



GRAZING MANAGEMENT IN ORGANIC FARMING

GOOD GRAZING MANAGEMENT IS ESSENTIAL FOR PARASITE CONTROL IN HEIFERS IN ORGANIC FARMING.

Parasite management is a major issue for the development of grazing cattle, especially in organic cattle breeding, which relies heavily on grazing and is characterised by restrictions on the use of pest control treatments. In order to determine good practices in the management of parasites in heifers in organic farming, a study covering six farms (three dairy and three meat) in the provinces of Luxembourg and Namur was conducted by the CRA-W.

In each farm, the growth of heifers in their first and second year of grazing, and their level of parasite infestation (with *Fasciola hepatica*, *Paramphistomum* sp., and *Ostertagia* sp.), were measured. Their blood pepsinogen level was also estimated in order to assess acquired immunity to *Ostertagia* sp., a high-risk nematode in cattle. In addition, the availability of grass, in quantity and quality, and the practices of the farmers were

recorded. Correlations between the studied variables were investigated by principal component analysis.

The growth of heifers was positively correlated with the number of plots in the grazing system. In contrast, these two variables (growth and number of plots) were negatively correlated with the stocking rate and the number of anti-parasite treatments and, to a lesser extent, with the level of parasite infestation and the nutritional value of dietary supplements. In addition, the blood pepsinogen level was positively correlated with heifer growth, suggesting that heifers with a high level of blood pepsinogen had acquired immunity to *Ostertagia*, which would have positively affected their growth.

In conclusion, this study highlighted the importance of rotational grazing and of a low stocking rate to limit parasite infestation

issues. Both of these practices were associated with little or no use of dietary supplements and anti-parasite treatments, as well as with a controlled parasite infestation.

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FIFTY YEARS OF IN VITRO CULTURE WORK AT THE CRA-W

THE CRA-W'S EXPERTISE AS A REFERENCE LABORATORY FOR IN VITRO CULTURE HAS BEEN BUILT UP OVER THE DECADES AND CONTINUES TO ALLOW US TO DEVELOP THE APPLICATIONS SOUGHT BY THE PROFESSION AND TO MEET THE STRATEGIC OBJECTIVES OF WALLONIA.



It was in the mid-1960s that the CRA-W began in vitro culture (IVC) research with the goal of eliminating viruses by means of meristem culture. The results on strawberries very soon led to an unexpected application: the cloning of plants by micropropagation. This process, which was immediately patented, represented part of the laboratory's active contribution to the first European development of large-scale production. At the same time, an approach was developed covering all woody fruit and related species of the *Rosaceae* family, which culminated in the 1980s with the production of apple, cherry, plum, mulberry and other rootstocks using multiclonal grafts. This was followed by a period of diversification and transfer of technologies for healthy, new or hard-to-propagate varieties. The focus was often on vitroplants as mother plants for conventional vegetative multiplication.

The laboratory gradually became a global benchmark for standards-compliant mass production of various high-quality plants of temperate or tropical origin. Work was carried out on various fruit trees (mulberry, redcurrant, raspberry, carob, walnut, cashew, cocoa, pineapple, banana) as well as on vegetable crops (chicory, potato, artichoke, rhubarb, tarragon), forest species (alder, birch, maple, ash, oak, cork oak, service, poplar, elm, walnut, chestnut, eucalyptus, terminalia, acacia, cypress) and ornamental plants (petunia, geranium, primrose, impatiens, rose, cyclamen, rhododendron, Christmas trees).

Tens of thousands of plants were produced annually to validate the technologies' industrial adaptability and to guide the process of solving the problems with transferring them to different species. Of the planting that was done, the multiclonal planting of Walloon cherry trees dating from the years 1985 to 1995 constitute an example of longevity.

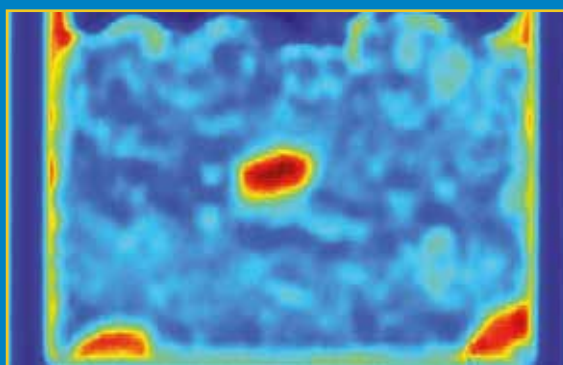
The laboratory was the first to discover somatic embryogenesis in *Prunus*. It helped to bringing about advances in the same process in *Coffea*, Nordmann fir and wheat and to establish successful adventitious budding techniques to create genetic diversity. Control of regenerative competence was improved as far as the cellular level with the achievement of protoclones (protoplast plants) and preliminary successes in somatic hybridisation.

At present, IVC is still involved in the provision of elite varieties of Christmas tree, asparagus and various ornamental species. It is becoming more integrated with multidisciplinary research projects targeting modern genetic improvement techniques (such as somaclonal variation or cisgenesis in the Gephyti project), the nutritional quality of animal and human feed (in the Phytohealth project), biostimulants and the protection of soils from pollution (in the Solindic project).

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TERAHERTZ: A UNIQUE PHOTONICS TECHNOLOGY FOR THE AGRI-FOOD SECTOR

IN RECENT YEARS, PHOTONICS HAS PLAYED AN IMPORTANT ROLE IN PROVIDING RAPID, NON-DESTRUCTIVE METHODS AND INSTANTANEOUS MEASUREMENTS IN AGRI-FOOD SECTOR. THE DEVELOPMENT OF TERAHERTZ (THz) SPECTROSCOPY REPRESENTS A NEW SOLUTION.



Example of THz measurements carried out in Multitel's laboratories: THz image of cocoa powder containing non-visible contaminated seeds.

There is a wide range of tools in the agri-food sector for the testing of both raw materials and production processes. THz spectroscopy is a new tool using radiation included between infrared and microwaves spectral regions. It has the advantage of being non-ionising and of low-energy, allowing non-destructive measurements and thus being safe to apply on any organic or biological product. This technology has numerous applications in Walloon industry, and in particular the agri-food sector. The FEDER project TERA4ALL, which aims to develop THz technology in Wallonia, is closely linked to the research program and activities of the CRA-W. With its expertise in rapid analysis methods, the latter will contribute to put forward THz spectroscopy as an innovative solution in the non-destructive testing of various agricultural and food products in connection with current problems such as food safety, the detection of foreign bodies during the food production process, the detection of micro-leaks in flexible plastic packaging, and the detection and identification of greenhouse gases.

The TERA4ALL project is coordinated by the research centre Multitel asbl (<http://www.multitel.be/>). The CRA-W, two university units (UCL and ULg) and the Liège Space Centre (CSL) are also participating, and it is also supported by six Walloon Food industries. The project's ultimate purpose is to propose THz as a new tool for non-destructive testing in industrial production chains.

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THE LINEAR PLANNER: A TOOL FOR SOW MANAGEMENT ON ORGANIC FARMS

AS A KIND OF MEMORY TOOL FOR THE FARMER, THE LINEAR PLANNER MAKES IT POSSIBLE TO SEE AT A GLANCE WHAT JOBS NEED TO BE DONE, ORGANISE THE WORK, RAISE PROFESSIONAL STANDARDS, RECORD PERFORMANCE AND MAKE PROGRESS. IT IS OFFERED BY THE CRA-W AS A DAILY TOOL FOR PIG BREEDERS.

The tool is an annual calendar for effective management of sows in farming, telling farmers exactly when sows will farrow, for example (by recording the insemination date), or when sows and piglets will require special care of any kind.

In practical terms, the tool is a wooden wall-mounted frame (200 x 40 cm) to which are attached two paper strips: one indicating day-to-day events and one for annual recording of activities:

- The event strip is attached at the top of the frame. It includes sow-rearing events such as Servicing-IA, 1st Return, 2nd Return, Farrowing and Weaning, positioned

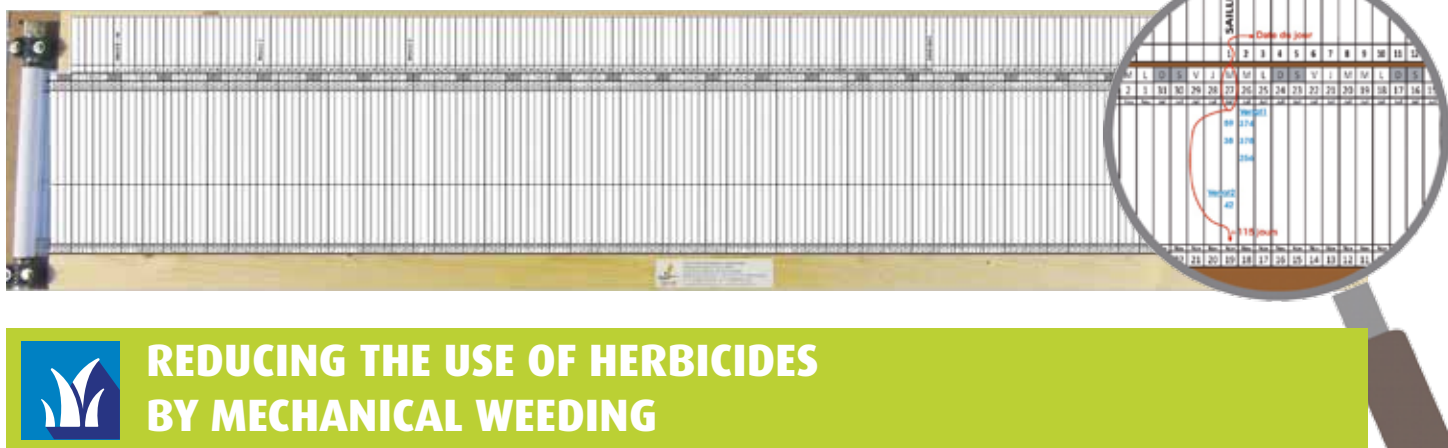
chronologically in one of 180 columns (covering about 6 months). Other events may be added as needed, such as Vaccination or Worming.

- The annual recording strip shows the days and months of the year. Each column shows a 115-day interval (the period of gestation) between top and bottom, enabling the farrow date of a sow whose insemination has been recorded to be determined instantly. The strip is kept rolled-up on the left of the wall bracket, from where it can be unrolled to the right from day to day. It allows the farmer to record sows' numbers on the insemination date and daily information relating to breeding events throughout the year.

The tool is also of economic value for small-scale farms that cannot afford pig herd software. The construction of the wall-mounted frame with the winding mechanisms and the event strip represents a cost of €70, and the annual recording strip costs around €25.

Assembly instructions and files for printing out are available from the CRA-W on request.

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REDUCING THE USE OF HERBICIDES BY MECHANICAL WEEDING

ALTHOUGH MUCH HAS ALREADY BEEN DONE BY THE AGRICULTURAL SECTOR TO REDUCE THE USE OF PESTICIDES (CONTROL OF SPRAYERS, THE IMPROVEMENT OF TECHNIQUES AND WARNING SYSTEMS, AND MORE RECENTLY THE INTRODUCTION OF THE PHYTOLICENCE SYSTEM), THERE ARE ALSO PLANS WITHIN THE WALLOON PESTICIDE REDUCTION PROGRAMME TO ENCOURAGE INTEGRATED PEST MANAGEMENT THROUGH, AMONG OTHER THINGS, THE USE OF NON-CHEMICAL ALTERNATIVES TO FURTHER REDUCE THE USE OF PLANT PROTECTION PRODUCTS.

Mechanical weeding is one of the clearly identified approaches to reducing the application of herbicides. The techniques in question involve the destruction of weeds, coupled with their management throughout the rotation, through the repeated use of specific equipment such as hoes, weeding harrows and rotary hoes, assisted in some cases by camera, GPS, sensors, etc. These techniques have been used for many years by organic producers, allowing lessons to be drawn regarding their use in an approach to conventional agriculture which is sparing of inputs. However, the feasibility of integrating these practices into conventional chemical programmes and their optimisation under these conditions needs to be analysed. Moreover, the involvement of technology in new ways suggests that technical developments may occur that will need to be evaluated in terms of the effectiveness of weeding and the technical and economic performance of fields where these techniques are used, compared with the use of chemical herbicides.

The objective of the CRA-W, therefore, is to study the integration of mechanical weeding techniques in Wallonia, through partnerships with the agricultural sector.

For example, over the past two years, the CRA-W has been conducting trials to compare the effectiveness of different weed control treatments for beet and chicory crops. These trials are being carried out in collaboration with a number of farmers, the IRBAB, the PVBC and industry (Beneo Orafit and Cosucra). Various different approaches are being compared, with a varying degree of integration of different mechanical tools such as weeders, hoes with various types of equipment, weeding harrows and rotary hoes. Given the significant impact of meteorological conditions on the success of mechanical weeding, the trials need to be carried out for several more years to be able to evaluate with certainty the potential of

mechanical tools to reduce the use of herbicides and make it possible to promote these techniques to farmers.



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IMPROVING OUR KNOWLEDGE OF CEREAL VARIETIES IN ORDER TO GIVE PERSONALISED ADVICE

IN A FAST-CHANGING AGRICULTURAL SECTOR, USE OF THE VARIETAL FACTOR IS A KEY TO SUCCESSFULLY ADAPTING TO NEW CLIMATIC AND SOCIETAL CONDITIONS.



The evaluation of cereal varieties has been one of the CRA-W's specialities for more than 30 years. Our institution carries out both the registration trials for the National Catalogue and post-registration trials to inform the farmers. The registration trials involve assessing the suitability of varieties produced by breeders in order to provide the national committee with the information required to decide whether to accept or reject a variety. The registration of a variety on the national list is accompanied by the right to market it in Belgium, and possibly the rest of Europe. The post-registration trials, on the other hand, concern the varieties which are already marketed in Belgium, and are carried out in order to give farmers the best advice on their varietal choices.

In all, the CRA-W Varietal Evaluation team sets up around 50 trials every year across Wallonia. Some 30 of these relate to cereals, mainly wheat, barley and spelt.

The results of the post-registration trials for cereals are collated with those of the trials of our three partners, Gembloux Agro-Bio Tech, CARAH and CPL-Végémar, in order to

enhance the relevance of the advice. The findings of this network are used in the publication of the "Livre Blanc" and regularly presented in the Belgian agricultural press.

Although the harvest brings the season to an end in the fields, the measured yields are just one of many pieces of data. For more than 15 years, emphasis has been placed on the tolerances and resistances of varieties as well as their ability to be grown with few inputs.

To increase farmers' awareness of environmental considerations, a list of recommended varieties is drawn up every year and presented at the "Livre Blanc" information day. As a result, the varieties most susceptible to diseases gradually give way to much more tolerant varieties. However, monitoring is essential, because pathogens adapt and the search for tolerant varieties must be continued to be pursued vigorously.

Given the growing number of evaluation requests, the Varietal Evaluation team has acquired a new experimental combine harvester (see photo). Last season, nearly 5,000 plots of cereals were harvested for these trials.

The establishment and management of this trial network for the main cereal species allow the CRA-W to advise farmers on their varietal choices. They then have validated and independent data on the different varieties' characteristics. Given the multi-regional and multi-annual nature of the trials, they can adapt their choices to suit farming conditions.

Plant breeders and seed companies are the sponsors of post-registration testing. The publication of trial reports and the degree of adaptation of new varieties to conditions in Wallonia enable them to orient their commercial choices and hence develop the varieties of most use to our farmers.

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AGENDA

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