

JOINT PRODUCTS

Definition and Overview:

In some production processes, particularly in agriculture and natural resources, two or more products undergo the same process up to a **split-off point**, after which one or more of the products may undergo additional processing. An oil company drills for oil and obtains both crude oil and natural gas. A second-growth forest is harvested, and lumber of various grades are milled. A farmer maintains a herd of dairy cows, and after the cows are milked, the milk naturally separates into skim and cream or can be separated into various products characterized by the amount of milkfat. Some of these products then constitute raw materials in the manufacture of other products such as butter and cheese.

Following are some important terms:

Common costs: These costs cannot be identified with a particular joint product. By definition, joint products incur common costs until they reach the split-off point.

Split-off point: At this stage, the joint products acquire separate identities. Costs incurred prior to this point are common costs, and any costs incurred after this point are separable costs.

Separable costs: These costs can be identified with a particular joint product. These costs are incurred for a specific product, after the split-off point.

The characteristic feature of joint products is that all costs incurred prior to the split-off point are common costs, and cannot be identified with individual products that are derived at split-off. Furthermore, the costs incurred by the dairy farmer to feed and care for the cows do not significantly affect the relative amounts of cream and skim obtained, and the costs incurred by the lumber company to maintain and harvest the second-growth timber do not significantly affect the relative quantities of lumber of various grades that are obtained.

Reasons for Allocating Common Costs:

Given the lack of a cause-and-effect relationship between the incurrence of common costs and the relative quantities of joint products obtained, any allocation of these common costs to the joint products is arbitrary. Consequently, there is no management accounting purpose served by the allocation of these common costs. Literally, there is no managerial decision that becomes better informed by such an allocation. Consider the possibilities:

1. Can the allocation of common costs prompt the manager to favor some joint products over other joint products and to therefore change the production process, and hence the quantities of joint products obtained?

No. By definition, the relative quantities obtained from the joint process are inherent in the production process itself, and cannot be managed. In fact, the manager probably does have strong preferences for some joint products over others (high-grade lumber over low-grade lumber; cream over skim milk), but the manager's preferences are irrelevant.

2. Can the allocation of common costs prompt the manager to change the sales prices for the joint products, or to change decisions about whether to incur separable costs to process one or more of the joint products further?

No. The decision to sell a joint product at split-off or to process it further depends only on the **incremental** costs and revenues of the additional processing, not on the common costs. In fact, the common costs can be considered sunk at the time the additional processing decision is made. As for pricing, most joint products are commodities, and producers are generally price-takers. To the extent that the producer faces a downward sloping demand curve, determining the optimal combination of price and production level depends on the variable cost of production, but this calculation would have to be done simultaneously for all joint products, in which case no allocation of common costs would be necessary.

3. Can the allocation of common costs inform the manager that the entire production process is unprofitable and should be terminated? For example, does this allocation tell the dairy farmer whether the farmer should sell the herd and get out of the dairy business?

No. Such an allocation is unnecessary for the decision of whether to terminate the joint production process. For this decision, the producer can look at the operation in its entirety (total revenues from all joint products less total common costs and total separable costs).

Yet despite the fact that allocating common costs to joint products serves no decision-making purpose, it is required for external financial reporting. It is necessary for product costing if we wish to honor the matching principle for common costs, because these common costs are manufacturing costs. For example, if the dairy sells lowfat milk shortly after split-off, but processes high milkfat product into cheese that requires an aging process, the allocation of common costs is necessary for the valuation of ending inventory (work-in-process for cheese) and the determination of cost-of-goods sold (lowfat milk).

Alternative Methods for Allocating Common Costs:

Here are four methods of allocating common costs:

1. **Physical measure:** Using this method, some common physical measure is identified to describe the quantity of each product obtained at split-off. For example: the weight of the joint products, or the volume. Common costs are then allocated in proportion to this physical measure. This method presumes that the quantities of all joint products can be expressed using a common measure, which is not always the case. For example, crude oil is a liquid, while natural gas is, naturally, a gas, and volumes of liquids and gasses are not normally measured in the same units.
2. **Sales value at split-off:** If a market price can be established for the products that are obtained at split-off, common costs can be allocated in proportion to the sales value of the products at split-off. The sales value of each joint product is derived by multiplying the price per unit by the number of units obtained. For example, if the dairy farmer obtains 20 gallons of cream, and if cream can be sold for \$3 per gallon, then the sales value for cream is \$60. If the farmer also obtains 40 gallons of skim milk that sells for \$2 per gallon, then the sales value of skim milk is \$80. The total value of both products is \$140, and 43% ($\$60 \div \140) of common costs would be allocated to all 20 gallons of cream. This method can be used whether or not one or more of the joint products are actually processed further, as long as a market price exists for the product obtained at split-off. In other words, even if the farmer does not sell any cream, but processes all of the cream into butter, the fact that there is a market price for cream is sufficient for the farmer to be able to apply this method of common cost allocation.
3. **Net Realizable Value:** The net realizable value of a joint product at split-off is the sales price of the final product after additional processing, minus the separable costs incurred during the additional processing. If the joint product is going to be sold at split-off without further processing, the net realizable value is simply the sales value at split-off, as in the previous method. Under the net realizable value method of common cost allocation, common costs are allocated in proportion to their net realizable values. As with the previous method, the allocation is based on the total value of all quantities of each joint product obtained (the net realizable value per unit, multiplied by the number of units of each joint product).
4. **Constant Gross Margin Percentage:** This method allocates common costs such that the overall gross margin percentage is identical for each joint product. The gross margin percentage is calculated as follows:

$$\text{Gross Margin Percentage} = (\text{Sales} - \text{Cost of Goods Sold}) \div \text{Sales}$$

Cost of Goods Sold for each product includes common costs and possibly some separable costs. The application of the Constant Gross Margin Percentage requires solving for the allocation of common costs that equates the Gross Margin Percentage across all joint products.

Conclusion:

The choice of method for allocating common costs should depend on the ease of application, the perceived quality of information reported to external parties, and the perceived fairness of the allocation when multiple product managers are responsible for joint products. However, as discussed above, the allocation of common costs is arbitrary, and no method is conceptually preferable to any other method. All methods of allocating common costs across joint products are generally useless for operational, marketing, and product pricing decisions.