ISIP - A WEB-BASED INFORMATION SYSTEM ON INTEGRATED CROP PRODUCTION IN GERMANY

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ABSTRACT

In modern agriculture the demand for solutions for complex problems, e.g. the optimisation of decision – making in integrated crop production, is strongly increasing. To obtain all relevant information for decision – making farmers or extension officers up to now need access to a multitude of databanks offered by different providers. In 2001 a project, funded by the German Foundation of Environment, was started to elaborate an internet – based information system (ISIP) which facilitates a simple and rapid access to integrated crop production data.
The first version of ISIP provides information on crop protection as they are given the highest priority within arable crop production by the farmers. Thus for the most important crops, cereals, potatoes and sugar beet, comprehensive warning services were made available. They are based on three pillars: results of forecasting or simulation models for the relevant pests and diseases, data from monitorings conducted by staff of governmental crop protection services and recommendations given by extension officers. In 2002 results of several ten thousands of model runs with weather data from 220 meteorological stations, about 10,000 records from about 1,200 plots on farmers` fields and some hundred recommendations by a total of ninety extension officers were presented to agricultural practice via ISIP. In 2002 the internet pages have been visited during the vegetation periods of cereals 500-600 times/day, of sugar beet 600-700 times/day and of potatoes 1000-1200 times/day.
In the second version of ISIP the number of included pest and disease models will be increased. But greatest progress will be made by including interactive components. Extension officers can insert their data and recommendations directly into the system from 2003 on, so that there is no delay in the availability of actual information. On the other hand the user of ISIP will be able to combine his own farm or plot data with decision support systems provided by the internet platform in order to obtain optimised plot-specific decisions. His data also may be stored within ISIP so that a repeated data insertion is no longer necessary. Farmers can define their own user profile and filter the non-necessary from the needed information. Databanks with weather data, cultivar information and all information on plant protection products (incl. the restrictions in use) will be made available to the users. A service will be established which by automatically sending SMS or faxes informs the farmers that action thresholds are overridden or an emergency case is present and pesticide applications are required or recommended.

IZVLEČEK

ISIP - INFORMACIJSKI SISTEM ZA INTEGRIRANO PRIDELAVO V NEMČIJI

V sodobni kmetijski pridelavi zahteva po rešitvah kompleksnih problemov, npr. optimizacije odločanja v integriranem sistemu pridelovanja, vse bolj narašča. Pridelovalci ali svetovalci potrebujejo za pridobivanje pomembnih informacij za odločanje dostop do številnih baz podatkov. Nemška ustanova za okolje (German Foundation of Environment) je v l. 2001 financirala projekt izdelave informacijskega sistema na medmrežju (ISIP), za enostavnejši in hitrejši dostop do podatkov za integrirano pridelavo.
Prva verzija ISIP sistema daje informacije o varstvu rastlin, saj pridelovalci temu dajejo najvišjo prioriteto - v okviru pojedelstva za najbolj pomembne poljščine, žita, krompir in sladkorno peso. Te temeljijo na rezultatih prognostičnih ali simulacijskih modelov za pomembne škodljivce in bolezni; na podatkih iz monitoringov, ki jih izvaja osebje vladnih služb za varstvo rastlin in na priporočilih, ki jih dajejo svetovalci. V l. 2002 je bilo preko ISIP-a praksi posredovanih več deset tisoč izračunov z

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vremenskimi podatki iz 220 meteoroloških postaj, okoli 10.000 podatkov iz okoli 1.200 parcel na poljih pridelovalcev in nekaj 100 priporočil od skupno 90 svetovalcev. Internetne strani v l. 2002 so bile med rastno dobo žit obiskane 500 – 600 krat/dan, za sladkorno peso 600 – 700 krat/dan in za krompir 1000 – 1200 krat/dan.
V drugi verziji ISIP-a se bo število modelov za škodljivce in bolezni povečalo. Največji napredek pa pomeni vključitev interaktivnih komponent. Svetovalci lahko od 2003 dalje svoje podatke in priporočila vnašajo direktno v sistem, tako so aktualne informacije dostopne brez zamud. Uporabniki ISIP sistema bodo lahko v iskanju optimalnih rešitev kombinirali svoje podatke s sistemom za podporo odločanja (DSS) na medmrežju. Podatki se lahko tudi shranijo v sistem ISIP, tako da ponovno vnašanje ni potrebno. Pridelovalci lahko definirajo svoj uporabniški profil in tako »filtrirajo« nepotrebne informacije. Za uporabnike bodo dostopne baze podatkov z vremenskimi podatki, podatki o sorti in vsi podatki o sredstvih za varstvo rastlin (vključno z omejitvami rabe). Ustanovljena bo služba, ki z SMS sporočili ali po faksu obvešča kmetovalce, da so bili preseženi pragovi, ko je potrebno ukrepati ali v nujnih primerih, ko je potrebno ali priporočljivo škropljenje.

1 INTRODUCTION

Implementing the principles of integrated plant production generates an increasing demand for solutions of complex problems. This demand is met by the extension services by means of an abundant supply of information and recommendations. For a sustainable success of these efforts, however, it is crucial, how effective modern communication and information technologies are used.
Currently, both farmers and advisors have to screen a range of sources and providers, to get the necessary information for production and extension work. A comprehensive provision of this information from magazines, brochures and also from the internet is both costly and time-consuming.
On the other hand, available information for an optimised and environmentally sound plant production such as monitoring data or models for decision support are disseminated and presented in an inefficient way:
The governmental extension services in Germany put a lot resources in monitoring crops on different pest and diseases. These data are highly valuable to farmers if disseminated without a time lag. For the time being, monitoring data are distributed by fax and mail after thorough processing.
Likewise, a range of models for decision support are available, but compared to their number their practical application is limited for several reasons:

- PC software requires not only the installation on a local computer but also frequent updates.
- Weather data has to be obtained and fed into the model as it is often required for simulation runs.
- For each model, an own user interface has to be learned, because a standardisation is lacking.
- Model developers, namely universities and research institutes, hardly ever have the logistic means for distribution and maintenance of their work, let alone a hotline system for user support.

Thus, these models do not fulfil their aim of knowledge transfer and, what is worse, are not further adapted or improved.
To pool necessary information sources, to process the collected data intelligently and to make it readily accessible is of utmost significance for effective extension work. In demand is decision support that puts the agricultural professional in the position to immediately take advantage of up-to-date information and new scientific results in management practice.

2 AIMS OF THE PROJECT

These shortcomings in information transfer initiated the R&D project ISIP (**I**nformation **S**ystem for **I**ntegrated **P**lant production), which is carried out by the German Chambers of Agriculture and the federal states of Rhineland-Palatinate and Saxony-Anhalt. During the project, an internet-based information system is to be developed that gives fast and easy access to all data necessary for integrated plant production. Target groups are farmers as well as extension workers. In the future, both groups will face increasing pressure towards a sustainable production concerning both economy and ecology.
By developing ISIP as an internet-based system, a high availability and interactivity can be realised. Furthermore, a standardised user interface facilitates the usability of the system. Thus, a promotion of the principles of integrated plant production can be expected. ISIP will help to maintain a high yield level and at the same time reduce the resource input. These are the advantages of ISIP in economical respect; a market survey prior to the project confirmed this and revealed a significant market potential. The extension services themselves reach more farmers as before, thus making their work more efficient. Last but not least, the environment benefits from optimised production processes.

3 CONCEPTS

ISIP is developed in consecutive steps, the first being launched in April 2002. The system focuses on problem-specific decision support for cereals, potatoes and sugar beet (Table 1). In ISIP, such a decision support does not only comprise a model for decision support. Due to the fact that a model is only a simplified representation of reality, simulation results are supplemented by monitoring data (if available) and a comment of a regional extension worker This 'threefold decision support' is one of the unique features of ISIP.

Table 1: Decision support in ISIP 2002

Crop	Disease(s)	Model	Monitoring data	Advisor comment
Cereals	Eye spot disease	SIMCERC	No	Yes
Cereals	Leaf diseases	No	Yes	Yes
Potato	Potato late blight	SIMPHYT 1 & 3	Yes	Yes
Sugar beet	Cercospora leaf spot	CERCBET	No	Yes
Sugar beet	Leaf diseases	No	Yes	Yes

The user navigates through the system along hierarchical pages: Changing with the time in the season, links to the current topics are given on the ISIP home page (

Fig. *1*). When a decision support is selected, a map of Germany is shown, on which the participating regions are highlighted (Fig. 2). After clicking on a region, a detailed map is displayed (Fig. 3): On the correct geographical position, symbols represent the location of either monitored fields or meteorological stations, weather data of which are used for simulation. The colour of the symbols correspond to certain thresholds, thus giving a good overall impression. Selecting a symbol links to a table view of the data (Fig. 4): together with the comment of the local advisor, detailed information is given for a precise assessment of the current situation.

Fig. 1: Homepage of isip.de: Shown are the menu bar with basic functionality (login, help, print), a follow-up navigation line and the main area with links to the current topics.

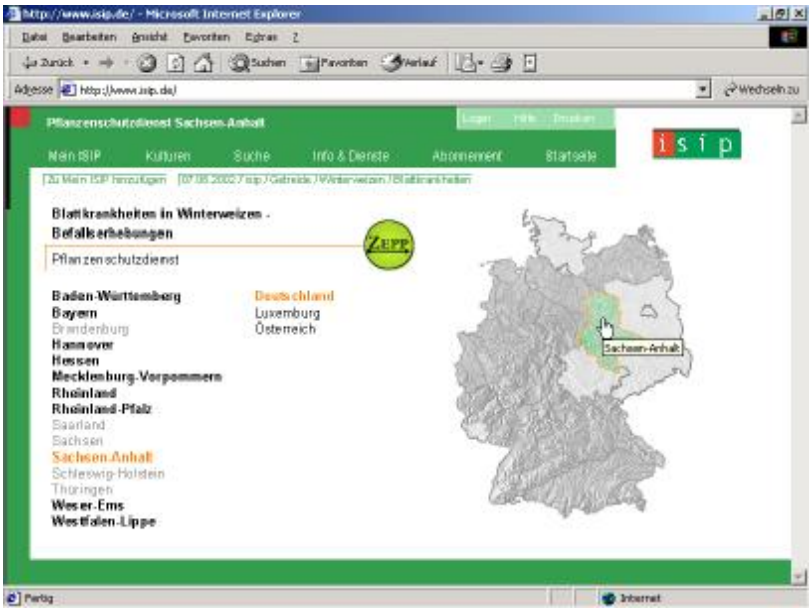

Fig. 2: Map of Germany with the regions participating in a problem-specific decision support, here the monitoring of leaf diseases in winter wheat.

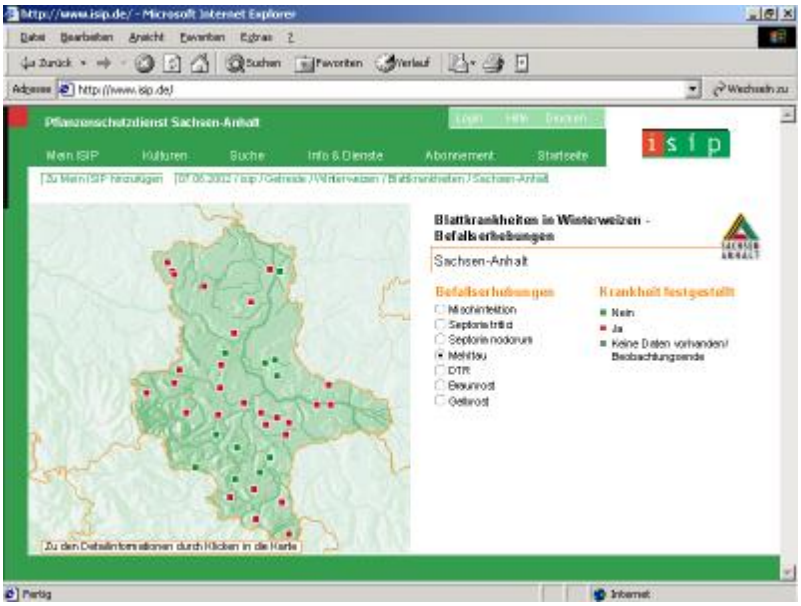

Fig. 3: Regional map (Saxony-Anhalt) giving an overview on the current status: Symbols represent the location of recurrently monitored fields; the symbol colour turns from green to red, if the disease was found.

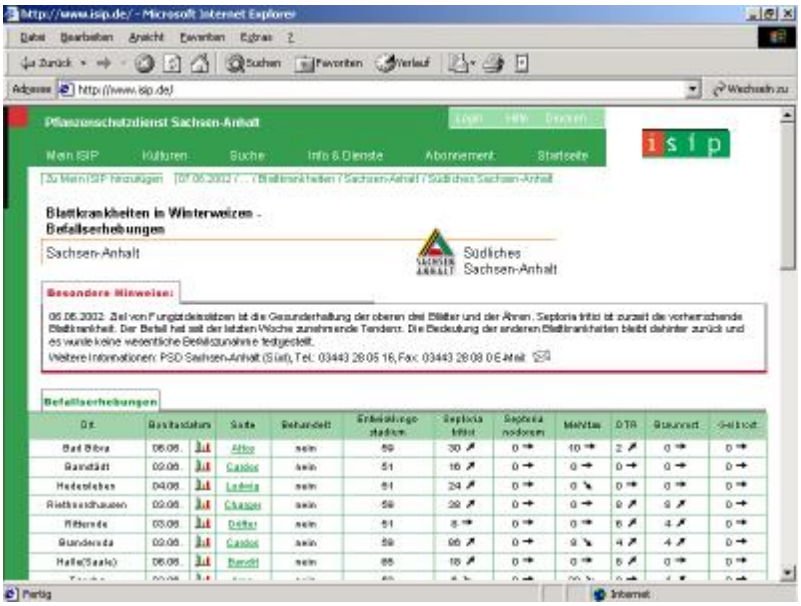

Fig. 4: Table view of monitoring data within an area (Southern Saxony-Anhalt) of the region. Shown are the advisor's comment and the survey results: Location, date, variety, treatment, developmental stage and details on the six monitored diseases.

3.1 Launch I

In 2002, some 35.000 simulation runs were calculated by ZEPP on a stand-alone computer, which gathered weather data from over 220 meteorological stations. Likewise, monitoring data from 90 governmental extension workers, who collected a total of more than 10.000 records on 1.166 fields, were send to the ZEPP office. On average, these advisors commented on the data about twice a week. After processing, all data were uploaded to a database in the ISIP system, overwriting the existing values. Thus, only the latest simulation and monitoring results were shown in the internet.

For a first launch, the overall acceptance was satisfying: According to the web log, the site had about 373.000 visits from May to August. A separately programmed site statistic revealed that the visits per day on crop specific decision support amounted to 500 to 600

for cereals, 600 to 700 for sugar beet and 1000 to 1200 for potato. The high values for potato are a result of a prototype (www.phytophthora.de), which was also online in 2000 and 2001.

3.2 Launch II

In 2003, the greatest progress will be made by including more interactivity. The models as well as a large weather database will be implemented on a central server. Thus, the models can be run online with user-defined parameters, which in turn can be stored to avoid redundant input. This is a significant step towards site-specific recommendations: General and individual data are combined to deliver individual results (Fig. 5). Nonetheless, the system will only be an additional tool for decision support and cannot replace the personal communication with an extension worker. The system kernel of ISIP that incorporates models for decision support is build in an open and readily extensible architecture. This speeds up model development and ensures a fast knowledge transfer.

On one side, the user will be able to personalise the system and thus adapt it to his needs: In a separate area ('My ISIP'), the user can maintain a bookmark list with links. Results of individual simulations are also kept here for easy and fast access. An automatic warning service will also be implemented: The user is informed via SMS, fax or e-mail, if actions are recommended due to an urgent situation, like the occurrence of a disease on a monitored field nearby or the passing of a certain threshold.

On the other side, extension workers will be able to enter their monitoring data and comments through a web interface directly into the system. This will significantly reduce the time from data acquisition to internet presentation.

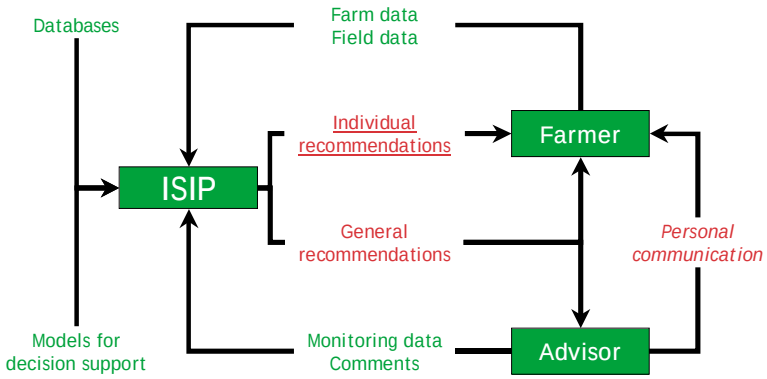

Fig. 5: Information flow in the ISIP system

4 SUMMARY

The added value of ISIP will be the online provision of models for decision support and the effective way to disseminate up-to-date information. Due to the open architecture, the system provides for an easy maintenance of existing models and is readily extendable to incorporate new simulation approaches. The user can access data from a range of sources, thus keeping the time and costs for acquisition low. Adaptation to user needs by personalisation will further promote the acceptance of the system. In addition, the user will benefit from an increased effectiveness of the extension services.

Hitherto, the information flow was more or less unidirectional from the extension services to the farmer. With ISIP, an attempt is made to develop an interactive network for information exchange between model developers, data providers, extension services, farmers and others. Using the internet as the linking platform, ISIP will be a comprehensive tool for decision support in integrated plant production.