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Joint Costs: Evaluation Problems and Solutions

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Keywords: joint costs, joint production, valuation of closing inventories of joint products, bulk purchase and sale of tangible fixed assets: valuation issues.

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1) *Joint Costs and Common Costs: Preliminary Remarks*

The analysis of joint costs presupposes a prior clarification of the difference between common costs and joint costs.

For the accounting-decision-making tools to be fully understood, it is first necessary to illustrate the concept of common costs and their difference from special costs.

Company costs are defined as special (or specific) if they can be allocated objectively and thus without the need for questionable attributions to a particular company department/product.

An example is the labour costs of a department head or the depreciation of a machine used in a specific responsibility centre. Such costs are special to that centre. For such factors of production, the theoretical problem of allocation does not arise. It is evident how, since the elements are used in a particular department /centre, the cost of the factor must be allocated to that specific user centre.

While there are many costs specifically referable to a particular department/product of the company, there are numerous negative income components that, on the other hand, relate to several departments /products. These costs are termed common costs in that they affect, at the same time, a diversity of objects. Common costs are subdivided, in turn, into specialisable and non-specialisable costs. The first mentioned category consists of costs which, although lacking a direct connection to departments/products, are attributable to the various objects of interest through sufficiently objective parameters. Consider, for example, the case of energy. If by hypothesis, counters were installed in the company, which allow the exact amount of input consumed by the various departments to be determined, the cost associated with energy consumption could be included in the specialised costs. However, numerous examples of negative income components are attributable to the various departments only as a result of the use of subjective and thus questionable parameters. The depreciation of a building, the general manager's salary, advertising, voluntary insurance, the cost of a plant manager, etc., are typical examples of such costs. The allocation of these income elements to specific departments and/or products could only occur by resorting to subjective criteria. These costs are, therefore, part of the so-called non-specialisable common costs, i.e. in the category of costs which, regardless of more or less discretionary 'rebates', cannot be apportioned precisely between the various company areas as they concern the company considered in its entirety and wholeness. The reader is referred to for a practical and theoretical illustration of the allocation of common costs in the following paragraphs.

To conclude these brief considerations, it should point out that the division between special and common costs is relative in that it strictly depends on the object under consideration. It is evident that as the size of the object increases, the amount of special costs also increase proportionally against a corresponding reduction in common costs. This implies that a cost that identifies a special negative income component for an object may become common if the analysis perspective is changed. If, for example, the reference object were the entire company, each cost would become special and, consequently, cancel the common cost category.

In addition, common corporate costs are characterised by the peculiarity that such costs are divisible in the sense that they can eliminate the common cost, e.g. by removing an asset produced by the company, without other assets being affected by this decision.

On the other hand, joint costs in the production sphere are costs that cannot stop the production of a single good without also stopping that of different goods that are, precisely, joint with the first one. The goods are thus simultaneously obtained from the same production process. Instead of only one good or several goods that

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can separate at the level of cost allocation, a set of products emerges whose cost is interconnected, i.e. affects each good simultaneously. In the case of joint products, it is therefore impossible to limit, modify or even stop the production of a single product without having a direct impact on the joint products, which will cease to be produced when joint production is stopped.

The difference between joint production and joint costs must be well understood to determine the correct product cost. Misunderstanding these costs inevitably leads to incorrect and misleading product costing.

2) *Joint Costs Relating to the Sale/Purchase of Tangible Fixed Assets*

This hypothesis occurs when an enterprise acquires a differentiated set of assets, usually multi-year investments, at a price determined as "a lump sum".

Specific identification only concerns the common cost determined by accounting support (purchase invoice or other documents).

In Italy, civil law requires, in Art. 2423 bis, item no. 5, those heterogeneous elements included in individual items must be valued separately.

Although this operative principle does not directly concern the issue of joint assets purchased at an overall determining cost, indirectly, it is helpful for understanding the rationale that obligatorily requires the separation of the joint cost between the various assets purchased.

Mainly if the assets subject to the purchase agreement are of a multi-year nature, the identification of the cost attributable to the individual asset becomes indispensable to correctly calculate the annual depreciation rate, which, as is obvious, depends on the use of each item for more than one financial year.

The circumstance of having a single cost concerning a summation of differentiated assets would therefore not allow, on the one hand, the determination of the exact qualitative composition of the company's assets and, on the other hand, the identification of the loss of value of each asset due to economic obsolescence and physical wear and tear. This applies to both the seller and the buyer even though the two parties, as we shall see in the following pages, have to deal with, in part, different issues.

The separation of the total cost arising from the purchase/sale on a lump-sum basis of several real estate assets is, therefore, a necessary step for financial reporting to be clear and correct and, consequently, to be legitimate and regular in civil law.

The doctrine agrees that the "allocation" of the overall cost to the various assets acquired en bloc must be accomplished by dividing the total cost of acquisition of the whole of the assets implemented based on the allocation parameter constituted by the market value of the individual assets purchased by the company in a single solution.

The most frequent example of such bulk purchases concerns the acquisition of a plurality of buildings and/or assets. Consider, for example, the purchase of a building containing several fixed assets (plant, machinery, furniture, etc.) at a price determined 'in lump sum'.

Such a contract of sale and purchase imposes, on a substantive level, the use of the parameter of apportionment of the total cost on the various assets purchased based on their market value. The hypothesis of using other parameters, whether physical (e.g. volume of the goods, space occupied by the goods, number of goods, etc.) or economic, is not acceptable as it would lead to an allocation lacking the elements of economic correctness necessary for determining civil law values that are true.

This principle, which has always been unanimously shared by national and international doctrine, has also been adopted by the Italian national accounting standards issued by the National Council of Chartered Accountants and Accounting Experts. Principle No. 16 Tangible Fixed Assets states that:

"45 When a tangible fixed asset is an economic-technical unit, i.e. an assembly of assets coordinated with each other in a technical-productive logic (e.g. a production line or a factory), its purchase or production cost refers to the entire unit as a whole; in such cases, the values of the individual assets composing it must be determined to (a) distinguish assets that are subject to depreciation from those that are not and (b) identify the different lengths of their helpful lives. The value of individual assets is determined based on market prices, considering their condition. "

Principle No. 16 Property, plant and equipment, cited above, also addresses the hypothesis that the sum of the market values of the individual assets being purchased/sold does not coincide perfectly with the figure agreed for the lump-sum purchase. Where there is a divergence between the sum of the market values and the agreed lump sum value, it is suggested that this allocation method be applied:

"46 Suppose the sum of the values attributed to the individual assets exceeds the cost of the entire economic-technical unit. In that case, the unique values attributed are proportionately reduced to bring the total cost of the whole unit. If, on the other hand, the sum of the values attributed to the individual assets is less than the cost of the entire unit, the difference is proportionally increased in the market values of the individual assets, provided that the resulting value is recoverable.

Having outlined the recommended methodologies for allocating an overall cost for a purchase/sale of a set of tangible fixed assets, one must ask oneself the fundamental importance of correctly determining these individual values.

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The observations that can be made on this issue partly differ when considering the seller or the buyer, while they coincide perfectly.

Let us begin by analysing the issue that differentiates between the position of the buyer of the block of assets and the seller of such assets. One must ask oneself what the consequences might be of determining untrue and thus incorrect unit values of individual assets. The element of profound differentiation between the position of the purchaser and the position of the seller concerns the tax aspect of the transaction. For the seller, even if the values determined with reference to the individual assets were incorrect, there is no fiscal effect or problem because the sum of the capital gains and losses referred to each asset is identical whatever the value attributed to the individual assets. There are, therefore, no tax consequences for the seller in the event of incorrect determination of the values attributed to the individual assets. Profoundly different is the situation of the purchaser of the assets. For this person, the value attributed to the individual assets represents the figure indicated in financial reporting and on which it will calculate depreciation, which is tax-relevant. Should the values attributed to the individual assets be manifestly incorrect, it is evident that the determination of depreciation would also be manifestly untrue. Since, albeit with various differentiations, all the laws of the different countries generally assume that the starting value for the tax determination of income is the depreciation recognised in financial reporting (albeit with differences concerning the use of this data), it is evident that the recognition of untrue values of tangible fixed assets in the balance sheet leads to the determination of incorrect and therefore faulty depreciation, which can inevitably have severe consequences for tax purposes.

For the purchaser of the assets as a whole, it is therefore essential that the unit value attributed to each asset purchased en bloc is correct and accurate. In contrast, this problem, at the tax level, is less relevant for the seller.

At the time of the sale, this party discharges the values recorded in financial reporting. Even from the preparation of correct, valid and understandable financial reporting, determining any unit values associated with the individual assets sold in bulk has no particular impact on the seller's financial reporting. If any, an incorrectly attributed value will affect the individual capital gain or loss attributed to the various assets. Still, it will not affect the algebraic sum of the capital losses and gains connected to each asset.

Quite different is the situation of the purchaser. The person who acquires the assets must report the values in the financial reporting for the year as determined by the application of the allocation method used, illustrated in the preceding pages as the only method unanimously accepted by all doctrines. If the values attributed to individual assets purchased en bloc were to identify an incorrect and untrue figure, untrue and potentially misleading values would inevitably be reported in financial reporting. If such a situation were to occur, financial reporting would certainly not be able to be described as fair, true and understandable, postulates that, despite the differences found in the various national laws and accounting standards, always represent the three basic reference postulates for the preparation of financial reporting for the financial year.

In such a situation, the acquirer's financial reporting would therefore be invalid and subject to challenge by third parties outside the company or shareholders. The methods of challenge vary from country to country, as does the time frame within which it must bring a challenge. Despite this inevitable differentiation, it can affirm that in all the laws of any country, the presence of incorrect values in financial reporting identifies a ground for challenging financial reporting as an illegitimate and invalid document.

In addition, it may also recall that if the incorrect allocation of values was carried out to deceive third parties or obtain an unfair profit for the person who carried it out, most nations' legislations provide that criminal regulations apply. False financial reporting or, in the formulation adopted by the Italian legislator, fraudulent corporate communications of a criminal nature entail, among other penalties, potential imprisonment. An identification of unitary values of assets resulting from a block sale carried out within illegal boundaries brings the transaction within the criminal field, with all the consequences that such a situation entails.

It can understand from the previous that it is essential that, in the event of a sale en bloc of tangible assets, the unit values of the individual assets are determined correctly. As we have already pointed out, the unanimously accepted benchmark is the market value of the individual assets based on which the lump-sum transfer price is allocated. In this regard, it should note that it is difficult to identify the market value of individual assets because tangible fixed assets sold in the bloc are always second-hand assets, and, consequently, no objective price lists are available for such assets. Therefore, the sales price assessment is a subjective evaluation by the party making the determination. Because this figure is correct as it directly impacts the apportionment of the total lump sum cost determined for the sale of individual assets en bloc, it should carry out appraisals as only an estimate can validate the market value of individual assets.

In this regard, it must be emphasised that there are three types of appraisals:

a) Simple (or Straightforward) Appraisal
b) Certified Appraisal
c) Sworn Expertise.

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A straightforward appraisal is a document written by an expert in the relevant subject matter in which the person sets out their opinion on a given issue. Where the subject of the appraisal is the market values of the assets being sold for a lump sum, the appraiser indicates the values that, in his experience, reflect the reality of those assets.

The characteristic feature of the straightforward appraisal is that it can draw up without observing special formalities concerning the document's form and substance. An expert in the field must issue such an appraisal after he has carried out research, examinations of the property to be sold, and in-depth studies that he deems indispensable to draw up the document he is called upon to draft. The expert signs the appraisal and, in the case of a simple appraisal, this person is not responsible for the truthfulness of the content of the assessment. Due to its characteristics, the simple expert's report does not require any formalities for its use. The simple expert's report does not need the expert to make any statements before third parties marked by a specific authority.

The straightforward appraisal does not explicitly require a particular type of expert to whom one can turn. The hypothesis of a block sale and the need to determine the market value of individual assets to implement the apportionment of the determined lump sum price could be a surveyor, engineer or architect. But there is nothing to prevent it also being a person other than those mentioned above who can vouch for experience gained in selling long-term fixed assets already subject to partial wear and tear.

Like the straightforward appraisal, the sworn assessment does not require the appraiser to make any statements before third parties marked with authority. The expert must draw up a written report without any particular formalities. In fact, the appraiser himself certifies the truthfulness and correctness of what is stated in the appraisal and the methodology used to determine what is required by the assessment. In the certification, the expert also declares the existence of his professionalism under his criminal responsibility. The expert assumes all civil and criminal liability for everything stated in the expert report. This declaration generally uses declaratory formulas recommended by notaries or lawyers. Since everything declared in the sworn appraisal is written under the civil and criminal liability of the appraiser, if the document contains material or ideological forgery, the appraiser shall be held civilly and criminally liable for what is declared and found to be false.

A sworn expert's report is defined because the expert takes full civil and criminal responsibility for what is written in the report by swearing an oath certifying the truthfulness and formal and substantial correctness of the report's contents. It must take the oath before a public official who may be a court clerk or a notary public in Italy. The promise is characterised by a predefined formula that the expert must follow and established by law (art. 5 R. D. 1366/22 if made before a court clerk, or art. 1, R: D: 1666/37 if made before a notary). The formula to be used provides for the explicit affirmation of "having well and faithfully performed the task entrusted to him for the sole purpose of making known the truth". Since the appraiser assumes all responsibility, including criminal responsibility, for what he asserts, the law punishes the appraiser who makes a false statement with the offence of ideological forgery committed by a private individual in a public act. Therefore, in addition to being liable, civilly and criminally, for the content of the sworn statement, the expert has an additional liability due to the oath taken, punishable by imprisonment.

The previous shows that the safest and most complete expert report is the sworn report since it must follow the formality to validate that the statement is more significant than any other report. The consequence is that the certified expert's report has more excellent legal value and is the one that, in a possible trial, is assessed as more credible by the adjudicating body. This means that, in the event of a block sale of several assets with a lump sum price, the sale price of each asset, which is the parameter based on which each asset is awarded a certain value based on the lump sum price paid by the purchaser, should be based on valuations contained in a sworn appraisal. In this case, the values recorded in financial reporting by the purchaser will have more excellent reliability and certainty.

3) *The Valuation of Joint Product Costs and Inventories of Goods Output from Joint Production Processes*

The valuation of joint products obtained through a unitary production process presents significantly more problems than the valuation of jointly acquired goods.

One speaks of joint products if several goods are obtained from a single production process for the production of which costs are not objectively attributable to each product. Conjoint goods are thus goods simultaneously obtained with the exact input costs by a common process. Each has a considerably high sales value that none can be recognised as the top product. In joint products, the plurality of products obtained from a single product results from a conscious managerial decision and is not the consequence of a poorly planned process. If, on the other hand, good is also obtained from production, which is obligatorily derived from the process but is not the specific objective of production, we refer to so-called by-products, which we will discuss in the following pages and whose value is generally much smaller than that of the joint main goods.

The point in production at which goods are separated and identified as having their physicality different from other products is called the point of

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separation. From this point onwards, the goods have a life of their own, different markets, different prices, or may undergo further processing, becoming work-in-progress of internal production to all intents and purposes. All costs incurred before the point of separation are considered as one overall cost and are generally referred to as joint costs.

In the oil, chemical, agricultural, and dairy industries, many examples of joint production pose the problem of valuing jointly produced goods. Since, in these sectors, the issue of determining the value of goods obtained through joint production is widespread and has considerable weight in the context of both the determination of product cost for making managerial decisions and the valuation of closing inventories, the issue in question has been and still is the subject of numerous scholars.

It may happen that, as a result of a single production run, one or more main joint products and one or more sub-products are obtained. These goods are almost production scraps or waste products of the primary process, but they have a market value despite their smallness. The by-product is a good that results from the production of other products and is characterised by a significantly lower economic importance than the main product (s). Again, the by-product may be sold or represent a work-in-progress of internal production.

It should note that the main joint products are often the subject of different processes to improve the goods, while the sub-products are sold exactly as they come out of production. There are cases where the sub-product if further processed, can be sold at relatively high prices. When this occurs, the by-product is further processed.

A substantial difference between main joint products and sub-products concerns the selling price of the goods, provided, as argued above, that the sub-product does not undergo further processing. If this is not the case, the sub-product price is lower than that of the main joint products.

In essence, therefore, it can be said that the joint main products represent management's production targets while the so-called by-products identify a by-product of the production process which, at times, may have a market value which, if any, is generally much lower than that of the joint main products.

Where there is a joint production with outputs of primary products and/or by-products, there is a need to identify the cost attributable to the individual assets obtained from the production process both to be able to make effective managerial decisions and to be able to evaluate the eventual final inventories of these assets.

Before analysing the methodologies for allocating costs to the output goods of joint processes and the valuation of joint goods, it should point out that costing can be carried out using the traditional method by centres and the ABC methodology.

In works dealing with the issue of product costing, contrast is often made between so-called "traditional" and so-called "evolved" methods. Not infrequently, the first mentioned category is illustrated in such a way as to convey the idea that, fundamentally, it is an ancient technique. Inevitably, this permeates every one of its statements with a sense of 'overcoming any problem' when illustrating so-called 'evolved' methods. In the following pages, we will show how, for accounting data to be correctly understood by those who determine them and by the users, it is necessary to overcome the labels that have always accompanied the in-depth study of this subject.

For the time being, we intend to limit ourselves to illustrating the various calculation techniques, deferring to the paragraph mentioned above any consideration of the "goodness" or "insufficiency" of the methods examined and of the terminology used to identify the various costing techniques.

Concerning the methodology implemented according to the so-called traditional methods, the product cost is the result of the allocation of the company's costs to the centres, which, in turn, can be included in companies where work is carried out by order or by the process.

The two types of processing present substantial differences but, albeit with some relevant distinctions, it is possible to summarise the considerations regarding determining product cost cross-sectional for the two production realities. For this reason, while being fully aware of their respective specificities, we will summarise, in a compact manner, the critical points that can be identified in the calculation of production cost in the so-called traditional methods without making further theoretical subdivisions between observations concerning job order processes and considerations inherent to process processing.

In synthetic terms and, consequently, somewhat simplifying concerning the complexity of the business reality, it can state that the determination of cost per process is realised when a company produces large numbers of units of a single good/service or goods/services distinguished by similar characteristics. When, on the contrary, the goods produced are many and differentiated by quality/type, it is necessary to apply a system that allows the determination of cost per order. The difference between the two types of production appears, at this point, evident: in the first case, the product cost can be standardised while, in the second case, the unit cost must, of necessity, be derived from the consideration of the individual job order being determined quantitatively.

In calculating the job order cost, it is necessary to identify the individual materials, specific labour, and other costs associated with a particular order/goods

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/service produced. At the same time, in-process production, it makes no sense to implement such a "specific identification" operation since each good/order /service placed on the market by the company is the same as all the others.

The determination of the unit cost of a product is more straightforward in the context of production by the process because the calculation of the individual costs inherent in the various and multiple orders complicates the work of those charged with determining the negative components of income that can be related to the individual goods/orders/services produced by the company.

An element that differentiates, in reality only partially, the two calculation methods also concerns the concept of "accumulation" of costs. Whereas in-process production by order, costs must be 'stratified' on the product, in-process production, negative income components are accumulated in various departments /centres from which they are subsequently 'passed on to the different output products of the centre itself. From this assertion, it could deduce that the two methods of calculating unit product costs are characterised by such specificities that no cross-cutting consideration is possible. However, this does not correspond to reality since, despite the apparent differences, it can recognise a number of problems in the two methods, which, similarly, concern both production per order and production per process.

In the panorama of the many problems that an analyst/controller must solve to obtain meaningful accounting data, the issue concerning the allocation of fixed (special and/or common) costs to the individual objects of quantitative determination is of particular importance.

In process production, this calculation appears simplified concerning the technique of production by order in that all fixed costs are densified in a few selected centres. In reality, perhaps to overcome irresolvable problems and to facilitate the determination of the unit cost, such "agglomeration" is also often implemented in contract manufacturing. The issue, therefore, cuts across the two product types.

Simplifying the reality for the sake of expository clarity (and, consequently, leaving it to the analyst/contractor to transpose the following concepts into the variegated company realities), it is possible to state that, in general terms and, leaving aside the consideration of whether the individual cost is specific to job order or common to the entire process, the unit product cost derives from the summation of three essential elements variable unit cost + unit share of special fixed costs + unit share of common fixed costs = full cost.

Therefore, with the traditional methodology, whether production is by order or by process, costs must be localised in the various centres and then subsequently allocated to the individual products.

The delimitation of the centres of responsibility serves a twofold purpose: on the one hand, the precise identification of the technical, and organisational characteristics of the processes that make up the complex business combination and, on the other, the precise definition of the areas of autonomy of responsibility assigned to each organisational subject.

The determination of the centres is indispensable because it is based on these 'organisational' elements that can identify the specific organisational methods of deploying production resources, which in turn form the basis for the definition of standard operating conditions.

The determination of product costs implemented according to the traditional methodology focused mainly on centres has evolved, leading to the identification of an innovative method based not on centres but on so-called activities.

In the context of a flexible production system, such as the one we have today, the great difficulty in calculating product costs is allocating indirect costs, mainly due to the lack of equipment dedicated to individual products or production lines. It should also note that in advanced production realities, labour is almost always indirect, which makes it challenging to allocate it to the various products with which the worker comes into contact. Often in advanced production realities, the only cost that can be directly allocated is the cost of raw materials, which, for obvious reasons, can always be directly assigned to the product itself.

The costing technique called Activity Based Costing (ABC) has been proposed as a solution to the problems induced by using the traditional accounting system in the modern, highly flexible production environment.

ABC should therefore be one of the most critical responses to the need to renew management accounting systems.

Also in this case, as in the traditional methodology, the ultimate objective is to determine the cost of the product.

ABC represents a full cost system in that it aims to allocate all costs to the various products through an allocation mechanism which, instead of being based on centres, is based on another concept, that of activities, which we will discuss in the following pages. Since one of the most widespread criticisms of traditional accounting is that it fails to reflect the actual use of resources in the production process and to use the volume of production as the basis of attribution for the determination of product costs, the ABC, by overcoming these problems, focuses its attention, not on the centres. Still, the activities carried out by the enterprises minimised the importance of the production volume implemented, since the imputation parameters, as we

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shall see later, can be different from the volume produced.

The application of ABC, therefore, leads to the determination of a company's full cost, which is intended to direct many more cost items than in traditional systems. The full cost thus identified should, therefore, be characterised by greater objectivity in that the parameters applied, if well identified, identify the resources used to produce each good less subjectively than is the case with imputation to company centres.

We, therefore, speak of an innovative tool through which indirect costs are controlled, partially overcoming the product perspective to attribute a different meaning to the various activities used and developed to realise the company's production.

The ABC system is based on the following considerations:

1. All company activities are created to support the production and distribution of products and services. Consequently, the resources used by these activities must be related to that production process, and their cost must be included in the cost of the product;
2. All costs are considered variable and not fixed. As will be seen, variability is not a function of production volume but other parameters;
3. All costs are allocated to the activities performed by the enterprise. Therefore, an attempt is made to pass on to the activities all indirect costs, be they production, sales, and administration.

As can be seen, this approach is based on the identification of the so-called activity, which identifies an aggregation of elementary operations in the performance of which people, materials, technologies, structures and methodologies are combined to obtain output, products or services.

To conclude, some considerations must be made regarding the strategic use of information deducible through the application of the ABC methodology.

The doctrine has always emphasised that any accounting approach is meaningful if it can use for management and decision-making purposes. For this reason, it is essential to identify the decision-making scope of ABC.

According to the traditional approach of this methodology, ABC is not intended to provide information for operational control but to allocate overhead costs within the value chain to calculate the profitability of individual products, product lines, distribution channels and customers.

The information is intended to constitute what Kaplan calls the system of product measurements, i.e. the system of information intended to support decisions such as pricing, mixer, marketing, discontinuation of unprofitable products, etc. Other authors, e.g. Cooper, extend the scope of the system to investment decisions and, in general, to all budget decisions concerning the level of operating costs in the production of different products.

Some authors emphasise that the ABC methodology can also be used to produce information for decision-making in developing new product designs. The costs determined according to the ABC methodology since they are also linked to the size of production batches, set-up activities and material management should induce the designer to take an interest not only in the intrinsic characteristics of the product but also in its production process, thus stimulating the integration of product and process design. In this case, the ABC system produces cost information that can also use in medium to long-term product decisions. Only in the medium to long term can the costs ABC considers variable be considered genuinely variable. That is to say, in the medium to long time, and it is possible to make decisions which modify the resources owned or acquired or which change the consumption pattern of the resources already available to the company.

In this context, it can say that ABC can be used as an accounting method characterised by a strategic orientation, i.e. as a methodology that can provide information that can use not only in the short term but also in the medium and long term. According to Kaplan, the strategic nature of costs within the ABC system would derive from the notion of long-term variability, which is one of the fundamental prerequisites of the methodology under investigation, and from its ability to provide helpful information for constructing the value chain within the company.

A strategic accounting system should, however, first and foremost support the process of strategy formulation and implementation. According to the cited author, this process can be divided into four elements:

- Strategy formulation;
- Communication of the strategy;
- Identification of the political tactics to implement the strategy;
- Monitoring the achievement of the set strategic objectives.

On the one hand, ABC produces useful cost information in the strategy process. But it should not forget that a strategically oriented accounting system must, of necessity, be based on calculation principles explicitly derived from a strategic decision-making perspective, a circumstance that does not seem to characterise ABC.

Furthermore, the suitability of the ABC in supporting certain product decisions cannot be considered a sufficient element to define the system as strategic since it must be capable of addressing all possible options and not only those of a specific

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category. In other words, a costing system from a strategic perspective should be based on the variability of costs concerning the different possible strategic options for the company. However, the cost drivers used by ABC do not relate to strategic aspects but are exclusively connected to purely short-term operational elements.

Other authors also point out how attributing a presumed strategic orientation to ABC can reduce the importance of the products considered strategically most important by companies, i.e. those with a high innovation content and, consequently, lead to the reconsideration of product range expansion strategies because they are too costly.

To have relevant costs in the decision-making processes, it is incorrect to argue that changes in the business undoubtedly impact product costs. From this typically managerial point of view, it is necessary to determine differential costs caused by the different types of decisions under consideration. In other words, the emphasis placed on the role of the activity for costing purposes must be placed in a context of reference proper to financial reporting and not management control. According to this logic, costs, therefore, reflect the nature of the decisions under consideration, not the activity. Suppose companies using traditionally determined full costs are induced to assess the incorrect profitability of products. In that case, using full costs, based on a more reasonable allocation of general production, administration and marketing costs, offers no guarantee of having the most helpful information. In other words, the full cost determined by ABC logic is better than the full cost determined by traditional logic when pure knowledge inspires the calculation. On the other hand, the aim is to calculate costs relevant to a given decision; it is indispensable to identify a cost figure in the dimension deemed appropriate from a differential point of view.

There is no doubt, however, that the ABC system is aimed at determining product costs more accurately than the traditional methodology to support medium- and long-term strategic decisions. There is also no doubt that not all product decisions can be considered strategic. Therefore, it is not always correct to consider varying fixed or general costs in the calculation. This is only the case in the medium to long term. This means that the use of traditional marginalistic analysis techniques is definitely still valid for short-term decisions.

The fact that the traditionally employed accounting system and the ABC produce different types of information and are therefore not alternatives finds an authoritative consensus in doctrine. The ABC is thus interpreted as a complementary system, not a substitute for the traditional costing methodology.

In conclusion, it must recognise that the strategic scope of the ABC tends to be limited and, above all, that this system is not suitable for supporting the strategic process in the context of production activity. It must be recognised, however, that an accounting system can hardly have such elements of flexibility within it to permit its use in evaluating strategic alternatives, which are very diverse. In this sense, an ABC-type approach, which is based on the analysis of the management of the activity and its cost drivers, can be of help concerning an accounting system that is rigid and tied in its structure to clear strategic choices made in the past but which may no longer have any use in the company's future.

As already emphasised in the previous pages, it is also possible in joint production to use either the traditional cost allocation method or the ABC methodology, depending on the characteristics of the production process itself. Depending on the aspects of the production process, which are output-providing joint products, it will be necessary to use either the traditional cost allocation method or the ABC method. Adopting one process is subjective and must be taken by the company management with accounting, strategic, and cost allocation methodology skills. Each company will opt for the methodology that best suits the production characteristics of the process under analysis. Regardless of the option, at the end of the chosen accounting methodology, a joint cost associated with the production process will be obtained, which will have to be divided between the joint products obtained from production.

The procedures that the doctrine has identified to subdivide the production cost of the production process between the products, main or sub-products, that result from the latter can be summarised as follows

1) *Allocation based on Revenues from the Sale of the Output Goods of the Production Process*

The allocation of the total joint cost to the various output goods of the process based on the sales value of the goods obtained from production identifies one of the main methods of allocating joint costs. This methodology attaches considerable relevance to the economic value of the goods obtained from the joint process. Based on this value, it divides the overall costs incurred to implement the entire process with a plurality of goods as output. An element that simultaneously represents both a strength and a weakness of this methodology is that the basic assumption of such an allocation is summarised in the concept that a higher cost corresponds to a higher value and that it is, therefore, correct to attribute more costs to an asset that has a higher market value. This does not always represent the reality, but, as we shall see later, the advantages obtained from this allocation method often exceed its conceptual limits and therefore, those who support this methodology, and accept allocate costs based on the market value of the joint assets, accept

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the possibility that there is no perfect coincidence between the value of the costs absorbed by the individual products and the market value of the latter.

2) *Allocation of Costs to the Various Joint Products Based on a Quantitative Value*

The allocation of costs based on a quantitative value, i.e. according to technical quantities of production, rests its logical basis in the notion that the factors fed into the joint process have contributed to the creation of all the goods in a substantially similar manner obtained. This means that all units produced are assumed to have absorbed almost equally the costs of the joint production process. Adopting a quantitative value to allocate costs to the various products appears to be a simplification that sometimes borders on accounting absurdity unless the production is characterised by production peculiarities that make this logical methodology worthwhile. There are differences in applying this methodology: sometimes, the simple allocation of the total process cost according to the number of goods produced is used. It is evident that such a methodology can only be used in the presence of goods with a similar value. This can make it acceptable to determine an average cost from the simple division of the total cost of joint production by the number of goods produced. Another variant of the methodology under analysis is the apportionment of the total cost of a joint production through a physical measurement identified as the apportionment parameter. One can think, for example, of the weight of the goods obtained, the volume of goods obtained, or other quantitative measurements. Again, the application of such a methodology can be accepted if the physical quantity used as an apportionment parameter reflects a possibility of measuring the value of the good obtained. If, on the other hand, e.g. the weight of the goods obtained has no significance concerning the issue of the value of the joint products output of the production process, it is evident that the use of such a methodology appears to be inadvisable. If, for example, one thinks of a joint process that has as its output two products of identical weight but of completely different value, it is evident that the use of the criterion of allocating the costs of the joint process based on the weight of the goods obtained is not possible when such a production process occurs. Part of the doctrine, highlighting the limitations of the methodologies described above, has proposed calculating weighted quantities through a parameter to be determined subjectively by the management. Even in this case, the restrictions mentioned above of allocating a cost based on a quantitative value remain, and a further subjective assessment is added concerning determining the parameter with which to weigh the weights. For this reason, the latter cost allocation method does not seem advisable, just as all processes based on a quantitative value have apparent limitations that discourage their application.

3) *Allocation of all Costs to a Single Product if two Goods Emerge from Production: The Main Product and a Discarded Sub-Product that is Eliminated as Unsaleable*

The application of such a methodology is straightforward, and the logic is obvious. Out of the process comes a primary product or products is a waste by-product that has no market. In this case, the waste by-product is given zero value as it will eliminate it, and all the costs of the joint production process will be attributed to the main product (s) output from the joint process. In the presence of a single primary product, the entire cost of the production process will be attributed to the product obtained; in the presence, on the other hand, of a plurality of primary products, it must allocate the costs through one of the methods described above.

4) *Allocation to the Sub-Product of a Cost Equal to its Presumed Revenue*

This criterion is applied when the production process produces the main product and a sub-product with a value that, however small, is identifiable. The total of the production costs of the joint process, reduced by the cost attributed to the sub-product, is either allocated to the main product or apportioned between the various main products according to the criteria of the selling price of the goods or based on quantitative values.

The four methods of allocating the costs of a joint process to the individual products alt of production identify the main cost allocation methods. Alongside these methods, other forms of lesser significance are characterised by such a complex calculations that they are, in practice, unworkable. For this reason, we do not deem it appropriate to continue with the list of imputation methodologies which, due to their difficulty or their limited doctrinal diffusion, are irrelevant in the context of the topic analysed in this article.

In the preceding pages, we have highlighted the problems associated with determining the cost of the output products of a joint process and the solutions that can potentially apply for calculating the costs of joint products.

In addition to this issue is the valuation of the closing inventories of such goods. On this issue, there are diverse positions, not only at the doctrinal level but also within the accounting standards of the various countries and the IAS/IFRS international standards.

In summary, the valuation of joint assets is addressed in the following ways in Italian legislation, Italian national accounting standards and IAS/IFRS.

As far as Italian legislation is concerned, when reading the articles on financial reporting and year-end valuations, it can see that the legislation does not comment on the principles applicable to the valuation of

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the closing inventories of joint products since Italian law provides that the national accounting standards issued by the Italian accounting body supplement and complete the civil law provisions, it is necessary to illustrate the content, concerning this issue, of the national accounting standards to understand what the Italian regulations provide.

The principle issued by the Italian accounting body No. 13 Inventories, taking up what is established by the Italian Civil Code and aligning itself with what is now unanimously accepted by all doctrine and practice worldwide, establishes that "inventories are valued in financial reporting at the lower of purchase or production cost and realisable value inferable from the market (Article 2426, No. 9, Italian Civil Code).

The valuation of inventories is carried out independently for each category of elements comprising the item..... (so that) 'the heterogeneous elements included in the individual items are valued separately.

As for all goods, including those not arising from joint production, Italian National Standard No. 13 Inventories states that "16 Assets included in inventories are initially recognised at the date on which the risks and rewards associated with the acquired asset are transferred.

The transfer of risks and rewards usually occurs when the title is transferred following contractually agreed terms.

If, under specific contractual provisions, there is no coincidence between the date on which the transfer of risks and rewards takes place and the date on which title is transferred, the date on which the transfer of risks and rewards prevails.

The date on which the transfer of risks and rewards took place. Inventories may include, but are not limited to:

a) Inventories at the Company's factories and warehouses, excluding those received from third parties for viewing, trial, processing and/or storage, etc.
b) Inventories owned by society at third parties on consignment, processing, trial, etc.
c) Materials, goods and products purchased that have not yet been received but are in transit when, according to the terms of purchase, the risks and rewards associated with the asset purchased have already been transferred to society (e.g. delivery of the supplier's factory or warehouse)".

The purchase cost also includes incidental charges (such as transport costs, customs, and other taxes directly attributable to that material).

Returns, discounts, rebates and premiums are deducted from costs. The discounts mentioned are commercial ones."

Italian National Accounting Standard No. 13 Inventories specifies, in more detail than the code does, that "production cost includes direct costs and indirect costs (so-called production overheads) incurred in the course of production and necessary to bring inventories to their present condition and location for the portion reasonably attributable to the product relative to the period of manufacture and up to the time from which the asset can use; using the same criteria, ... charges relating to the financing of manufacture, whether in-house or at third parties, can be added. It excludes distribution costs .....

The charges typically identifiable as components of the cost of production may be summarised, by way of example but not limited to, as follows:

Direct Costs

- Cost of materials used, including transport on purchases (direct material);
- Cost of direct labour, including ancillary charges;
- Packaging;
- Costs for services directly related to the manufacturing process;
- Costs related to production licences.

General production costs

- Salaries, wages and related charges relating to indirect labour and costs of technical management of the plant;
- Depreciation of tangible and intangible assets that contribute to production;
- Maintenance and repairs;
- Consumables;
- Other costs incurred in the processing of products (methane gas, water external maintenance, security services, etc.).

Production overheads include all common production costs necessary to bring inventories to their current condition and location. Production overheads include production costs that are not directly attributable to products.

Without prejudice to the specific characteristics of the production process of each company, the allocation parameters that can use for the purpose of allocating common overheads are, by way of example but not limited to

- The direct labour hours;
- The direct labour cost;
- The machine hours;
- The prime cost (i.e. direct material and direct labour).

In some cases, it may be appropriate to use absorption percentages by department or groups of departments.

Production overheads can be either fixed or variable.

Fixed production overheads are those indirect costs of production that remain relatively constant as the volume of production changes, such as depreciation

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and maintenance of plant and machinery and the costs of technical management of the plant.

Variable production overheads are those indirect costs that vary with production volumes, such as indirect materials and labour.

Fixed production overheads are allocated to each unit based on average production capacity.

The average production capacity represents the production that is expected to be realised on average during several financial years or seasonal periods under normal conditions, taking into account the loss of capacity resulting from planned maintenance; it is lower than the theoretical maximum capacity, as from it must be deducted the downtimes for repairs, unavailability of material or labour, other unforeseeable causes of interruption, etc. It may use the actual production level to allocate fixed overhead costs if this approximates the average production capacity.

The amount of fixed overhead costs allocated to each unit produced must not increase as a result of low production or idle capacity. Indeed, if, for various reasons, the average production capacity of a plant is not utilised, the allocation of fixed overhead production costs based on an actual level of the production below the normal levels for that plant would result in the allocation to inventories of higher costs due to the non-utilisation of normal production capacity. These higher costs not attributable to the products in stock are recognised as costs for the period.

In the case of utilising production capacity beyond the level considered normal, the allocation of fixed overhead costs to products is made based on actual production capacity to prevent inventories' value from exceeding the cost incurred.

Variable production overheads are allocated to each unit based on the actual production level.

Costs of an exceptional or abnormal nature are excluded from production costs; for example, the costs of moving a plant from one facility to another (unless they are necessary for the production process before a further production stage), repair costs of an exceptional nature due to fires, hurricanes, etc., or the costs of repairing a plant in the event of a fire or a hurricane.

Regarding the determination of the price of presumed realisation, with which it must compare the cost of production, Italian Accounting Standard No. 13 Inventories specifies that: "the realisable value that can infer from the market trend of raw and ancillary materials, goods, finished products, semi-finished and work-in-progress is equal to the estimated selling price of the goods and finished products in the normal course of business, having regard to information inferable from the market, net of presumed completion costs and direct selling costs (such as, for example, commissions, transport packaging). To determine the realisable value based on market trends, the rate of obsolescence and inventory turnaround times, among other things, must be considered. In addition to general and administrative costs, distribution costs are excluded from the valuation of inventories."

If there are confirmed sales orders with a fixed price, this price is used to determine the realisable value based on the market trend of the corresponding inventories in the warehouse. Thus, inventory quantities relating to confirmed sales orders with a fixed price remain valued at cost, despite declining prices inferable from market trends. This is based on the assumption that it is reasonably sure that the agreed prices will be adhered to. Otherwise, the inventories are written down to their market-denominated realisable value in the same way as other inventories of that commodity."

After explaining the basic principle of the valuation of closing inventories, Principle No. 13 Inventories deals with the valuation of joint products.

Italian National Accounting Standard No. 13 Inventories addresses the issue of joint products by implicitly stating that such products are also subject to the general rule applicable to the valuation of all closing inventories. However, concerning allocating costs common to all joint goods, the accounting standard establishes a simplified principle concerning what is indicated for all other types of goods in inventories. Indeed, Standard No. 13 states that: "concerning products with non-divisible common costs, in cases where it is not technically possible to reasonably determine the share of the cost to be allocated to each product, it may be determined in proportion to the realisable value inferable from the market trend of the various products."

The cited principle also addresses the issue of the valuation of by-products and rejects a joint process. Concerning this issue, even if there is no unanimous consensus on the definition, it can state that almost all authors agree on the circumstance that while offcuts are, in general, materials used in processing that, precisely because of the characteristics of the finished product, represent elements that are not included in the final product, offcuts identify products or sub-products that, due to quality, processing inaccuracies, or production errors, are not saleable assets on a par with the company's primary product. Both offcuts and scraps can have various uses.

According to doctrine, each of these uses corresponds to a detailed assessment:

- Offcuts may be without recovery (e.g. small pieces of cloth from textile processing that have to be disposed of in landfills)
- Offcuts may have an internal recovery in production (e.g. sawdust used in the woodworking process to run boilers producing motive power): Their valuation must be done at the cost of the raw material from which they derive.

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- Offcuts may be sold at low prices (e.g. sawdust sold to third parties at low prices): They are valued at a lower cost, and market value
- Offcuts may be unrecoverable (e.g. spoiled wood panels that have to be taken to landfill): The cost for disposal has to be added to the cost of producing the goods output of the production process
- Scrap may be resalable (low-quality wood panels that can resell at reduced prices): They are valued at a lower cost and market value
- Scrap can have an internal recovery in production (damaged wood panels that can be used in the production process in the boiler department): They are valued at the cost of the raw material they derive.

The Italian accounting principle no. 13 Inventories has addressed the issue of the valuation of by-products and offcuts by stating that "Without prejudice to the provisions of paragraph 37, by-products or offcuts of insignificant amount may be valued directly at their realisable value inferable from the market trend, provided that this value is deducted from the cost of the main product".

IAS 2 Inventories, first of all, emphasises that "This Standard applies to all inventories, except:

a) [Deleted]
b) ……..
c) Biological assets related to agricultural activity and agricultural produce at the point of harvest (see IAS 41 Agriculture).

This Standard does not apply to the measurement of inventories held by:

a) Producers of agricultural and forest products, agricultural produce after harvest, and minerals and mineral products, to the extent that they are measured at net realisable value in accordance with well-established practices in those industries……".

Subsequently, it addresses the issue of the valuation of joint products. Even IAS 2, while noting the difficulties of allocating costs to the individual product outputs of joint production, does not consider it necessary to abandon the basic valuation principle that can use for all inventories.

IAS 2 emphasises that when the transformation costs of each product are not separately identifiable, they are allocated between the products according to a rational and uniform criterion. The allocation may be based, for example, on the relative sales values of each product, considered at the stage of the production process at which the products are separately identifiable or at the end of production. The International Standard, therefore, suggests that an attempt should be made to allocate common costs using the parameter that, in the context, may be recommended as "the most consistent and objective". As an example, it cites market value. International Accounting Standard IAS two does not give any examples or further comments on this form of cost allocation. The doctrine unanimously holds that the application of the method of allocating costs based on the sales values of the products presupposes the definition of the total sales revenues of the individual joint products, the identification of the weighted weight of the revenues of each product obtained from the joint process concerning the total revenues of the output goods of that production, and the allocation of the common costs of the production process to the individual products based on the weight of the revenues of the products themselves measured on the total revenues.

It should be noted that scholars always point out that this method of allocating the common costs of the joint process results in the correct determination and allocation of common costs, especially if a similar profit margin characterises the joint products.

The allocation principle based on the product sales value method is only one example that IAS 2 performs. This standard does not define the required methods of allocating joint costs and, consequently, leaves the preparer of financial reports complete freedom to use other parameters should they be considered more valid than the one indicated by the international standard merely as an example.

Assuming that the criterion suggested by IAS 2 is used, the valuation of inventories of joint products would follow the general principles that can use for the valuation of inventories: obligation to choose the lower cost and market value.

The international accounting standard also addresses the issue of the presence of by-products or scrap in the joint process and states that "most by-products, by their nature, are immaterial. When this is the case, they are often measured at net realisable value and this value is deducted from the cost of the main product. As a result, the carrying amount of the main product is not materially different from its cost."

Therefore, the above international accounting standard points out that if by-products of processing and offcuts do not have a relevant value, the net realisable value method may be applied. This method assumes that the offcuts or derivatives of a primary product are assigned a cost equal to the value of the assumed selling price with fewer distribution costs. The deemed finished value identifies the total cost allocated to the joint process's main product output. Applying this methodology, a common cost share is attributed to the main product, which identifies the accounting difference between the total cost of the joint process and the market value attributed to the by-products and waste. As can be seen, the Italian national accounting standard 13 inventories transpose, concerning by-products and waste, as stated in IAS 2.

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As pointed out in the preceding pages, IAS 2 does not address the issue of the valuation of agricultural products. Concerning these goods, IAS 2 states: "in accordance with IAS 41 Agriculture inventories comprising agricultural produce that an entity has harvested from its biological assets are measured on initial recognition at their fair value less costs to sell at the point of harvest. This is the cost of the inventories at that date for application of this Standard".

As noted above, while OIC No. 13 makes no specific reference to joint products of an agricultural nature, IAS No. 41 highlights a particular valuation criterion that applies only to farm products. It should note that in IAS 2 Inventories and IAS 41 Agriculture. There is no specific reference to the fact that agricultural products can be considered joint products. The doctrine, however, agrees that agricultural production is often a 'textbook' example of joint production.

IAS No. 41 emphasises that the principle applies to agricultural products, i.e. products that represent the harvest of the enterprise's biological assets up to the harvest time. From that point onwards, IAS 2, Inventories, or any other International Accounting Standard as may be appropriate is applied. Therefore, IAS No. 41 Agriculture and the valuation criteria outlined therein never apply to the post-harvest agricultural production process. For example, IAS No. 41 emphasises that the process that transforms grapes into wine by the winegrower who has grown the grapes does not fall within the specifics regulated by IAS No. 41 but must be considered an example regulated by IAS No. 2.

The International Standard emphasises that although such a process may be a logical and natural extension of agricultural activity and the events that occur may bear certain similarities to biological processing, it is not included in the definition of agricultural activity considered in IAS 41'. applied. Accordingly, this Standard does not deal with the processing of agricultural produce after harvest; for example, the processing of grapes into wine by a vintner who has grown the grapes. While such processing may be a logical and natural extension of agricultural activity, and the events taking place may bear some similarity to biological transformation, such processing is not included within the definition of agricultural activity in this Standard."

The table below provides examples of biological assets, agricultural produce, and products that are the result of processing after harvest:

Table No. 1: Biological Assets, Agriculture Produce and Products that are the Result of Processign after Harvest, in IAS N. 41 about Agricultural Pro

Biological assets	**Agricultural produce**	**Products that are the result of processing after harvest**
Sheep	Wool	Yarn, carpet
Trees in a timber planta-tion	Felled trees	Logs, lumber
Dairy cattle	Milk	Cheese
Pigs	Carcass	Sausages, cured hams
Cotton plants	Harvested cotton	Thread, clothing
Sugarcane	Harvested cane	Sugar
Tobacco plants	Picked leaves	Cured tobacco
Tea bushes	Picked leaves	Tea
Grape vines	Picked grapes	Wine
Fruit trees	Picked fruit	Processed fruit
Oil palms	Picked fruit	Palm oil
Rubber trees	Harvested latex	Rubber products
Some plants, for example, tea bushes, grape vines, oil palms and rubber trees, usually meet the definition of a bearer plant and are within the scope of IAS 16. However, the produce growing on bearer plants, for example, tea leaves, grapes, oil palm fruit and latex, is within the scope of IAS 41.		

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With regard, exclusively, to agricultural products as identified above, IAS No 41 points out that the general valuation principle of comparing cost and market value and then choosing the lower can be replaced by the following code: it shall measure agricultural produce harvested from the enterprise's biological assets at its fair value less estimated costs to sell at the time of harvest. This measurement is the cost at the date that IAS 2, Inventories or another applicable International Accounting Standard is applied.

Selling costs include commissions to brokers and agents, contributions from supervisory authorities and commodity exchanges, taxes and transfer charges. Selling costs exclude transport and other expenses necessary to physically bring the assets to the location where the sale occurs.

Calculating the fair value of a biological asset or agricultural product may be facilitated by grouping biological or agricultural products about specific significant characteristics, for example, age or quality. The company chooses these characteristics about those used in the market as a basis for price calculation.

Companies often enter into contracts to sell their organic assets or agricultural products at a future date. Contract prices are not necessarily relevant in assessing fair value, as fair value reflects the current market situation in which a willing buyer and a willing seller enter a transaction. As a result, the fair value of a biological asset or agricultural product is not changed due to the existence of a contract.

In conclusion, it should note that International Accounting Standard 42 emphasises that if the fair value of a biological asset and market values are not available and alternative estimates cannot be identified, the fair value should not be applied. When such a situation occurs, the biological asset, even the output of a joint process, can only be valued at cost less any depreciation and impairment losses created during production. It should recall that regardless of the reference value, selling costs must always be subtracted from the value that identifies the valuation of the final inventories of agricultural products, whether or not they are outputs of joint production.

Conclusions

After this summary concerning joint products, it can see that the various international and national accounting standards tend to converge on the basic principle of closing inventories, whereby goods must be valued at a lower cost and net market value. However, as we have seen in the preceding pages, this principle is subject to simplification or modification in the case of joint products, precisely because of the characteristics of the multiple goods that are the output of a joint process that cannot be objectively attributed to the goods and by-products that emerge from joint production.

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