

SYSTEMS RESEARCH INSTITUTE,
POLISH ACADEMY OF SCIENCES, SZCZECIN DEPARTMENT
AGRICULTURAL UNIVERSITY OF SZCZECIN
FACULTY OF ECONOMICS AND ORGANIZATION OF FOOD ECONOMY

MODELLING OF ECONOMY IN SPECIALLY PROTECTED REGIONS

*Proceedings of the international conference
held on 9-11 june 1994 in Drawno, Poland*

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SUPPORTING THE DEVELOPMENT OF ENVIRONMENTAL PROTECTION STANDARDS THROUGH A COMPUTERIZED FARM RECORDS SYSTEM

Hans Joachim Budde) and Michał Świtłyk**)*

**) University of Göttingen*

***) Agricultural University of Szczecin*

Introduction

An increasing number of forward-looking managers seek support from computer-based monitoring and control systems for their business operations. They recognize the value of record-keeping, particularly in situations requiring the analysis of certain key areas that need attention. In the past, record-keeping was mainly used for purposes of documentation. Daily records were maintained to provide historical accounts of the past production processes. Currently, this notion of documentation has changed. Record-keeping has now become an integral part of the decision-making process vis-a-vis the operations of the business. The issue at hand now lies on the question of whether a documentation as such could offer something to the decision-making process of the people involved in environmental protection.

The work required: the case of single proprietorship

The farm record system has long been traditionally used as an instrument in business management. In principle, the larger the business, the more important it is to record the details of the operations with a high degree of precision. For this purposes, the daily record performs an important job.

Many recording systems in the past were more or less done haphazardly. This is because there is some doubt as to the usefulness of a comprehensive recording system, which is time-consuming and therefore costly. In this case, the records became of little use and are indeed seldom used to reconstruct the historical accounts of field operations.

The introduction of the electronic-based data documentation system offers a solution to the basic problems cited, by making the job of recording lighter. In addition, the manager is in a position to expand the information base to include certain key variables that were normally not properly recorded in the past. The ease in handling data through a computerized system makes it possible to accommodate a larger base of data for a much less amount of effort. For instance, this computer-based system is prepared to undertake a comparative performance review at any time desired, using all the information stored. Management decisions on the basis of the results of the analysis could be made much more effective.

A farm manager initially uses the farm records as reference for the production process yet to be undertaken. The amounts of inputs to use, as well as the input-output relation could readily be drawn. At the same time, one gets information on the spatial aspects of the production, i.e., which areas produce how much.

One can treat a specific parcel of land to be an instrument or a medium that converts inputs to outputs. Inputs could be

nitrogen, pesticides, etc., but also land characteristics such as soil erosion, elevation, slope, etc. Each parcel of land contains information on historical quantities of production, as well as inputs used, given the characteristics of the land. As an example, suppose a certain area showed a high rate of nitrogen utilization. Despite this, it has failed to produce a high level of output (which is measured in say, in protein units). The information system provides some data which could be used as a basis to explain variations in output. This is done by comparing certain features of a particular parcel of land with other parcels. One reason provided could be the high rate of erosion due to say, steep slopes. On the basis of this information, one could make a decision to decrease the amount of nitrogen fertilizers in the next production period, to a level that optimizes the rate of application with respect to output production. In summary, the information on the productivity potentials of a certain piece of land is given as a basis for management decisions. At the same time, this information could also be a basis for formulating regulations on use of nitrogen fertilizers in the production process.

An economic analysis could also be readily performed, as the system contains information not only on quantities but also on prices. Calculations on the economic performance of the selected input levels in a particular parcel of land could be compared with other parcels, providing an overall perspective of the whole business operation.

A further work of interest is the determination of activities that will lead to optimal business management, given variable conditions. For instance, field management also requires the monitoring of weeds. To do this, one needs information on soil characteristics such as, among others, land quality, water storage capacity, and underground composition. Some of these information could be readily drawn from cadastral survey data. Keeping such data on storage provide the capability to draw explanations

on extreme situations such as super harvests or failed harvests.

Advisory Work Needed in the business

The amount of data normally available for the management of a single proprietorship is often too little to establish the root and causes of extreme conditions such as a bumper harvest or a disaster. Statistical analysis of the business data provides little explanation of the relationships of business performance with key variables normally beyond the manager's control. A good business manager would be expected to perform a comparison of data beyond the business activities.

Factor intensities in say, fertilizers and pesticides/herbicides can provide an idea of the production function. An understanding of the peculiarities of the production process with a locational data component provides a better view of the profitability of the operations. By drawing information on the relative changes in performance of a piece of land through locational differences, one could have a basis for improving the overall profitability of the business. This comparative data is of extreme utility to an advisor in actual field operations. A framework could also be established on the regional conditions transcending the bounds of a particular business, i.e., to a level of inter-business or cross-business activities, which allows differentiation of performance of the various businesses.

Regional environmental protection

The function of the farm record system is basically unchanged when used for purposes of environmental protection activities. The basic issue remains to be the relative precision and secured documentation of the business operations. The additional point to consider in this case is its contribution to ensuring

that the larger interest of the society towards environmental protection as a responsibility is considered. As an example, suppose data on biotopes which are included in the information stored in a field record system. If biotope preservation is an objective in environmental protection, controls could be instituted in land utilization to ensure that there is minimum damage to the existing biotopes in specific areas. This is made effective only when such data are available at hand. Many aspects of land use data are already built into the modern version of the farm record system, simply because these have been incorporated to be part of the documentation system stemming from the daily records. This applies as well to aspects related to natural conditions. Some data which should describe aspects ranging from water circulation to underground water conditions, are not included in the software but could be supplemented.

Control is Required

If environmental considerations are important to the policy-maker, then it is important to have the framework conditions by which the controls are to be instituted. This is required because profit-seeking firms will not freely reduce their land utilization unless this has a bearing on the achievement of a higher profit. It is also to be expected that the firm will seek to be compensated for the negative effects of a reduced land use through environmental protection measures. A misuse of this process could be prevented if the compensation is tied up with carrying out record-keeping activities. For instance, it is in the interest of the policy maker to have production conditions that in certain periods, no production of silage is to be undertaken. Controls could be designed such that prohibitions on the use of reapers in grasslands at particular periods are instituted. Livestock grazing could also be restricted during certain periods, on grounds

of environmental protection. The data storage in this case must include time aspects, i.e., that the activities are classified according to time/date accomplished, and the correctness of the entry must be, in principle, doubt-free.

Compliance control measures in such situations could be easier to implement through the use of a computer-based field record system. If one provides a standardized computerized system, an additional feature of easy handling techniques in the implementation of control measures, as well as ease in learning and training, is incorporated. This is particularly important, since all businesses will basically have the same program design. Checks could be easily instituted and controls on field record with false entries could also be monitored.

Applications in land-use planning

The application of farm record system for the purposes of environmental protection also has useful advantages from the point of view of land-use planning activities. In many cases, the maximum carrying capacity of environmental and resource utilization is unknown. A computerized field data system as such offers information on the approximation of the maximum carrying capacity levels. This information could also be provided in a time series format, i.e., to answer questions like how much environmental and resource use is possible at specific points in time over a certain period, that is still tolerable in as far as carrying capacity of the environment is concerned. One can also calculate the amount of compensation required on the basis of the damages made per period. This provides an idea of how much it would cost to make the activities environmentally sustainable.

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