



An experimental network to study “pesticide free” cropping systems in arable crops

Violaine Deytieux, Marie-Hélène Bernicot, Vincent Cellier, Caroline Colnenne-David, Anne-Laure Toupet, Jean-Noel Aubertot

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AN EXPERIMENTAL NETWORK TO STUDY “PESTICIDE FREE” CROPPING SYSTEMS IN ARABLE CROPS

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Introduction

New agriculture context and regulations in Europe requires to modify agricultural systems (e.g. Directive 2009/128/EC on sustainable use of pesticides). In 2011, the INRA/CIRAD Integrated Pest Management Network set up a “pesticide free” trial network, named Res0Pest. Its purpose is to produce new references and knowledge useful for the design of innovative cropping systems less reliant on pesticides by identifying technical barriers, testing innovative techniques and gaining knowledge on biological regulations and pest management. The Res0Pest experimental network has two main objectives:

- Designing and testing cropping systems under the constraint of using no pesticide, and assessing their agronomic, environmental and socio-economic performances;
- Analysing the effects of pesticide free cropping systems on pest populations and natural biological regulations.

In this paper, we present this “pesticide free” field trial network and its potential as a unique experimental support for new research programs.

Materials and Methods

In this network, tested cropping systems were designed using Integrated Pest Management principles and combining different techniques in order to limit damages caused by pests and to benefit from biological regulations, as proposed by Attoumani-Ronceux et al., 2011. All the considered cropping systems were adapted to their regional production situation (*i.e.* soil and climate conditions, social and economic drivers, local concerns). Nevertheless, they were all designed according to the same set of constraints and objectives:

-Constraints: no pesticide use (except for biopesticides), cultivation of the major crops of the considered region;

- Objectives: to maximise, under these constraints, crop production (yield quantity) satisfying market specifications (yield quality) while (i) reducing other environmental impacts such as fossil energy consumption or greenhouse gas emissions and (ii) maintaining economic profitability for farmers.

Results and Discussion

The network includes eight long-term experiments implemented in INRA experimental units and one agricultural high school, in different production situations in France (Figure 1). All the field experiments started in autumn 2012, except for one which is

located in Grignon and started in spring 2008 – it is one out of the four systems assessed in the "Innovative Cropping systems under Constraints" long-term field trial (Colnenne-David and Doré, submitted). For all experiments, the plot area is at least 0.5 ha, in order to be representative of commercial fields. Fifty per cent of crops of the rotation are tested every year. A set of protocols was written with experimenters, in order to standardise data collection and to allow (i) future agronomic diagnosis and performance analysis of the tested cropping systems, (ii) cross-cutting analysis within the network. In these tested cropping systems, biological diversity is enhanced by diversifying crop sequence (Figure 1), or by associating several species or cultivars in a same field. Many other technics are combined in the systems (e.g: sowing date and rate, false-seed bed tillage, mechanical weeding...).



Figure 1. Res0Pest sites in France and two examples of crop sequence of pesticide free cropping systems tested in Le Rheu (in Brittany region), and Grignon (in Ile de France region). Sites related to mixed systems are in grey; sites related to arable crop systems in black.

Conclusions

The pesticide free cropping systems tested in the Res0Pest network are prospective and ambitious and are implemented for a large range of production situations. The system approach used in long-term field experiments is also original and permits to analyse long-term effects of cropping systems on the environment. Thus, the Res0Pest network represents a unique experimental tool in France and probably in Europe for research programs related to disciplines related to agroecology. Currently, some specific protocols are being written to characterise pest injuries levels and the establishment of biological regulations, in connection with another specific project. New collaborations have to be initiated and developed in order to fully take advantage of the network.

Acknowledgements

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ABSTRACTS



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Welcome to 13th ESA Congress!

In the last few decades, several changes have occurred worldwide in the agricultural sectors of developed and developing countries, especially in the manufacturing of plant products. As a result of the “green revolution” that has been taking place in developing countries since the 1960s, yields have significantly increased, primarily in the case of cereals. Crop production in developed countries has also changed considerably. The results are definite and considerable, but at the beginning of the 21st century, we have to face new challenges and issues in crop production.

As a consequence of globalisation, economic challenges appeared in the crop production of the 21st century, which resulted in irrational technological solutions in favour of competitiveness and profitability. In the European Union, the development and introduction of an agricultural and rural development policy is expected from 2014. Agriculture, and especially crop production, face growing social expectations, which drive it towards environmentally friendly, sustainable production and mean a growing challenge in the field of food (fodder) safety.

New challenges need new solutions, which cannot be imagined without broad, multidisciplinary research. Today, more efficient and widespread innovation of the research results represents a basic task. Expanded and effective research is currently being done to the better understanding of the agro-ecological conditions of crop production, to reduce the effects of ecological stress, to realise the behaviour of new genotypes to the greatest possible extent and to optimise sustainable crop production technologies.

Our aim with the program of the XIIIth ESA Congress is:

- to introduce the latest scientific results in all the three divisions of the ESA
- to identify new scientific trends and put forward recommendations to political decision-makers
- to promote scientific collaboration and improve cooperation activities
- to give an overall picture of Hungarian plant cultivation and present the research activities in the fields of plant cultivation and other interdisciplinary fields which are carried out at the University of Debrecen
- to facilitate the integration of researchers from Central and Eastern European countries into the ESA

The congress will be academically and professionally beneficial not only to a wide range of professors, university teachers, researchers in the areas of crop sciences, but to PhD students, extensionists and other specialists alike who are interested in fields of study.

Hungary and Debrecen are beautiful all year round and give a nice hospitality. We hope you have a great time in the company and friendship of all our participants.

I hope you have a scientifically productive and fruitful stay and that the memory of your visit to Hungary and Debrecen will be a lasting and pleasant one.

Sincerely yours,

Prof. Peter Pepó
President of ESA



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INDEX

A

Achard, R.	81, 345
Acin, V.	57
Acutis, M.	295, 393
Ács, E.	453
Aggarwa, P. K.	223
Agneta, R.	469
Alderman, P. D.	223
Alletto, L.	127, 333
Alric, F.	429
Angevin, F.	319
Anothai, J.	223
Aouadi, N.	323
Archer, D. W.	413
Árendás, T.	97, 409
Asensio, C.	65, 411
Asseng, S.	203, 223
Atzori, A. S.	185
Aubertot, J.-N.	211, 323, 339

B

Bach, M.	215, 217
Bachinger, J.	361, 363
Bachmann, S.	47, 131
Baddeley, J.	365, 379
Baeten, V.	237
Báez, D.	201
Bakos, K.	91, 249, 263, 423
Balalić, I.	121
Ban, H.-Y.	383
Bányai, J.	417
Bao, X.-G.	415
Barbanti, L.	257
Barber, H. M.	193
Barbi, F.	289
Barbier, J.-M.	329
Barbieri, M.	287
Barbottin, A.	261
Barcza, Z.	235
Barot, S.	51
Barriere, V.	145
Basa, A. G.	101
Basci, F.	289
Basso, B.	185, 223
Báth, B.	363
Battle, F.	427
Baumecker, M.	147
Baviello, G.	477
Beaudoin, N.	229
Becker, C.	75
Becze, Zs. J.	115
Bell, A.	271

Bellocchi, G.	235
Benoit, M.	127, 321
Beres, B.	141
Berger, M.	429
Bergkvist, G.	361, 363
Bernicot, M.-H.	339
Bertrand, M.	51
Berzsenyi, Z.	63, 85, 97, 409
Bettati, T.	257
Beugniet, G.	429
Bianchi, F.	271
Bianchi, S.	257
Bienes, R.	169
Bieńkowski, J.	163, 425
Biernath, C.	223
Bilski, P.	89
Birba, O.	81
Bischof, A.	135
Blackshaw, R.	331, 357
Blade, S. F.	283
Blanchard, M.	81
Blazy, J.-M.	149, 327, 341
Blouin, M.	51
Bobille, H.	375
Bocchi, S.	287
Bocianowski, J.	285, 459
Bodner, G.	109, 433
Bodson, B.	71, 237
Bóna, L.	453
Bónis, P.	97
Boogaard, H.	213
Borin, M.	173, 175
Boros, N.	467
Boschetti, M.	287
Bouty, C.	261
Böck, A.	359
Böhm, K.	439
Böttcher, U.	219
Brak, B.	421
Bregaglio, S.	207, 295, 393
Brenna, S.	295, 393
Breza-Boruta, B.	285
Britz, W.	197
Brivio, P. A.	287
Brown, H.	83
Brunori, A.	477
Burel, E.	221
Bussel, van L.	213, 215, 217
Büchi, L.	221, 275, 369
Byrns, B. M.	195

C

Cacak-Pietrzak, G.	479
Calvet	429



Cammarano, D.	223	D	
Campi, P.	279	Dąbrowicz, R.	163, 425
Campillo, del M. C.	189	Damalas, C. A.	455
Čanak, P.	405	Damour, G.	81, 343, 345
Cañasveras, J. C.	189	Dayde, J.	429
Caneill, J.	151, 323	De Luca Picione, F.	133
Cannas, A.	185	Debaeke, P.	211, 429, 435
Cannavacciuolo, M.	373	Dejoux, J-F.	435
Cano, M.	289	Delaney, K. J.	285
Capouchová, I.	473	Delgado, A.	31, 189
Cappelli, G.	207, 393, 397	Delmotte, S.	329
Caputo, F.	133	Demarez, V.	435
Cass, S.	371	Deng, X. Z.	271
Cassagne, N.	373	Descheemaeker, K.	325
Ceglińska, A.	479	Dessaint, F.	307
Cellier, V.	339	Deytieux, V.	151, 339
Chakwizira, E.	83	Díaz, A. G.	169
Challinor, A. J.	223	Dicu, G.	101
Chambert, C.	429	Dobos, A. Cs.	91, 249, 263, 423
Champolivier, L.	429, 435	Doisy, D.	205, 335
Chapman, S.	79	Dóka, L. F.	107
Charles, R.	221, 275, 369	Doltra, J.	201, 223
Charlier, A.	51	Dore, T.	149, 273, 327
Charrier, X.	335	Dorel, M.	81, 87, 343, 345
Chauvel, B.	395	Dorey, E.	209
Chauvin, C.	87	Doro, L.	215, 217
Chelin, M.	71	Doumenc, A.	429
Chen, T-W.	25, 243	Dove, H.	183
Chernin, L.	313	Döring, T. F.	147, 317
Chiodini, M. E.	207	Dővényi-Nagy, T.	91, 249, 263, 423
Chirinda, N.	201	Dramalis, C.	287, 289, 419
Choi, D. H.	383	Drexler, D.	305
Cholez, C.	211	Drinić, G.	281
Chołuj, D.	105	Dudek, S.	77
Chopin, P.	149, 327, 341	Dumbrava, M.	101
Christen, O.	53	Dunai, A.	441
Čirić, M.	405	Duncan, K.	381
Clark, F.	381		
Clarke, C.	401	E	
Colbach, N.	205, 259	Ebrahimi, E.	433
Colnenne-David, C.	273, 319, 339	Eckersten, H.	215, 217
Confalonieri, R.	207, 287, 393, 397	Edney, M.	141
Cong, W-F.	415	Edwards, A.	165
Constantin, J.	215, 217	Egido, del L. L.	381
Cordeau, S.	259, 307, 395	Eichler-Löbermann, B.	47, 131
Cortazar-Atauri, de I. G.	229	Elía, M.	427, 475
Coste, F.	451	Ellis, R. H.	481
Couderc, V.	329	Ellmer, F.	147
Cox, W.J.	41	Enders, A.	215, 217
Craheix, D.	319	Eory, V.	361, 363
Crampton, V.	381	Epie, K. E.	379
Crnobarac, J.	57, 121	Epure, L. I.	101
Csajbók, J.	113, 447	Espadafor, M.	111
Csáder, I.	11	Estragnat, A.	429
		Ewert, F.	197, 215, 217, 223, 227, 231, 239, 241

Eylenbosch, D.	237
Eyshi Rezaei, E.	223, 227, 239

F

Falconnier, G.	325
Fasolini, D.	393
Fereres, E.	111, 223
Fernández Pierna, J. A.	237
Ferreira, M. E.	265
Fletcher, A.	83
Florio, G.	175
Fodor, N.	97, 409
Fotiadis, S.	367, 455
Fournier, P.	209
Fowler, D. B.	195
Francone, C.	397
Frankow-Lindberg, B.	363
Franzluebbbers, A. J.	391
Frasso, N.	207
Fumagalli, M.	295
Fustec, J.	373, 375

G

Gaiser, T.	197, 215, 217, 239
Gallardo, P.	65
Gan, Y.	331, 357
García, O.	111
Garcia, R. L.	289
Garcia-Tejera, O.	251, 253
Gary, C.	95
Gayler, S.	223
Gebhard, C-A.	369
Geertsema, W.	271
George, M.	83
Gertrude, J. C.	81
Gilardelli, C.	207
Giller, K. E.	325
Giola, P.	185
Gitas, I.	287
Giuliano, S.	127, 333
Giunta, F.	185
Giussani, A.	393
Godfroy, G.	321
Golba, J.	479
Gooding, M.	193, 401, 421
Gosme, M.	335
Gover, O.	313
Gozdowski, D.	277, 479
Götze, P.	53
Graham, J.	183
Grandeau, G.	273
Grandi, M.	295
Granger, S.	259
Grant, C.	141, 357
Gras, A.	429

Greer, K. J.	195
Gregory, P.	401
Gréhan, E.	353
Griffiths, S.	421
Grimmett, M.	79
Groot, de H.	213
Gropp, M.	47
Grosz, B.	215, 217
Groszyk, J.	277
Gualano, N.	457
Guillemin, J-P.	395
Guilpart, N.	95
Györi, Z.	465, 467

H

Haas, E.	215, 217
Hagen, T.	131
Hajšlová, J.	473
Hall, R. M.	439
Hammond, R.	329
Harasimowicz-Hermann, G.	67
Harker, N.	141, 331, 357
Haro, J. G.	287
Hawes, C.	379, 381
He, P.	129
Hecker, J. M.	361, 363
Hegedűs, B.	305
Helming, J.	365
Hendrickson, J. R.	413
Herreman, T.	83
Herz, P.	359
Hidy, D.	235
Hiel, M-P.	71
Hirschy, M.	151
Hledík, P.	297
Hoffland, E.	415
Hoffmann, H.	197, 215, 217
Hoffmann, M. P.	199
Hofmann, D.	347
Holecz, F.	287
Holka, M.	163, 425
Honsová, H.	473
Hoogenboom, G.	223
Horaczek, T.	105, 443
Horn, D.	73
Horváth, D. E.	167
Hossard, L.	329
Hou, L.	271
Houdijk, J.	381
Huang, J.	271
Huerta, J.	287
Hunt, J.	139
Hunt, L. A.	223
Hülsbergen, K-J.	347



I

Ianieri, J.	381
Iannetta, P. P. M.	379, 381
Ingver, A.	471
Inubushi, K.	123
Ion, V.	101
Ittersum, van M.	213
Izaurralde, R. C.	223

J

Jabloun, M.	223
Jaćimović, G.	57, 121
Jacobs, A.	53, 199
Jakubczak, M.	277, 479
James, E. K.	379, 381
Jamont, M.	373
Jankowiak, J.	163, 425, 445
Janovská, D.	473
Jeanson, P.	429
Jeong, W-S.	99
Jeske, M.	459
Jeuffroy, M. H.	61
Jiang, Y.	79
Johnson, E.	141, 331, 357
Johnston, A. M.	129
Joly, F-X.	373
Jones, C. D.	223
Jones, H. E.	421
Jones, S.	365
Jouffret, P.	429
Józefczyk, D.	445
Juskiw, P.	141
Justes, E.	127, 333, 353, 429

K

Kabeta, Y.	141
Kage, H.	219
Kahlen, K.	243
Kalka, I.	285
Kangor, T.	463
Karancsi, L. G.	293
Karg, G.	445
Karley, A.	381
Karydás, C.	287
Kaszkowiak, J.	67
Káтай, J.	123
Katsantonis, D.	287, 289, 419
Katsoulas, N.	265
Kaul, H-P.	55, 109, 359, 433, 439
Kędziora, A.	445
Kelderer, M.	133
Kersebaum, K. C.	213, 215, 217, 223
Kiese, R.	215, 217
Kimball, B. A.	223

Kimi, Y-U.	383
Kirkegaard, J.	139, 183
Kishimoto-Mo, A. W.	389
Kittas, C.	265
Knapowski, T.	461
Koch, H-J.	73, 75, 233
Kocoń, A.	137
Koehler, A-K.	223
Kong, Y.	123
Kontopoulou, C. K.	379
Konvalina, P.	473
Koppel, M.	463
Koppel, R.	471
Kotkowski, G.	247
Koutroubas, S. D.	367, 419, 455
Kozyra, J.	93, 303
Krauss, G.	215, 217, 239
Kuchar, K.	247
Kuchar, L.	247
Kuhnert, M.	215, 217
Kupisch, M.	231, 241
Kuśmieriek-Tomaszewska, R.	77
Kutasy, E.	113, 447

L

Labalette, F.	429
Labarrere, M.	429
Lafond, G.	141, 357
Langensiepen, M.	231, 241
Langó, B.	453
Latković, D.	57, 121
Launay, M.	229
Lechaudel, M.	209
Lecompte, F.	145
Lee, B-W.	99, 383
Lee, K-J.	99
Legner, N.	377
Lellei-Kovács, E.	235
Lemańczyk, G.	285, 461
Lemme, H.	73
Léonard, J.	353
Lescourret, F.	145
Leszczyńska, E.	277
Lévai, L.	187
Lewan, E.	215, 217
Li, L.	415
Li, Q.	79
Liaudanskienė, I.	59, 407
Liebig, M. A.	413
Liebis, F.	369
Lilley, J.	139
Lizaso, J. I.	5, 255
Lloveras, J.	49, 255, 351
Lobell, D.	223
Lof, M.	309
Loiskandl, W.	109

Łopatka, A.	303	Meunier, D.	307
López, O.	289	Meynard, C.	345
López-Bernal, A.	251, 253	Mézière, D.	259
Lorin, M.	61	Michalska-Klimczak, B.	89
Lorite, I.	111	Michelena, A.	351
Lozano, F. J.	65	Micskei, Gy.	85, 97, 409, 417
Lu, Y.	271	Miglietta, F.	257
Lukac, M.	421	Miroslavljević, M.	403, 405
Lupwayi, N.	357	Miša, P.	337
M		Mitrović, B.	403
Ma, S.	235	Mochizuki, K.	389
Mađry, W.	479	Modugno, F.	279
Mailly, F.	329	Moench, M.	381
Maire, J.	361	Molnár, K.	91, 249, 263, 423
Majumdar, K.	129	Monti, M.	363, 379
Mäkelä, P. S. A.	159	Moore, A.	139
Mako, A.	441	Moreau, D.	343
Makó, A.	245	Mouret, J-C.	329
Makowski, D.	157	Mourik, van T.	325
Malenica, A.	79	Mozes-Koch, R.	313
Maley, S.	83	Munier-Jolain, N.	151, 307, 323
Malik, Al I.	187	Murányi, E.	161
Manenji, B. T.	385	Murgia, L.	185
Manici, L. M.	133	Murray, B.	79
Mańkowski, D. R.	301	Müller, C.	223
Manschadi, A. M.	55	N	
Maori, E.	313	Nagano, H.	123
Mar Albarrán, del M.	169	Nagasaka, K.	389
Marchand, D.	51	Nagy, J.	45, 91, 249, 263, 423
Maria, de S.	469	Nareh Kumar, S.	223
Marinković, B.	57, 121	Nassab, A. D. M.	433
Martin, P.	261	Naudin, C.	375
Martinez, E.	49	Navalho, N.	265
Martinez-Exigarch, M.	421	Navarro, A.	279
Martin-Lammerding, D.	169	Negri, M.	397
Marton, Cs. L.	417	Nemeskéri, E.	91
Martre, P.	223	Németh, T.	38
Mary, B.	229, 353	Nendel, C.	215, 217, 223
Mas, O.	435	Neugschwandtner, R. W.	359, 439
Mastrorilli, M.	279	Nichols, K. A.	413
Matyka, M.	303	Nieróbca, A.	93, 213
Maucieri, C.	173, 175	Noble, A.	83
Maury, P.	429	Novák, A.	291
Mawois, M.	451	Nowa, A.	43
May, M.	357	Nyiraneza, J.	79
May, W.	141	O	
McBeath, T.	139	O'Donovan, J.	141, 331, 357
McDonald, S.	183	O'Leary, G. J.	223
McLeod, A.	141	Ogola, J. B.	385
Mearns, L.	203	Oleksiak, T.	301, 431
Médiène, S.	205, 335	Olesen, J. E.	201, 223
Meinen, C.	377	Oliver, Y.	139
Melo-Abreu, de J. P.	265	Olivier, C.	71
Mendes, J. R.	289		
Metay, A.	95		



Olukosi, O.	381	Puigdollers, P.	289
Orgaz, F.	111, 251, 253	Puigpinós, E.	49
Ortega, E.	411		
Ortiz, C.	49	R	
Otop, I.	247	Rácz, Cs.	91, 249, 263, 423
Ottman, M. J.	223	Raffaillac, D.	353
Oura, N.	389	Ragán, P.	45
P		Rametti, G.	127, 333
Pagowski, K.	105, 443	Rampini, A.	287
Paleari, L.	393, 397	Ramsay, G.	381
Pallas-Areny, R.	289	Ramseier, H.	369
Palomba, G.	381	Randazzo, B.	179, 483
Palosuo, T.	223	Ranieri, R.	257
Palumbo, D.	279	Rauber, R.	377
Pampolino, M. F.	129	Raynal, H.	215, 217
Paňka, D.	459, 461	Reau, R.	349
Papantoniou, A.	289	Reckling, M.	361, 363
Papp, Z.	311	Rees, R. M.	361, 379
Pappa, V. A.	379	Reibel, C.	395
Paravano, L.	349	Reinsdorf, E.	233
Paridaen, A.	183	Rengel, Z.	187
Pazderu, K.	473	Requejo, M.	131
Pecio, A.	137, 153, 155	Resmond, R.	81
Pelzer, E.	319	Reynolds, M. P.	223
Peng, G.	331	Riccobene, F.	169
Pepe, M.	287	Rigakis, N.	265
Pepó, P.	161, 171, 299, 477, 485	Rijk, B.	213
Perdrieux, F.	127, 333	Rinaldi, E.	437
Pereiras, J.	289	Risede, J. M.	87
Peretz, Y.	313	Rivelli, A. R.	469
Pernicová, A.	297	Rizzo, D.	321
Perrin, P.	353	Robertson, M.	139
Petit, M-S.	151	Robin, M. H.	211
Peyrard, C.	353	Robles, J.	351
Piacentino, G.	257	Rodd, V.	79
Piedrafita, O. C.	289	Rodriguez, C.	65
Pierreux, J.	71	Roger-Estrade, J.	51, 81, 205, 335
Piesik, D.	285, 459	Roggero, P. P.	215, 217
Pietkiewicz, S.	105, 443	Roisin, C.	71
Pignatti, S.	287	Rolbiecki, R.	77
Piva, G.	373, 375	Rolbiecki, S.	77
Podlaski, S.	105	Romano, F.	287
Pokorný, E.	337	Ros, G.	181
Poma, I.	179, 437, 483	Rossi, V.	257
Popp, J.	11	Rossing, W.	271
Postma, R.	181	Rotterdam, van D.	181
Prasad, P. V. V.	223	Roux, S.	95
Priesack, E.	223	Rozbicki, J.	277, 479
Pristeri, A.	361, 363, 379	Rötter, R.	203, 215, 217, 223
Procházka, J.	297	Ruane, A. C.	223
Procházková, B.	297	Rudolph, S.	231
Prokinová, E.	473	Ruiter, de J.	83
Prost, L.	349	Rücknage, J.	53
Pruneddu, G.	185	Rykaczewska, K.	399
Pržulj, N.	403, 405		

S

Samborski, S.	277
Sánchez-Rodríguez, A. R.	189
Sanctis, de G.	223
Sándor, G.	477
Sanna, A. V.	289
Santanen, A.	159
Santín-Montanyá, M. I.	177
Santiveri, F.	49, 351
Sapna, K.	481
Sárdi, K.	135, 167, 245, 305
Sarno, M.	179, 437, 483
Sárvári, M.	119, 485
Satkus, A.	59
Satyanarayana, T.	129
Savin, R.	427, 457, 475
Savvas, D.	379
Schäfer, A-K.	359
Schaminee, J.	271
Schaub, A.	151
Schils, R.	213
Schläfke, N.	361, 363
Schmer, M. A.	413
Schmid, H.	347
Scholl, P.	109
Schöll, van L.	181
Schweitzer, K.	147
Sela, I.	313
Seleiman, M. F.	159
Semenov, M. A.	193, 223
Sendel, S.	285
Seres, E.	117
Serra, M. G.	185
Shcherbak, I.	223
Shewry, P. R.	17
Siebert, S.	215, 217, 227
Sieling, K.	219
Sim, D.	99
Simon, R.	347
Sinaj, S.	369
Sisák, I.	38
Six, J.	415
Slafer, G. A.	427, 457, 475
Šlepetienė, A.	407
Sobczyński, G.	277, 479
Sooväli, P.	463
Soriano, M.	411
Sosa, C.	215, 217
Spáčilová, V.	337
Specka, X.	215, 217
Spitkó, T.	417
Sprague, S.	183
Squire, G. R.	381
Stadler, A.	231, 241
Stanisavljević, D.	403
State, D.	101

Steduto, P.	223
Stella, T.	207, 397
Stickse, E.	347
Stoddard, F. L.	159, 361, 363, 365, 379
Stomph, T. J.	157
Stout, J.	371
Stöckle, C.	223
Stratonovitch, P.	223
Streck, T.	223
Streit, B.	275
Strullu, L.	229
Studnicki, M.	277, 479
Stuedemann, J. A.	391
Stützel, H.	25, 243
Sugár, E.	63, 85
Sun, J-H.	415
Supit, I.	223
Syp, A.	153, 155
Szabo, A.	103
Szabo, É.	103
Szarka, B.	281
Szczepanek, M.	67, 69
Széles, A.	45
Szilágyi, G.	143

T

Tabaglio, V.	295
Tamm, I.	463
Tamm, Ü.	463
Tanaka, D. L.	413
Tanne, E.	313
Tao, F.	215, 217, 223
Tardivo, C.	329
Tardy, F.	343, 345
Teixeira, E.	83, 215, 217, 239
Tenorio, J. L.	169, 177
Testi, L.	111, 251, 253
Thorburn, P.	223
Tixier, P.	209
Toborowicz-Borda, I.	443
Todde, G.	185
Toncea, I.	361, 363
Topp, A.	133
Topp, C. F. E.	361, 363, 365
Torrent, J.	189
Torres, N.	319
Toscano, P.	257
Tóth, B.	245
Tóth, Z.	167, 441
Touhami, H. B.	235
Toupet, A-L.	339
Tömösközi, S.	453
Troczyński, M.	459
Turkington, K.	141, 357



U		Wery, J.....	269
Uptmoor, R.	131	Weymann, W.	219
V		Whitbread, A. M.	139, 199
Václavíková, M.	473	White, J. W.	223
Vágó, I.	123	Wilczewski, E.	67, 69
Valantin-Morison, M.	61	Williams, M.	371, 379
Valera, D. L.	411	Wingen, L. U.	421
Vallavieille-Pope, de C.	309	Wiśniewski, G.	105
Valsangiacomo, A.	221	Wolf, J.	197, 213, 223
Végvári, Gy.	477	Wu, F.	271
Velykis, A.	59	Wu, K.	271
Venezia, G.	179, 437, 483	Wyszyński, Z.	89, 105, 443
Vepříková, Z.	473	X	
Verburg, K.	139	Xiao, H.	271
Veres, Sz.	187	Y	
Vergunov, V.	485	Yakoub, A.	255
Vergunova, I.	485	Yamaç, S. S.	397
Véricel, G.	127, 353	Yamasaki, S.	389
Vidéki, E.	477	Ye, L.	271
Vieira, M. I.	265	Yeluripati, J.	215, 217
Villalobos Coa, V. L.	279	Young, M.	379
Villalobos, F. J.	251, 253	Yu, Y.	157
W		Z	
Wach, D.	137	Zambrana, E.	169, 177
Wágner, L.	135	Zander, P.	361, 363
Waha, K.	223	Zanirato, G.	185
Walker, G.	381	Żarski, J.	77
Walker, R.	165, 361, 363	Zhang, F-S.	415
Wall, G. W.	223	Zhang, W.	271
Wallach, D.	203, 215, 217, 223	Zhao, G.	197, 215, 217, 239
Walter, A.	275	Zhao, Z.	215, 217, 223
Wang, E.	215, 217, 223	Zhou, K.	271
Watson, C. A.	165, 361, 363, 365	Zhu, Y.	223
Wawer, R.	303	Zingore, S.	129
Webber, H.	197, 239	Zou, Y.	271
Wenda-Piesik, A.	43, 461	Żyłowska, K.	93, 213
Wendling, M.	275	Zsuposné Oláh, Á.	123
Werf, van der W.	157, 271, 309, 415		

TABLE OF CONTENT

Plenary session

Jon I. LIZASO

IMPROVING CROP MODELS: INCORPORATING NEW PROCESSES, NEW APPROACHES, AND BETTER CALIBRATIONS5

József POPP, Ibolya CSÍDER

COMPETITIVE CROP PRODUCTION: FOOD-, ENERGY- AND ENVIRONMENTAL SECURITY11

Peter R SHEWRY

CHALLENGES FOR THE IMPROVEMENT OF WHEAT GRAIN QUALITY17

Hartmut STÜTZEL, Tsu-Wei CHEN

PLANT CANOPIES UNDER DROUGHT STRESS – STRUCTURES, FUNCTIONS, GENES AND MODELS25

Antonio DELGADO

PHOSPHORUS FERTILIZATION: A GLOBAL CONSTRAINT IN THE FUTURE?31

Session 1: Crop production and agroecology

István SISÁK, Tamás NÉMETH

ROLLING ANALYSES OF LONG-TERM DATA SETS FOR WHEAT AND MAIZE PRODUCTION IN HUNGARY39

William J. COX

BT CORN HYBRIDS DID NOT RESPOND TO HIGHER THAN RECOMMENDED SEEDING AND N RATES IN STUDIES IN THE NORTHEAST USA41

Agnieszka NOWA, Anna WENDA-PIESIK

EFFECTS OF MICROELEMENTS AND AMINO ACIDS APPLICATION ON WINTER RAPE PLANT AND CANOPY.43

Adrienn SZÉLES, Péter RAGÁN, János NAGY

EFFECT OF THE SOWING DATE ON THE YIELD OF THREE MAIZE CULTIVARS IN HUNGARY. .45

Silvia BACHMANN, Markus GROPP, Bettina EICHLER-LÖBERMANN

PHOSPHORUS AVAILABILITY AND MICROBIAL ACTIVITY IN SOIL AFTER FOUR YEARS OF DIGESTATE APPLICATION.....47

Elias MARTINEZ, Francisca SANTIVERI, Elena PUIGPINÓS, Carlos ORTÍZ, Jaume LLOVERAS

COPPER AND ZINC SOIL ACCUMULATION IN IRRIGATED MAIZE AFTER 10 YEARS OF FERTILIZATION WITH LIQUID SWINE MANURE.....49

Michel BERTRAND, Manuel BLOUIN, Sébastien BAROT, Aude CHARLIER, Damien MARCHAND, Jean ROGER-ESTRADE

BIOCONTROL OF EYESPOT WINTER WHEAT FUNGAL DISEASE BY AN ANECIC EARTHWORM (LUMBRISCUS TERRESTRIS, L.).....51

Philipp GÖTZE, Jan RÜCKNAGEL, Anna JACOBS, Olaf CHRISTEN

CROP ROTATION EFFECTS ON SOIL ORGANIC MATTER IN THE SUGAR BEET ROTATION EXPERIMENT ETZDORF53

Ahmad M. MANSCHADI, Hans-Peter KAUL

IMPROVING NUTRIENT-USE EFFICIENCY IN CROP PLANTS – PHYSIOLOGICAL OPPORTUNITIES AND LIMITS55

Goran JACIMOVIĆ, Branko MARINKOVIĆ, Jovan CRNOBARAC, Vladimir AĆIN, Dragana LATKOVIĆ

EFFECTS OF THE YEAR AND the rate OF NITROGEN FERTILIZATION ON WHEAT PRODUCTION IN SERBIA57



<i>Inga LLAUDANSKIENĖ, Aleksandras VELYKIS, Antanas SATKUS</i>	
THE INFLUENCE OF SOIL TILLAGE ON HUMUS FRACTIONAL COMPOSITION	59
<i>Mathieu LORIN, Muriel VALANTIN-MORISON, Marie Helene JEUFFROY</i>	
UNDERSOWING WINTER OILSEED RAPE WITH FROST-SENSITIVE LEGUME LIVING MULCHES IN ORDER TO IMPROVE WEED CONTROL	61
<i>Eszter SUGÁR, Zoltán BERZSENYI</i>	
N-FERTILISER RESPONSES OF WINTER WHEAT VARIETIES USING THE FUNCTIONAL METHOD OF GROWTH ANALYSIS	63
<i>C. ASENSIO, P. GALLARDO, C. RODRÍGUEZ, F.J. LOZANO</i>	
USING A WIND TUNNEL TO CHECK THE PRODUCTIVITY LOSS OF CEREAL SOILS DAMAGED BY WIND EROSION.	65
<i>Edward WILCZEWSKI, Grażyna HARASIMOWICZ-HERMANN, Małgorzata SZCZEPANEK, Jerzy KASZKOWIAK</i>	
EFFECT OF SOWING METHOD ON SOIL PROPERTIES IN THE SURROUNDINGS OF SEEDS AND EMERGENCE DYNAMICS OF WINTER OILSEED RAPE.....	67
<i>Małgorzata SZCZEPANEK, Edward WILCZEWSKI</i>	
MALTING BARLEY RESPONSE TO FOLIAR APPLICATION OF BIOSTIMULANTS	69
<i>Marie-Pierre HIEL, Claire OLIVIER, Jérôme PIERREUX, Marie CHELIN, Christian ROISIN, Bernard BODSON</i>	
MULTIDISCIPLINARY FIELD EXPERIMENT ON CROP RESIDUE MANAGEMENT IN SILTY SOIL: FIRST ASSESSMENT ON CROP PRODUCTION	71
<i>Holger LEMME, Dietmar HORN, Heinz-Josef KOCH</i>	
LIMING INCREASES EUF EXTRACTABLE, LABILE, AND PLANT AVAILABLE P ON LOESS SOILS	73
<i>Clemens BECKER, Heinz-Josef KOCH</i>	
UTILIZATION OF DETERIORATED BEETS AS TOP-DRESSED MANURE IN WINTER WHEAT	75
<i>Roman ROLBIECKI, Stanisław ROLBIECKI, Stanisław DUDEK, Renata KUŚMIEREK-TOMASZEWSKA, Jacek ŻARSKI</i>	
INFLUENCE OF DRIP IRRIGATION AND FERTIGATION ON YIELD OF MID-EARLY POTATOES CULTIVATED ON THE VERY LIGHT SOIL	77
<i>Yefang JIANG, Steve CHAPMAN, Judith NYIRANEZA, Amanda MALENICA, Qing LI, Brian MURRAY, Mark GRIMMETT, Vernon RODD</i>	
GROUNDWATER QUALITY UNDER A RETIRED POTATO FIELD EVIDENCES SIGNIFICANT CONTRIBUTION OF SOIL N TO NITRATE LEACHING	79
<i>Raphaël ACHARD, Rémi RESMOND, Morgane BLANCHARD, Jean Claude GERTRUDE, Olivier BIRBA, Gaelle DAMOUR, Marc DOREL, Jean ROGER ESTRADE</i>	
FROM A TRAIT-BASED APPROACH OF COVER PLANT POTENTIAL TO ON FIELD EVALUATION OF WEED CONTROL IN BANANA CROPPING SYSTEMS	81
<i>Edmar TEIXEIRA, Mike GEORGE, Thibault HERREMAN, Hamish BROWN, Andrew FLETCHER, Emmanuel CHAKWIZIRA, John de RUITER, Shane MALEY, Alasdair NOBLE</i>	
EFFECTS OF LIMITED WATER AND NITROGEN SUPPLY ON YIELD AND RESOURCE USE EFFICIENCIES OF MAIZE CROPS.....	83
<i>Zoltan BERZSENYI, Györgyi MICSKEI, Eszter SUGÁR</i>	
EFFECT OF FERTILISATION AND PLANT DENSITY ON THE DYNAMICS OF GROWTH AND YIELD OF MAIZE HYBRIDS IN A LONG-TERM EXPERIMENT	85
<i>Camille CHAUVIN, Marc DOREL, Jean Michel RISEDE</i>	
CHANGES IN SOIL FOOD WEB STRUCTURE AND REGULATION OF PARASITIC NEMATODES DURING EARLY LITTER DECOMPOSITION OF CONTRASTED QUALITY	87

<i>Beata MICHALSKA-KLIMCZAK, Piotr BILSKI, Zdzisław WYSZYŃSKI</i>	
IMPACT OF CANOPY TRAITS ON SUGAR BEET ROOT MASS	89
<i>Krisztina MOLNÁR, Attila Csaba DOBOS, János NAGY, Eszter NEMESKÉRI, Tamás DÖVÉNYI-NAGY, Csaba RÁCZ, Károly Líviusz BAKOS</i>	
THE EFFECT OF WATER SUPPLY ON YIELD AND WATER USE OF GREEN BEAN.....	91
<i>Jerzy KOZYRA, Anna NIERÓBCA, Katarzyna ŻYŁOWSKA</i>	
CHANGES IN WINTER WHEAT PHENOLOGY IN POLAND DURING THE YEARS 1975-2011	93
<i>Nicolas GUILPART, Sébastien ROUX, Aurélie METAY, Christian GARY</i>	
EXPERIMENTAL EVIDENCE OF TRADE-OFF BETWEEN POWDERY MILDEW REGULATION AND GRAPE YIELD IN VINEYARDS.....	95
<i>Tamás ÁRENDÁS, Györgyi MICSKEI, Péter BÓNIS, Zoltán BERZSENYI, Nándor FODOR</i>	
STUDIES ON THE P RESPONSES OF MAIZE (ZEA MAYS L.) IN A LONG-TERM FERTILISATION EXPERIMENT	97
<i>Dana SIM, Kyu-jong LEE, Woo-seong JEONG, Byun-woo LEE</i>	
RESPONSE OF YIELD-RELATED TRAITS TO ELEVATED GROWTH TEMPERATURE IN MAIZE...99	
<i>Viorel ION, Adrian Gheorghe BASA, Marin DUMBRAVA, Georgeta DICU, Daniel STATE, Lenuta Iuliana EPURE</i>	
RESULTS ABOUT SUNFLOWER YIELD COMPONENTS IN SOUTH ROMANIA AT DIFFERENT PLANTING PATTERNS	101
<i>Andras SZABO, Eva SZABO</i>	
EFFECT OF THE SOWING DENSITY ON THE YIELD STABILITY OF SUNFLOWER HYBRIDS	103
<i>Tomasz HORACZEK, Stefan PIETKIEWICZ, Sławomir PODLASKI, Danuta CHOŁUJ, Grzegorz WIŚNIEWSKI, Krzysztof PAŁGOWSKI, Zdzisław WYSZYŃSKI</i>	
INFLUENCE OF IRRIGATION ON CO ₂ BALANCE OF 7 THE MOST PROMISING ENERGY CROPS CULTIVATED IN CENTRAL POLAND	105
<i>Lajos Fülöp DÓKA</i>	
THE EFFECT OF CROP ROTATION ON THE WATER MANAGEMENT OF WINTER WHEAT (TRITICUM AESTIVUM L.)	107
<i>Gernot BODNER, Peter SCHOLL, Willibald LOISKANDL, Hans-Peter KAUL</i>	
COVER CROP ROOT SYSTEMS TO IMPROVE SOIL HYDRAULIC PROPERTIES	109
<i>Monica ESPADAFOR, Francisco ORGAZ, Omar GARCÍA, Luca TESTI, Ignacio LORITE, Elias FERERES</i>	
TRANSPIRATION AND WATER RELATIONS OF YOUNG ALMOND TREES	111
<i>József CSAJBOK, Erika KUTASY</i>	
PHOTOSYNTHESIS AND WATER USE EFFICIENCY IN MAIZE (ZEA MAYS L.) EXPERIMENTS ..113	
<i>Zsófia Judit BECZE</i>	
THE EFFECT OF FERTILIZER LEVELS AND ROW SPACING ON THE YIELD OF MAIZE IN HUNGARY	115
<i>Emese SERES</i>	
RELATIONSHIP BETWEEN THE AGROTECHNICAL FACTORS AND THE YIELD PRODUCTION OF MILLET (PANICUM MILIACEUM L.).....	117
<i>Mihály SÁRVÁRI</i>	
THE EFFECT OF SOWING TIME ON THE YIELD OF MAIZE	119
<i>Jovan CRNOBARAC, Igor BALALIĆ, Branko MARINKOVIĆ, Dragana LATKOVIĆ, Goran JAĆIMOVIĆ</i>	
INFLUENCE OF PLANT DENSITY AND PLANTING DATE ON YIELD AND QUALITY OF CONFECTIONERY SUNFLOWER	121



<i>Kazuyuki INUBUSHI, Janos KÁTAI, Imre VÁGÓ, Ágnes ZSUPOSNÉ OLÁH, Yuhua KONG, Hirohiko NAGANO</i>	
AGROECOLOGICAL IMPACTS ON CARBON AND NITROGEN DYNAMICS IN CROPLAND IN EASTERN HUNGARY AND JAPAN	123
Session 2: Competitive and sustainable crop production	
<i>Lionel ALLETTO, Simon GIULIANO, Francois PERDRIEUX, Gaël RAMETTI, Pierre BENOIT, Grégory VÉRICEL, Eric JUSTES</i>	
COMPARISON OF THE ENVIRONMENTAL PERFORMANCE OF FOUR MAIZE MONOCROPPING SYSTEMS: A THREE-YEAR MONITORING OF PESTICIDE LEACHING.	127
<i>Mirasol F. PAMPOLINO, Ping HE, Kaushik MAJUMDAR, T. SATYANARAYANA, Shamie ZINGORE, Adrian M. JOHNSTON</i>	
AGRONOMIC, ECONOMIC, AND ENVIRONMENTAL BENEFITS OF FERTILIZER RECOMMENDATIONS BASED ON NUTRIENT EXPERT® DECISION SUPPORT TOOL FOR MAIZE AND WHEAT	129
<i>Bettina EICHLER-LÖBERMANN, Maria REQUEJO, Torsten HAGEN, Silvia BACHMANN, Ralf UPTMOOR</i>	
EFFECTS OF LONG-TERM P FERTILIZING PRACTICES ON CHARACTERISTICS IN TOPSOIL AND SUBSOIL	131
<i>Luisa Maria MANICI, Markus KELDERER, Francesco CAPUTO, Fabiano DE LUCA PICIONE, Anne TOPP</i>	
BENEFITS FROM COVER CROPS BASED ON PLANT-MICROBE INTERACTION.	133
<i>Katalin SÁRDI, András BISCHOF, László WÁGNER</i>	
EFFECTS OF NUTRIENT SUPPLY AND SOIL AMELIORATION ON SPRING BARLEY YIELD PARAMETERS GROWN IN AN ACIDIC SOIL	135
<i>Damian WACH, Alicja PECIO, Anna KOCON</i>	
GRAIN YIELD AND YIELD COMPONENTS OF SPRING BARLEY LINES AS THE MEASURES OF THE TOLERANCE TO TEMPORAL DROUGHT STRESS.....	137
<i>John KIRKEGAARD, James HUNT, Therese McBEATH, Julianne LILLEY, Andrew MOORE, Kirsten VERBURG, Michael ROBERTSON, Yvette OLIVER, Anthony WHITBREAD</i>	
IMPROVING CROP AND SYSTEM WATER-USE EFFICIENCY IN SOUTHERN AUSTRALIA	139
<i>John O'DONOVAN, Michael EDNEY, Aaron McLEOD, Kelly TURKINGTON, Cynthia GRANT, Neil HARKER, Eric JOHNSON, Guy LAFOND, William MAY, Brian BERES, Yadeta KABETA, Patricia JUSKIW</i>	
RESPONSE OF NEW MALTING BARLEY CULTIVARS TO INCREASING NITROGEN RATES IN WESTERN CANADA.....	141
<i>Gergely SZILÁGYI</i>	
HARVEST INDEX OF WINTER WHEAT AFTER SWEET MAIZE FORECROP IN A LONG-TERM EXPERIMENT	143
<i>Virginie BARRIERE, François LECOMPTE, Françoise LESCOURRET</i>	
APPRAISAL OF LETTUCE CROPPING SYSTEMS WITH REDUCED PESTICIDE APPLICATIONS ..	145
<i>Thomas F. DÖRING, Kathlin SCHWEITZER, Michael BAUMECKER, Frank ELLMER</i>	
YIELD STABILITY OF WHEAT IS LOWEST AT HIGH LEVELS OF MINERAL NITROGEN INPUT ..	147
<i>Pierre CHOPIN, Jean-Marc BLAZY, Thierry DORE</i>	
INDICATORS FOR THE ASSESSMENT OF THE SUSTAINABILITY LEVEL OF AGRICULTURAL LANDSCAPES.....	149
<i>Violaine DEYTIEUX, Matthieu HIRSCHY, Marie-Sophie PETIT, Anne SCHAUB, Nicolas MUNIER-JOLAIN, Jacques CANEILL</i>	
IDENTIFICATION OF SUSTAINABLE CROPPING SYSTEMS WITH HIGH MULTI-SECTOR PERFORMANCES.....	151

Alicja PECIO, Alina SYP

THE INFLUENCE OF SOIL TILLAGE PRACTICES ON THE CONTENTS OF SOIL ORGANIC CARBON..... 153

Alicja PECIO, Alina SYP

THE INFLUENCE OF SOIL TILLAGE PRACTICES ON THE SOIL ORGANIC CARBON STOCKS 155

Yang YU, TjeerdJan STOMPH, David MAKOWSKI, Wopke van der WERF

A GLOBAL META-ANALYSIS OF THE EFFECTS OF TEMPORAL NICHE DIFFERENTIATION ON LAND EQUIVALENT RATIO OF INTERCROPS 157

Mahmoud F. SELEIMAN, Arja SANTANEN, Frederick L. STODDARD, Pirjo S. A. MÄKELÄ

THE IMPACT OF SYNTHETIC FERTILIZER ON MYCORRHIZA ACTIVITY IN COMPARISON TO SLUDGE APPLICATION ON CROPLAND 159

Eszter MURÁNYI, Péter PEPÓ

THE EFFECT OF PLANT DENSITY ON THE YIELD AND LAI VALUES OF TWO MAIZE (ZEA MAYS L.) HYBRIDS 161

Janusz JANKOWIAK, Jerzy BIEŃKOWSKI, Małgorzata HOLKA, Radosław DĄBROWICZ

JOINT APPRAISAL OF PRODUCTION AND ENVIRONMENTAL EFFECTS OF AGRICULTURE IN POLAND, FROM A REGIONAL PERSPECTIVE..... 163

Robin L WALKER, Anthony C EDWARDS, Christine A WATSON

NUTRIENT INPUT AND CLIMATIC EFFECTS ON THE DRY BIOMASS PRODUCTIVITY OF A CROP ROTATION OVER 60 YEARS 165

Zoltán TÓTH, Katalin SÁRDI, Dóra Elvira HORVÁTH

EVALUATION OF THE RELATIONSHIP BETWEEN SPAD CHLOROPHYLL VALUES AND LEAF NITROGEN CONTENTS OF MAIZE 167

Diana MARTIN-LAMMERDING, Andrés García DÍAZ, Flora RICCOBENE, Encarna ZAMBRANA, Maria del MAR ALBARRÁN, José Luis TENORIO, Ramón BIENES

SOIL WATER RETENTION AND FIELD SATURATED CONDUCTIVITY INFLUENCED BY TILLAGE PRACTICES IN A SEMIARID ALFISOL 169

Peter PEPÓ

AGRONOMIC STUDY OF CEREAL CROP MODELS 171

Carmelo MAUCIERI, Maurizio BORIN

TREATMENT AND ENHANCEMENT OF DIGESTATE LIQUID FRACTION FROM ANIMAL WASTE AND BIOMASSES ANAEROBIC DIGESTION..... 173

Giulia FLORIO, Carmelo MAUCIERI, Maurizio BORIN

COMPOSITION AND POTENTIAL SECOND GENERATION ETHANOL PRODUCTION OF 14 SPECIES SUITABLE FOR PHYTOREMEDIATION..... 175

M. Inés SANTÍN-MONTANYÁ, Encarna ZAMBRANA, José Luis TENORIO

WEED ABUNDANCE RESPONSE TO TILLAGE SYSTEMS IN CONTINUOUS MAIZE 177

Giacomo VENEZIA, Ignazio POMA, Biagio RANDAZZO, Mauro SARNO

THE EFFECTS OF IRRIGATION WATER AS A FUNCTION OF THE DISTANCE BETWEEN IRRIGATION DRIPPERS IN A TOMATO FIELD. 179

Laura van SCHÖLL, Romke POSTMA, Gerard. ROS, Debby van ROTTERDAM

A CONCEPTUAL FRAMEWORK FOR SUSTAINABLE FERTILIZER RECOMMENDATIONS: A CASE STUDY FOR ASPARAGUS..... 181

John KIRKEGAARD, Susan SPRAGUE, Hugh DOVE, John GRAHAM, Scott McDONALD, Anneika PARIDAEN

HAVE YOUR CANOLA AND EAT IT TOO - EUROPEAN WINTER CANOLA FOR DUAL-PURPOSE (GRAIN-GRAZE) USE IN AUSTRALIA 183



GIOLA P., GIUNTA F., PRUNEDDU G., BASSO B., ATZORI A.S., SERRA M.G., TODDE G., MURGIA L., CANNAS A., ZANIRATO G.	
EVALUATING THE EFFECTS OF NITROGEN CROP MANAGEMENT ON GREENHOUSE GAS EMISSIONS IN DAIRY CATTLE FARMS OF SOUTHERN ITALY	185
<i>Szilvia VERES, Imran Al MALIK, László LÉVAI, Zed RENGEL</i>	
CHLOROPHYLL FLUORESCENCE METHOD AS A TOOL FOR ESTABLISHING CROP CONDITIONS	187
<i>Antonio Rafael SÁNCHEZ-RODRÍGUEZ, Juan Carlos CAÑASVERAS, María Carmen del CAMPILLO, Antonio DELGADO, José TORRENT</i>	
HIGH PHOSPHATE FERTILIZATION AGGRAVATES IRON DEFICIENCY IN OLIVE TREES	189
Session 3: Crop modelling	
<i>Henry Mark BARBER, Mike GOODING, Mikhail A SEMENOV</i>	
IMPROVING MODELLING OF WHEAT RESPONSES TO HIGH TEMPERATURE STRESS UNDER CLIMATE CHANGE	193
<i>D. B. FOWLER, B. M. BYRNS, K. J. GREER</i>	
SIMULATION OF WINTER STRESS RESPONSES IN CEREALS	195
<i>Gang ZHAO, Heidi WEBBER, Holger HOFFMANN, Joost WOLF, Wolfgang BRITZ, Thomas GAISER, Frank EWERT</i>	
TECHNOLOGY AND CLIMATE CHANGE IMPACTS ON EUROPEAN CROP YIELDS TO 2050	197
<i>M.P. HOFFMANN, A. JACOBS, A.M. WHITBREAD</i>	
MODELLING WINTER OILSEED RAPE (BRASSICA NAPUS L.) IN GERMANY TO DEVELOP SITE-SPECIFIC NITROGEN FERTILISER STRATEGIES	199
<i>Jordi DOLTRA, Jorgen E. OLESEN, Dolores BÁEZ, Ngonidzashe CHIRINDA</i>	
MODEL-BASED EVALUATION OF CLIMATE, SOIL AND FERTILITY MANAGEMENT IMPACTS ON N ₂ O EMISSIONS FROM CEREAL-BASED CROPPING SYSTEMS	201
<i>Daniel WALLACH, Linda MEARNS, Senthold ASSENG, Reimund P. RÖTTER</i>	
USING ENSEMBLES OF MODELS IN CLIMATE AND CROP MODELING	203
<i>D. DOISY, N. COLBACH, J. ROGER-ESTRADE, S. MÉDIÈNE</i>	
MODELLING CROP ROTATION INCLUDING TEMPORARY GRASSLANDS FOR WEED MANAGEMENT	205
<i>Carlo GILARDELLI, Tommaso STELLA, Nicolò FRASSO, Giovanni CAPPELLI, Simone BREGAGLIO, Marcello Ermido CHIODINI, Roberto CONFALONIERI</i>	
AN IMPROVED VERSION OF WOFOST FOR THE SIMULATION OF QUANTITATIVE AND QUALITATIVE ASPECTS OF WINTER RAPESEED PRODUCTION	207
<i>Elodie DOREY, Patrick FOURNIER, Mathieu LECHAUDEL, Philippe TIXIER</i>	
SIMPIÑA, A COMPREHENSIVE MODEL TO OPTIMIZE YIELD, MINERAL RESOURCES, AND FRUIT QUALITY OF PINEAPPLE	209
<i>ROBIN M.H., DEBAEKE P., CHOLEZ C., AUBERTOT J.N.</i>	
IPSIM, INJURY PROFILE SIMULATOR, A HIERARCHICAL MODEL TO PREDICT AN INJURY PROFILE AS A FUNCTION OF CROPPING PRACTICES, SOIL, CLIMATE AND FIELD ENVIRONMENT.	211
<i>René SCHILS, Kurt Christian KERSEBAUM, Anna NIERÓBCA, Katarzyna ŻYŁOWSKA, Hendrik BOOGAARD, Hugo de GROOT, Bert RIJK, Lenny van BUSSEL, Joost WOLF, Martin van ITTERSUM</i>	
GLOBAL YIELD GAP ATLAS; CEREALS IN EUROPE	213

Gang ZHAO, Holger HOFFMANN, Lenny van BUSSEL, Andreas ENDERS, Xenia SPECKA, Carmen SOSA, Jagadeesh YELURIPATI, Fulu TAO, Julie CONSTANTIN, Edmar TEIXEIRA, Balasz GROSZ, Luca DORO, Zhigan ZHAO, Claas NENDEL, Ralf KIESE, Helene RAYNAL, Henrik ECKERSTEN, Edwin HAAS, Enli WANG, Matthias KUHNERT, Elisabet LEWAN, Michaela BACH, Kurt-Christian KERSEBAUM, Reimund RÖTTER, Pier Paolo ROGGERO, Daniel WALLACH, Gunther KRAUSS, Stefan SIEBERT, Thomas GAISER, Frank EWERT	
WEATHER DATA AGGREGATION'S EFFECTS ON SIMULATION OF CROPPING SYSTEMS: A MODEL, PRODUCTION SYSTEM AND CROP COMPARISON	215
Holger HOFFMANN, Gang ZHAO, Lenny van BUSSEL, Andreas ENDERS, Xenia SPECKA, Carmen SOSA, Jagadeesh YELURIPATI, Fulu TAO, Julie CONSTANTIN, Edmar TEIXEIRA, Balasz GROSZ, Luca DORO, Zhigan ZHAO, Claas NENDEL, Ralf KIESE, Helene RAYNAL, Henrik ECKERSTEN, Edwin HAAS, Enli WANG, Matthias KUHNERT, Elisabet LEWAN, Michaela BACH, Kurt-Christian KERSEBAUM, Reimund RÖTTER, Pier Paolo ROGGERO, Daniel WALLACH, Gunther KRAUSS, Stefan SIEBERT, Thomas GAISER, Frank EWERT	
INFLUENCE OF CLIMATE INPUT DATA AGGREGATION ON SIMULATED YIELD	217
Wiebke WEYMANN, Ulf BÖTTCHER, Klaus SIELING, Henning KAGE	
MODEL-BASED ANALYSIS OF NITROGEN USE EFFICIENCY OF AUTUMNAL FERTILIZATION IN WINTER OILSEED RAPE	219
Lucie BÜCHI, Alain VALSANGIACOMO, Enguerrand BUREL, Raphaël CHARLES	
INTEGRATING SIMULATION DATA FROM A CROP MODEL INTO AN INDICATOR FOR SOIL COVER	221
S. ASSENG, F. EWERT, P. MARTRE, R.P. RÖTTER, D. LOBELL, D. CAMMARANO, B.A. KIMBALL, M.J. OTTMAN, G.W. WALL, J.W. WHITE, M.P. REYNOLDS, P.D. ALDERMAN, P.V.V. PRASAD, P.K. AGGARWAL, J. ANOTHAI, B. BASSO, C. BIERNATH, A.J. CHALLINOR, G. DE SANCTIS, J. DOLTRA, E. FERERES, S. GAYLER, G. HOOGENBOOM, L.A. HUNT, R.C. IZAURRALDE, M. JABLOUN, C.D. JONES, K.C. KERSEBAUM, A.-K. KOEHLER, C. MÜLLER, S. NARESH KUMAR, C. NENDEL, G.J. O'LEARY, J. E. OLESEN, T. PALOSUO, E. PRIESACK, E. EYSHI REZAEI, A.C. RUANE, M.A. SEMENOV, I. SHCHERBAK, P. STEDUTO, C. STÖCKLE, P. STRATONOVITCH, T. STRECK, I. SUPIT, F. TAO, P. THORBURN, K. WAHA, E. WANG, D. WALLACH, J. WOLF, Z. ZHAO, Y. ZHU	
AgMIP WHEAT – IMPROVING THE PREDICTION OF WHEAT YIELDS	223
Ehsan EYSHI REZAEI, Stefan SIEBERT, Frank EWERT	
EFFECT OF DATA AGGREGATION ON CROP YIELDS SIMULATED AT LARGE SCALES	227
Lolc STRULLU, Nicolas BEAUDOIN, Inaki Garcia de CORTAZAR-ATAURI, Atauri Marie LAUNAY, Bruno MARY	
SIMULATION OF BIOMASS AND NITROGEN DYNAMICS IN PERENNIAL ORGANS AND SHOOTS OF <i>MISCANTHUS</i> × <i>GIGANTEUS</i> USING THE STICS MODEL	229
Anja STADLER, Sebastian RUDOLPH, Moritz KUPISCH, Matthias LANGENSIEPEN, Frank EWERT	
QUANTIFYING AND MODELING SPATIO-TEMPORAL CROP GROWTH VARIABILITY AT FIELD SCALE	231
Eric REINSDORF, Heinz-Josef KOCH	
RISK ASSESSMENT FOR FROST KILLING OF WINTER SUGAR BEET BY MODELING THE CROWN TEMPERATURE	233
Shaoxiu MA, Haythem Ben TOUHAMI, Eszter LELLEI-KOVÁCS, Zoltán BARCZA, Dóra HIDY, Gianni BELLOCCHI	
GRASSLAND MODEL INTERCOMPARISON OF THE KNOWLEDGE HUB MACSUR: ILLUSTRATIVE RESULTS FROM THE MODELS PASIM AND BIOME-BGC MUSO	235
Damien EYLENBOSCH, Juan Antonio FERNÁNDEZ PIERNA, Vincent BAETEN, Bernard BODSON	
DETECTION OF WHEAT ROOT AND STRAW IN SOIL BY USE OF NIR HYPERSPECTRAL IMAGING SPECTROSCOPY AND PARTIAL LEAST SQUARE DISCRIMINANT ANALYSIS	237



<i>Heidi WEBBER, Thomas GAISER, Edmar TEIXEIRA, Ehsan EYSHI REZAEI, Gunther KRAUSS, Gang ZHAO, Frank EWERT</i>	
HOW IMPORTANT ARE ET-ESTIMATION METHODS IN CROP GROWTH MODELS FOR SIMULATING YIELD AND WATER USE WHEN CONSIDERING CLIMATE CHANGE ADAPTATIONS?	239
<i>Moritz KUPISCH, Anja STADLER, Matthias LANGENSIEPEN, Frank EWERT</i>	
ANALYSIS OF SPATIO-TEMPORAL PATTERNS OF CO ₂ AND H ₂ O FLUXES IN CROP FIELDS	241
<i>Tsu-Wei CHEN, Katrin KAHLEN, Hartmut STÜTZEL</i>	
QUANTIFYING PHOTOSYNTHETIC LIMITATIONS FROM LEAF TO CANOPY LEVEL	243
<i>Brigitta TÓTH, András MAKÓ, Katalin SÁRDI</i>	
PREDICTION OF PLANT AVAILABLE WATER CONTENT OF CHERNOZEMS	245
<i>Leszek KUCHAR, Grzegorz KOTKOWSKI, Karol KUCHAR, Irena OTOP</i>	
ESTIMATION OF SOLAR RADIATION FOR USE IN WEATHER-CROP MODELS IN POLAND.....	247
<i>Csaba RÁCZ, Attila Csaba DOBOS, János NAGY, Tamás DÖVÉNYI NAGY, Krisztina MOLNÁR, Károly Livius BAKOS</i>	
EVALUATION OF THE DIVERGENCE BETWEEN OUTPUTS OF DIFFERENT EVAPOTRANSPIRATION MODELS.....	249
<i>Omar GARCIA-TEJERA, Álvaro LÓPEZ-BERNAL, Francisco ORGAZ, Francisco J.VILLALOBOS, Luca TESTI</i>	
ROOT DISTRIBUTION UNDER DIFFERENT IRRIGATION REGIMES	251
<i>Álvaro LÓPEZ-BERNAL, Omar GARCÍA-TEJERA, Francisco ORGAZ, Luca TESTI, Francisco J. VILLALOBOS</i>	
OLIVE BUD DORMANCY IS INDUCED BY LOW TEMPERATURES	253
<i>Abdul M. YAKOUB, Jaume LLOVERAS, Jon I. LIZASO</i>	
EVALUATING CERES AND IXIM MAIZE MODELS UNDER HIGH YIELDING CONDITIONS.....	255
<i>Simone BIANCHI, Lorenzo BARBANTI, Tiziano BETTATI, Vittorio ROSSI, Franco MIGLIETTA, Roberto RANIERI, Giuseppe PIACENTINO, Piero TOSCANO</i>	
DEVELOPING A NEURAL NETWORK TO SIMPLIFY DURUM WHEAT YIELD PREDICTION IN ITALY	257
<i>Delphine MÉZIÈRE, Stéphane CORDEAU, Sylvie GRANGER, Nathalie COLBACH</i>	
HOW DOES REDUCED HERBICIDE USE AFFECT BIODIVERSITY AND CROP PRODUCTION?	259
<i>Clemence BOUTY, Aude BARBOTTIN, Philippe MARTIN</i>	
CHARACTERIZATION OF FARM TERRITORY CHANGES AND THEIR EFFECTS ON THE STABILITY OF PERMANENT GRASSLANDS IN THE NIORT PLAIN (FRANCE).....	261
<i>Tamás DÖVÉNYI-NAGY, Attila DOBOS, János NAGY, Károly BAKOS, Krisztina MOLNÁR, Csaba RÁCZ</i>	
A MODEL BASED ONLINE DECISION SUPPORT FOR INCREASED IRRIGATION EFFICIENCY ...	263
<i>J. P. DE MELO-ABREU, M. I. VIEIRA, N. RIGAKIS, M.E. FERREIRA, N. KATSOULAS, C. KITTAS, N. NAVALHO</i>	
USE OF A CROP SIMULATION MODEL TO PREDICT BELL PEPPER YIELD, FRUIT SIZE AND QUALITY.....	265
Session 4: Innovation in crop production	
<i>Jacques WERY</i>	
STRUCTURE OR INPUT CHANGES IN CROPPING SYSTEMS FOR AN AGROECOLOGICAL TRANSITION?	269

<i>Wopke van der WERF, Felix BIANCHI, Walter ROSSING, Willemien GEERTSEMA, Joop SCHAMINEE, Wei ZHANG, Yanhui LU, Kongming WU, Jikun HUANG, Ke ZHOU, Lefu YE, XiangZheng DENG, Andrew BELL, Yi ZOU, Haijun XIAO, Feng WU, Lingling HOU</i>	
HABITAT MANAGEMENT FOR SUPPORTING MOBILE-AGENT BASED ECOSYSTEM SERVICE PROVISION IN AGRICULTURAL LANDSCAPES	271
<i>C. COLNENNE-DAVID, G. GRANDEAU, T. DORE</i>	
INNOVATIVE CROPPING SYSTEMS UNDER ENVIRONMENTAL CONSTRAINTS: RESULTS OF A LONG-TERM TRIAL FIELD ASSESSMENT AFTER ONE COMPLETE CROP ROTATION	273
<i>Marina WENDLING, Lucie BÜCHI, Bernhard STREIT, Achim WALTER, Raphaël CHARLES</i>	
COVER CROPS FOR CONSERVATION AGRICULTURE	275
<i>Grzegorz SOBCZYŃSKI, Marcin STUDNICKI, Magdalena JAKUBCZAK, Dariusz GOZDOWSKI, Stanisław SAMBORSKI, Joanna GROSZYK, Elżbieta LESZCZYŃSKA, Jan ROZBICKI</i>	
SPRING WHEAT CULTIVAR, ENVIRONMENT AND MANAGEMENT EFFECTS ON GRAIN YIELD, YIELD COMPONENTS AND GRAIN QUALITY IN POLAND	277
<i>Pasquale CAMPI, Francesca MODUGNO, Alejandra NAVARRO, Valentina L. VILLALOBOS COA, Domenico PALUMBO, Marcello MASTRORILLI</i>	
IRRIGATION OF BIOMASS SORGHUM WITH URBAN WASTEWATER: EFFECTS ON BIOMASS AND ENERGY VALUE	279
<i>Goran DRINIĆ, Béla SZARKA</i>	
THE BREEDING OF OPTIMUM [®] AQUAMAX [™] PIONEER CORN HYBRIDS	281
<i>Stanford F. BLADE</i>	
CROP DIVERSIFICATION IN CANADA: DEVELOPING NEW CROPS AND MARKETS	283
<i>Kevin J. DELANEY, Grzegorz LEMAŃCZYK, Barbara BREZA-BORUTA, Jan BOCIANOWSKI, Sebastian SENDEL, Ireneusz KALKÁ, Dariusz PIESIK</i>	
VOLATILE ORGANIC COMPOUNDS RELEASED BY MAIZE AFTER INFECTION OF PANTOEA ANANATIS	285
<i>Mirco BOSCHETTI, Pietro Alessandro BRIVIO, Anna RAMPINI, Monica PEPE, Stefano PIGNATTI, Filomena ROMANO, Roberto CONFALONIERI, Stefano BOCCHI, Francesco HOLECZ, Massimo BARBIERI, Javier García HARO, Joaquín HUERTA, Ioannis GITAS, Christos KARYDÁS, Dimitrios KATSANTONIS, Christos DRAMALIS</i>	
ERMES: AN EARTH OBSERVATION MODEL BASED RICE INFORMATION SERVICE	287
<i>Christos DRAMALIS, Dimitrios KATSANTONIS, Pau PUIGDOLLERS, Jaime PEREIRAS, Ramon PALLAS-ARENY, Oscar LÓPEZ, Oscar Casas PIEDRAFITA, Fausto BARBI, Faysal BASCI, Manuel CANO, Antonios PAPANTONIOU, Antonio Vittorio SANNA, Joao Reis MENDES, Roser Llaó GARCIA</i>	
RICE-GUARD: AN IN-FIELD WIRELESS SENSOR NETWORK TO PREDICT RICE BLAST	289
<i>Adrienn NOVÁK</i>	
THE EFFECT OF GENOTYPE, SOWING TIME AND FUNGICIDE TREATMENT ON THE YIELD AND OIL CHARACTERISTICS OF SUNFLOWER (HELIANTHUS ANNUUS L.)	291
<i>Lajos Gábor KARANCSI</i>	
ANALYSIS OF THE EFFECT OF NUTRIENT SUPPLY ON YIELD PRODUCTION AND CHLOROPHYLL CONTENT IN DIFFERENT GENOTYPES OF MAIZE HYBRIDS	293
<i>Stefano BRENNI, Marco ACUTIS, Vincenzo TABAGLIO, Mauro GRANDI, Simone BREGAGLIO, Mattia FUMAGALLI</i>	
LIFE+ PROJECT "HELPSOIL": PROMOTING CONSERVATIVE AGRICULTURAL TECHNIQUES ..	295
<i>Blanka PROCHÁZKOVÁ, Jaromír PROCHÁZKA, Alena PERNICOVÁ, Pavel HLEDÍK</i>	
EFFECTS OF DIFFERENT TILLAGE INTENSITY ON YIELDS OF SPRING BARLEY	297
<i>Peter PEPÓ</i>	
VARIETY-SPECIFIC FERTILIZER RESPONSES IN WINTER WHEAT (<i>Triticum aestivum</i> L.)	299



<i>Tadeusz OLEKSIK, Dariusz R. MAŃKOWSKI</i>	
ECONOMIC EFFECTIVENESS OF GENETICALLY MODIFIED MAIZE IN POLAND	301
<i>Rafał WAWER, Jerzy KOZYRA, Artur ŁOPATKA, Mariusz MATYKA</i>	
A DECISION SUPPORT SYSTEM FOR AGRICULTURAL IRRIGATION INTEGRATING WIRELESS SENSOR NETWORKS AND WEATHER FORECAST	303
<i>Boglárka HEGEDŰS, Dóra DREXLER, Katalin SÁRDI</i>	305
IS IT POSSIBLE TO PRDEICT THE GRAIN PROTEIN CONTENT OF FERTILIZED ORGANIC SPELT?	305
<i>Stéphane CORDEAU, Fabrice DESSAINT, Dominique MEUNIER, Nicolas MUNIER-JOLAIN</i>	
CONTRASTED INTEGRATED WEED MANAGEMENT SYSTEMS REDUCE RELIANCE ON HERBICIDES AND LEAD TO VARIOUS DYNAMICS OF WEED COMMUNITIES	307
<i>Marjolein LOF, Claude de VALLAVIEILLE-POPE, Wopke van der WERF</i>	
SPATIAL BLUEPRINTS FOR A MORE DURABLE USE OF RESISTANCE GENES AGAINST PLANT DISEASES	309
<i>Zoltán PAPP</i>	
THE IMPORTANCE AND IMPACT OF THE NITROGEN STABILIZATORS ON THE MAIN ARABLE CROPS	311
<i>Rita MOZES-KOCH, Ofer GOVER, Edna TANNE, Yuval PERETZ, Eyal MAORI, Leonid CHERNIN, Ilan SELA</i>	
EXPRESSION OF AN ENTIRE BACTERIAL OPERON IN PLANTS	313
Session 5: Farm system design	
<i>Thomas F. DÖRING</i>	
YIELD VARIABILITY IN ORGANIC VS. CONVENTIONAL CROPPING SYSTEMS AS MODIFIED BY SOIL CONDITIONS	317
<i>Damien CRAHEIX, Caroline COLNENNE-DAVID, Elise PELZER, Nathalie TORRES, Frédérique ANGEVIN</i>	
DESIGN AND ASSESSMENT WITH FARMERS OF INNOVATIVE CROPPING SYSTEMS TO MITIGATE CLIMATE CHANGE AND TO MEET SUSTAINABLE REQUIREMENTS	319
<i>Davide RIZZO, Guillaume GODFROY, Marc BENOÎT</i>	
TEMPOROSPATIAL ANALYSIS OF AGRICULTURAL SYSTEMS AT REGIONAL WATERSHED LEVEL: 30 YEARS OF DATA TO CHARACTERIZE THE MEUSE AND MOSELLE WATERSHEDS, FRANCE	321
<i>Nawel AOUADI, Jean-Noël AUBERTOT, Jacques CANEILL, Nicolas MUNIER JOLAIN</i>	
ANALYSIS OF THE RELATIONSHIP BETWEEN PRODUCTION SITUATION DRIVERS AND CROPPING SYSTEMS AT THE REGIONAL SCALE	323
<i>Gatien FALCONNIER, Thomas VAN MOURIK, Katrien DESCHEEMAEKER, Ken E. GILLER</i>	
EXPLORING INTENSIFICATION OPTIONS FOR MIXED CROP-LIVESTOCK FARMS IN SOUTHERN MALI	325
<i>Pierre CHOPIN, Jean-Marc BLAZY, Thierry DORE</i>	
A TYPOLOGY-BASED METHODOLOGY FOR ANALYZING THE DETERMINANTS OF AGRICULTURAL LANDSCAPE CHANGES IN TIME AND SPACE	327
<i>Vincent COUDERC, Jean-Marc BARBIER, Roy HAMMOND, Laure HOSSARD, Florine MAILLY, Jean- Claude MOURET, Caroline TARDIVO, Sylvestre DELMOTTE</i>	
FARMING SYSTEMS DESIGN: COMPLEMENTARITIES BETWEEN EXPERTS' PROTOTYPING AND MODELING.	329
<i>R.E BLACKSHAW, K.N. HARKER, J.T. O'DONOVAN, E.N. JOHNSON, Y. GAN, G. PENG</i>	
HOW FREQUENTLY CAN OILSEED RAPE BE GROWN IN SUSTAINABLE CROPPING SYSTEMS?	331

<i>Simon GIULIANO, Gaël RAMETTI, François PERDRIEUX, Eric JUSTES, Lionel ALLETTO</i>	333
AGRONOMIC PERFORMANCES OF LOW-INPUT MAIZE CROPPING SYSTEMS	333
<i>D. DOISY, J. ROGER-ESTRADE, M. GOSME, X. CHARRIER, S. MÉDIÈNE</i>	
SEED BANK CHANGES IN CROP VS. GRASSLAND SYSTEMS.....	335
<i>Václava SPÁČILOVÁ, Petr MÍŠA, Eduard POKORNÝ</i>	
IMPACT MARKET ORIENTED ARABLE FARMING SYSTEMS ON THE PROFITABILITY OF ADDITIONAL FOSSIL ENERGY INPUTS AND ITS EFFECT ON THE SOIL DEGRADATION	337
<i>Violaine DEYTIEUX, Marie-Helene BERNICOT, Vincent CELLIER, Caroline COLNENNE-DAVID, Anne- Laure TOUPET, Jean-Noël AUBERTOT</i>	
AN EXPERIMENTAL NETWORK TO STUDY “PESTICIDE FREE” CROPPING SYSTEMS IN ARABLE CROPS	339
<i>Pierre CHOPIN, Jean-Marc BLAZY</i>	
CAPTURING THE HETEROGENEITY OF YIELDS AT THE REGIONAL SCALE THROUGH GEOSTATISTICAL ANALYSIS.....	341
<i>Florence TARDY, Delphine MOREAU, Marc DOREL, Gaëlle DAMOUR</i>	
A TRAIT-BASED ANALYSIS OF COVER CROP STRATEGIES FOR RESOURCE ACQUISITION AND USE: APPLICATION TO WEED CONTROL IN BANANA CROPPING SYSTEMS	343
<i>Gaëlle DAMOUR, Charles MEYNARD, Raphaël ACHARD, Florence TARDY, Marc DOREL</i>	
A TRAIT-BASED METHOD TO CHOOSE COVER PLANTS THE BEST ADAPTED TO A CROPPING SYSTEM	345
<i>Robert SIMON, Ewald STICKSEL, Dorothea HOFMANN, Harald SCHMID, Kurt-Jürgen HÜLSBERGEN</i>	
NET ENERGY OUTPUT AND ENERGY EFFICIENCY OF BIOGAS ENERGY CROPS.....	347
<i>Raymond REAU, Laurette PARAVANO, Lorène PROST</i>	
MULTI-STAKEHOLDER RE-DESIGN IN ORDER TO CHANGE WATER QUALITY AT CATCHMENT LEVEL	349
<i>SANTIVERI F., ROBLES J., LLOVERAS J., MICHELENA A.</i>	
COMPARISON OF SUSTAINABILITY BETWEEN ORGANIC AND CONVENTIONAL WHEAT PRODUCTION.....	351
<i>C. PEYRARD, E. JUSTES, B. MARY, G. VÉRICEL, E. GRÉHAN, P. PERRIN, D. RAFFAILLAC, J. LÉONARD</i>	
N ₂ O EMISSIONS IN LOW INPUT CROPPING SYSTEMS AIMING AT ENVIRONMENTAL IMPACTS REDUCTION IN THE SOUTH OF FRANCE	353
Session 6: Legumes in farming systems	
<i>John O'DONOVAN, Robert BLACKSHAW, Cynthia GRANT, Neil HARKER, Eric JOHNSON, Yantai GAN, Guy LAFOND, William MAY, Kelly TURKINGTON, Newton LUPWAYI</i>	
LEGUME CROPS GROWN IN ROTATION ENHANCE CANOLA AND BARLEY PRODUCTIVITY IN WESTERN CANADA.....	357
<i>NEUGSCHWANDTNER R.W., HERZ P., BÖCK A., SCHÄFER A.-K., KAUL H.-P.</i>	
SOWING RATIO AND SOWING DATE AFFECT YIELD AND YIELD COMPONENTS OF WHEAT AND PEA IN INTERCROPS	359
<i>F.L. STODDARD, M. RECKLING, J. BACHINGER, J.M. HECKER, N. SCHLÄFKE, P. ZANDER, G. BERGKVIST, A. PRISTERI, I. TONCEA, R.L. WALKER, V. EORY, J. MAIRE, C.F.E. TOPP, R.M. REES, C.A. WATSON</i>	
THE LEGUME FUTURES ROTATION GENERATOR II. AGRONOMIC ANALYSIS OF ROTATIONS.	361



M. RECKLING, J.M. HECKER, N. SCHLÄFKE, P. ZANDER, G. BERGKVIST, B. FRANKOW-LINDBERG, B. BÁTH, A. PRISTERI, M. MONTI, I. TONCEA, R. WALKER, C.A. WATSON, V. EORY, C.F.A. TOPP, F.L. STODDARD, J. BACHINGER	
THE LEGUME FUTURES ROTATION GENERATOR I. GENERATION AND EVALUATION OF ROTATIONS.....	363
J.A. BADDELEY, S. JONES, C.F.E. TOPP, C.A. WATSON, J. HELMING, F.L. STODDARD	
INTEGRATED ANALYSIS OF NITROGEN FIXATION BY LEGUMES IN EUROPEAN AGRICULTURE	365
S. FOTIADIS, S.D. KOUTROUBAS	
NUTRIENT TRANSLOCATION AND UTILIZATION EFFICIENCY OF CHICKPEA UNDER MEDITERRANEAN CONDITIONS	367
Claude-Alain GEBHARD, Lucie BÜCHI, Frank LIEBISCH, Sokrat SINAJ, Hans RAMSEIER, Raphaël CHARLES	
BIOLOGICAL NITROGEN FIXATION BY COVER CROPS	369
Susannah CASS, Mike WILLIAMS, Jane STOUT	
BIODIVERSITY IN LEGUME-SUPPORTED CROPPING	371
FUSTEC J. , JAMONT M. , JOLY F.-X., PIVA G. , CANNAVACCIUOLO M.,- CASSAGNE N.	
MEASURING N TRANSFER IN ANNUAL INTERCROPS	373
BOBILLE Hélène, NAUDIN Christophe, PIVA Guillaume, FUSTEC Joëlle	
SULFUR SHARING IN RAPESEED-FABA BEAN INTERCROPS – PRELIMINARY RESULTS.....	375
Nicole LEGNER, Catharina MEINEN, Rolf RAUBER	
VERTICAL AND HORIZONTAL ROOT DISTRIBUTION IN PEA-OAT INTERCROPPING WITH PROFILE-WALL METHOD AND FTIR ANALYSIS	377
WILLIAMS M., PAPPAS V. A., BADDELEY J., PRISTERI A., KONTOPOULOU C.K., EPIE K.E., STODDARD F., JAMES E.K., YOUNG M., HAWES C., IANETTA P.P.M., SAVVAS D., MONTI M., REES R.M.,	
NITROUS OXIDE EMISSION FACTORS FOR BIOLOGICAL NITROGEN FIXATION FROM LEGUMES: A REASSESSMENT.....	379
Pietro P.M. IANETTA, Euan K. JAMES, Cathy HAWES, Laura Lopez del EGIDO, Alison KARLEY, Oluyinka OLUKOSI, Jos HOUDIJK, Viv CRAMPTON, Martin MOENCH, Gabriele PALOMBA, Jacopo IANIERI, Fergus CLARK, Ken DUNCAN, Geoff R. SQUIRE, Graeme WALKER, Gavin RAMSAY	
A FARM-TO-FORK APPROACH TO OPTIMISE ENVIRONMENTALLY-SUSTAINABLE AND PROFITABLE PROTEIN PRODUCTION USING VICIA FABA L. (FABA BEAN).....	381
HO-YOUNG BAN, DOUG HWAN CHOI, YEAN-UK KIMI, BYUN-WOO LEE	
COMPARISON BETWEEN THE OBSERVED AND SIMULATED RESPONSES OF SOYBEAN REPRODUCTIVE GROWTH TRAITS TO ELEVATED AIR TEMPERATURE	383
B. T. MANENJI, J. B. OGOLA	
GROWTH AND YIELD RESPONSE OF SIX CHICKPEA (<i>CICER ARIETINUM</i>) GENOTYPES TO DIFFERENT WATERING LEVELS	385
Session 7: Crop science in changing environments	
Ayaka W. KISHIMOTO-MO, Kumiko MOCHIZUKI, Noriko OURA, Shuhei YAMASAKI, Katsuhiko NAGASAKA	
CO ₂ , N ₂ O, AND CH ₄ FLUXES FROM SOIL COVERED WITH AND WITHOUT PLASTIC MULCH FILM	389
FRANZLUEBBERS Alan J., STUEDEMANN John A.	
PRODUCTION AND SOIL RESPONSES TO TILLAGE AND COVER CROP MANAGEMENT IN AN INTEGRATED CROP-LIVESTOCK SYSTEM IN THE SOUTHEASTERN USA	391

<i>Giovanni CAPPELLI, Livia PALEARI, Simone BREGAGLIO, Andrea GIUSSANI, Marco ACUTIS, Dante FASOLINI, Stefano BRENNI, Roberto CONFALONIERI</i>	
IMPACT OF CLIMATE CHANGE ON THE SUSTAINABILITY OF CEREAL-LIVESTOCK FARMING IN THE LOMBARDY REGION (NORTHERN ITALY)	393
<i>REIBEL Carole, CORDEAU Stéphane, GUILLEMIN Jean-Philippe, CHAUVEL, Bruno</i>	
DROUGHT AFFECTS WEED EMERGENCE IN COVER CROPS OF NO-TILL SYSTEMS	395
<i>Giovanni CAPPELLI, Tommaso STELLA, Sevim Seda YAMAÇ, Caterina FRANCONI, Livia PALEARI, Marco NEGRI, Roberto CONFALONIERI</i>	
IN-SILICO EVALUATION OF GIANT REED PRODUCTIVITY IN A CHANGING CLIMATE: THE CASE OF LOMBARDY PLAIN IN NORTHERN ITALY	397
<i>Krystyna RYKACZEWSKA</i>	
SEARCH FOR POTATO CULTIVARS TOLERANT TO HIGH TEMPERATURE PERIODICALLY OCCURRING DURING THE GROWING SEASON	399
<i>Christina CLARKE, Mike GOODING, Peter GREGORY</i>	
ROOT SYSTEMS FOR THE SUSTAINABLE INTENSIFICATION AND RESILIENCE OF WHEAT	401
<i>Novo PRŽULJ, Milan MIROSAVLJEVIĆ, Bojan MITROVIĆ, Dušan STANISAVLJEVIĆ</i>	
BARLEY MULTI-YEARS TRIALS EVALUATION USING BILOT	403
<i>Novo PRŽULJ, Milan MIROSAVLJEVIĆ, Petar ČANAK, Mihajlo ĆIRIĆ</i>	
IDENTIFICATION OF DESIRABLE LOCATIONS FOR BARLEY MULTI-LOCATION TRIALS	405
<i>Inga LIAUDANSKIENĖ, Alvyra ŠLEPETIENĖ</i>	
SOIL ORGANIC CARBON STABILITY IN GRASSLANDS OF PROTECTED AREAS AND ARABLE LANDS IN CENTRAL LITHUANIA	407
<i>Györgyi MICSKEI, Zoltán BERZSENYI, Tamás ÁRENDÁS, Nándor FODOR</i>	
PHOTOSYNTHETIC ACTIVITY OF MAIZE (ZEA MAYS L.) HYBRIDS AFFECTED BY NITROGEN IN A DRY YEAR	409
<i>C. ASENSIO, E. ORTEGA, M. SORIANO, D.L. VALERA</i>	
EVALUATING THE EFFECTIVENESS FOR A SYSTEM OF PROTECTIVE BARRIERS AGAINST WIND EROSION, IN SOILS UNDER CEREALS, BY SONIC ANEMOMETRY	411
<i>M.A. LIEBIG, D.W. ARCHER, J.R. HENDRICKSON, M.A. SCHMER, K.A. NICHOLS, AND D.L. TANAKA</i>	
AGRONOMIC RESPONSES TO LATE-SEEDED COVER CROPS IN A SEMIARID REGION	413
<i>Wen-Feng CONG, Ellis HOFFLAND, Long LI, Johan SIX, Jian-Hao SUN, Xing-Guo BAO, Fu-Suo ZHANG, Wopke van der WERF</i>	
ECOLOGICAL INTENSIFICATION THROUGH INTERCROPPING ENHANCES SEQUESTRATION OF SOIL CARBON AND NITROGEN	415
<i>Tamás SPITKÓ¹ – Judit BÁNYAI² – Györgyi MICSKEI³ – Csaba L. MARTON¹</i>	417
CONNECTION BETWEEN DROUGHT TOLERANCE AND PROTERANDRY IN MAIZE (ZEA MAYS L.)	417
<i>C. DRAMALIS, D. KATSANTONIS, S. D. KOUTROUBAS</i>	
EFFECT OF SALINITY ON NITROGEN ACCUMULATION AND TRANSLOCATION IN RICE UNDER FIELD CONDITIONS	419
<i>M. LUKAC, B. BRAK, L. U. WINGEN, M. MARTINEZ-EXIGARCH, M.J. GOODING, S. GRIFFITHS, H.E. JONES</i>	
FLOWERING DURATION IN WHEAT: MANAGING THE RISK OF HEAT STRESS	421
<i>Károly Livius BAKOS, Attila Csaba DOBOS, Tamás DÖVÉNYI-NAGY, Krisztina MOLNÁR, Csaba RÁCZ, János NAGY</i>	
MONITORING INLAND WATER AND FLOOD EXTENT USING MULTISPECTRAL REMOTELY SENSED IMAGERY FOR LAND EVALUATION	423



<i>Jerzy BIENKOWSKI, Janusz JANKOWIAK, Radosław DĄBROWICZ, Małgorzata HOLKA</i> REGIONAL DIFFERENTIATION OF GREENHOUSE GAS (GHG) EMISSIONS FROM AGRICULTURE IN POLAND	425
<i>Mónica ELÍA, Roxana SAVIN, Francisco BATLLE, Gustavo A. SLAFER</i> FRUITING EFFICIENCY AS AN ALTERNATIVE TRAIT FOR FURTHER INCREASING YIELD IN WHEAT	427
<i>Charlotte CHAMBERT, Francis ALRIC, Monique BERGER, Gilles BEUGNIET, Fabien CALVET, Luc CHAMPOLIVIER, Jean DAYDE, Anthony DOUMENC, André ESTRAGNAT, Amandine GRAS, Patrice JEANSON, Pierre JOUFFRET, Françoise LABALETTE, Michel LABARRERE, Eric JUSTES, Philippe DEBAEKE, Pierre MAURY</i> CROP MANAGEMENT AND VARIETAL STRATEGIES TO DESIGN WATER EFFICIENT AND HIGH QUALITY SOYBEAN IN SOUTHWESTERN FRANCE	429
<i>Tadeusz OLEKSIK</i> THE USE OF CERTIFIED SEED AND THE YIELD OF CEREALS	431
<i>Elnaz EBRAHIMI, Gernot BODNER, Hans-Peter KAUL, Adel Dabbagh Mohammadi NASSAB</i> TETRAPLOID WHEAT ROOT TRAITS ARE AFFECTED BY SOIL WATER AVAILABILITY	433
<i>DEBAEKE P., DEJOUX J.-F., DEMAREZ V., MAS O., CHAMPOLIVIER L.</i> ASSESSMENT OF LEAF AREA INDEX IN SUNFLOWER CROP USING NON-DESTRUCTIVE METHODS	435
<i>Mauro SARNO, Ignazio POMA, Giacomo VENEZIA, Emanuele RINALDI</i> ASSESSING SPREADABILITY OF WARM SEASON SPECIES USED FOR TURFGRASS ON THREE TYPES OF SUBSTRATE IN THE MEDITERRANEAN ENVIRONMENT	437
<i>NEUGSCHWANDTNER R.W., BÖHM K., HALL R.M., KAUL H.-P.</i> SOWING DATE AFFECTS NITROGEN YIELD AND NITROGEN UTILIZATION OF FACULTATIVE WHEAT	439
<i>Attila DUNAI, Zoltan TOTH, Andras MAKÓ</i> EFFECT OF ORGANIC FERTILIZATION ON WATER RETENTION AND ACTUAL MOISTURE CONTENT OF SOIL	441
<i>Izabella TOBOROWICZ-BORDA, Zdzisław WYSZYŃSKI, Tomasz HORACZEK, Stefan PIETKIEWICZ, Krzysztof PAŁGOWSKI</i> FORMING NUMBER OF STEMS IN <i>MISCANTHUS X GIGANTEUS</i> FOLLOWING DIFFERENTIATED NITROGEN FERTILIZATION AND IRRIGATION	443
<i>Andrzej KĘDZIORA, Janusz JANKOWIAK, Damian JÓZEFczyk, Grzegorz KARG</i> THE PROBABILITY DISTRIBUTION OF SHORTAGE OF RAINFALL FOR SPRING BARLEY DURING THE REFERENCE AND THE PROJECTION PERIODS IN POLAND.	445
<i>Erika KUTASY, József CSAJBÓK</i> ASSIMILATION PARAMETERS OF MAIZE (<i>ZEAMAYS L.</i>) AT DIFFERENT NUTRIENT SUPPLY AND CROPYEARS	447
Session 8: Crop science - crop quality - human health and nutrition	
<i>MAWOIS, COSTE</i> ARE ENVIRONMENTAL ISSUES AND QUALITY REQUIREMENTS IN AGRO-FOOD CHAIN COMPATIBLE? CASE OF HARD WHEAT SUPPLY CHAIN IN THE CENTER OF FRANCE	451
<i>B. LANGÓ, S.TÖMÖSKÖZI, E. ÁCS, L. BÓNA</i> COMPARATIVE STUDY OF TRITICALE, WHEAT AND RYE GRAIN NUTRITIONAL FEATURES .	453
<i>S.D. KOUTROUBAS, S. FOTIADIS, C.A. DAMALAS</i> NITROGEN UTILIZATION EFFICIENCY OF SPELT WHEAT UNDER MEDITERRANEAN CONDITIONS	455

<i>Nicolás A. GUALANO, Gustavo A. SLAFER, Roxana SAVIN</i>	
β-GLUCAN ACCUMULATION DYNAMICS IN DIFFERENT BARLEY GENOTYPES UNDER MEDITERRANEAN CROPPING CONDITIONS	457
<i>Dariusz PAŃKA, Dariusz PIESIK, Malgorzata JESKE, Mikolaj TROCZYŃSKI, Jan BOCIANOWSKI</i>	
EFFECT OF ENDOPHYTE <i>NEOTYPHODIUM LOLII</i> ON DEFENSE REACTION OF PERENNIAL RYEGRASS (<i>LOLIUM PERENNE</i> L.) INFECTED BY <i>RHIZOCTONIA SOLANI</i>	459
<i>Anna WENDA-PIESIK, Grzegorz LEMANŃCZYK, Dariusz PAŃKA, Tomasz KNAPOWSKI</i>	
USE-VALUE OF GRAIN AND FLOUR OBTAINED FROM FACULTATIVE AND SPRING WHEAT ..	461
<i>Tiia KANGOR, Pille SOOVÄLI, Ülle TAMM, Ilmar TAMM, Mati KOPPEL</i>	
MALTING BARLEY DISEASE, YIELD AND QUALITY– RESPONSES TO FERTILIZATION AND FUNGICIDE APPLICATION	463
<i>Zoltán GYŐRI</i>	
A COMPARISON OF THE MINERAL CONTENTS OF WHEAT FLOUR AND BRAN	465
<i>Norbert BOROS, Zoltán GYŐRI</i>	
ESTIMATION OF BREAD-MAKING QUALITY ON THE BASE OF RHEOLOGICAL PROPERTIES ..	467
<i>Susanna DE MARIA, Rosa AGNETA, Anna Rita RIVELLI</i>	
ROOT YIELD AND GLUCOSINOLATE CONTENT OF FIELD-GROWN HORSE RADISH IN SOUTHERN ITALY	469
<i>Reine KOPPEL, Anne INGVER</i>	
WHEAT BAKING QUALITY DEPENDING ON PRECROP AND WHEAT TYPE IN ORGANIC FARMING	471
<i>Kateřina PAZDERU, Zdenka VEPŘÍKOVÁ, Marta VÁCLAVÍKOVÁ, Ivana CAPOUCHOVÁ, Jana HAJŠLOVÁ, Petr KONVALINA, Evženie PROKINOVÁ, Dagmar JANOVSÁ, Hana HONSOVÁ</i>	
CHANGES OF <i>FUSARIUM</i> MYCOTOXINS CONTENT IN GERMINATING CEREALS	473
<i>Mónica ELÍA, Gustavo A. SLAFER, Roxana SAVIN</i>	
GENOTYPIC VARIATION IN GRAIN WEIGHT AND QUALITY RESPONSIVENESS TO SHORT PERIODS OF MILD HEAT STRESS IN GRAIN FILLING OF FIELD GROWN WHEAT	475
<i>Andrea BRUNORI, Gerardo BAVIELLO, Gergő SÁNDOR, Edina VIDÉKI, Péter PEPÓ, György VÉGVÁRI</i>	
GRAIN RUTIN CONTENT OF 33 BUCKWHEAT VARIETIES (<i>FAGOPYRUM ESCULENTUM</i> MOENCH AND <i>FAGOPYRUM TATARICUM</i> GAERTN.) GROWN IN EASTERN HUNGARY	477
<i>Jan ROZBICKI, Dariusz GOZDOWSKI, Magdalena JAKUBCZAK, Alicja CEGLIŃSKA, Grażyna CACAK-PIETRZAK, Wiesław MĄDRY, Jan GOLBA, Grzegorz SOBCZYŃSKI, Marcin STUDNICKI</i>	
WINTER WHEAT CULTIVAR, ENVIRONMENT AND MANAGEMENT EFFECTS ON GRAIN YIELD AND BREAD-MAKING QUALITY IN POLAND	479
<i>K. SAPNA, R.H. ELLIS</i>	
EFFECT OF DROUGHT AND SIMULATED RAINFALL ON THE DEVELOPMENT OF HAGBERG FALLING NUMBER IN WHEAT	481
<i>Ignazio POMA, Biagio RANDAZZO, Giacomo VENEZIA, Mauro SARNO</i>	483
NEW VARIETIES OF DURUM WHEAT (<i>TRITICUM DURUM</i> DESF.) IN SICILY: EVALUATION OF GENOTYPE-ENVIRONMENT INTERACTION	483
<i>Irina VERGUNOVA, Viktor VERGUNOV, Peter PEPO, Mihaly SARVARI</i>	
SIMULATION OF TECHNOLOGICAL PROCESSES USING THE ALGEBRAIC FUNCTIONAL NETWORKS AND FUZZY SUBSET	485