian Wheat Board grain delivery quotas. Such restrictions may affect the pricing options available for these commodities as well as the timing of delivery and sale.

When access to markets is limited by these restrictions, neither price nor yield is defined by an open, public market. Consequently, great care must be exercised in interpreting price and yield values or in applying them to alternative time periods or geographic locations. In these situations, *both* yield and price information may be nonmarket values. The source of the data in these cases should be explained in notes to the CAR estimate.

Pricing Consumer Oriented Commodities

The point in the production process at which the commodity is priced has been described previously as the point at which the commodity leaves the ownership of the grower. Although selecting the actual point of transfer varies from commodity to commodity, the selection of this point is critical in many systems for determining the actual cost of production. This selection is particularly important for commodities that require little processing prior to consumer purchase. For these commodities every effort should be used to define clearly the intent of the CAR and to identify the cost of the system even if those costs include some postharvest processing and marketing.

Example: Fresh vegetables and fruits are often taken to grower-owned or controlled packing houses where the commodities are cleaned, sorted, graded, and packed for shipment. These costs are clearly a part of providing a product for final sale due to the ownership and control of the packing house, and are a part of the grower costs. Inclusion of processing costs for fresh produce may distort CAR comparisons with other producing areas and/or commodities that list processing costs as a separate marketing enterprise. However, the relevant processing costs should be included when they are required to receive the price listed in the CAR.

As discussed in the section of Chapter 5 entitled Other Commodity-specific Costs, cost items should not be subtracted from the commodity price, if at all possible. For example, transportation or packing costs should not be subtracted from the price of the product, but included as a cost. The reported product price should be the price before any costs are deducted. If it is not possible to have the cost items separated from the commodity price, the CAR estimate must indicate clearly which cost items have been included in the price.

Forward Pricing

Forward pricing includes several forms of cash forward contracting (pricing and/or sale before delivery or before production), futures marketing (hedging or cash-to-futures roll-overs), and hedging with options. When the product price used in calculating revenue assumes one of these pricing methods, the costs

involved with these transactions should be included in CAR estimates.[3] For many commodities there will be a counterpart set of forward contracting alternatives on the buying side (e.g., grain for livestock feed) creating the same estimation problems on the cost side.

When forward pricing is part of farm management practices, selling (or buying) and delivery may be significantly separated in time. In many cases, sale (or purchase) will precede production (or use). As a result, postharvest prices for the contracted product may be very different from the contract prices actually received, and revenue will differ from arbitrarily specified sale dates. Also, if the product is pre-sold there may be no storage or "marketing" costs associated with the contract price. A note of caution is warranted: contracts often have specific delivery requirements that, if not met by the grower, result in significant price reductions. In many cases, two separate CAR estimates may be necessary to illustrate and contrast the sale of contract and noncontract production.

Cash Forward Contracting

Cash forward contracting permits the buyer and the seller of the crop, livestock, or livestock product to agree on several terms of the transaction in advance of the time the product changes ownership. Such contracts usually specify a fixed price subject to premiums/discounts for quality and time of delivery differentials. For example, cash forward contracts offered by elevators to midwestern U.S. grain producers commonly specify the quantity, quality, timing of delivery, grading procedures, terms for dispute settlement, and the price.

The transaction costs paid by farmers on cash forward contracts are typically very low unless the farmer fails to deliver the agreed-upon quantity within an acceptable time period. The contract price received for the quality delivered can be recorded in the revenue section. Any deductions for late delivery and other failure to comply with contract provisions either can be recorded as negative revenue or can be included as marketing costs in the operating inputs section. This entry should be explained with a footnote to the CAR estimates. When only part of the product was priced using the contract and the remainder was sold for the spot price, the quantity sold by each method should be listed as separate entries and the price received for each should be shown. This will enable users to combine the yield and price data in ways appropriate for different uses. If other costs were incurred to fulfill contract provisions, they should be included in the operating input section. For example, if yields are lower than the amount contracted for sale, the producer may need to purchase commodity from other producers to fulfill the contract. In this case, the revenue section should only include the amount produced and sold at the contract price. The difference between the buying and selling price of the additional commodity purchased should be included as a cost.

It seems unlikely that those preparing projected CAR estimates would want to make the calculation assuming use of a cash forward contract. In the event they do, the following entries should be included. The price offered by the buyer can usually be obtained either from direct quotes of buyers or by applying historical differentials between the futures price and the contract price for the same location and season of the year. In addition, it is necessary (1) to determine the proportion of the expected production that is priced

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[3]Use of futures or options for purely speculative purposes should be excluded from the revenues in CAR estimates.

with the contract, (2) to estimate the expected cost of fulfilling the contract when production is less than the amount contracted, and (3) to estimate the expected revenue from producing and selling more than the amount contracted. Thus, the receipt section of a projected CAR assuming the product is being priced under a cash forward contract should include (1) the contract price times the amount contracted, and (2) the expected receipts of selling excess production on the alternative market. The operating expenses should include the expected costs of fulfilling the contract when the actual production is less than the contracted amount. The assumption used in entries should be explained in notes to the CAR estimates.

Futures Contracts

Farmers who use futures contracts to hedge commodity prices incur some additional transaction costs. It is important in collecting prices received for use in historical CAR estimates to obtain the price received for the commodity in the cash market and the costs associated with the futures contract. These costs would include the commission fees paid and interest on the money used to meet margin requirements. To fairly reflect the net price received, it is also important to obtain information on the gain or loss on the futures transaction. A historic CAR estimate for a commodity hedged would include the following entries in the revenue and operating cost section: (1) revenue received from cash sale (quantity times the spot price received); (2) gain (loss) on the futures contract; (3) commission fees on the futures contract; and (4) interest on the capital required for margin calls. It would be appropriate to include the first two categories in the revenue section of the CAR and the final two in the operating cost section. Notes explaining the entries should accompany the historical CAR estimate.

It seems unlikely that preparers of projected CAR estimates will want to assume hedging because of the complexity of making the calculations. Preparation of a projected CAR estimate requires calculating the expected value of each of the four categories of receipts and operating expenses discussed in the previous paragraph. Making these estimates is sufficiently complex that preparers are unlikely to include the efforts of hedging in the projected CAR. When they do, knowledge of the local basis, the commodity, commission fees, and margin requirements is important in preparing such estimates. Generous use of notes to explain the assumptions should accompany the projected CAR estimates. Readers interested in pursuing this topic are referred to a textbook on commodity marketing (Purcell; Marshall) for a discussion of procedures to use in making the calculations.

Futures Options

Options are similar to insurance programs. A premium is paid irrespective of whether the option is exercised or allowed to lapse. If exercised, an option position is converted to a futures position which presumably will lock in a price for the farmer.

Historical CAR estimates with pricing through futures options include the revenue and cost entries noted under futures contracts above. In addition, the estimate would include another line of operating costs to list the cost of the option contract. Similarly, projected CAR estimates with pricing through futures options include the four categories of revenues and operating costs listed in the previous subsection, plus another line of operating cost to list the cost of the option contract. To the extent that the purchase of this options contract affects revenues, it is essential that these also be included in the same CAR estimate. In

analyzing options and futures, it is essential to keep hedging and speculative activities separate, and to monitor proxy hedges and roll-overs.

For farm management purposes, basic market related information such as price forecasts, seasonality, and forward contracting opportunities are required. Estimators working in conjunction with market analysts may be able to provide some of this information when significant opportunities on specific commodities exist.

Selecting the Appropriate Prices: Transactions or Averages

The selection of prices for the calculation of revenues is determined, as are most other CAR variables, by the use for which the CAR is estimated. In some cases it may become critical to examine the records of individual transactions at either the farm level or some marketing association level to determine the specific prices or revenues needed to examine the issues at hand. Aggregation of prices at higher levels is often inappropriate in project planning and specific planning for farm investment because these aggregates do not reflect the condition for which the activity is being planned. For many types of aggregate analysis, however, the use of state or national prices may be the appropriate procedure.

Sources of Price Data

Data sources for prices include sources that are of primary importance for historical analysis as well as those for planning and decision making as shown in the following list:

Historic Data: farm-level data; state/federal data; marketing associations, cooperatives, and private dealers.

Forecast Data: contracting agents; futures markets; researchers, forecasters, and forecast models.

In contrast to output data, price data are based primarily on secondary data collected, processed, and provided by government agencies. Sometimes private sources are the only source of specific data needs. These data reflect an accounting of what has happened in the past.

Historic and Forecast Data

Historic data are of considerable importance in analyzing the performance of a region or farm relative to the existing markets for the commodities that are produced. The difference between historic and forecasted prices is critical, and the choice between the two concepts is established by the purpose of the CAR estimate. Forward planning requires some anticipation of commodity prices and relationships among prices. Of considerable importance is the term of the forecast and how it relates to the goal of the CAR. Short-term farm planning requires considerable accuracy of forecasting while longer-term planning for public policy decisions may require more general and less specific information on long-term trends for general commodity prices. Several important sources of this type of data are described briefly in the following sections.

Farm-Level Data

Actual prices received by a farmer can often be determined by examining the farm's records. One can start with actual prices received and proceed by making appropriate adjustments for hauling costs, promotion costs, dockage, co-op fees, and other charges that were deducted to obtain gross sale prices.

State/Federal Data

Historic data are available from ERS and NASS for the major and many of the minor commodities. Periodic publications provide summary data for prices at the state level and occasionally for more local markets. The data are usually reported as average price received by farmers. This type of measure aggregates information across transactions for all qualities of the commodity and across the entire geographic area being considered. Appropriate adjustments may need to be made to reflect regional differences.

Another important source of historic data is the USDA's Agricultural Marketing Service publications. These publications are often developed in conjunction with state agencies concerned with the regulation of the quality of the shipments of specific commodities.

Some states and/or counties collect and publish data in addition to that routinely collected by NASS or state level departments of agriculture. In California, for instance, the County Commissioner publishes data on sales of commodities within the county. The Iowa Department of Agriculture sometimes collects data via special surveys to supplement regularly collected data.

Marketing Associations, Cooperatives, and Private Dealers

Like farm data, the price data from marketing associations and cooperatives, if these data can be tapped, offer a measure of actual performance of a farm or a group of farmers. The data are on record at the market association or cooperative specifically because the association or cooperative is the marketing agent for a set of growers. Private dealers and even specialized media sources may be the only source of recorded specialized data. For example, regional or quality-specific data required may only be available from dealers or specialized farm newspapers.

Contracting Agents

For farm planning purposes, prices provided by potential purchasers of a contracted commodity are important in many cases. Many farmers are able to establish through contracts for delivery of commodities the price that will be received at delivery. Forward planning is greatly enhanced when the price of the output can be predetermined. As noted earlier, contracts often have specific delivery requirements that, if not met by the grower, result in significant price reductions. Thus, price data should be obtained on the price received for the proportion of the output that meets the delivery requirements and the proportion that does not meet the desired delivery schedule.

Futures Markets

Futures markets represent one way to anticipate or forecast the prices of commodities. Although this method is often used as the expected price at a future point in time, it has many potential pitfalls that limit its effectiveness as a forward planning tool. Futures prices are simply a single day's anticipation of the future and, of course, change daily as conditions change. Furthermore, the basis (futures price minus the local cash price) varies seasonally and by the market conditions that exist. Thus, futures prices should be used cautiously as a method of calculating projected prices.

Researchers, Forecasters, and Forecast Models

State university, federal, and private researchers have established complex forecasting models for agricultural commodity prices (usually the "bulk" commodities). These forecasts are extremely important in establishing estimated future revenues to be used in CARs for individual producers as well as policy and public investment decisions.

Recommendations for Pricing Output

Cost and return estimates are typically prepared for the production process, but the point at which production ends and marketing begins is not always obvious.

> ***The Task Force recommends that commodities in CAR estimates be priced at the point in the production process at which the commodity leaves ownership of the grower. In cases where the timing of transfer is after the end of the calendar year, the estimate of the price at the end of December should generally be used. For perennial crops, a time point consistent with normal harvesting patterns should be chosen.***

Commodity prices used in CAR estimates should reflect market value. Pricing a commodity with an established market, such as hard red winter wheat, presents fewer problems than pricing commodities that are traded in thin or nonexistent markets. The following general hierarchy should be used in pricing commodities:

1. Use market price when available;
2. Use an annual price that is seasonally adjusted based on historical data, surveys not conducted every year, estimates for similar markets, etc. for continuously marketed commodities;
3. Use a proxy in nonexistent or thinly traded markets; and
4. Use cost of production as an alternative when no other market or proxy is available.

The first situation is evident and will not be discussed further. The second situation may be appropriate when monthly prices are not easily obtainable but a seasonal index based on previous years is available. For a projected budget, an econometric estimate of the season average price may be available but monthly prices may not. In this case a seasonal index may be a useful way to forecast monthly prices. The third situation occurs for a crop like corn silage. Corn silage could be priced on a feed-equivalent basis as

a proxy. For example, corn silage could be valued at 25% of feeder quality hay, or it could be valued based on its corn grain content.

GOVERNMENT PROGRAM RECEIPTS

Government commodity programs have often provided a significant proportion of the income on many farms, especially in the United States, Canada, and Europe. Government farm programs frequently supplement (subsidize) farm revenues for farmers who have historically produced a given set of commodities. In the United States, commodities that have been included in such programs include upland and extra-long staple cotton, wool and mohair, corn, oats, grain sorghum, wheat, sugar, barley, peanuts, rye, rice, and tobacco. The subsidy process has varied by commodity and has changed from year to year to meet the immediate problems of producers and market supply and demand. Subsidies usually come with a strict set of guidelines as legislated by the governments involved. Producers are often required to reduce production, follow specific production or marketing practices, purchase insurance, or participate in educational programs in order to receive subsidies on all or a portion of their production. Even during periods when government intervention is declining and the move is towards a freer market, some programs affecting producer revenues usually exist. For example, export promotion programs may lead to a higher price for specific grades of a given commodity during a particular year.

Crop Programs

For appropriate crops, and when a CAR estimate assumes farm program participation, costs and returns for such participation should be included. Farmer programs that retire land from production, but are not crop/commodity specific such as the Conservation Reserve Program (CRP), usually warrant a separate CAR estimate.

Determining the actual or potential revenues from government programs requires that farm conditions be stated explicitly. These conditions vary depending on the purpose of the CAR estimate. Historic farm level parameters can be obtained from farm records which establish historic payment acreage and payment yields. Farm receipts may be constrained by legal limitations such as the upper limit of $50,000 per "farmer" often imposed for U.S. farm programs. For payment purposes, the business organization of the farm further determines the upper limit on payments. In reality, exact farm program payments can only be estimated after the season has ended. Government program payments can be taken fully into account only within a whole farm definition that includes farm size, farm business organization, and crop mix. However, several farm-specific conditions can provide an important base if government programs are to be estimated as a part of a CAR. For the set of farm programs that existed in the 1980s and early 1990s these conditions would include

1. total farm acreage of crops covered by a particular program (Crop Base);
2. acreage that must be set-aside or otherwise differentiated as a percentage for each crop (Acreage Reduction Program (ARP));
3. payment yield for each crop if this is different from actual yield;
4. number of business partners and payment limitations;

5. payment acreages, flexible acreage, and participation options; and
6. payment rates (deficiency rate).

Historic estimates for the 1950s and '60s would need to consider alternative payment schemes such as the soil bank, government storage programs, etc. With the gradual elimination of many traditional U.S. farm programs starting in the mid 1990s, cost estimates must consider those revenues that are applicable to a given year and program eligibility status. Long run estimates for 10 to 15 years into the future need to specify a set of programs consistent with the policy scenario adopted for the analysis. A major consideration is the basis upon which the estimate is to be made.

The Task Force recommends that all estimates be made on the basis of planted acres of any individual crop. If the crop being considered is a farm program participation crop requiring the idling of certain acres, the costs of production should include a cost of maintenance of set-aside land as a pro-rata share of the total required farm set-aside or diversion including appropriate allocated costs.

Deficiency Payments

The options for farm program participation in the major government-supported crops are numerous and vary somewhat by commodity. It is important that a consistent approach be used in making CAR estimates and that estimates be made on a planted acre basis with the costs of ARP maintenance included in the cost. In some programs "flexibility acres" are usually assumed to be planted in some commodity with cost allocation attributed to that crop. Other options such as 0/50/85/92 participation provide complexities of allocating the cost of maintaining land required for compliance that is not used to produce the commodity.

Example: The California cotton farmer in the cotton/almond example received a deficiency payment of $196.35/acre on 417 acres as determined by the 556 acre cotton base reduced by the 10% ARP (56 acres) and the 15% Normal Flex Acreage (83 acres). At an assumed payment yield of 1,100 lbs/acre, the deficiency payment was $0.1785/lb for total government program receipts of about $81,878, which exceeds the $50,000 payment limitation. If the farm is a partnership, perhaps between two family members both of whom are counted as individual farmers, the payment limitation is $100,000 for the farm and the deficiency payment is $196.35 per planted acre. However, if the farm is a sole proprietorship and the payment limitation is $50,000, the deficiency payment would be 81.88% of $196.35, or $160.77 per planted acre.

Consistency in determining the allocation of costs and revenues is most important. An example of a case that is difficult to determine is the case of skip-row cotton which is based on farming most of a farm's acreage as cotton. Market revenues are determined by the yield on the entire acreage, but government payments are based on farm program base acres and yield. Historic yields are determined from program base acres, leading to a distortion in the actual yields.

Example: A farmer with an 80-acre cotton base on a 160-acre farm will plant cotton in a skip-row pattern on all 160 acres. Yields and government payments are based on 80 base acres even though all 160 acres are planted in cotton. In this case, each planted acre requires

two acres of land. The yield is 500 lbs./planted acre. The costs for each planted acre include tillage and other costs for 2 acres of total land.

Example: Grain–summer fallow rotations create similar questions about determining planted area. If a farmer has 160 acres, 80 in wheat and 80 in summer fallow, the wheat yield is only calculated on 80 acres. However, the summer fallow is the common practice and the grain could not be produced without the fallow acreage. In this example, each planted acre requires two acres of land. The yield is calculated per planted acre and the costs include the costs of the acre actually planted to wheat plus the cost of one acre of summer fallow.

Marketing Loan Deficiency

Some farm commodity programs provide for additional grower incentives to move commodities from government storage into the market by adding a payment called the marketing loan deficiency (MLD) payment. This payment provides an additional revenue to growers equal to the difference between the Commodity Credit Corporation (CCC) loan rate and an "adjusted world price" (AWP), if the AWP is below the loan rate. For Upland cotton, the AWP is computed weekly and becomes information to be used as a part of the farmer's marketing strategy. Commodities receiving a marketing loan deficiency payment cannot be placed in CCC loan stocks. Marketing loan payments are subject to $75,000 payment limitation per farm and are computed separately from deficiency payments.

Example: In the California cotton farm example, the farmer received an MLD payment (popularly called POP or Producer Option Payment) amounting to $74.80 for each acre of the 417 acres planted to cotton. The total payment for all of the production amounted to about $31,191, which is below the $75,000 limitation on MLD payments per farmer.

Since the MLD is available only when the AWP falls below the loan rate and only when the farmer chooses not to exercise the right to place the crop under the CCC loan program, the actual receipts depend on the farmer's decision. The actual amount ineligible for the MLD is the same amount ineligible for the CCC loan. The 1996 legislation only authorizes MLD payments for Upland cotton production.

Historic estimates of revenue should reflect an estimate of the farmer's actual receipts including those from MLD payments. For forecasting revenues, MLD cannot be anticipated and should not be included except in the form of a substitute price that includes potential farmer receipts up to the established Target Price plus local quality adjustments as appropriate.

Production Flexibility Contract Payments

The Federal Agriculture Improvement and Reform Act of 1996 offered producers a onetime Production Flexibility Contract (PFC) to cover seven years, 1996-2002. The program complicates preparing CAR estimates because the payments are associated with the historical base acres on each farm, not the number of acres and types of crops currently grown. The payments do not affect decisions concerning the mix of crops currently being grown and should probably not be included in CAR estimates used to make future farm organization plans. On the other hand, historical CAR estimates should, in some way, include

the payments to reflect farm income levels accurately. The difficulty is determining how to divide the annual payment between crops and among acres of each crop. To reflect the allocation of payment income to each CAR estimate accurately, it is necessary to know the size of farm and the number of base acres for that farm. Conceptually, the PFC payment is a source of farm income that is very much like an overhead expense; it is difficult to allocate, but does affect farm profitability. How CAR estimate developers include PFC payments depends on the purpose of the estimate. A useful guide is to include them in the estimates in the same fashion and at the same point as overhead costs are included. A discussion of this overhead is contained in Chapter 9.

Livestock Programs

Several livestock commodities have had direct government payments to qualified producers, but they are being phased out. Congress eliminated the honey support program beginning in fiscal 1994. The incentive payments for wool and mohair, based on the qualified production and the incentive rate, were phased out over 1994 and 1995. The income from these payments should be included in the enterprise receipts only through 1995.

Dairy program provisions support farm income indirectly through government purchases of processed milk products in support of the price. Therefore, prices established in the local market reflect the effects of government purchases, and no further computation of additions to producer receipts is necessary. See the discussion of marketing orders that follows for an explanation of the cost considerations.

Marketing Orders

Marketing orders do not, in general, establish market prices; rather, they establish shipping quotas, quality standards, or production limits. This process clearly restricts the entry of some products into the market and influences both the price and quantity of marketable goods. There is no direct government payment for marketing orders that most commonly govern selected fruit and vegetable crops by region. Dairy production is governed by marketing orders in some areas of the United States. Thus, there are no direct revenues to be included in CAR estimates although there may be some costs due to marketing and association dues that should be included in the CAR estimate for a commodity sold under a marketing order.

Disaster Payments

Government disaster assistance payments should be included in historic CAR estimates when these payments have been received and can be allocated to specific commodities. The expected use of the CAR estimate determines the need for including these payments in the revenue estimates. However, disaster payments cannot be anticipated and should not be used in projected CAR estimates. Given this difference in recording these payments, disaster payments used to replace or repair land and capital improvements should be included in historic CAR estimates, but they should not be included in projected CAR estimates.

> ***In summary, the Task Force recommends that government program payments be included in the revenues of CAR estimates if (1) the costs of obtaining program benefits are included in the cost calculations, and (2) the benefits are not otherwise reflected in the computed price and yield for the outputs.***

MISCELLANEOUS REVENUES

The discussion covers four potential sources of miscellaneous revenues: (1) insurance revenues for loss of crops and livestock, (2) assessment rebates, (3) consumption by the farm household, and (4) cooperative dividends. Although other miscellaneous revenues may be available to a farm, they are generally minor and will not be considered here. When other revenues occur and can be connected to a commodity, the revenue and any associated costs should be included in the CAR estimates.

Insurance Revenues

For purposes of this report, insurance revenues are defined as the following two types.

Commodity Loss or Damage Insurance: Crop/livestock insurance that is associated with expected outputs, e.g., replacing commodity revenue if a claim is made. Revenue is uncertain, depending on the production environment, but the farmer may have significant (or frequent) probability of collecting.

Commodity Stabilization Insurance (where it exists; Canada has several examples as does Iowa): The premium is related to commodity value or revenue protection; payouts are in relation to market conditions or production problems and have a significant probability of occurring. Claims are made against less-than-target revenue.

Cost and return estimates should include insurance costs where they can be identified and designated as commodity specific. In such cases, expected revenues should be included in the total revenue estimate. Insurance premiums on inputs (e.g., insurance on feed, fertilizer, and seed stored before use) will usually be included as an overhead cost. Because any revenues will likely be limited to replacement cost, revenues from insurance on inputs should be omitted from revenues.

Commodity Loss or Damage Insurance

The use of publicly subsidized or private commodity loss insurance varies by region within the United States and Canada. In many areas crop insurance has become mandatory if a farm wishes to receive bank financing for the production activity. In other areas, the expected gains far exceed the cost and as a result farmers use crop insurance as a common practice. Where common practice is to utilize commodity loss insurance, the cost of the insurance premium should be included in the CAR estimate. The choice of participation level (e.g., 50% or 65% coverage) is arbitrary but should also reflect the cost used in the estimate.

Insurance revenues should not be included in developing projected CAR estimates because the intent of the revenue is to maintain farm income at levels normally anticipated. Forward planning usually considers normal prices and yields and, thus, automatically adjusts revenues to the levels expected.

Historic CAR estimates based on specific years of production data should include an estimate of revenues received from commodity loss insurance if the use is for performance analysis at the farm level and

the actual (lower) yields and/or prices are used. For regional CAR estimates, a weighted average (using the insurance participation rate) revenue from commodity insurance should be used.

Commodity Stabilization Insurance

This form of insurance insures against loss of targeted income and should be treated in a manner similar to commodity loss or damage insurance. For planning purposes the inclusion of costs and potential or expected revenues should be included if the decision maker commonly uses the insurance. For regional estimations the historic returns should be weighted by the participation rate.

In summary, the Task Force recommends that historical CAR estimates include revenues from insurance claims against any included costs. Expected insurance revenues can be derived from historic payment records of insurance companies and federal agencies and from insurance participation rates. However, claims often seriously lag premium payments.

If stabilization insurance costs and revenues are significant numbers (as they have been sometimes in Canadian grains and livestock programs), "with" and "without" estimates could be prepared to provide relevant information on the benefits and likelihood of voluntary participation.

Assessment Rebates

This revenue source is derived from assessments based on commodity output imposed on growers through state taxing authority. The assessments are usually established on a per unit output basis and extracted from the growers' revenue checks at the first point of sale to be used for specific purposes such as market development, research and promotion, and insect control and eradication. Assessments are, in some cases, "voluntary" and may be returned to the producer in whole, or in part, under certain conditions. Assessments should be charged as cost against the anticipated revenue of the activity.

The Task Force recommends that involuntary assessments be charged as input costs to growers. Return of assessments (usually by way of a special application process) should be considered as a possible revenue source depending on the extent of applications for rebates. These revenues are usually small.

For regional historic CAR estimates, actual data on rebate rates can be obtained and used as a weighted average increase in revenues.

Example: Growers in a specific area are charged $2.00 per bale (480 lbs) of cotton for insect control. However, 40% of growers request a refund of this assessment. A cost of $2.00 per bale could be included in the input costs section and a revenue of $.80 per bale (40% x $2.00) could be included as revenue in the regional CAR estimate. Alternatively, the $.80 could be deducted from the gross assessment, resulting in a net assessment of $1.20 per bale in the operating cost section.

Consumption by Farm Household

The value of enterprise production that is consumed by the farm household and hired workers without compensating the business in cash should be included in enterprise revenue. For example, when the farm household and hired workers consume milk produced by the dairy herd, the quantity consumed should be included as a source of income in the revenue section of the dairy enterprise. The milk should be valued at its net selling price. The value of these products represents production by the enterprise and should be added to cash operating income to account more accurately for the income produced. The expenses used to produce these products are normally included in the appropriate expense categories of the enterprise. This consumption represents a small adjustment to the CAR estimates for larger farms, but it may represent a large proportion of income on smaller and subsistence farms.

Cooperative Dividends

Many growers participate in cooperative or other similar enterprises that rebate through dividends a portion of the costs of inputs. Although this type of income is usually small relative to the total value of other revenues, it reflects a potential cost savings or revenue addition that should be measured. Efforts should be made to clarify and identify marketing and input dividends that affect grower production and marketing costs.

> **Example:** A milk marketing cooperative annually provides a dividend $.10/cwt to be paid on the quantity of milk marketed by participating members. A dairy farmer sells 250,000 cwt of milk through the cooperative and receives a dividend check for $25,000 to be credited to the revenue received for milk production. The dividend may, in fact, lag actual production by several years. Care should be taken to include the price paid by the cooperative and also to include the present value of patronage dividends related to the dairy enterprise.

SUMMARY

Revenue calculations for CAR estimates should be consistent with the conditions specified for the estimate and with the use of the estimate. Expected or historic yields and prices are the primary components of computing expected or "actual" revenues. Appropriate recognition of variability of revenues should be included in both planning and historic estimates. If costs for participation in government programs, purchase of crop insurance, membership in marketing organizations, and so forth are included in estimating total production costs, then revenues consistent with these expenditures should also be included. In particular, prices and yields and other payments should be in accord with these production costs.

Separation of production from marketing is not always easy or appropriate. The gains from sound marketing strategies are as much a part of modern farming as the gains from good production management. It is important to include both the costs and returns of such activities.