DATABASE "SIGMA PRO" INFORMATION SYSTEM AND BIBLIOGRAPHICAL MANAGEMENT OF ACTIVE SUBSTANCES OF PLANT PROTECTION PRODUCTS AND BIOCIDES

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SUMMARY

In order to satisfy its obligations as stipulated in European legislative, in 1998, the Management of Surface Waters in the Walloon Region modified its monitoring of plant protection products in surface waters in co-operation with the Regional Phyto Committee (LLN). Notably, this monitoring network takes into account the agricultural specifics of the main watersheds in Wallonia. It has led to the publication of a specific decree (A.G.W. of June 29th, 2000), which, among others, specifies the list of dangerous relevant substances in Walloon Region as well as their investigation methods (quality, monitoring network, action programmes). Together with the implementation of Directive 76/464/EEC concerning the pollution caused by some dangerous substances in aquatic environment, the Management of Surface Waters is also finalising a database connected with plant production products. It contains technical data on active ingredients and relevant metabolites (nomenclature, toxicology, physico-chemical properties, ...), bibliographical information referring to these (synthesis of documents, table with results, ...) and some Internet connections. It has been elaborated so as to help Walloon public authorities make their decision.

INTRODUCTION

In order to respond to the stipulations in European directives, the Ministry of the Walloon Region wanted to have a tool for helping to make decisions with respect to plant production products in water. As defined by administrative requirements, this information management tool enables thematic research and makes it possible to relatively easily update information. First of all, administration requirements stipulate that a hierarchy list of active ingredients be established, which can be found in the aquatic environment. The existence or absence of registration in Belgium must be shown for each commercial product concerned with identification of active ingredients that they contain. Remanence, identification of producers and potential users as well as application conditions having a potential impact on the aquatic environment and human health must also be specified. All of these elements must be completed by taking into consideration new active ingredients, responsible for actual water pollution by plant production products.

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MATERIAL AND METHODS

Hardware

The database functions perfectly on a PC having a minimum of one Pentium II processor, 64 Mb RAM and in its actual version a space disk of around
35 Mb. The documents have been scanned with a scanner + photocopier + printer system "HP OfficeJet Pro 1150C". The forms have been preferably optimised for a 17" monitor.

Software

The "Microsoft Access 97" (SR-2) software served as basis for the database developments. The "PictureScan" software from Hewlett Packard supplied with combined apparatus allowed us to incorporate the bibliographical documents in the form of images in "Microsoft Word 97" (SR-2) files. Character recognition tests were done with the "OmniPage" (Limited Edition 5.0) software from Caere Corporation. Image processing (conversion, reducing, ...) was mainly done with "Photoshop" (version 4.0) software from "Adobe".

Collected information

Parallel to computer information technology development, we also collected considerable information about plant protection products, which we wanted, to process before being able to enter it into the database. This operation was essentially axed to providing pertinent elements allowing the Administration to comply with the decree of the European Court of Justice of 21 January 1999 concerning pollution caused by certain dangerous substances in the aquatic environment. Although Annex 1 of Directive 76/464/EC lists 132 dangerous substances, our investigations were principally done on around 50 plant protection products and metabolites.
Figure 1 shows the main collaborations established with internal and external persons and organisations at two initiating institutions of the study
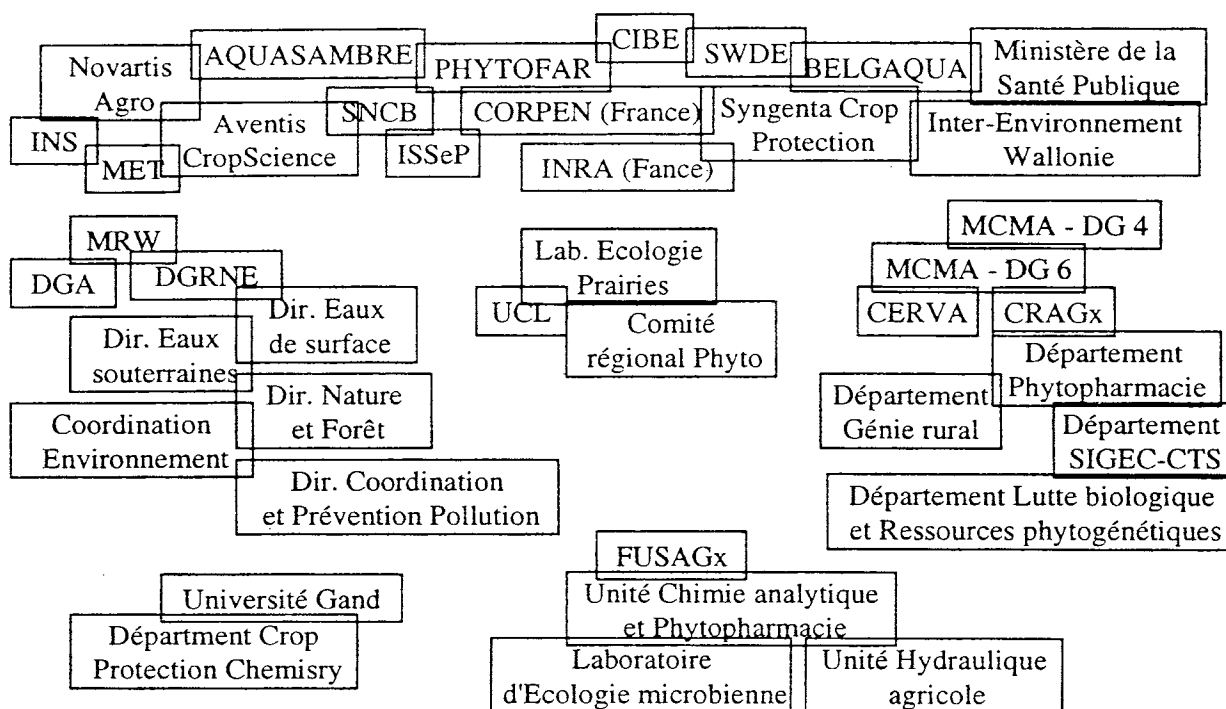
Novartis Agro | AQUASAMBRE | PHYTOFAR | CIBE | SWDE | BELGAQUA | Ministère de la Santé Publique

INS | Aventis CropScience | SNCB | ISSeP | CORPEN (France) | INRA (Fance) | Syngenta Crop Protection | Inter-Environnement Wallonie

MET

MRW | DGA | DGRNE | Dir. Eaux souterraines | Dir. Eaux de surface | Dir. Nature et Forêt | Dir. Coordination et Prévention Pollution | Coordination Environnement

Lab. Ecologie Prairies | UCL | Comité régional Phyto

MCMA - DG 4 | MCMA - DG 6 | CERVA | CRAGx | Département Génie rural | Département Phytopharmacie | Département SIGEC-CTS | Département Lutte biologique et Ressources phytogénétiques

Université Gand | Départment Crop Protection Chemisry

FUSAGx | Unité Chimie analytique et Phytopharmacie | Laboratoire d'Ecologie microbienne | Unité Hydraulique agricole

Figure 1 : Collaborations and contacts

Methodology and bibliographical processing

This work, done in co-operation with a group of experts, enabled us to identify the nature and origin of each of the active ingredients listed in the annex of the Council Directive. In order to better understand the information collected and to prepare synthesis technical sheets per active ingredient, the Administration was based on a series of documents defined as "scientific references" (Houins 2000, Verschueren 1983, X 1-8).

The pertinence of plant production products was determined after elaboration of a technical sheet per compound on the basis of information contained in the reference documents. The most relevant data on the nature of each plant protection product such as use, their toxicological, ecotoxicological characteristics, physico-chemical properties and their behaviour in water and soil have been placed on individual work sheets.

Then, the data contained in these synthesis sheets could be directly integrated into the Access databases by means of a global file (Excel) containing information on the 50 active ingredient and degradation products. An alternative is to create reports in the databases so as to automatically get out of the target information. The global file also contains intervening aspects in the international commissions, CIPE, CIPM, and CIPR (International Commissions for the Protection of the Scheldt, Maas and Rhine).

RESULTS

Database Methods

The bibliographical information collected was classified by theme before being processed, synthesised and finally encoded into the database. Each document was identified and localised at the same time in its classification file but also referenced in the database.

General structure

The general structure consists of 20 tables. 10 tables are dedicated to active ingredients and are linked to "product" tables by two indexed keys, i.e. the "CAS RN" (Chemical Abstracts Service Registry Number) for active ingredients and the Belgian registration number (for example 4627/B) for commercial products.

The "*SIGMA Pro*" database is made up mainly of these five modules:

- Technical: technical data related to products and/or active ingredients and metabolites
- Bibliographical: bibliographical documents and sources containing various information about plant protection products
- Person "Resources": information and "resources" people and organisations that helped to collect the scientific information on plant protection products
- Internet: Internet connections to relevant sites or to other databases
- Others: bibliographical references of the Phyto Regional Committee, cartographic results of the diagnostic study on the hydrographic Haine basin.

Figure 2 shows the general structure of the database and the interactions between the different modules.
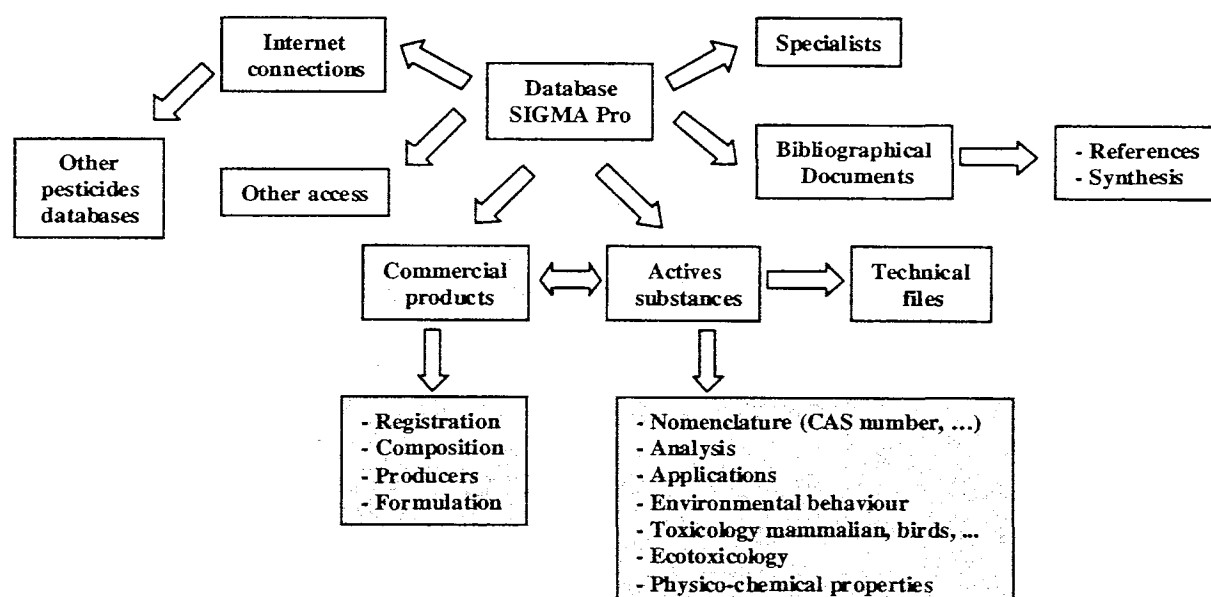
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                    ┌──────────┐         ┌──────────┐
        ⬈           │ Internet │    ⬈    │Specialists│
      ⬋             │connections│        └──────────┘
                    └──────────┘  ⬊    ⬈
┌──────────┐                  ┌──────────┐
│  Other   │            ⬈     │ Database │  ⬈   ┌──────────────┐      ┌──────────────┐
│pesticides│      ⬋           │SIGMA Pro │      │Bibliographical│ ⇒ │ - References │
│databases │    ┌──────────┐  └──────────┘  ⬊  │  Documents   │      │ - Synthesis  │
└──────────┘    │Other access│  ⬋      ⬊        └──────────────┘      └──────────────┘
                └──────────┘
              ┌──────────┐   ┌──────────┐   ┌──────────┐
              │Commercial│ ⇔ │ Actives  │ ⇒ │Technical │
              │ products │   │substances│   │  files   │
              └──────────┘   └──────────┘   └──────────┘
                   ⇓              ⇓
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- Registration
- Composition
- Producers
- Formulation

- Nomenclature (CAS number, ...)
- Analysis
- Applications
- Environmental behaviour
- Toxicology mammalian, birds, ...
- Ecotoxicology
- Physico-chemical properties

Figure 2: general structure of the database modules

This configuration is of course not rigid and may change over time. These modifications and the global file (Excel) containing technical data on the active ingredients and the list of approved agricultural plant protection products (updated "May 2000") transmitted by the Ministry of National Economic Development and Agriculture have been included into a more complete version. Notably, these two files enable queries to be made concerning the content of the bibliographical documents but also about products, active ingredients and metabolites (cultures, treatment, uses, various specificities, toxicity,...).

Up to now, more than a hundred documents have been entered into the database. Encoding is no longer done directly in the data tables by means of drop-down menus but in a user-friendly interactive form, selected via a main menu enabling access to specific themes.

Synthesis and formatting of scanned documents

Via a simple "click" on the mouse, a hypertext link enables you to open the file in a Word window containing the synthesis of the document referenced in the database. This Word file, specific to each bibliographic source contains the essential of the initial text but also all important graphics, tables or figures. A list of the most representative key words for the information contained in the document is also presented and there is perhaps a summary. As a result users can launch a series of queries in order to find the specific information searched for, even the document itself.

All Internet links (physico-chemical, toxicological data, etc.) have been integrated into the final version of the database. The hierarchy and the fundamental structure of these addresses have been transcribed in order to better identify available information. Each "html" address is saved under its

domain name (at least the first part) so as to avoid duplicates or closed hypertext links. There is a recapitulative text of the site between parentheses.

Creating a synthesis technical sheet in the form of an Access report

The work sheets containing the information from the reference documents used as discussion basis for determining the relevant substances have been recreated in the form of a more complete report. The list of "resource" people or active ingredients or products fulfilling a particular selection criteria can always be created.

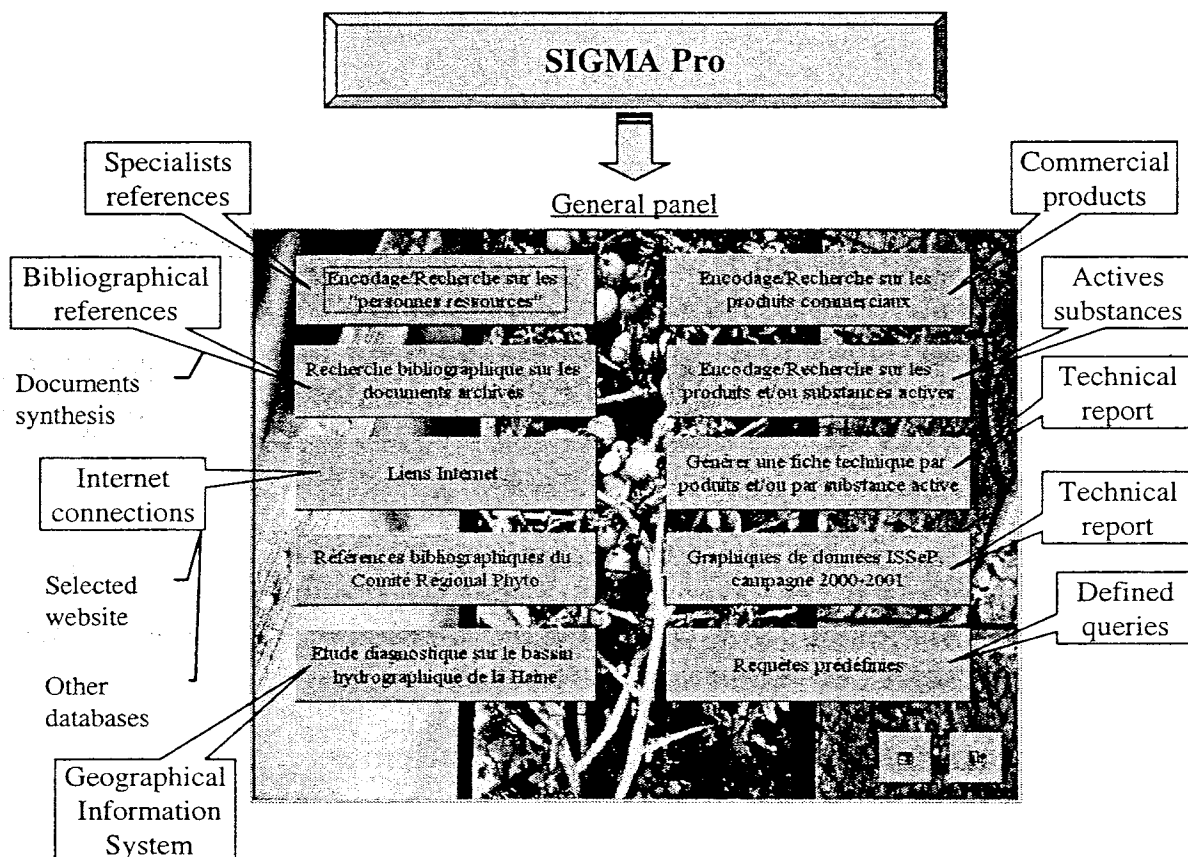Figure 3 illustrates perfectly the different working possibilites that can be conceived of with respect to queries.

Figure 3: Database organisational chart

Explain some specific tables

The main base tables which make up the database are:

Actives ingredients

• Nomenclature (Figure 4 see below)

- Physico-chemical properties
- Mammalian toxicology
- Ecotoxicology
- Biological indicators
- Applications
- Behaviour in the environment

NOMENCLATURE	
NomCASRNId	Code "Chemical Abstracts Service Registry Number" de la SA
NomEECnoRéf	Code "European Inventory of Existing Chemical Substances" de la SA
NomCommunNom	Nom commun ou nom ISO et synonymes de la SA
NomIUPACNom	Nom "IUPAC" de la SA
NomCANom	Nom "Chemical Abstracts" de la SA
NomGroupeUtilisation	Nom du groupe d'utilisation
NomFamilleNom	Nom de la famille chimique
NomFormuleDev	Image de la formule chimique développée
NomAgreMCMA93	Agréation de la SA en Belgique de 1993 à 1995
NomAgreMCMA96	Agréation de la SA en Belgique de 1996 à 1999
NomAgreMCMA00	Agréation de la SA en Belgique en 2000
NomAgreIA00	Agréation de la SA en France en 2000
NomAgrePM00	Agréation de la SA internationale en 2000
NomRem	Remarques
NomStatut	Statut Annexe Directive 76/464/CEE

Figure 4: List of fields that make up the *"Nomenclature"* table on active ingredients

Commercial products

- Registration (Figure 5 see below)
- Composition
- Formulation
- Companies

AGREATION	
AgrMCMAId	Numéro d'agréation selon MCMA 2000
AgrCommercialNom	Nom commercial du produit
AgrFormRéf	Code International "GIFAP" de la formulation
AgrFirmNom	Nom de la firme productrice du produit
AgrBelDate	Agréation ou retrait en Belgique
AgrEurDate	Agréation ou retrait en Europe
AgrRem	Remarques

Figure 5 : List of fields making up the "Registration " table on commercial products

Bibliographical documents

- Documents
- Specialists
- Internet connections

Other tables or data libraries

Analysis, laboratories, monitoring, regulations, documents classification, action mode, ...

DISCUSSION

This informational management tool enables us to trace the sensitive zone cards per watershed, to respond in the form of predefined reports to the demands of the Walloon Administration, to easily update technical and bibliographical data compatible with new active ingredients or metabolites of phytopharmaceutical products and biocides associated with the actual problems.

CONCLUSIONS

On the basis of this document, Walloon public authorities can make decisions regarding policy, the environment and with respect to the application of European directives in the Walloon region. This also enables environmental indicators to be established which must help the authorities of the Walloon region and the public administrations or all actors interested in improving the quality of water.

ACKNOWLEDGEMENTS

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