UNIVERSITY LEVEL EDUCATION IN INFORMATION TECHNOLOGY FOR ANIMAL PRODUCTION

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Abstract: Two university level courses and permanent education on information technology in animal production are described. »Computer tools in animal production« is a 75 hour advanced course teaching about information technology (IT) in animal production. It gives the students an insight into a variety of software tools that can be utilized in the field of animal production. Topics include databases and farm management applications, the Internet and WWW, and simulation modelling. The course »Swine science« makes extensive use of IT in the educational process. Permanent education seminars for extension service personnel, farm management personnel, and secondary school teachers are presented.

Keywords: information technology, education, animal science, computer, Internet

1. Introduction

Information technology (IT) has found its way to animal production. In Slovenia's animal selection programs, centralized computerized data analysis has been conducted since 1975. Today, larger industrial farms own computers and run regular data analysis. Besides larger units, Slovenia features a number of family farms. On these farms the computer is not widespread. If they do own a computer, they generally acquired it for children and are not using it for production monitoring. The reasons are lack of education, partly lack of appropriate software, and sometimes the nature of production on family farms.

To leverage the use of IT in animal production in the field is education of the younger generations on the university and high school level on one hand, and education of extension service specialists on the other. The Zootechnical department at the University of Ljubljana is involved in activities on both of these levels.

2. University courses

University courses can convey knowledge of information technology by organizing courses which explicitly teach about IT, and by actively including IT in regular courses by using it as a teaching aid.

Two courses taught at the Zootechnical Department are described: »Computer tools in animal production« as an advanced course teaching about IT in animal production, and »Swine science« where IT is used in the coursework.

2.1. Education about information technology

Two courses are designed to acquaint students with information technology. In the second year of the study the course "Biometry and computer technology" dedicates part of the course time to information technology and provides a general introduction to working with a PC and the basic office suite. Since 1991, students have the option to attend an advanced course, called "Computer tools in animal production". The 75 hour course gives the students an insight into a variety of software tools that can be utilized in the field of animal production. Databases and farm management applications, the Internet and WWW, and simulation modelling are among the stressed topics.

The course begins with a general introduction to information technology that acquaints the students with the state and development of information technology. It gives an overview of today's computer systems and the type of their use, trends in IT, and encourages to use IT literature to follow developments.

Internet and the World Wide Web. Typical topology of subjects involved in a selection program includes a large number of locations. The sites vary in size and are geographically disseminated across territory. The ideal information system would be based on a telecommunication system that allows instant data flow among locations and allows integration of local databases into a coherent system. The emerging technologies, i.e., the Internet and World Wide Web offer the necessary basis: low cost, standardised, easy to use data transfer tools and techniques. Besides learning to use and navigate through the World Wide Web, students also learn the basics of HTML, get insight into other tools and techniques used to construct the WWW applications (CGI scripts, graphical converters, JavaScript)

Database and information system. Management information systems and the underlying databases are an established application of IT in animal production. In the introductory part the areas of IT utilization are presented and the underlying information needs are identified. The main part acquaints the students with basic techniques of database and application design. Entity-Relationship diagramming and data flow charts are used to design a simple animal database and a simple application. Students are explained the concept of a normalized database. A relational database management system is used. Students learn the standard query language SQL and create simple applications.

Simulation modelling. The simulation modelling part of the course in intended to give students some hands-on experience with development of simulation models in animal science. After a brief introduction on the concepts and goals of simulation modelling, the students are familiarised with a software program that allows the students to solve differential equations. Flow diagrams, that are now core of most GUI-based simulation packages, allow the students to maintain an overview of the models they created. Groups of two or three students re-create a model (e.g., a lactation or growth model) based on an article published in a scientific journal. This forces the students to rearrange the published mathematical equations in a structural flow diagram. After development of the model, the students are requested to change model parameters in order to better understand the model's logic and perform a sensitivity analysis on the parameters.

Statistical analysis of field and experimental data is a topic well covered in other courses. In »Computer tools« the students receive an overview of statistical packages and practical exercises are organized.

2.2. IT as a tool to support coursework

Some of the university courses at the Zootechnical department make extensive use of the Internet and World Wide Web as teaching aids. An example of a more supported courses is "Swine science". Before the beginning of the academic year the exact content outline and timetable for the lecures, exercises, and practical work are published on the course home page. Included are all instructions,

course requirements, and timeframes. All the handouts (most of the textbook and instructions for all exercises) are available on the home page.

During the coursework, students are expected to use the WWW to find information relevant to covered topics from various Internet sites. For instance, statistical data, feed market data, and swine market data are sought for examining the developments in swine production, pork production, and efficiency of swine production. Publicly accessible databases are utilized for studying swine breeds, among them servers on FAO; EEAP, and Oklahoma State University. The students prepare data about Slovenian swine breeds and pass them on to the named databases by E-mail. Also, the Internet is used to find legislation about ekological concerns in swine production, basics in housing, organization of insemination, and other topics.

"Evaluation of production level in reproduction, fattening and carcas traits" is a WWW aplication where students are presented with a table of questions and asked to fill in the blank spaces. The objective of the application is to train students how to analyse production level on a swine farm. The aim of these exercises is:

- to examine sow and boar fertility,
- to evaluate growth, feed efficiency, feed intake, and carcass traits in growing pigs,
- to attain carcass grading system, and
- to develop replacement policy.

First the students have to learn the definitions of traits describing reproduction, fattening, and slaughter. They are also acquainted with expected values, variances and covariances, distributions, dependences among traits, and results reached on Slovenian farms. To support the learning process, exercises were programmed and put on the Internet. The input data were obtained from the information system PiggyBank and represent production level on different farm units. The exercise contains the minimum amout of information that is needed to evaluate efficiency of production. Students are asked to calculate all possible traits that can be derived from the data and type in the results. After completing the form, the student submits it and immediatelly receives a response where uncorrect answers are marked. If the student is satisfied with the grade the exercise can be turned in in order to fullfil one of the course requirements. The exercises may be used from everywhere, therefore, they are available to secondary schools as well as for home activity. The user may choose among several levels of complexity. The form of the quiz resembles exams for the course.

"Virtual swine farm" is an educational purpose WWW application. It contains testing and production data for pigs. Farms of various sizes are represented, ranging from small, 10 sow farms, to large industrial units holding 2000 sows. The data are taken from real life and span over several years. The students have access to a set of applications for data monitoring and production evaluation: current list of newly tested males, phenotypic trends of tested males, list of breeders who sell breeding animals, animal inventory, sow an boar history records, pedigree, inbreeding, reproduction analysis, culling analysis, slaughter data, various documentation (regulations, instructions, messages), breeding animal subsidy information, reports, archives.

The students are asked to examine herds and evaluate production efficiency, reproduction efficiency and phenotypic trends in tested animals. Via the same WWW UI they have access to class notes with parameter definitions, and to selected reports with national-level results. Therefore, they can compare herds to each other and to the national averages. The data entry part lets the users to enter new data or to alter existing data in order to examine the impact of changed original data to the values of parameters that we use to evaluate production efficiency.

The user interface is written using WWW technology: HTML documents and CGI scripts for accessing ORACLE database. Therefore, the application is widely accessible.

3. Permanent education

The Slovenian animal breeding is organized into national breeding programs, separately for species. Breeders included in the NBPs are eligible for subsidies for breeding animals, administered by the Ministry of Agriculture. One of the requirements for subsidy eligibility for the breeders is presence of animal pedigree and test data in the central databases in the selection offices. In these databases,

production and slaughter data are collected as well. The data are used primarily for selection purposes, and also for production monitoring on farms. The breeders receive regular reports which contrain production analysis, comparison with national results, and between-farm comparisons. Periodically, expert opinions are included. The contact with breeders is either direct or via the seven regional institutions with veterinary and agriculture extension service.

The selection office is attempting to make the system more dinamic. The central database offices are getting ready to port most of the information flow to the Internet. The database applications are ported to the Web, allowing remote program execution and database lookup. The home page is divided into a public part where generally acessible information is published, and into the password-protected intranet where the access to information is limited to the owners of data and their extension service advisers. The users also have access to aggregated data.

An effective device to transfer IT into practice is to educate extension service personnel, farm management personnel, and secondary school teachers. The Zootechnical Department organizes permanent education seminars for teachers of agricultural secondary schools where information technology in animal production is a regular topic. The teachers are familiarized with the data processing within the national selection programs, standardized definitions of traits, data and information flow, the regular reports, and also with newly introduced technologies.

Seminars and workshops for personnel from Ministry of Agriculture, extension service, and farm management personnel are being organized (10 in the past year). The seminars include round table discussions on the use of the IS in the Slovenian animal production. An important objective of the workshops is to practically demonstrate the potencial of the use of the WWW technology in the data and information flow The workshops take place in a computer classroom and the users are trained to use the existing applications for swine and small ruminants.

4. Conclusion

The regular education cycle that produces knowledgable personnel takes several years and.is mostly too slow to follow the rapid development of the information technology. Therefore, special attention needs to be placed to the education of IT in agricultural schools. Besides, the transfer into practice can be stimulated by organizing permanent education for people in the field.

Intranets have great potencial for animal breeding associations. They offers numerous ways to improve communication efficiency. An important emerging application of the Internet is education *via* the Internet. The technology is available today, but the transfer into practice, again, has to be stimulated by education.