SCIENTIFIC SUPPORT PLAN FOR A SUSTAINABLE DEVELOPMENT POLICY

Intermediary report - January 2003

DEVELOPMENT OF AWARENESS TOOLS FOR A SUSTAINABLE USE OF PESTICIDES CP-33

UCL – RUG – CERVA/CODA

SPSD II

PART 1

SUSTAINABLE PRODUCTION AND CONSUMPTION PATTERNS

GENERAL ISSUES

AGRO-FOOD

ENERGY

TRANSPORT

This research project is realised within the framework of the Scientific support plan for a sustainable development policy (SPSD II)

Part I "Sustainable production and consumption patterns"

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Scientific report - January 2003

1 Project title

Development of awareness tools for a sustainable use of pesticides

2 Introduction

2.1 Context and summary

About 10.000 tons of active ingredients of pesticides are marketed annually in Belgium in agricultural and not agricultural sectors. These pesticides allow a sufficient high quality food. Profitability of a majority of agricultural productions is linked to the use of pesticides in the current farming system.
However, side effects of their use are sometimes observed: toxicity for the applicator (farmer), presence of residues above the threshold level in food, development of resistant pathogens and damage on natural resources.
That is why, it is important to have a **P**esticide **I**mpact **A**ssessment **S**ystem (PIAS) to monitor and to manage a safer use of pesticides in the framework of good agricultural practices.

The first stage is to identify, among the presently developed indicators, those that are relevant for the objectives (cf. point 2.2.). Toxicological and ecotoxicological data are to be selected in the literature (scientific papers or registration documentation) and in the existing database (Ecotox, Agritox, etc.). The indicators will then be aggregated in a PIAS. An inquiry will be realized with the farmers to identify the major parameters that influence the pest control strategies. Results of the inquiry will determine the presentation of the indicators in order to optimize their efficacy and also understand the behavior of the farmers who are confronted with the choice of a various plant protection strategies and to underscore the elements that intervene in their decision. In a second stage, the PIAS will be validated as much as possible with a surface water quality monitoring. PIAS will also be validated on the basis of an expert evaluation. Finally this tool will allow to assess the impact of some measures (current or proposed in the future) on human health and on environment.

2.2 Objectives

- Select or develop a **P**esticide **I**mpact **A**ssessment **S**ystem (PIAS) in order to estimate the pesticide use impact on the food quality, on the environment, and on the farm economy.
- Gain knowledge on the way farmers are facing, integrating and managing the socio-economic, agronomic and environmental constraints.
- Use of the PIAS to estimate the advantages and the disadvantages of various measures, as for example, the application of grass strips along rivers or restriction in the use of compounds or an environmental policy.
- Propose scenarios and tools to support farmers, extension services and also politicians in their decision for a more sustainable use of pesticides.

2.3 Expected outcomes

1. The project aims to provide a PIAS for the assessment, at farm scale, of the impact on the environment and on the economy of present and new crop protection methods.

2. According to human health and environmental risk, a ranking of the pesticides will be performed with the PIAS.

3. The tool will be used as a decision aid system for the farmer, grower and other land manager in order to minimize the side effe ct of pesticides applications.

4. Extension services will use the PIAS to provide more accurate advices for a sustainable crop protection.

5. If possible, the PIAS will be regionally adapted in order to provide the public authorities with a decision support system.

3 Detailed description of the scientific methodology

3.1 Task A. – Selection of representative scenarios (region/crop/pesticide)

3.1.1 Task A.1. – GIS approach

3.1.1.1 Database for PPP[1] use in Belgium

Data on PPP use was obtained from research reports [1-5] and from a publication [6] where the pesticide usage was calculated from several inquiries. The differences between those sets of data were sometimes important. This problem was addressed by generating a set of highest values, and a set of lowest values.

3.1.1.2 Database for crop area in Belgium

Crops were grouped into categories on the basis of National Institute of Statistic categories [7] but also taking into account the pesticide application schemes. For example, grain maize was grouped with fodder maize instead of with cereals as it is usually done.

The PPP quantity applied on each crop category was calculated from an average of pesticide application on each crop of the category weighted by its respective area. Crop areas were collected from the national statistical information [7], [8], [9]. For example, PPP application on industrial crops was based on an average of the pesticides application quantities on sugar beet, flax, colza and chicory weighted by their respective importance in term of cultivated area.

[1] Plant Protection Product

3.1.1.3 PPP application at a regional level

The calculations were automatically performed with a spreadsheet developed with Microsoft Excel 2000. PPP applications at a regional level were obtained following the same principle than for the calculation of the PPP application on crop categories (i.e. average of the PPP application by crop categories weighted by the crop importance in term of area at a regional level).

3.1.1.4 PPP application on a regional crop sample

In order to measure the representativeness of a regional crop sample, the PPP application was also calculated on a selection of the major regional crops. The representativeness trigger value was 70 % for sample area relatively to the regional AA[2], and also 70 % for the PPP applied on the crop sample relatively to the total PPP applied in the region.

3.1.2 Task A.2. – Stratification on basis of farming structures

Stratification of the farms was realised on the basis of the following criteria:

- share-out of the AA use;
- technical-economical orientation;
- specific categories of the declarants;
- farm size;
- farm activity expectative for the future.

This information was collected from the national statistical information [7], [8], [9].

Field Code Changed

3.2 Task B - Development of a global indicator

3.2.1 Task B.1. - Study and evaluation of existing indicators and databases concerning pesticides

The indicator study was based on a literature review of the last twenty years. The information was analysed in order to obtain a clear definition of some basis concepts (i.e. hazard, risk, Pesticide Risk Indicator, Pesticide Use Indicators, Pesticide Impact Assessment System) and a practical typology of the pesticides indicators. Indicators were analysed on following aspects:

- the environmental compartment(s) on which they are focussed;
- the calculation method(s) on which they are based;
- the method(s) used to aggregate the results when the indicator is focussed on several environmental compartments;
- the scoring method(s) used to transform the variables into categories.

[2] Agricultural Area

The review was written in order to obtain an operational database of existing indicators including all the required information to understand the way they are built, and to use them in the framework of the global indicator design.

3.2.2 Task B.2. – Elaboration/Updating of the data bank about the physico-chemical, toxicological and ecotoxicological pesticides that are registered for the identified cultures of the task A.

The database developed by RUG within the framework of the indicator POCER-1 development was used as a base (more or less 500 active substances). The database was further updated with several sources like the Pesticide Manual, Extoxnet, Toxnet or scientific literature. The database was also developed to address field crops.

3.2.3 Task B.3. - Selection and/or development of indicators

Due to the fact that the selection of indicators is dependent of the global indicator characteristics, this task was realized together with Task B.4.
The global indicator was developed in an iterative process where, in a first step, a prototype was designed and used to assess the risk of several already well-documented a.s. applications. The prototype was then improved on the basis of criticisms of the results.

The first selection of indicators was based on the following principles:

1 PRI[3] is preferred to a PIAS[4];
2 if no suitable PRI is registered for a specific compartment in the indicator database (result of task B.1.), a further look in the literature is required;
3 if, finally, no suitable PRI is available, a specific PRI should be developed.

For each PRI, the obtained result (namely "index" or "indices" when there are several results) was compared to a value considered to be excessive (too risky) named **E**xcess **K**ey **v**alues (**EKv**). We have also defined another category of key values that represent the expected target in the framework of a "sustainable pesticide use". These were named **T**argeted **K**ey **v**alues (**TKv**).
With the choice of two key values per indicator, the indices were to be shared into three classes: Targeted value, Excessive value and "in between" value (that can be considered as "Normal").

In the context of the pesticide risk evaluation there is a sense to distinguish the indices signification in function of the distance to any key value. An interesting method to address this problem is to use the fuzzy logic methodology [10, 11]. With this approach, the membership of a value to a class is progressively modified when the value get closer to the limit. Membership functions (m) are to be chosen in consideration of the studied system.

[3] Pesticide Risk Indicator (cf. the literature review in annex)
[4] Pesticide Impact Assessment System (cf. the literature review in annex)

3.2.4 Task B.4. - Aggregation of the selected indicators into a global indicator

The global indicator is, presently, built on a triple pesticide impact assessment: for **H**uman health (**H**), for the **F**armer interest (**F**) and for **E**nvironment (**E**) including respectively n_1, n_2 and n_3 indicators. Consequently, human health, farmer interest and environment indices are separately aggregated.

The standardized indices were aggregated in a two-steps procedure:

Step 1: membership values of each compartment are combined following specific decision rules;

Step 2: compartment's indices are averaged and weighted in function of compartment's ranking.
The compartments are ranked by the global indicator user (e.g. water producers, consumer organisation, particular farmer, authorities) in function of his specific interest; a weighting factor is calculated from this ranking;

The results were presented both numerically and graphically.

3.3 Task C : Validation and improvement of the global indicator

3.3.1 Task C.1. - Validation for Human and environmental exposure

At this stage of the research, the global indicator is validated and improved by the partner's expertise. The global indicator was tested and compared with the set of 15 scenarios of pesticide application already tested in the CAPER research [12].

3.3.2 Task C.2. - Validation for technical and socio-economical aspects

The inquiry questionnaire was written after a Sonecom (*sondages, études et communication*) methodology training focussed on inquiries in agricultural milieu.

Due to the complexity of the task objectives the following inquiry characteristics were selected: an individual inquiry (face to face); the individual inquiry should not exceed one hour duration; questionnaires are to be specific to field crop, fruit crop and vegetable crop farming systems.
The questionnaire was built on several assumptions that have to be tested (see in annex). Questions were designed in order to verify these assumptions. The majority of the questions is multiple-choice in order to facilitate the answers management and analysis. Some particular aspects are questioned several times in order to avoid the Halo effect. The questionnaire was improved progressively in an iterative process where proposals were submitted to each scientific partner for criticisms and suggestions.
The questionnaire of the inquiry changes according to the types of cultivations cited in task A.2 (cf. 4.1.1.2). However, most questions are similar so that it will be easier to deal with these data later. The questionnaire was finally validated by an expert evaluation and by a pre-inquiry realised with 10 farmers.

3.4 Task D: Evaluation of various crop protection schemes with the global indicator

To be done in 2003.

3.5 Task E : Finalisation

To be done in 2003.

4 Detailed description of the intermediary results, preliminary conclusions and recommendations

4.1 Detailed description of the intermediary results

4.1.1 Task A. – Selection of representative scenarios (region/crop/pesticide)

4.1.1.1 Task A.1. – GIS approach

The major result of the literature review realized in Task A.1. is a database of PPP applied quantities on the Belg ian crops (Table 1).

Table 1 – PPP application on Belgian crops

Crop categories / Crops	Area proportion of the category	PPP application (kg a.s./ha) Minima	Maxima
Grasslands		***0.13***	***0.13***
Temporary grasslands	82.2%	0.10	0.10
Permanent grasslands	17.8%	0.14	0.14
Green forages		**1.77**	**2.34**
Maize	98.2%	1.77	2.34
Cereals		***3.39***	***3.84***
For bread processing*	77.1%	3.37	3.69
For animal feeding**	22.9%	3.46	4.36
Industrial crops		***3.70***	***4.74***
Sugar beet	71.6%	4.15	5.38
Flax	11.5%	0.91	0.91
Winter colza	3.7%	2.36	2.36
Fruit crops		**19.81**	**37.55**
Low-stem apple	53.2%	19.81	37.55
Potatoes		**19.48**	**29.15**
Field vegetables		**4.54**	**4.54**
Greenhouse vegetables		**48.12**	**48.12**

Legend
** 94 % of the area cropped with winter wheat. ** 64 % of the area cropped with winter barley.The PPP application dosage for crop categories is indicated in bold character. When these values are obtained from a weighted average of several crops values it is indicated in italic*

A worksheet was developed in order to select representative scenarios. The output of the calculation is presented hereafter with an example at the Belgian level.

Table 2 – Worksheet output example with a crop selection at the Belgian level

a)

Crops categories	AA *(a)* *ha*	PPP applied on the considered region: At minimum *(a)* x *min* *t a.s.*	At maximum *(a)* x *max* *t a.s.*	Averaged relative contribution
Potatoes	63 979	1 246	1 865	36%
Cereals	277 703	942	1 067	23%
Industrial crops	126 882	469	602	12%
Fruit crops	17 224	341	647	11%
Green forages	205 819	364	482	10%
Field vegetable crops	34 787	158	158	4%
Greenhouse vegetables	1 007	48	48	2%
Grasslands	620 254	84	84	2%
Root and tuber crops	7 338			
Others	39 090			
Total	1394 083 ha	3 653 t a.s.	4 952 t a.s.	

b)

Crop selection	AA *(b)* *% de (a)*	PPP applied on the crop selection: At minimum *(a)* x *(b)* x *min* *t a.s.*	At maximum *(a)* x *(b)* x *max* *t a.s.*
Potatoes	100%	1 246	1 865
Cereals (only winter wheat and winter barley)	87%	821	929
Industrial crops (only sugar beet)	72%	377	489
Fruit crops (only apple trees)	53%	182	344
Green forages (only fodder maize)	98%	358	474
Field vegetable crops	0%	0	0
Greenhouse vegetables	100%	48	48
Grasslands	0%	0	0
Root and tuber crops	0%	0	0
Others	0%	0	0
Total	609 084 ha	3 031 t a.s.	4 149 t a.s.
AA percentage	44%		
AA (less grasslands) percentage	**79%**		
Part of PPP applied on the considered region		**83%**	**84%**

Legend: min & max are obtained from PPP applied quantities database on Belgian crops (table 1); PPP: Plant Protection Product; AA: Agricultural Area.

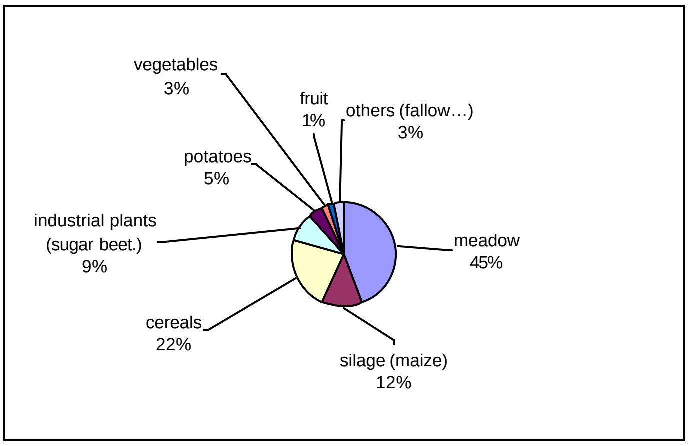
The part a) of the table indicate the PPP quantities applied in the considered region in function of the crops. Due to variability of the inputs (cf. 3.1.1), the outputs are presented both with minimal and a maximal values. The relative contribution (averaged), in term of quantity, of every crop is indicated in the right column of this table.
The part b) of the table concerns the calculation of the PPP applied in a selection of crops. The final outputs (written in bold) are relative to the representativeness of the crop selection for the considered region. The representativeness is expressed in % of AA and in % of the total PPP application in the considered region.

Similar worksheets are available for all the Belgian agricultural and administrative regions.

4.1.1.2 Task A.2. – Stratification on basis of farming structures

The share-out of the crops on the AA (graph 1) combined with the results of the task 1 allowed to target three types of productions.

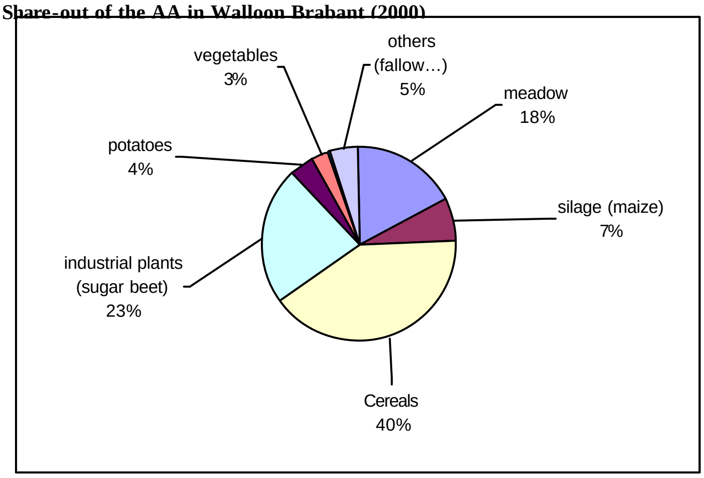
Graph 1 – Share-out of the AA in Belgium (2000)



The three types of productions are 'field crops', 'fruit crops' and 'vegetable crops'.
The AA use is presented in the annex for all the Belgian agricultural and administrative regions.

The 'field crops' scenario are taking place in Walloon Brabant (Graph 2) was selected to represent the 'field crops' scenario. The inquiry will focus on cereals, sugar beets, potatoes and maize crops which cover 80 % of the AA and where 88 % of the pesticides a.s. is applied (see results of task A1 in annex). In relation with the farmer population of this province, about 100 fulfilled questionnaires should allow enough representativeness.

Graph 2 – Share-out of the AA in Walloon Brabant (2000)



The fruit production is more than 55 % located in Limburg . But producers associations (Veilings) of this region were considered as not representative of the fruit production sector. The proportion of the fruit surface area cultivated in reality in the different Belgian provinces (Limburg 55 %; Vlaams Brabant 22 %; Oost Flanders 8 %; Luik 6 %; Antwerpen 3% and West Flanders 3 %) will be respected in our sample. Indeed the presence of different 'veilings' according to the regions might lead to a distorted sample. More or less 100 inquiries are planned.

The vegetable production (except for field vegetable crops) is more than 46 % located in West Flanders. Producers associations (Veilings) considered that 'Veilings' of Roeselare and Machelen as representative of the vegetable production sector. The products cultivated by most of the 'vegetable crops' producers are increasing in technical natu re during their career. The inquiry will focus on salad, tomato, carrot and cabbage for studied this evolution. More or less 100 inquiries are also planned.

4.1.2 Task B - Development of a global indicator

4.1.2.1 Task B.1. - Study and evaluation of existing indicators and databases concerning pesticides

As a result of the literature review concerning the pesticide indicators, several concepts were precised. The major ones were:

1. Pesticide Use Indicators (PUI) : total amounts of PPP used or total number of sprayings;
2. Pesticide Risk Indicator (PRI): a parameter based on a combination of hazard and exposure that provide information about the risk of pesticide use on a single environmental compartment (e.g. crustacean, birds, ground water);
3. Pesticide Impact Assessment Systems (PIAS) : evaluation of the impact of several PRI's (implies not only toxicology, but also attributing relative importance to different categories of non-target organisms, which leaves the realm of objective science to enter that of values judgment).

When analysing the pesticide indicators, it appears that they can also be distinguished following the three following criteria:

- Distinction between RISK indicators (i.e. PRI and PIAS) and other pesticide indicators (e.g. hazard indicator, PUI).
- The assessment level of risk indicators:
  - level I for active substance comparison in a fixed spatio-temporal context;
  - level II for active substance comparison with spatial and/or temporal variations;
  - level III: a.s. comparison for risk + other areas of interest (e.g. economy).
- Distinction between PRI's and PIAS's.

This multi-criteria typology is presented in the annex at Table 7 of Task B.1.

More than hundred indicators were studied and registered in a database presented in annex. PRI's were more abundant than PIAS's and the most frequently assessed compartments were those concerning living organisms in surface water.

4.1.2.2 Task B.2. – Elaboration/Updating of the data bank about the physico-chemical, toxicological and ecotoxicological properties of pesticides that are registered for the identified cultures of the task A.

More or less 500 active substances are registered in the data bank. The main characteristics physico-chemical, toxicological and ecotoxocological mentioned for most of the active substances are the following:

DT_{50}	**D**egradation **T**ime for **50** % of the ingredient (half-time)
K_{om}	**o**rganic **m**atter /water partition coefficient
PEC	**P**redicted **E**nvironmental **C**oncentration
K_{ow}	**o**ctanol / **w**ater partition coefficient
ADI	**A**dmissible **D**aily **I**ntake
AOEL	**A**cceptable **O**perator **E**xposure **L**evel
EC_{50}	**E**ffect **C**oncentration for **50** % of the observed population
NOEC	**N**o **O**bservable **E**ffect **C**oncentration
LC_{50}	**L**ethal **C**oncentration for **50** %of the observed population
MTC	**M**aximum **T**olerable **C**oncentration
LD_{50}	**L**ethal **D**ose for **50** %of the observed population
GUS	**G**round **U**biquity **S**core

4.1.2.3 Task B.3. - Selection and/or development of indicators

Two risk indicators were proposed to assess the risk of pesticide use in Belgium:
- one PRI as a gross and "easy-to-establish" indicator that would mainly be used at a regional level in inter-annual or inter-regional analyses for policy purposes (e.g. CTPU[5] as used in the USA);
- one PIAS as a detailed indicator based on several (10-15) risk indicators specific for particular compartment and aggregated in a traceable procedure. This detailed indicator would mainly be used at the farm or the field level to support any IPM improvement for sustainable development or quality label evaluation purposes. In a further step, this PIAS could also be used at a regional level for policy purposes.

The first prototype of the detailed pesticide indicator was designed and tested. A second prototype is presently in development.

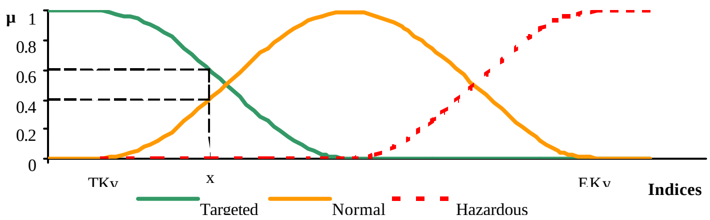
The first prototype was designed in order to assess the risk of pesticide use for three major centres of interest:
- Human health
- Farmer long term interest
- Environment

These centres of interest were separately analysed by the use of several adapted pesticide indicators. Fourteen adapted risk indicators were selected (see Table 9, p 25 of detailed results of task B in annex) among which eight were coming from the POCER[13] PIAS, two indicators are still to be developed and four were issued from various sources. Due to its major inspiring source, the prototype was named POCER-II.

In order to be standardized after calculation, each risk index was compared to three "s" shaped membership functions generated with a sinusoidal function (Figure 1).

[5] Chronic Toxicity Persistence Unit (for details cf. annex – Task B.1.)

Figure 1 – Comparison of indices with "s" shaped membership functions



*Legend: **TKv**: **T**arget **K**ey **v**alue; **EKv**: **E**xcess **K**ey **v**alue. Indices are the results obtained from the indicator calculation.*

TKv and EKv and the median value between these key values are inflexion points of the membership functions m_T, m_N and m_H (for Targeted, Normal and Excessive respectively). Any indicator output situated at the left of TKv is 100 % member of the group Targeted. On the reverse, any value situated at the right of EKv is 100 % member of the group Excessive. Between these two key values, the indices are partly member of the group Normal and also partly member of one of the two other groups.
In this figure (Figure 1) the value (x) is characterized a membership to the group Targeted equal to 60 % ($\mu_T(x) = 0.6$) and a membership to Normal equal to 40 % ($\mu_N(x) = 0.4$).

In summary, the standardisation procedure was defined as above:

- for $i = 1$ to n (n is the total number of indicators), I_i is an indicator of the selected group of indicators of the prototype;
- x_i is a value obtained from the I_i indicator calculation;
- the fuzzy set is composed with three "s" shaped membership functions defined as:
    - "Targeted" in the interval]TKv, median(TKv, EKv)];
    - "Excessive" in the interval [median(TKv, EKv), EKv[;
    - "Normal" in the interval [TKv, EKv];
- for each I_i, a triplet $\mu_T(x_i)$, $\mu_N(x_i)$, $\mu_E(x_i)$ is produced.

The Key values were defined for the selected indicators (see Table 10, p 26 of the detailed results of Task B in annex).

4.1.2.4 Task B.4. – Aggregation of the selected indicators into a global indicator

After calculation and standardization, the risk indices were aggregated in a two-steps procedure, separately for each centre of interest.

The decision rules defined to combine the membership values into a single "sustainable use" representative value were:

- membership to "Targeted" (μ_T) has a positive effect on the Belgian global PIAS;
- membership to "Normal" (μ_N) has no effect;
- membership to "Excessive" (μ_E) has a negative effect.

The **d**ecision **r**ules **o**utput (**dro**) was then : dro = $\mu_T - \mu_E$

Indices were then averaged and weighted by the relative importance of each compartment of the centre of interest (c.f. to 2.5.3. & 2.5.4. of the detailed results of Task B in annex).

The fourteen standardized indices were also presented in a general figure (see 2.5.5. of the detailed results of Task B and task C in annex).

4.2 Task C : Validation and improvement of the global indicator

4.2.1 Task C.1. - Validation for Human and environmental exposure

The POCER-II prototype was tested with 15 scenarios of pesticide application and the results were compared to the similar exercise made in the CAPER research[12].
Detail of this test is reported in annex.

4.2.2 Task C.2. - Validation for technical and socio-economical aspects

Inquiry was begun in Walloon Brabant (field crop farming systems) in the course of January 2003.

The fruit producers were questioned during an information day organised by 'Proefcentrum voor fruitteelt' in Saint-Trond on January 2003 the 17th.

Inquiries on vegetable crops farming systems were planned for February.

4.3 Preliminary conclusions

A tool to select representatives region-crop combinations was successfully developed and tested in the framework of the Task A.1.

From Task A., it appears that three scenarios are necessary to be representative of the different crops in Belgium.

From Task B.1. it appears that more than hundred indicators are already developed for assessing the risk of pesticide use. Important distinction is to be made between PRI's, PIAS's and the other indicators. Some of them get a big interest for the Belgian context especially those developed in the framework of the POCER [13]PIAS.

From task B.2., it appears that a reliable data bank is primordial for the development of an outstanding indicator. The data bank previously adapted to fruit and vegetables crops is presently developed to address also field crops.

From Tasks B.3., B.4. and C.1. it appears that a first prototype of the Belgian global pesticide indicator was designed and tested. Improvements for the second prototype are required at the following levels:

- the toxicology database is to be completed (lacking data) and verified (distortion between values obtained from other comparable databases);
- adequate indicators are still to be found for two compartments;
- indicators are still to be analysed in deep for their sensitivity, traceability and reliability;
- Key values (i.e. TKv & EKv) are to be fine tuned in function of a definition of the "sustainable use of pesticides";
- the interest of various membership functions and various decision rules is to be controlled.

5 Future prospects and future planning

According to the annex I of the research contract, the carrying out deadline of the tasks are the following ones:

TASKS	2002		2003		2004	
	I-VI	VII-XII	I-VI	VII-XII	I-VI	VII-XII
A.1	**X**					
A.2	**X**					
B.1	**X**	**X**				
B.2	**X**	**X**				
B.3	**X**	**X**				
B.4		**X**	**X**			
C.1		**X**	**X**			
C.2		**X**	**X**			
D.1			**X**	**X**		
D.2			**X**	**X**		
E.1				**X**	**X**	
E.2				**X**	**X**	

The tasks B.3, B.4 and C.1 are realised jointly. The global indicator is proposed at once and is improved progressively according to the validation of the results. It had been necessary to proceed in that way because the selection and the development of the indicators meant to be integrated into a global indicator closely depends on the characteristics of this global indicator. The whole process (tasks B.3, B.4 and C.1) was already realised once so that a first prototype of a global indicator had been tested and a second prototype will be developed.

The task C.2 is in progress. The inquiries began at the beginning of January 2003 and will be finished during March. Thus, the results analysis will be closed within the prescribed time.

The tasks D and E would be realised as planned .

6 Annexes

6.1 References

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6.2 Publications

- A poster was presented at the 'Stakeholders Conference' organised on the fourth of November 2002 according to the proposition of the European Commission on the Development of a Thematic Strategy on the Sustainable Use of Pesticides (see annex).
- A summary of our project was published in a brochure given out at the Johannesburg World-wide Summit on the lasting Development which took place from the 26^{th} of August to the 4^{th} of September 2002.
- Two publications are in preparation.
- The research is also presented on internet at http://www.var.fgov.be/section_agrochemistry_eng.php and http://www.fymy.ucl.ac.be/crp

6.3 Detailed results

Task A1 methodology: See attached file: task A1 method.pdf

Task A1 results: See attached file: Tâche A1 - résultats.xls

Task A2 results: See attached file: Tâche A2 – utilisation-SAU-en-Belgique.xls

Methodology and results of the tasks B1 and B3: See attached file: Tâche B1 + B3 texte XXVI.pdf

Methodology and results of the task C1: See attached file: Test BGPIAS avec CAPER 061202.pdf

Synthesis and discussion about the task C1 results: See attached file: BGPIAS test n°1 - 101202 coordination meeting .pdf

Inquiry questionnaires of the task C2: See attached files:
questionnaire_grandes_cultures.doc
enquête fruitteelt.doc
enquête groententeelt.doc

Poster: See attached file: Poster Stakeholders conference.ppt