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Ascertaining Construction Costs

What is the Status of Agricultural Construction?

The number of agricultural construction measures is steadily declining, as a result of the enormous structural changes that have taken place in the past decades in Germany. In the first nine months of 2002, completed agricultural constructions amounted to only 3.1% of structural engineering measures and 1.7% of the costs. On the average € 143,000 were invested per measure. Per m² utilisable area, this was € 320 [1]. Due to this development, agricultural construction lost considerable influence in building standards and data bases. Using an example on ascertaining costs and cost planning, an attempt is made to categorise agricultural construction into the entire field of structural engineering.

Building and permanent facilities which are needed by the farm are special buildings, but are planned exclusively by planners and builders according to the same principles, laws and regulations, restrictions and guidelines as other types of buildings. The example of a method for cost ascertaining and cost planning is used as the basis for a study to place agricultural buildings in the proper perspective in the entire field of civil engineering .

Types of cost ascertaining

The level of exactness of a ascertaining costs is always dependent on the status of the planning, the available drawings, calculations and descriptions. For the initial planning including the farmer, the building consultant and the architect, construction cost data related to a usage unit, for example, €/animal place is sufficient. This permits a cost framework to be drawn relatively easily and to answer the question, if the construction is at all possible in the light of the prevailing conditions.

When the decision to build is made in the further process of planning the buildings, the *cost estimate* is made with the help of cost indicators, at least up the first level of the cost breakdown according to DIN 276. Through the multiplication of the gross ground area and the cost indicator, the cost for each of the seven following cost groups can be calculated. In this planning stage, it is recommended to calculate the costs in terms of general elements even when mainly only line sketches of the buildings are available. (2nd level). This level of organisation is the minimum required for the *cost calculation*. In the *cost proposal*, the total costs should be presented in

cost groups at least to the third level of the cost groups. The *costs established* are to be divided among the total costs according to cost groups to at least the second level. In construction measures, for which comparisons and cost indicators are to be evaluated and documented, the total costs should be divided down to at least the third level.

Cost Breakdown

A differentiation between planning-oriented *cost breakdowns* according to cost groups and the construction-oriented breakdown into service areas. For farmers, planners and architects who do not calculate the costs exactly in the planning phase, but rather, only estimate, the breakdown according to cost groups is decisive.

The construction of the cost breakdown presupposes three levels. They are characterised by three-figure organisational numbers. In the first level of the cost breakdown, the total costs are broken down into the following seven cost groups:

- 100 Land
- 200 Linkage to Public Services, Development
- 300 Construction – Building Constructions
- 400 Construction – Technical Facilities
- 500 External Facilities
- 600 Equipment and Artwork
- 700 Additional construction costs

These cost groups can be further broken down as necessary. At the second level, the building is broken down into general elements and at the third level in building elements.

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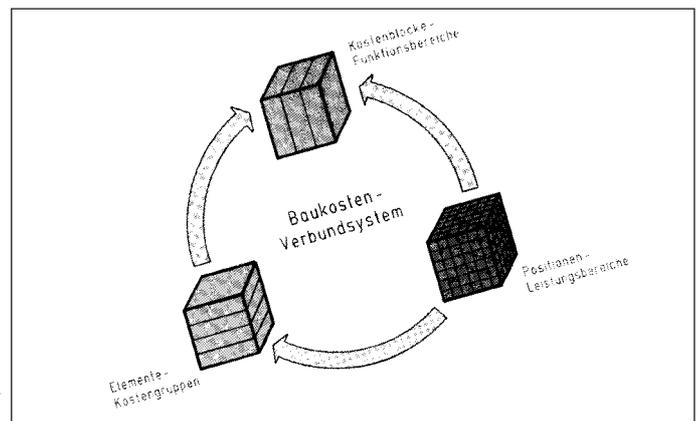


Fig. 1: Construction costs – compound system; interfaces of different cost structuring methods

ments. With this structure, a clear relation to the cost calculation and its individual differential level is created. According to the technical processes, the costs can be divided further.

Reference Characteristics

Floor areas and space areas are, among other things, determining factors for the calculation of costs for buildings and in comparing with constructed objects. Between the DIN 276 and the DIN 277, there is a close relationship due to the necessity to develop cost indicators for cost calculations. A cost indicator is a value presenting the relationship of costs to a relational unit (for example, ground area or space area).

The calculation of quantities takes place according to the planning progress on the basis of the planning papers, which are the basis for the types of the above mentioned cost calculation. Here certain measurement rules must be observed.

Cost indicators for non-agricultural constructions

All cost ascertaining processes are only as good as the data material available. Experience is needed, and values gained by experience are essential. The chambers of architecture for all German federal states started the Construction Cost Information Centre (BKI) in 1996. Its purpose is to continually document construction cost data and to maintain a construction cost database. The construction cost database includes at this time over 1,100 completed projects for new constructions, renovations, energy saving constructions and free-standing facilities. This database includes complete documentation of the completed buildings. The cost information contains photos, drawings and object descriptions. After a maximum of five years, the objects are updated with new objects. In the meantime, the data is adapted with the help of a construction cost index of the appropriate price development.

The BKI is now the leader in Germany, in terms of the preparation of construction cost data and the availability of working helps for cost calculation and cost planning. There are other institutions which also offer cost data but within the framework of this short article they cannot be named individually.

In the BKI, only two agricultural buildings have been documented to date. They were compiled without problems by the database managers according to the strict rules of the BKI. At this time the data for different horse stables and riding stables are being collected and prepared for inclusion in the database.

Cost indicators for agricultural buildings

Since 1975 the Institute of Production Engineering and Building Research of the German Federal Agricultural Research Centre has been working on construction cost data for selected farm buildings. Since 1982, they have been used as orientation data in the breakdown of costs into blocks for KTBL pocket manual. The data also flows into the price guidelines of the ALB Hessen. In addition to other publications, such as Landbauforschung Völklenrode, the cost indicators can also be found in Internet under the address: www.ktbl.de.stallbaukosten or obtained on a CD ROM.

Ranging from cubicle houses for dairy cows to ground keeping husbandry of laying hens, the database contains 95 stable types at the moment. In LANDTECHNIK 2/2002 a more complete report is available [2].

The available data has all been calculated by the FAL within the framework of the KTBL project „Calculation Standards.“ Documentation and ascertaining took place with FALs own methods and programs in accordance within the above mentioned framework. The own construction cost compound system permits use of the construction costs from the finely broken down level of unit prices for construction services over the building elements through to the general breakdown in cost blocks (Fig. 1).

Cost blocks are functionally related building parts or construction part groups. In dairy cattle stables, for example, they include the functional areas STABLE; MANURE; FEED and MILK. A further division according to usage times was also planned to calculate the annual building costs. The costs are always related to one usage unit, for example, one stable place .

Cost data blocks are orientation works for quick assessment of investment requirements. Their use takes place in the first planning phase mainly by the farmers or business advisor. The goal here is to get a rough idea of the total costs. But with cost block data, it is possible to make a rough comparison of different building sizes, husbandry practices and construction variations.

All of the levels set in the standard (DIN 276) are taken into consideration by BKI. A continuing monitoring of the construction cost data is possible for a period of four to five years. Following this period, a complete reworking and update is required. On the one hand, this is because the standard sized stable types, husbandry methods and functional measures change over time, and on the other hand, because new general conditions – for example environmental or animal rights regulations – take effect, and make new measurements or construction types necessary.

New building materials, construction forms and assembling processes also require new calculations.

It is planned, that the offering of the database be expanded. Within the framework of the KTBL working program „Calculation Standards 2003,“ the FAL is currently studying the costs of poultry fattening stables.

Despite all efforts to prepare the most important building types in agriculture with construction cost data as soon as possible, it must be warned that new work cannot take place at the expense of available models. Only if all that takes place in the next four to five years, can the database maintain the same information standard over the long term as contained in the BKI for non agricultural buildings.

Summary

The basic work of the Institute for Production Engineering and Building Research of the FAL in the area of building economics has been oriented for many years on the usual standards and guidelines for general construction. Through intensive exchanges with professionals, above all with the BKI, it was possible to provide planners with cost indicators for farm buildings and construction facilities in Germany almost as complete as the cost indicators for other building types.

The KTBL database „BAUKOST“ (Construction Costs) at this time contains construction cost data for the production facilities for dairy cattle, fattening bulls, fattening pigs, breeding pigs and laying hens. Appropriate data is available in the Internet or on CD ROM for 95 different stable types and herd sizes. The database will be increased to include information on broiler- and horse stables in the near future.

It can be hoped that in addition to the planned expansion of the database, adequate capacities are made available to include information on the updating of the stable types, herd sizes and construction types and remain consistent for new buildings and facilities such as biogas, waste air purifiers etc., and will maintain the quality of the data over the long term.

Literature

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