A modern farm specific labour budgeting system.

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Abstract

The computerised farm labour budgeting system known as PUBAS and developed at IMAG-DLO, is currently being used by insurance companies. They can work with relatively rough labour figures. For use in a research environment, however, the current version of this labour budgeting system is not sufficiently accurate. The present PUBAS version cannot answer questions relating to the real limiting conditions of the labour demand as these relate to work organisation. By extending PUBAS with a more detailed level of input and output, more facilities of the underlying labour budgeting model can be made available to users of the PUBAS user interface. This paper provides an overview of useful extensions and the way they will be implemented in the extended version of PUBAS.

Keywords: task time, computer system

Introduction

In the 1970s and 1980s, researchers at IMAG-DLO Wageningen developed a computerised farm labour budgeting system known as ARBGRO (Kroeze, 1982). The model calculations themselves are still usable, but the user interface is not user-friendly. Data input is time consuming and tedious and questions must be answered one after another. In addition the correction of mistakes only becomes possible after the entire question list has been completed.

To improve the user interface a new shell was developed. This takes care of handling the input and output of the ARBGRO model and also contains a database with many predefined task packages and machines. In earlier CIOSTA papers the principle of task packages has been introduced (Kroeze and Vink, 1995) and the development of a computer program for insurance companies has been presented (Kroeze and Vink, 1997). The name given to the combination of the ARBGRO model with a new shell is PUBAS. The program is currently used by a dozen insurance companies to evaluate the potential labour capacity of disabled farmers.

The program is sufficient for the insurance companies, because they only need to calculate the global labour demand for an agricultural business. Research stations and educational institutes can also use PUBAS, but need more detailed data. At agricultural schools and university, for example, students carry out an assignment in which they compose a farm and calculate all costs. PUBAS could be the tool to assess the practicability of the chosen production plan. However calculating task times alone is not enough. PUBAS must also show the bottlenecks in the work organisation, which is not possible in the current version.

Researchers or advisory service scan also use PUBAS if they want to know the effects of changing input variables and wish to compare alternatives. An example here would be comparing the labour demand of normally and ecologically grown crops. The overall goal of the extended PUBAS version is a better analysis of the effects of changes in management, principally at strategic level.

Current version of PUBAS

PUBAS consists of a database containing standard labour data, a labour budgeting model (ARBGRO) and a user interface suited for Windows 95 (see Figure 1). The current user interface is tailored to the needs of the insurance companies. This means that users with little agricultural knowledge should be able to produce an overview of the farm labour demand with as little input as possible. The user interface is programmed in Delphi 3 and the data are stored in a Paradox database. PUBAS is currently used by about 100 labour experts from insurance companies.

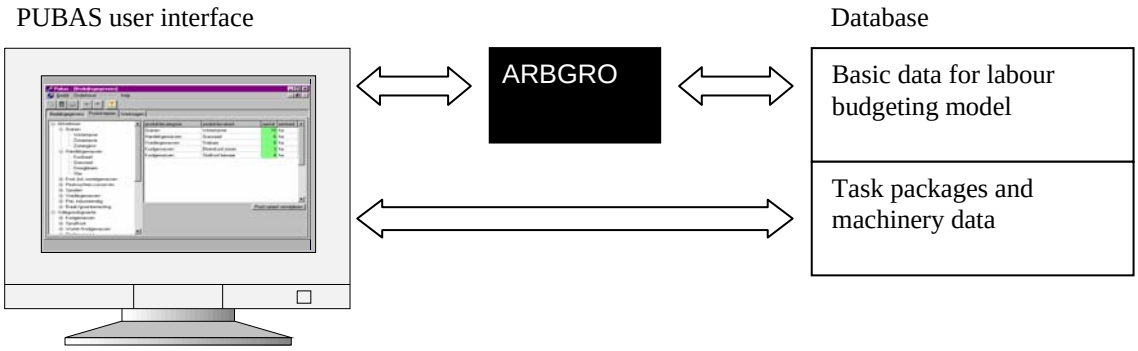

Figure 1. Schematic representation of the components of PUBAS.

Users can compose a farm production plan by selecting crops and cattle from a predefined list that contains all available production variants of 15 branches in agriculture, from arable farming to pot plants and from dairy farming to sheep. A production variant contains all necessary tasks for the growth of a crop or cattle breeding. The user only has to supply the number of animals or the acreage of the crop. It is also possible to combine production variants of more than one agricultural branch, for example, arable crops with pig fattening. If dairy (grassland), arable or vegetable production variants are chosen, PUBAS presents a list with necessary machinery. The user can indicate which implements are used and he or she may change the working width of the implements. It is also possible to indicate which tasks are contractors' work. Based on this input, the total labour demand for the chosen production plan can be calculated and shown on the screen. The farm labour demand is expressed in hours per year and divided in four quarters. PUBAS also shows the total farm labour demand divided over thirteen periods of four weeks, as a graph or in numbers. After the calculation of the total labour demand, the labour expert can use PUBAS to assess the remaining labour capacity of his or her client. The labour expert fills in the percentage of the hours that the client can no longer perform that a particular task and PUBAS calculates the total disability percentage.

New extensions to PUBAS

Input

Task packages

At this stage, the PUBAS database contains a limited number of predefined task packages for crops and cattle. An example: PUBAS contains only one task package for growing winter wheat, while there are many variables that influence the growing of this crop, including soil

type, available machines and possible working methods. In the research version IMAG-DLO will add the ability to choose from a greater range of predefined task packages, to be able to calculate a more farm specific labour budget. The program database should contain various task packages for winter wheat, for example: grown on clay, on sand, or grown ecologically.

In the current program, the user interface does not allow any change to be made to the task package. Users can only select a predefined task package and indicate the number of cattle or the acreage to which the task package must be applied. A new feature will be that it becomes possible to change the contents of a predefined task package and save it for future use. In other words, research and educational users will be able to build their own database of task packages, adapted to their own specific needs. Possible adaptations are the insertion or deletion of tasks within a task package and the assignment of another implement or working method to a task. It should also be possible to adapt characteristics of machinery, like working speed or capacity.

Field characteristics

Another extension should be the specification of the acreage of fields in arable farming. In the current version users select a crop and simply specify the acreage for that crop. The program computes a length and width for the parcel, depending on the total farm area. It is not possible to specify distances for the various parcels. All parcels in the field are supposed to be the same distance from the farmhouse. In the new version it should be possible to assign each crop to a field at a specified length, width and distance from the farmhouse. This is already facilitated in the labour budgeting model, but the user interface needs to be changed.

Weather constraints

The labour budgeting model ARBGRO also contains a method for taking the weather constraints into account that influence the workability of operations. A workability class is assigned to each operation, ranging from 1 (good weather conditions necessary) to 5 (can be performed under any weather conditions). The workability class is already implemented in the database, but the user interface does not at yet support it. The weather constraints of the various operations indicate whether it is possible to complete all operations in the calculated time, given the weather situation.

Work organisation

In the past, IMAG-DLO has also developed a model dealing with work organisation. Work organisation is another factor that influences the feasibility of the calculated labour budget. Even if the supply of machines and personnel meets the total labour demand on a farm, it is still possible that not all the operations can be performed because of work organisation problems (Oving, 1971). If PUBAS can offer insights in this problem, it will be especially appreciated on larger farms with more staff. When PUBAS can address work organisation and combine it with weather constraints, it will also be possible to know how much contractor’s work is necessary to complete a certain production plan.

Database

The database included in PUBAS will have to be extended to work with more detailed input. Some of the necessary data structures are already available in the database, such as the

weather constraints and the predefined task packages structure. To make it possible for the user to create his or her own task packages, the database structure must be extended with a section to save user-defined task packages. Extensions of the user interface are also necessary because the software must enable the user to modify task packages and must verify these modifications.

Output

With a much more detailed input, the output of PUBAS can also be given in more detail. The user can choose the level at which results are aggregated from global to very detailed (see Figure 2).

The most global view is a list with all tasks that occur on the farm during the year accompanied by corresponding task times. Tasks can be grouped according to branches, if more than one branch is present on the farm. A further detailed grouping into task packages is also possible. Here a list containing all tasks and task times for each task package is presented. In this way the user can choose his or her own view, global or more detailed, and concentrate on the information that is needed at that moment. A completely different grouping is possible when weather constraints are used. The user can identify the total labour demand for each weather class and thus find out if these tasks can be finished in the allotted time.

From each aggregation level users can call up more detailed information about a single task, by simply clicking on a task. Possibilities are the task time, a division of the hours in 26 or 52 periods of a year and an extensive textual description of the task. The description of the task gives background information about the machinery and the working method used. For tasks carried out with machines not only the task time is available, but also machine times and possible waiting times. PUBAS will also show whether all activities within a task are geared to one another.

Conclusion

When these elements are incorporated into PUBAS, we will have a research tool for a very farm-specific method of labour budgeting.

The program will be able to show the influence of the input variables mentioned earlier and thus give a better insight in the issue of farm labour. The options concerning weather constraints and work organisation will give a surplus value to the PUBAS shell. PUBAS will be used for research, but is also suitable for use in education.

References

Kroeze, G.H., 1982. Computer labour budgeting on dairy farms. In: Proceedings of the XXI CIOSTA / CIGR V Congress, Reading, Great Britain, 183 – 187.

Kroeze, G.H. & A. Vink, 1995. Farm labour planning using task packages. In: Proceedings of the XXVI International Congress on Work Science (CIOSTA-CIGR V, ISHS), Lillehammer, Norway, paper 2.4.5.

Kroeze, G.H. & A. Vink, 1997. A farm specific labour budgeting system used by insurance companies. In: Mathe, A. (ed). Proceedings of the XXVII International Congress on Work Science, Kaposvar, Pannon Agricultural University, Hungary, 245 – 252.

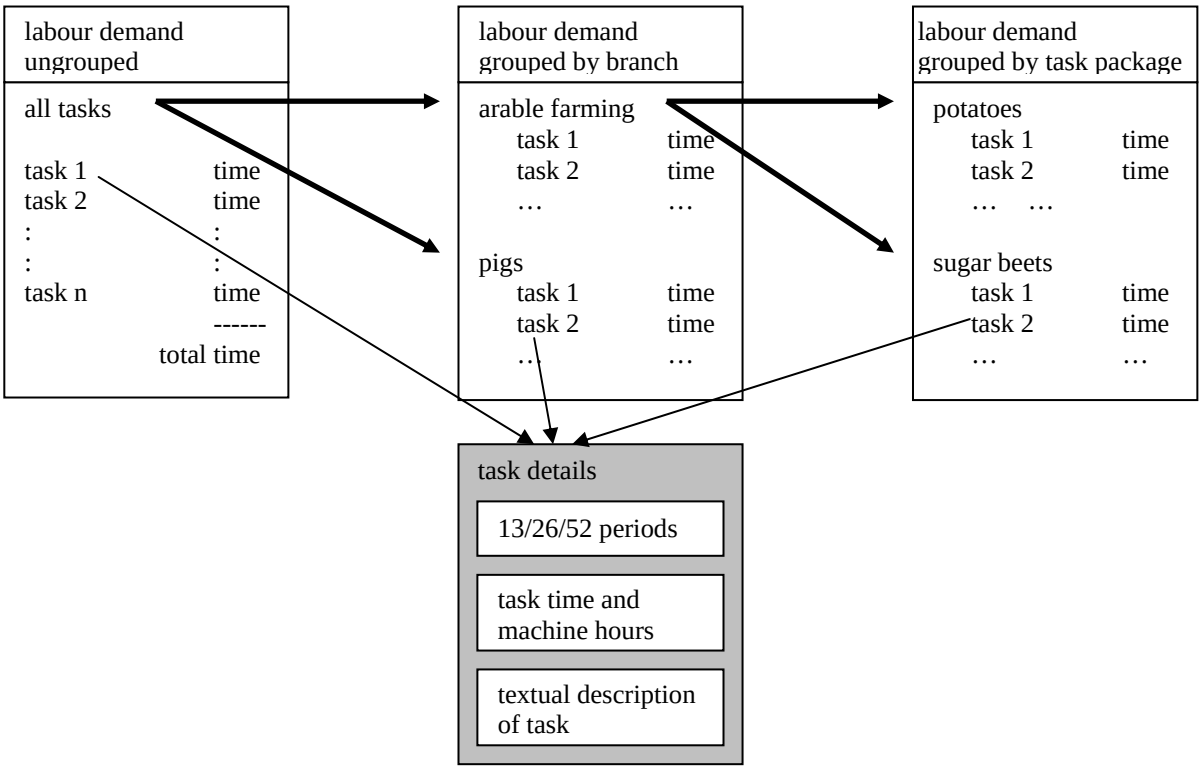

Figure 2. Output views of PUBAS

Oving, R.K., 1971. Farming task and machinery. ILR Research Report 3. IMAG-DLO Wageningen, The Netherlands.