Commodity Costs and Returns Estimation Handbook

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

July 20, 1998

Ames, Iowa

CHAPTER 11

INTERNATIONAL COMPARISONS

INTRODUCTION

In addition to generating cost and return (CAR) estimates for domestic purposes such as policy analysis, industry monitoring, and farm management extension, there is often a need for analysts to make comparisons with CAR estimates from other countries. Comparison requires that CAR estimates pertain to the producers, after allowing for all CARs associated with getting an identical product to a specific place, at a specific time, and in a specific form.

This section of the Task Force's report deals specifically with the subject of international comparisons. It is organized in four parts. The first part outlines some of the reasons for making international comparisons. The second offers a brief description of potential sources of CAR estimates in other countries. The third addresses the major issues associated with making international comparisons. The fourth and final part presents an example of an international comparison of farm CARs.

REASONS FOR UNDERTAKING INTERNATIONAL COMPARISONS

There are several reasons why agricultural economists might wish to undertake international comparisons of commodity CARs. The first involves intercountry competitiveness studies. In the context of market development, countries might be interested in determining whether or not their producers can compete against the "threat" of imports from another country, or whether they are able to exploit an export opportunity. In the latter case, there is interest in knowing whether producers are competitive not only with domestic production in the importing country, but also with exporters from other countries who could be interested in competing for this same market.

Another reason has to do with assessing how changes in trade policies affecting tariffs, quotas, and domestic support policies might affect the competitive position of producers. For example, in Canada, during the Uruguay round of international trade negotiations, there was considerable concern among producers of protected dairy and poultry products that they would be unable to compete against U.S. producers in the Canadian market following tarrification of the quantitative import controls used to protect these sectors under Canada's supply management system. Comparisons of Canadian and U.S. CARs for milk, eggs, and poultry meat helped to determine how many Canadian producers of these products could have survived had a more liberal trade regime been put in place.

There are a number of caveats that should be noted with regard to intercountry competitiveness studies. First, CARs at the farm level are only part of the competitiveness equation. There is also need to take account of the marketing and transportation costs incurred in moving the product from the farmgate to final destination. Second, competitiveness could vary within a country. In Brazil, for example, domestic corn producers in the interior cannot compete with U.S. imports in deficit coastal regions of the country. The domestic producers, however, are highly competitive in their own surplus production region.

A third reason for undertaking international comparisons of farm CARs is also trade-policy related. A country considering the imposition of countervailing or antidumping duties against imports from another country might wish to examine the costs of production of the commodity in question in the other country, and in particular how those costs are affected by government assistance programs such as input subsidies.

Finally, international comparisons of commodity CARs could be useful information in making investment decisions. For example, if a decision is being made to invest capital in the production of export commodity "X" in country "Y", the decision maker will probably want to know if country "Y" can be cost competitive in export markets, not only with domestic production in the importing country, but also with other exporters competing for that market.

INFORMATION SOURCES FOR INTERNATIONAL COMPARISONS

There are several potential information sources that can be pursued by analysts wishing to undertake international comparisons of CAR estimates between countries.

At the government level, CAR estimates might be available from national and/or provincial/state departments of agriculture including agricultural extension services. Other public sector sources of CAR estimates could include agricultural census or statistical agencies, planning departments, agricultural development banks, university departments of agriculture, and agricultural colleges. Local offices of international development organizations such as The World Bank, the Food and Agriculture Organization of the United Nations (FAO), and the United States Agency for International Development (USAID) could also be sources of CAR estimates.

Potential private sector sources of CAR estimates include producer organizations, agricultural lenders, input suppliers, agricultural cooperatives, and voluntary organizations.

ISSUES ASSOCIATED WITH INTERNATIONAL COMPARISONS

All countries that prepare estimates of commodity CARs are faced with the problems addressed in earlier chapters of this report. These issues are not addressed in this section. Instead, the objective here is to identify the issues that are specific to international comparisons of CARs, and to suggest ways of dealing with them. In other words, what problems should analysts and researchers be aware of in making international comparisons, and what adjustments should they make in order to ensure that the comparative analysis they are undertaking is valid? With the exceptions of exchange rates, interest rates, and inflation, the issues discussed in this section also apply to interregional comparisons of CAR estimates within the same country.

Terminologies, Definitions, and Concepts

Different countries (and institutions within a country) use different concepts, definitions, terminologies, and measurement methods to estimate their commodity CARs. They also use different formats to present their data. A few examples will serve to illustrate the point. In enterprise cost of

production studies undertaken in the United Kingdom, the difference between the value of gross output and variable costs is called the gross margin, whereas in Canada gross margin is now defined as the excess of total revenue over the cost of goods sold. The difference between total revenue and variable costs is called the contribution margin. In the United States, the Economic Research Service (ERS) presents its crop CAR estimates from the Agricultural Resource Management Study (ARMS) in terms of gross value of production and cash expenses including general farm overhead. In Canada, Alberta Agriculture presents its crop estimates in terms of gross returns, variable costs including unpaid and operator labor, and capital costs (land rent, taxes, insurance and water rates, depreciation, and paid capital interest). Alberta does not include an allowance for general farm overhead. ARMS does not use data it collects on depreciation for tax purposes to estimate capital costs, but instead computes capital recovery in a manner similar to Chapter 6 based on the equipment used by the various operations. Some of the items that Alberta includes in capital costs are regarded as cash expenses by ARMS. Some institutions go even further. For example, at one time in Canada the costs of egg production estimated by the Canadian Egg Marketing Agency included full allocation of all imputed costs, including a return to operator management.

Analysts undertaking international comparisons must be alert to these conceptual, definitional, and presentational differences. Care must be taken to ensure that the terms and concepts used by other countries are understood fully and that the appropriate adjustments are made to put the estimates in the two (or more) countries on the same basis.

More generally, there is a need for agricultural economists in North America to improve their understanding of how other countries have dealt with the issues being addressed by the Task Force—we might be able to learn something from the experiences of these countries. In this regard, it is worth noting that a Symposium on International Comparisons of Cost of Production was held at the International Association of Agricultural Economists (IAAE) Conference held in Tokyo, Japan in August 1991. The symposium heard from representatives of several countries about how they prepared their commodity CAR estimates. Specific issues relating to comparisons of international cost of production estimates were also addressed.

Policy-Induced Product and Input Price Distortions

Most countries engage in protective or extractive policies that affect input and/or product market prices to some extent. In some cases the price effects can be extreme, and could materially affect cost of production measures. These policies can be related directly to the commodity in question or to an input used in the production process, or they can be general economic policies that indirectly impact input or product prices. In addition, indirect subsidies could exist in the form of transportation and communication systems.

Product or input price distortions affect not only the international cost comparison of individual input items but also the quantity of input use, quantity of output, and form of output. These in turn complicate the measurement and comparison of costs of production between countries.

Examples of common price-distorting policies include commodity price supports (taxes), input subsidies (taxes), border subsidies (tariffs or duties), border quotas, and exchange rate controls. Often, the effect of these policies is cumulative and could cause cost distortions on commodities not affected directly by the policy. For example, during the 1970s and 1980s, the land costs of soybean producers in the United

States were influenced heavily by price supports for corn. These land costs were often the residual of a variety of price distortions as farmers bid excess profits (losses) into higher (lower) land rental rates (or prices) which then affected cost of production measurements.

Cost comparisons among Argentina, Brazil, and the United States in soybeans and corn during the 1980s provide dramatic examples of problems associated with policy-induced price distortions. These three countries are the principal competitors in international soybean markets. They have similar yield levels, yet displayed widely differing farm-level costs of production. Contrasting policies were responsible for these differences, and the principal input cost affected was land. In 1986, typical per acre land rents for soybean were $19 in Argentina, $31 in Brazil, and $50 in the United States. At that time, in terms of policies, Argentina taxed agriculture, Brazil was slightly supportive of agriculture, and the United States had strong subsidy support (corn).

Argentinean corn production is a second example of a policy impact on input use, output level and cost of production. Product exports were taxed at rates of 20 to 30%. Punitive exchange rates further taxed exports, and fertilizer imports were taxed. The net results were farm-level corn prices at about two-thirds of U.S. levels, no commercial fertilizer use, yields of about one-half of U.S. levels on comparable soils, extensive crop-livestock rotations that included pasture and forage production, and use of animal and green manure to maintain fertility.

Under similar policy regimes, with comparable soil and climate, similar input and output values would be expected. Yet the policy differences described above changed all that. Given these policy differences, problems in comparing costs of corn production between Argentina and the United States were substantial. For example, some fertility input to the corn crop could be assumed from the Argentinean rotation, yet no fertilizer use was included in the published corn estimate. Land costs (rents) were charged at about 40% of U.S. levels. Based on these estimates, Argentina in the 1980s was viewed as the lowest cost corn producer by a wide margin. Yet corn was not a dominant crop in Argentina and land was extensively cultivated.

In the 1990s price and cost distortion policies in both countries have been relaxed. As a result, cost of production differences between the countries have diminished.

There are several alternative methods of dealing with price-distorting policies in CAR estimates.

1. Estimates can be presented "as is" with the policy-induced price distortions. The estimates would then represent the cost of production conditions currently faced by farmers operating under these country policies. As a minimum, the impact of price-distorting policies should be pointed out to users of comparative estimates. However, in a practical sense there is little a researcher can do to adjust technology or quantities of inputs used that are influenced by policy actions.

2. If land prices are the principal distortion, rents can be eliminated as a cost item and comparisons made on a nonland basis.

3. Some estimate of economic costs as different from financial costs can be attempted for individual input cost items (see the subsection entitled **Financial Accounting Versus Economic CARs**).

Exchange Rates and Inflation

Choosing the appropriate exchange rate and adjusting for inflation are problems common to all intercountry cost of production estimates because all estimates have to be denominated in a common currency at one point in time in order to make accurate comparisons. The dollar is typically the currency of comparison.

Inflation

Price inflation distorts estimates in several ways. It tends to bias nominal net income upward because of the time lag between production costs and receipt of sales revenue, to increase investment in assets which hold value, to create economic uncertainty which discourages long-term investment, and to cause loss of value against foreign currencies.

The question of inflation is particularly troublesome in countries with rapid changes in the value of their currency. In Brazil, for example, where inflation has run at levels exceeding 30% per month, some estimators have attempted to predict inflation rates within a production season and thus use different nominal price estimates at different times of the year. In these cases, the estimates of the various cost items are made for the month in which the expenditure would occur at the estimated nominal market prices for that month. For example, seed, fertilizer, and planting labor are priced in the spring, while harvest labor or harvest custom hire are priced at inflated values for six months later. Similarly, interest rates include an inflation adjustment, and thus could be in the 30 to 50% per month range.

In other situations, quantities of inputs and outputs are presented and prices are updated as appropriate for the time period in question. All prices are generally presented on a specific date. This, of course, is a problem when there is great seasonal variation in prices even when corrected for inflation.

A final method used to circumvent inflation problems is to use a deflated measure or to present the budgets in dollar equivalents. Brazil, for example, has an inflation-neutral measure called an ORTN which is used in commerce agreements. Estimates are sometimes presented in number of ORTNs.

There are several methods to deal with inflation.

1. If nominal input and output prices were used during the production cycle in a high-inflation environment, an effort should be made to adjust all prices and values to a common point in time. This intra-seasonal adjustment can be done using monthly price indexes from the country's government sources. Adjustment requires specification of input use by month, and assumes that the inputs were purchased in the month they were used.

2. Interseasonal adjustments (e.g., across years) can be accomplished by uniformly adjusting all prices and values in the CAR to the desired point in time using the country's annual and/or monthly price indexes.

3. If the country's price indexes are unavailable or unreliable, linkage to a third-country's price index or currency exchange rate can be used for interseasonal comparisons.

Exchange Rates

Choosing the appropriate exchange rate to use in converting local currency costs to U.S. dollars can be a difficult task. First, there is often more than one exchange rate—an official exchange rate (some countries may have more than one official rate), and a black market exchange rate. Where these rates diverge strongly, the official rate is probably being manipulated by the government for policy purposes.

The dollar is the usual currency of comparison. Its value has varied considerably against other major currencies, especially in recent years. This raises the question of not only the appropriate exchange rate to use, but also the appropriate year(s) in which to select the exchange rate. For cost comparisons with countries that peg their currency to the dollar, changes in the relative value of the dollar will be less important.

There are several methods to consider exchange rates (Valdes et al.).

1. Some researchers use estimation techniques to measure an "equilibrium exchange rate" or "real exchange rate" using variables such as domestic absorption (ratio of domestic expenditure to gross domestic product), terms of trade, commercial policy, ad valorem tariff rates, and public sector wages among others. These efforts typically result in a different level of exchange distortion for each year measured, and are difficult to replicate across countries for lack of data. These estimates are probably beyond the scope of most CAR comparison studies.

2. On a more practical level many international agencies such as The World Bank attempt to measure the degree of over- or undervaluation of specific currencies. For example, for a number of years Brazil was considered to have an official exchange rate that was overvalued by 20%, and economic studies regularly discounted domestic costs by this amount when the official exchange rate was used to convert cruzeiros to dollars.

3. In countries with reasonably stable exchange rates, an average or mean exchange rate over a number of years adjusted by a ratio of domestic deflators can be used to test whether or not an exchange rate for a given year is appropriate.

Exclusions and Unaccounted Costs

It cannot be assumed when comparing the same CAR estimate from different countries that each estimate will contain the same cost items in the same level of detail. Often, the estimates will have no values, or very low (high) relative values for common cost items. This is most often noticeable with allocative items

such as overhead, machinery costs, interest rates, and land returns, and for imputed items such as unpaid labor.

There are several reasons for these exclusions or unaccounted costs. They could be definitional, conceptual, or technological. The most easily handled is a definitional problem in which the affected cost item is contained under a different heading or is included as part of another item (see the subsection entitled **Terminologies, Definitions, and Concepts** earlier in this chapter). For example, in Argentinean cost estimates, machinery overhead is very low, but custom hire costs are significantly greater than U.S. estimates. In this case, U.S. estimates generally assume machinery ownership, while Argentinean estimates assume a greater amount of custom hire for machinery operations. In comparing costs, one needs to point out these differences, but no adjustments to the estimates are needed.

Exclusions can result from a conceptual difference where it is not customary to include this item in the subject country's estimates. Interest on operating capital, land charges (rent or actual ownership costs), and family labor are some cost items that are sometimes omitted from country estimates. These are usually significant cost items that need to be included if realistic intercountry comparisons are to be made.

In some instances, exclusion of an item can result from a significantly different use of technology. For example, traditional cultivation methods in low-income countries (e.g., corn in Thailand) or specific policy-cost-price structures can preclude the use of certain machinery or chemicals. In these cases, cost item exclusion might not be a problem for intercountry comparisons. Also, as in the Argentinean corn situation discussed previously, soil fertility might be provided principally as part of a rotation. A similar situation can result from double cropping where there is a residual carryover of fertility from one crop to another, or shared overhead costs during one calendar year. In these cases the exclusion of fertility costs or the over- or under specification of a cost item from the estimate for a specific crop in the rotation will misrepresent the true cost in the subject estimate. Some attempt should be made to allocate these costs equitably to the individual enterprise estimates.

There are several ways to deal with these issues in CAR estimates.

1. In some instances, secondary information sources can be used to estimate the missing cost data—e.g., commercial interest rates for interest on operating capital.

2. Missing cost information could be estimated from similar cost items in other enterprise estimates in the same country; e.g., land preparation costs might be similar for wheat and rye. Alternatively, estimates can be secured for the same crop estimate in a country where production and policy situations are similar.

3. If no information can be found to estimate the missing values, a partial cost comparison can be made by eliminating the item from all of the country estimates. Thus the comparison can be made on a nonland cost basis, or without charging for interest on operating capital, or on a cash cost basis only.

Chapter 11. International Comparisons

Product and Input Definitions

Comparison of production CAR estimates among countries begins with identification of the product. Translation from one language to another is the obvious first step in comparison, and consultation with someone knowledgeable in both languages might be required. Once agreement is reached on the product name, however, there remains the issue of product definition. For example, "Grade A Milk" in Canada goes by the same name in the European Community, but the products differ in fat content and other specifications. The differences are significant in terms of production costs and market prices.

The importance of product definition depends upon the ultimate use of CAR estimates. If the objective is to resolve issues associated with international trade such as tariffs, quotas, and subsidies, accurate product definition is crucial to the analysis. If use of the estimates is confined to an investment program within a country, and if the product is intended only for domestic consumption, production definition could be less important.

Correct input definitions are also required to determine qualitative and quantitative equivalency among CAR estimates, and to adjust measurements and prices properly if they are incorrectly stated.

The issues associated with intercountry comparison of product and input definitions are sometimes equally relevant to intracountry comparisons. Regional language and cultural differences in countries such as India and Peru require the same diligence in comparison as do intercountry comparisons. For example, 46 different terms and/or measures of land area are in use in Peru (Instituto Nacional de Estadistica). The checklist shown in Table 11.1 can be used to verify that a product is defined accurately.

Alternatives

If the product definition is missing from the estimate, and if it is of consequence, the issuing agency should be contacted for clarification. If the definition is clear and the products are different, adjustments can be made by estimating the cost and revenue increases or decreases required to achieve comparability. For example, if the compared product is not cleaned or graded, the estimated cost of doing so should be added to make it comparable. Unfortunately, the specific information required to make such adjustments is often not available to the investigator. Furthermore, sometimes the activity cannot be physically performed in the country of product origin, hence no cost estimate is available. In such cases, the best the analyst can do is to make a subjective estimate.

TABLE 11.1 Checklist for Comparison of Product Definitions

Characteristic	Indicators
Grades & Standards	Variable according to the product. Examples include quality factors (below), shape, size, moisture content, impurities, weight.
Quality	Appearance, texture, flavor, nutritive value, safety.
Level of Transformation	Level 1: Cleaning, grading, drying.
	Level 2: Ginning, milling, cutting, mixing.
	Level 3: Cooking, pasteurization, canning, dehydration, weaving, extraction, assembly, freezing.
	Level 4: Chemical alteration, texturization.
Packaging	Bulk, containers, labeling.

Sources: USDA Grade Standards; Kader; Austin.

Measurement Issues

The Purpose of CAR Estimates

Estimates are generated for various reasons. Some agencies use them as would an extension worker —as a recommendation or guideline. Others use them as a maximum—such as lending limits by an agricultural bank. Some estimates are prepared to assist in setting product prices. For most analytical purposes, however, the CARs should reflect actual production practices. Given the different purposes, it therefore behooves the investigator to find out the intent of the issuing agency; different purposes can lead to different estimates.

Whose CARs are Being Estimated?

The producer is the assumed beneficiary of net returns shown in CAR estimates. There are instances, however, when some producer costs or revenues are hidden, or when the proceeds are shared. For example, if a government agency purchases the product but delays payment for several months during a period of high inflation, the producer suffers a devaluation of revenue; part of the real value of net returns therefore accrues to the government. A landowner or marketing intermediary might take a share of net returns due to "tied" production or marketing arrangements not reflected in the CAR estimates. Examples include repayment for credit advanced in cash or in kind, which can be paid via product price discounting or repayment in kind

(e.g., a portion of production). If the distribution of net returns is important to the analyst, an effort should be made to ensure that the production and sales transactions reflect an anonymous market, and that hidden costs and revenues do not influence distribution of the proceeds.

"Representativeness" of Data

Cost and return estimates should represent all producers within a specified category, such as soybean growers in a particular region of Brazil. As indicated in Chapter 12: Data Sources and Statistical Issues, there are various ways of collecting CAR data. The United States and other countries use probability samples, farm record systems, and/or the economic engineering approach to generate the data required to prepare CAR estimates. Just as there are problems in comparing estimates from alternative data sources within a country, so are there problems between countries. In an ideal world, comparisons between countries would only be made where the statistical reliability of the estimates is measurable and made available. Unless a large-scale survey is used to generate CAR estimates, there is usually no statistical verification of representativeness. It has to be recognized, however, that international comparisons of CAR estimates will be made whether or not these ideal conditions apply. Where they do not, the analyst must exercise his judgment regarding the "reasonableness" of the data collection methodology. If both statistical verification and data collection methodology are unspecified, the analyst can try to obtain an explanation from those who prepared the estimate.

If a CAR estimate is judged to be unrepresentative, the analyst can attempt adjustment or redefine the population. For example, if the estimate is found to represent only the top 10% of producers in a category, the analyst could lower the productivity estimate to a level representing the mean of all producers, or subdivide the population and generate a separate estimate for each group. The reality is that the analyst of other countries' CAR estimates rarely has access to the information required to adjust for unrepresentativeness.

Prices and Quantities

The analyst sometimes cannot take reported prices and quantities at face value. For example, the reported product price could be a government-administered or support price in lieu of a market price; the reported quantity could be only that which is marketable at a premium price, while some quantity of inferior grade is used for other purposes such as livestock feed. The possibilities for misinterpretation of CAR price and quantity estimates from an unfamiliar source are endless, and once again the analyst must pursue the explanation by contacting the source.

Labor Quantity and Value

Perhaps no production input is more difficult to measure than labor. In many countries the farm family constitutes a dominant and captive labor force, the returns to which might not equal the market wage rate. There also exists the issue of labor equivalency between men, women, and children. Nevertheless, CAR estimates typically assign a market wage rate to both family and hired labor. The requirement of wage assignment sometimes leads to calculations indicating that no product is profitable enough to continue farming and ranching, yet somehow producers continue to operate their farms. As long as families are

involved in production agriculture, there will be difficulty measuring how much labor is expended and what is its market price.

In some societies, hired agricultural workers receive payment in kind ranging from food to living accommodation. The preparer of CAR estimates could try to estimate the values of noncash payments, but the difficulty of doing so is usually avoided by substituting a cash market wage for a similar activity from the same region.

Labor time and cost might be accurately reported in CAR estimates, but the numbers are not always what they seem to be. In Honduras the unit of agricultural labor (work day) varies from four to eight hours depending on location (Parks et al., 1980). In Grenada, West Indies, agricultural labor contracts by task in lieu of time; thus it is difficult to know the actual time expended and the actual wage rate.

To compare CAR estimates from different countries the analyst must check the source. Again, cost adjustments can be made if the information is available, but the analyst rarely has access to such detail in another country.

Interest Rates

The nominal market rate of interest varies in part with the rate of inflation. If a high interest rate is used in the CAR estimates, the opportunity costs of capital and operating expenditures will also be high, thereby partially offsetting the effects of price inflation. Preparers of CAR estimates in many countries unfortunately do not include these opportunity costs, which results in overestimation of net revenues. If excluded, the analyst can try to adjust costs upward. The best alternative is to put all costs and expenditures on a real basis as of the end of the reporting period. This involves using nominal interest rates (including inflation) for the production period and using real revenues, costs, and interest rates for future periods in computing the costs of capital goods. Fuller discussions of interest rates are contained in Chapter 2 and also in Chapter 6 on durable machinery and equipment.

Activity Timing

For various reasons, the timing of production and marketing activities will vary within a calendar year across countries. Northern and Southern Hemisphere countries will have seasons reversed, resulting in a six-month lag (or advance). Other production cycles will be defined by monsoon (rainy) and dry seasons. This may also affect the length of the marketing season in countries that are minor actors in international markets. For example, soybean prices normally advance from harvest time (autumn in the Northern Hemisphere), rising for the interharvest period to reflect cost of storage. Southern Hemisphere harvests occur in the March-April period leaving a high international price window of four to five months until the new Northern Hemisphere crop depresses prices again. If a country takes advantage of this window, its average annual price could be somewhat higher, and storage costs somewhat less. Where these factors are present in international comparisons, they should be noted.

In some cases, in particular those involving the assessment of alternative investment decisions, international comparisons may involve multiyear crops covering different time horizons—e.g., a 10-year crop

versus a 20-year crop. The procedures discussed in Chapter 10: Allocating Preproductive Costs for Multiyear Enterprises should be followed in these circumstances.

Technological Differences

Unlike distortions in monetary values and measurements, technological differences must be accepted as they are. There are numerous reasons why crop and livestock production technologies differ, the most important of which are the relative cost differences of capital and labor, and the different production and marketing systems among countries. The principal task of the analyst is to determine if the same conditions have been met in terms of product definition, time and place of delivery, and form. Differences in production technology could affect these conditions. For example, if a different production technology creates a slightly different product, a market price differential might exist.

Differences in production technology among countries are sometimes difficult to understand for the analyst who is unfamiliar with a country's conditions or culture. For example, the term "pajarero" appears in CAR estimates in some parts of Mexico and Central America. This term pertains to a person who roams fields with a slingshot or gun, shooting at birds to keep them from devouring ripe grain. This understanding, however, is not essential to a comparison of grain production CARs between Honduras and another country because it does not materially affect the product definition, form, or time and place of delivery. As long as it is a legitimate cost, correctly measured and valued, it is not an issue of concern. Conversely, comparison of salad tomato CAR estimates for Mexico and the United States might reveal that different technologies yield different products in terms of color and firmness.

Financial Accounting Versus Economic CARs

Financial accounts make use of market prices paid or received to calculate CARs from the point of view of the producer within his own country. Economic analysis expresses CARs either in terms of opportunity cost or in values determined by the willingness to pay. The price that is substituted for the market price is called a **shadow price**. There are three categories of adjustments to financial statements to reflect economic values: (1) adjustment for direct transfer payments, (2) adjustment for price distortions in traded items, and (3) adjustment for price distortions in nontraded items (Gittinger). (Note that traded items pertains only to imports and exports, not trading within the country.)

In nearly all CAR comparisons related to trade, the analyst seeks financial values, not economic values. Financial values are the ones to which farmers respond, and that enter the world marketplace. Economic values are typically used only by governments or international agencies contemplating investment decisions. Guidelines for conversion of CAR estimates from financial to economic values can be found in numerous publications, including works by Gittinger and by Brown.

INTERNATIONAL COMPARISON OF PRODUCTION CARs: A CASE STUDY OF FIELD CORN IN CALIFORNIA AND HONDURAS

As discussed above, comparisons of production CAR estimates from different and dissimilar countries require both skill and imagination. Without firsthand knowledge of agricultural production in both

countries, the analyst might face a difficult task in trying to understand obscure agricultural terms, convert unfamiliar units of measurement, or imagine what is missing. In this case, however, the analyst has experience in both California and Honduras. The comparison made in this analysis is between typical Honduran practice and a special case in California—low input corn production. The California data is experimental in nature and does not represent typical farm practice. The Honduran system used is representative of the area and thereby capital deficient and low input by California standards. Structuring the comparison this way examines whether or not a low-input system by California standards is low input from an international perspective.

Objective of the Comparison

The objective of the comparison is to convert this Honduras CAR estimate to conform to a particular set of California CAR standards such that both are identical in time, form, and space. In practice, it will rarely be possible or necessary to achieve perfect comparability, and this comparison is no exception. Conversion of the Honduras CAR estimate to the California standard is an arbitrary choice; the California CAR estimate could just as well be converted to the Honduras standard. Neither the Honduras estimate nor the California estimate conform exactly to the guidelines of this report. The object of the exercise is to make the two comparable with one another, not to adjust them both to fit the guidelines of this report strictly.

The CAR Estimates

The California CAR estimate for San Joaquin Valley field corn (low input system) was prepared by the University of California Cooperative Extension Service (University of California). It is a 13-page document that clearly lists assumptions and conditions, and is calculated with the aid of a computer. For brevity, only the summary table is presented here (Table 11.2). The Honduras CAR estimate was prepared originally in 1979 (Parks et al., 1980), translated from Spanish, with monetary values updated to 1992 (Table 11.3A, B, C).

Comparison of California and Honduras CAR Estimates

A recommended first step in the comparison is to list the principal differences between the CAR estimates (Table 11.4). This can be a challenge if the analyst lacks a full and complete understanding of both estimates. The Honduran production is designated "high yield" because it represents the best technology used in the San Pedro Sula Valley, although by U.S. standards the technology is rudimentary. The absence of any entries pertaining to irrigation in the CAR estimate is a clue that this crop is not irrigated. The investment in infrastructure and equipment is low, with ownership costs (excluding land) not exceeding 10% of operating costs.

The Spanish version of the CAR estimate lists a labor entry for "dobla," or "bending" the corn stalk, which is said to date from the time of the Mayans. This practice consists of stripping the stalk of leaves and bending it so that the ears of corn hang upside down. In this position the husk sheds water and the sun dries the corn on the cob. Bending can therefore be considered as the cost of drying.

Two apparent omissions from the Honduras estimate are the cost of land and the cost of transport to a grain elevator or market. The cost of land is an important omission, but the cost of transport to market

is reflected in the farmgate price; marketing intermediaries typically purchase grain at the farm and transport it to market or a storage location. The fixed costs of structures are excluded because they are usually minimal.

Adjustments

The sequence of adjustments is arbitrary, but in this case physical units are adjusted before currency. An example of input quantity and cost conversion follows.

1. Adjust Honduras labor time for the difference in land base:

$$\frac{\text{2.8 days planting labor in May}}{\text{1.73 acres per manzana}} = \text{1.62 days per acre}$$

2. Adjust Honduras wage rate (Lempiras/Manzana) to U.S. dollars:

$$\frac{\text{L. 10.00/day}}{\text{5.4 Lempiras/U.S.\$}} = \text{\$1.85/day}.$$

Once the CAR estimate is adjusted for land and currency units, adjustments could be made for missing items, as well as differences in assumptions and conditions. The adjusted Honduras CAR estimate (without adjustments for assumptions) appears in Table 11.5, with explanations as follows.

Land Cost

A person was contacted in Honduras to obtain an estimate of land rent for unirrigated land in the San Pedro Sula Valley, suitable for corn production. The response was L. 1,000 to L. 1,500 per manzana per year, depending on the site, the size of the leased parcel, and the type of lease agreement. Assuming potential for two crops annually, the rental cost of land per crop therefore varies from about $50 to $80 per acre. The choice of the midpoint of $65 per acre is arbitrary.

Interest Rate

Both the California and Honduras estimates use the nominal approach to estimating CARs and use a nominal interest rate for all calculations. Recalculation of ownership costs is unnecessary because the rate used by the University of California Cooperative Extension (12.0%) is identical to that used in the Honduras estimate. In the event of a difference, however, costs that are affected by the interest rate should be recalculated for the Honduras estimate using the rate of interest employed in the California estimate if it is assumed that the opportunity costs of funds and inflation are the same in the two areas. If the real rate of interest and the rate of inflation are different, then it would be appropriate to recompute the California and the Honduras estimates using the real rate of interest in the respective areas for computing the costs of opportunity interest (and estimating salvage values, future revenues, etc.) for periods outside the current one. This could be a tedious and perhaps impossible task if there is too much or too little detail provided in the CAR estimate. Given the small proportion of interest-affected costs in Honduran agriculture, recalculation

for small differences in the interest rate would appear to be unnecessary given the potential for greater error in other variables.

Time of CAR Estimate

The California CAR estimate was completed in 1992—the same year for which the Honduras estimate was updated—hence no time adjustment is necessary. However, there are three possible scenarios the analyst might face.

1. If the California estimate were current and the Honduras estimate were not, the Honduras estimate could be updated by simply applying the current currency exchange rate, which takes into account both currency inflation and devaluation against the dollar. This simplified approach assumes uniformity in the rate of price inflation for all inputs and the product price. The alternative of seeking updated prices for each input would likely be too difficult unless the analyst had a helper in the other country.

2. If the Honduras estimate were current and the California estimate were not, the California estimate could be updated either by obtaining current input and product prices, or by adjusting prices globally according to the rate of inflation. One source of useful information for this adjustment is the *Agricultural Outlook* publication from USDA/ERS (USDA, 1992), which indicates price changes by input category.

3. If neither CAR estimate were current, the same techniques described above could be used to adjust costs to a common point in time.

Omissions and Unresolved Problems

There are some unresolved problem areas associated with this comparison of CAR estimates in California and Honduras.

Product Definition

The corn products in California and Honduras are not identical. Although production costs are probably not greatly affected by the varietal difference, market price definitely could be. Honduras does not typically produce sweet corn for human consumption and field corn for animal consumption; corn is produced for making tortillas, and some is diverted to animal feed.

Currency Conversion

The currency conversion rate is a "spot rate" as of June, 1992. However, the annual rate of inflation in Honduras was between 20% and 30% in 1992, with frequent devaluations against the dollar. Instability of the exchange rate over time could result in distortions of value.

Export Prices

If the analyst were interested in trade competitiveness, the costs of transportation to, and storage at, a port could be added to the CAR estimate.

Comparison of Results

There are numerous technical comparisons that might interest the analyst. The focus in this section is on the aggregate CARs to corn production.

TABLE 11.6 Summary Cost Comparison between California and Honduras Corn Production

Measure	California	Honduras
Operating Cost/Acre	$322.63	$126.20
Operating Cost/Ton	54.50	70.44
Total Cost/Acre	458.13	216.65
Total Cost/Ton	77.39	120.90
Net Revenue/Acre	104.27	82.01
Net Revenue/Ton	17.61	45.77

The estimated cost of producing corn in Honduras is less than one-half that of the low-input California system on a per acre basis. Since the California system produces 3.3 times more corn per acre than Honduras, however, the cost per ton produced is lower in California. Even with an estimated corn price in Honduras that is 76% higher than the California price, California production is more profitable on a per acre basis. Honduras corn is more profitable on a per ton basis.

Due to the volatility of product prices—especially in Honduras—the net revenue estimates are suspect. The highest farmgate price of corn in Honduras is typically triple the low price within the course of a year. This phenomenon emphasizes the necessity of focusing on what is important; it makes little sense to tinker with a small difference in the interest rate used to calculate ownership costs when enormous fluctuations in corn price and rapid currency devaluation dominate the outcome.

TABLE 11.2 Costs and Returns per Acre to Produce Field Corn

Low Input System: Sacramento Valley, 1991 - 92
Labor Rate: $8.04/hr. machine labor
$5.70/hr. nonmachine labor
Interest Rate: 12.00%

	Quantity/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre
GROSS RETURNS				
Grain	5.92	ton	95.00	562.40
TOTAL GROSS RETURNS FOR CORN				562.40
OPERATING COSTS				
Water:				
Water, district	36.00	acin	1.93	69.48
Seed:				
Lana vetch seed	50.00	lb	0.75	37.50
Corn seed	30.00	thou	1.05	31.50
Fertilizer:				
6-20-20	100.00	lb	0.15	15.00
34-0-0	205.00	lb	0.13	26.65
Labor (machine)	4.31	hrs	8.04	38.93
Labor (non-machine)	1.98	hrs	5.70	11.29
Fuel - Gas	0.29	gal	0.98	0.28
Fuel - Diesel	39.37	gal	0.71	27.96
Lube				4.23
Machinery repair				38.74
Interest on operating capital @ 12%				21.08
TOTAL OPERATING COSTS/ACRE				322.63
TOTAL OPERATING COSTS/TON				54.50
NET RETURNS ABOVE OPERATING COSTS				239.77
CASH OVERHEAD COSTS				
Land Rent				60.82
Office Expense				12.16
Property Taxes				3.07
Property Insurance				1.54
Investment Repairs				0.08
TOTAL CASH OVERHEAD COSTS/ACRE				77.66
TOTAL CASH COSTS/ACRE				400.29
TOTAL CASH COSTS/TON				67.62
NONCASH OVERHEAD COSTS (DEPRECIATION & INTEREST)				
Buildings				2.74
Shop Tools				0.25
ATV, 4wd				0.40
Equipment				54.45
TOTAL NONCASH OVERHEAD COSTS/ACRE				57.84
TOTAL COSTS/ACRE				458.13
TOTAL COSTS/TON				77.39
NET RETURNS ABOVE TOTAL COSTS				104.27

Source: University of California.

TABLE 11.3A Costs and Returns of Corn Production in the San Pedro Sula Valley, Honduras, 1992

Crop: Corn, high yield (62 cwt/manzana)
Region: San Pedro Sula and Yojoa
Author: Manuel de J. Sanchez, Banco Nacional de Desarrallo Agricola

Month	Labor (days)	Total Units	Cost per Unit (L.)	Total Cost (L.)
May	Plant	2.8	10.00	28.00
May	Apply fertilizer	2.0	10.00	20.00
May	Apply herbicide	4.7	10.00	47.00
June	Apply urea	2.8	10.00	28.00
July	Weeding/cultivation	1.5	10.00	15.00
August	Strip and bend stalks	10.5	10.00	105.00
September	Harvest and field haul	14.5	10.00	145.00
Other Contracted Services				
April	Annual land clearing	per Mz.	110.00	110.00
May	Plow and disc 2X	4.0 days	15.00	60.00
May	Plant (hired bullocks)	1.3 days	55.00	71.50
June	Furrow (hired bullocks)	1.3 days	55.00	71.50
October	Remove grain (machine)	per cwt.	2.30	142.60
Materials				
May	Improved seed	30.0 lb	1.10	33.00
May	Fertilizer	1.1 cwt	68.45	75.30
May	Herbicide	2.0 kg	48.60	97.20
June	Urea	1.5 cwt	69.00	103.50
June	Insecticide	16.0 lb	1.65	26.40
Sub-total (Operating Costs)				1,179.00
Other Costs				
Interest on invested capital (12%)				64.34
Interest on operating capital (12%)				29.48
Depreciation				111.48
Maintenance				32.40
Total Cost of Production				1,416.70
Total revenue @ L.45/cwt				2,790.00
Net revenue per manzana				1,373.30

Source: Parks et al., 1980.

TABLE 11.3B Ownership Costs

Equipment	Number	Initial Cost	Scrap Value	Useful Life	Manzanas per year
Backpack sprayer	1.00	225.00	40.00	4.00	20.00
Bags (35)	1.00	43.75	.00	2.00	1.00
Fence	1.00	1,050.00	200.00	5.00	10.00

Source: Parks et al., 1980.

TABLE 11.3C Allocated Ownership Costs

	Totals			Per Manzana		
Equipment	Interest†	Depreciation‡	Maintenance	Interest	Depreciation	Maintenance
Sprayer	15.9	46.25	40.00	.80	2.31	2.00
Bags	2.62	21.88	.00	2.62	21.88	.00
Fence	.75	170.00	100.00	7.50	17.00	10.00
Totals per manzana				10.92	41.19	12.00

Source: Parks, et al., 1980.

† Interest computed as $OC = \left(\frac{PP + SV}{2}\right)(i) = \left(\frac{225 + 40}{2}\right)(0.12) = 15.9$ for the sprayer

‡ Depreciation computed as $D = \left(\frac{PP - SV}{n}\right)$

TABLE 11.4 Comparison of Production Cost and Return Estimates

Field Corn: California and Honduras		
Item	California	Honduras
Production definition	Field corn	Not available
Product use	Animal feed	Multipurpose, but primarily for human consumption
Date of estimate	1990	1992
Harvest month	October	October
Container	Bulk	Bags of 100 lbs.
Price location	Delivered to grain elevator	Farmgate
Measurements		
Product	Ton (2,000 lbs.)	Hundredweight (cwt)
Land	Acre	Manzana (1.73 acres)
Currency	US $	Lempira (L. 5.4 per $US)
Labor	Hour	Day
Interest rate	12.0%	12.0%
Farm/field size	300 acres corn on 1,200 acre farm	Not specified
Water source	Irrigated	Rainfed
Principal omissions		Land cost

TABLE 11.5 Adjusted Costs and Returns of Corn Production in the San Pedro Sula Valley, Honduras, 1992

Yield: 1.79 tons/acre				
Month	Labor (days)	Total Units	Cost per Unit ($)	Total Cost ($)
May	Plant	1.62	1.85	3.00
May	Apply fertilizer	1.16	1.85	2.14
May	Apply herbicide	2.72	1.85	5.03
June	Apply urea	1.62	1.85	3.00
July	Weeding/cultivation	0.87	1.85	1.61
August	Strip and bend stalks	6.07	1.85	11.24
September	Harvest and field haul	8.38	1.85	15.52
Other Contracted Services				
April	Annual land clearing	1.00 acre	11.77	11.77
May	Plow and disc 2X	2.31 days	2.78	6.42
May	Plant (hired bullocks)	0.75 days	10.19	7.65
June	Furrow (hired bullocks)	0.75 days	10.19	7.65
October	Remove grain (machine)	1.79 tons	8.52	15.26
Materials				
May	Improved seed	17.34 lb.	0.20	3.53
May	Fertilizer	0.64 cwt	12.68	8.06
May	Herbicide	1.16 kg	9.00	10.40
June	Urea	0.87 cwt	12.78	11.08
June	Insecticide	9.25 lb.	0.31	2.83
Subtotal operating cost/acre				126.20
Subtotal operating cost/ton				70.44
Other Costs				
Interest on invested capital (12%)				6.89
Interest on operating capital (12%)				3.16
Depreciation				11.93
Maintenance				3.47
Land rental				65.00
Total cost of production per acre				216.65
Total cost of production per ton				120.90
Total revenue/acre @ $166.67/ton				298.66
Net revenue/acre				82.01
Net revenue/ton				45.77