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FRANK JOHN LOUWS
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I. BRIEF RESUME

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EDUCATION:

- Ph.D., Plant Pathology, 1994. Michigan State University, East Lansing, MI, 48824.
<http://www.msue.msu.edu/misanet/Abstracts/abs02.htm>
- M.Sc., Plant Pathology, 1987. University of Guelph, Guelph, Ont., Canada N1G 2W1.
- B.Sc., Horticulture (With Distinction), 1984. University of Guelph (1982-1984); Dordt College, Sioux Center, IA (1980-1982).

PROFESSIONAL EXPERIENCES:

- May 2002- present. Associate Professor. Develop extension and research programs that emphasize IPM and sustainable agricultural principles and practices for the small fruit and vegetable agricultural sector.
- January 15, 1996 - 2002. Assistant Professor. Develop extension and research programs that emphasize IPM and sustainable agricultural principles and practices for the small fruit and vegetable agricultural sector.
- November 1993 - December 1995. PostDoctoral Fellow, Center for Microbial Ecology/MSU-DOE Plant Research Laboratory, East Lansing, MI. Design and conduct experiments and technology applications for assessing microbial diversity of plant pathogens and soil microbes.
- September 1989 - November 1993. Graduate Assistant. Dept. Plant Pathology, Michigan State University, East Lansing, MI. Was a C.S. Mott Predoctoral Fellow for Sustainable Agriculture and designed integrated production systems for tomato and cucumbers emphasizing reduced tillage, use of green manure crops, and disease forecasting models.
- April 1987 - September 1989. Horticultural Crop Advisor, Ontario Ministry of Agriculture and Food, Bowmanville, Ontario, Canada. Provided extension production and IPM information and services for a four county area with an emphasis on apple, small fruit and vegetable crops.
- January 1995 - March 1987. Graduate research Assistant, Dept. Environmental Biology, University of Guelph, Guelph Ontario, Canada.

Scholarly and creative activities:

Refereed Activities:	Number
Journal Article, Refereed	1996-2008
Published	24
In press	
Book Chapter, Invited	7
Non Refereed Activities:	
Presentation, Regional (Extension)	229
Newsletter Article	154
Extension Publications, non-refereed (Bulletins)	83
Abstracts, research	66
Research Presentation, local (agent training)	64
Extension Publications, non-refereed (Electronic)	53
Extension Publications (peer reviewed)	52
Conference Proceeding	38
Presentation, Invited (Classroom Lectures)	20
Presentation, Invited (Community College)	12

SCHOLARLY AND PROFESSIONAL HONORS:

- Senior Editor, Phytopathology. 2006-present.
- Section Editor, Canadian Journal of Plant Pathology. 2005-present.
- Outstanding Service Award. 2003. North Carolina Strawberry Growers Association.
- College's Faculty and Student Organization Resource Development Award. Center for Environmental Framing Systems Research Team (Team member: F.J. Louws). April 4, 2000.
- Extension Publication Award. D.C. Sanders et al. (Team member: F.J. Louws). American Society for Horticultural Science-Southern Region. For: 1999 North Carolina Commercial Vegetable

Recommendations.

- Listed in Marquis' "Who's Who in Science and Engineering" 1996-97; 3rd edition.
- Postdoctoral Fellow, NSF-Center for Microbial Ecology. Michigan State Univ. 1993-1995.
- Mott Predoctoral Fellowship for Sustainable Agriculture. Michigan State Univ. (1991-1993).
- Initiated into the Honor Society of PHI KAPPA PHI, Michigan State University 1992.
- Initiated into the Phi Beta Delta Honor Society for International Scholars, MSU 1991.
- Sigma Xi Graduate Student Research Grant, Michigan State University. 1990
- Natural Science and Engineering Res. Council of Canada Scholarships; 1985-1987 (MSc.); 1989-1991 (Ph.D).
- OAC Centennial Graduate Fellowship; University Graduate Scholarship
- Natural Science and Engineering Research Council of Canada (NSERC) Undergraduate Research Competitive Scholarship, University of Guelph, 1984.
- Monsanto Canada Inc. Scholarship; Major James Rattray Scholarship, University of Guelph, 1984.

PROFESSIONAL SOCIETY MEMBERSHIPS:

- Sigma Xi, The Scientific Research Society
- The American Phytopathology Society
- Canadian Phytopathology Society
- International Society for Horticultural Science
- Phi Beta Delta Honor Society for International Scholars
- Phi Kappa Phi Honor Society

II. TEACHING AND MENTORING OF UNDERGRADUATE AND GRADUATE STUDENTS:

Summary: My program has a high commitment to INSTRUCTION. I Co-organized and co-taught 2 graduate level courses (4 and 3 cr); gave 20 invited undergrad/graduate lectures; advised 6 graduate students; was a committee member on 17 additional committees; mentored ~30 undergraduate or recently graduated students (6 with credit for special projects); and mentored 11 postdocs or senior scientists. I led a week-long internship program yearly, sponsored a K-12 science fair on campus for 3 successive years and participated yearly in a community college curriculum on sustainable agriculture. I co-taught and re-organized PP502, a core course for plant pathology majors and a popular service course to other departments.

A. TEACHING EFFECTIVENESS:

1. Teaching Effectiveness. List course code, semester, enrollment and course evaluation mean

Code	PP502	PP502	PP502	PP502
Sem	F2005	F2006	F2007	F2008
Enroll	12	15	10	4
Dept Mean	NA	NA	4.49	4.63

Q #	Mean	Mean	Mean	Mean
1	4.55	4.50	4.40	4.7
2	4.83	4.29	4.00	4.7
3	4.25	4.07	4.40	4.7
4	4.92	4.79	5.00	5.0
5	4.67	4.43	5.00	4.7
6	4.50	4.36	4.40	4.7
7	4.82	4.71	4.60	4.7
8	4.92	4.64	4.60	5.0
9	4.91	4.57	4.60	5.0
10	4.33	4.64	4.00	4.7
11	4.64	4.64	4.00	4.3
12	4.50	4.36	4.40	4.7
13	4.73	4.50	4.60	4.7
14	4.64	4.36	4.40	5.0
15	4.42	4.60	4.25	4.7
16	4.08	4.40	4.00	4.7
17	4.25	4.60	4.00	4.7
18	4.42	4.60	4.25	4.7

a: Summary of student evaluations: (PP502)

	2005	2006	2007	2008
Overall course rating	4.92	4.5	4.46	5.0
High scores				
The instructor (Louws) was enthusiastic about teaching	4.92	4.78	5.00	5.0
The instructor was prepared for class	4.67	4.43	5.00	4.7
Overall the instructor (Louws) was an effective teacher	4.91	4.71	4.6	5.0
Low Scores				
Lab facilities, equipment etc were adequate	4.08	4.07	4.00	4.7
The instructor was receptive to students outside the classroom	4.83	4.29	4.00	4.7

c. Evaluation-PP 590U Strawberries & Wheat/Louws and Co-Teacher 2005

Comments:

What did you like and dislike about this trip?

- I enjoyed both commodities that were covered (I work a lot with strawberries and so I thought that Dr. Louws' part of the day was very good).
- Took much too much time. Leaving at 7 and returning at 8 or 9 is too long of a day. Otherwise, I enjoyed learning about on-farm research very much.
- Great variety of diseases, nice to have interaction with a grower included, trip was too long to give justice to all that there was to see.
- Enjoyed it, but too much distance to cover in one day.
- Frank Louws did an amazing job planning his part of the trip. The grower visit was one of the best places we went to, and the strawberry talk was very educational.

How would you change this trip for next year?

- I don't think either of these crops should be left out next year, but I wouldn't put them together on one day; Split it up

2. a. Summary of Student Evaluations.

Selected Comments 2008: Strengths: Frank is one of the best instructors I have ever had; Dr. Louws was an effective communicator of complex ideas; Dr. Louws open ended exam questions and assignments challenged me a lot.; Weaknesses: I think there was too much emphasis on DNA/genetics, and too little regarding field techniques; This course should be 3 or 4 credits (not just 2) for the time that we spent in class and lab each week; Some of the labs were lengthy with a lecture at the beginning.

Selected comments: "Very knowledgeable in the field and could bring a great deal of practical information to the discussions"; "Dr. Louws is extremely enthusiastic, knowledgeable and charismatic about the subject! He expects a lot from his students, these expectations are motivating. Dr. Louws adds great anecdotes from his experience and appreciates the applied and research efforts of the subject". "Great attitude! Maybe slow down through some material". "Instructor was very enthusiastic about the course and his work. Instructor was fair on examinations. Instructor had an effective teaching style." "He always seems very busy to hard to get in touch with-almost like he has too much going on-not as approachable as he thinks he is, but very knowledgeable of the material".

b. Summary of peer evaluations of teaching

Selected Comments Reviewer 1: The course does a nice job of providing students with an overview of the principle classes of pathogens that cause plant disease and exposing them to classical and modern techniques for diagnosing and working with them... Overall I thought the course was well done, especially given the time the instructors had to prepare for it. **Selected Comments Reviewer 2:** Overall I

was very impressed with the classes I attended. The lecturers were very good and the lab session was well set up and run. The instructors and organizers of this course have clearly put a good deal of thought and time into it.

B. Instructional Development

I have no formal teaching appointment. However, I have co-organized a Methods and Diagnostics course (PP502); co-organized extension courses and collaborated with colleagues in the Department of Horticulture to teach 2 non-traditional courses designed for Cooperative Extension Agents, Faculty and other professionals. The following information relates to these courses and invited lectures I gave.

1) Courses Taught:

- PP502. Methods and Diagnosis. 3 cr. Graduate level core departmental course to train graduate students in diagnosis of disease and methods of detection and lab analysis. 12 students 2005, 15 in 2006, 10 in 2007 (see above).
- 2007; 2009. Team organized (under Dr. Sutton's primary leadership) PP590U Skills for Industry and Extension Professionals. Co-taught 2 lectures. Developing knowledge in Extension (2007/2009); Product testing: Scientific and ethical issues (2007).
- Team Organized PP610/810. 2006; 2008. Field Plant Pathology. 3 credit hours. This course is designed to introduce students to the principle crops grown in North Carolina, their diseases and how to diagnose them, and the strategies and tactics used to manage them. Principles of disease management underlying each strategy and tactic was emphasized. The course met all day every Friday during both summer sessions. Field trips were taken each class period to NCARS research stations, demonstration plots at grower locations, commercial farming operations, or agricultural chemical company research facilities at RTP. Principles of disease management were emphasized by various class projects. May 26, 2006 Co-organized class with Dr. Cowger. May 16, 2008 sole leadership.
- HS 512/PP 590. Alternative Research Strategies For Sustainable Farming Systems. 3 cr. Attendance: 21 CES Agents or other professionals. 2000-2001: Co-taught with K.R. Baldwin, S. Marlow, N.G Creamer and N. Ranells. Attendance included 21 agents or other professionals. Course was designed under a train-the trainer model. Participants learned how to plan, design, implement, and evaluate locally relevant, farmer initiated, participatory on-farm research (OFR) projects that address sustainable agriculture practices, issues and concerns in their community. Each agent designed and will report (fall 2001) on an implemented OFR project. My contribution included being co-PI on the grant, structuring the content and direction of the course, and presenting several topics or facilitating discussions.
- HS 610G/ PP 590G Organic Farming Systems. 4 cr. Attendance: 50 – 75 CES Agents or other professionals (depending on the topic). 24 students took it for credit. Co-taught with Dr. N. Creamer. This course was designed for Cooperative Extension field faculty to enhance NC CES advisory capabilities that relate to organic farming and sustainable

agriculture. This course took a unique approach that capitalized on seasonal training opportunities from April to September (six 2-day sessions) and combined formal lectures, hands-on exercises, field trips, and many guest lecturers/workshop leaders including nationally recognized leaders, farmers, NGO personnel and university faculty. Attendance fluctuated from 50 to 70 people, depending on the session. My contribution included being co-PI on the grant, structuring the content and direction of the course, co-supervising course coordinator, setting up several field trials and demonstrations, giving lectures/presentations in 5 of the 6 sessions.

2) Grants and Contracts: (to organize graduate level courses)

- K. Baldwin, N. Creamer, N. Ranells and **F.J. Louws**. "Training in Alternative Research Strategies for Sustainable Farming Systems". Southern Region SARE PDP \$101,800 (07/00-12/01).
- K. Baldwin, N. Creamer, and **F.J. Louws**. 1999. Building Capacity in Sustainable Agriculture. Z. Smith Reynolds Foundation. \$100,000.00.
- K. Baldwin, **F.J. Louws** and N. Creamer. 1998. Meeting the information needs for farm communities in transition: extension of funding. Z. Smith Reynolds Foundation. \$7,600.00. (Nov 1998-Oct 1999).
- Creamer, N., **F.J. Louws**, and G. Wilson. 1997 Building Capacity in Sustainable Agriculture: A Comprehensive Training Program in Organic Farming Systems for Cooperative Extension Agents, Specialists, and other Educators. \$97,500 over 2 years. Sustainable Agriculture Research and Education Southern Region Training Consortium.
- K. Baldwin, **F.J. Louws** and N. Creamer. 1997. Meeting the information needs for farm communities in transition. Z. Smith Reynolds Foundation. \$27,000.00.

3) Invited Lectures:

- I have given 20 invited lectures in a number of courses including cross-disciplinary invitations such as PP 503, Nov 26 2002; HS 590, May 3 2001; HS 590, April 19 2001; HS 590, March 8 2001; HS 590C, Jan 30 2001; PP 503, Nov 24 1999; PP 504, Mar 23 1998; PP 519, Nov 24 1997; PP 318, April 21 1997; PP Nov 26 1996; PP 504, Nov 4 1996. Plant Growth-Promoting Rhizobacteria Shuijin Hu course Soil Ecology PP790. 24 Nov 2003; 2005; Greenhouse Disease Management PP500 G. Holmes, Mar 26, 2004; Mar 24, 2006; Mar 14, 2008. G. Holmes, Taxonomy and Diseases Of Major Groups of Fungi. Feb 3, 2006. Disease Management in Vegetable Greenhouse Production IN HS590C-003 Greenhouse and High Tunnel Food Production. M. Peet. April 5, 2005; Mar 22, 2007
Greenhouse and High Tunnel Production: IPM and Disease Management IN HS543 19 Mar 2009; Organic Agriculture. Ent 591/791A: Organic Agriculture. "Organic Disease Management. 3 Apr.2009.
- IPM in Plant Disease Management. In CS415 Integrated Pest Management. 18 Oct. 2007. (For Dr. Mike Burton).

C. Mentoring Activities

1) Undergraduate and hourly Student Training:

I have placed a high priority on training undergraduate students. I hire students (N= 35) or mentor senior projects (n=6) and foster opportunities for independent research and create an environment for learning. Students benefited positively from my program and in most cases my program enabled them to move forward in substantial ways (e.g. secure a good job or continue their education in graduate school). In the

program we have supervised several Undergrad Senior Projects: Marc Gracieux (2008); William Bouldin (2005); Joey Nemargut (2002); Amanda Luchsinger (2001); Carl Andre (2001); Sheila Blanchard (2000).

2) Senior Scientist and Postdoctoral Student Training:

1. Mahfuzur Rahman: 04/07-present. IPM of foliar and fruit diseases of strawberry.
2. Liu Bo 01/07 –present. Microbial ecology of long-term farming systems.
3. Rob Welker: 09/04-present: coordinator for the methyl bromide alternatives research and education project.
4. Leonor Leandro; 10/02 – 3/05: biological based approaches to manage strawberry root rot disease.
5. Hilda Silva-Rosas: 03/04 -08/04 Visiting research scientist from Mexico and did microbial ecology research.
6. Tanya Guzman: 10/03 – 9-04: molecular analysis of strawberry pathogens and beneficial fungi.
7. David Fargo: 03/01 – 04/02: conducted molecular approaches to characterizing soil microbial communities
8. Lisa Ferguson: 03/01 – 04/04: coordinator for the methyl bromide alternatives research and education project.
9. Dolly Watson: 03/03 – present: mycorrhizae identification and cropping systems biology.
10. Jean Harrison: 1999-2000: Developed IPM training materials for strawberry growers and agents.
11. Gloria Abad: 1998 – 2003: Mycologist responsible for characterizing fungi and pathogens associated with strawberry roots as part of the methyl bromide alternatives project.

4) Internship Training:

2007 & 2008: Summer Internship Program In Sustainable Agriculture. Trained two interns in sustainable agriculture.

2000, 2001, 2002, 2003, 2004, 2005: Summer Internship Program In Sustainable Agriculture. 6 credit course for undergraduates. Co-coordinated week 5 or 7 that focused on pest ecology, field diagnosis, participatory on-farm research and integrated pest management. Mentored 1-2 iterns/yr in intensive research projects. Organized farm tour, genetic engineering tour and discussion session.

5) Community College Training

NOTE: The Central Carolina Community College Training programs are part of the community college's curriculum in sustainable agriculture. I have been recurrently invited (12) to lecture in numerous different courses or provide lab tours having an average attendance of 15-25 students.

6) **Training Programs:** Heather Smith, University of Florida. Genomic Fingerprinting of bacterial communities from nematode gut; David Gent, Colorado State University; Genomic Fingerprinting of Xanthomonas strains pathogenic on onions: An emerging Disease.

D) ADVISING ACTIVITIES:

1) Master's and doctoral thesis directed and being directed:

1. Laura (Butler) Carver. Commenced January 1997. M.S. graduate. (G. Fernandez, Co-advisor). Thesis topic: Biology and Ecology of *Botrytis cinerea* in plasticulture strawberry production. Thesis completed March 1999. pp 90.
2. Michelle Grabowski. Commenced August 1998. M.S. graduate. (G. Fernandez, Co-advisor). Thesis topic: Biologically- and Chemically-Based Alternatives to Methyl Bromide Fumigation in Strawberry Production. Thesis completed January 2001. pp 113.
3. Alyssa Collins. Commenced August 1999. M.S. candidate. Alyssa Collins. Commenced August 1999. M.S. candidate. Characterization of bacterial communities in soil during transition to organic agriculture. Thesis completed April 2002. pp. 83
4. Rosemary Schwegel. Commenced August 2003. Specific detection of *Colletotrichum acutatum* and management of anthracnose of strawberries. Completed 2006.
5. Travis DeSavigny. Commenced August 2004. Management of Verticillium wilt and weeds in plasticulture tomatoes. Quit August 2005.
6. Cary Rivard. Commenced January 2005-2006. Applied and Basic Studies in Grafting of Tomatoes. Recipient of SARE Graduate Student Award \$10,000.00. Completed Ms 2006. Initiated PhD. Program 2007.; Co-Secured OFRF grant \$11,174, 2008; Winner The 4th Annual NC State University Graduate Student Research Symposium (Agriculture Division) March 18 2009.

2) Graduate Student Committees:

1. Mary Claire Garrison. M.S. candidate in Plant Pathology. 2008-present. (S. Hu, Chair).
2. Suzanne O'Connell. M.S. candidate in Horticulture. 2006-present. (M. Peet, Chair).
 - i. (poster won first place at the ASHS graduate student competition 2008)
 - ii. Co-Secured OFRF grant \$11,174, 2008.
 - iii. Recipient of SARE Graduate Student Award \$10,000 2008.
3. Amanda Beaudoin. Ph.D. candidate in Entomology. 2005-present (G. Kennedy, Chair).
4. Mary Helen Ferguson. MS candidate in Horticulture. 2004-2006. (G. Fernandez, Chair).
5. Alexander Krings. Ph.D. candidate in Botany; Graduate School Representative 2005-2007.
6. Mark Abney. Ph.D. candidate in Entomology; Graduate School Representative 2003-2005.
7. Julie Miranda. M.S. candidate in Plant Pathology. 2003-2004 (T. Sutton, Chair).
8. Eugenia Gonzalez. Ph.D. candidate in Plant Pathology. 2001-204 (T. Sutton, Chair).
9. Nathan McClintock. M.S. candidate in Crop Science. 2002-2004.(N. Ranells, Chair).
10. Laura Duffie. M.S. candidate in Plant Pathology. 2001-2003 (B.Shew, Chair).
11. Joel Shuman. Ph.D. candidate in Horticulture. 1997- 2001. (J. Ballington, Chair).
12. Janet Miles. M.S. candidate in Horticulture. 1997- 2000. (M. Peet, Chair).
13. Karen Stamen. M.S. candidate in Botany. 1998 – 2000. (U. Blum, Chair).
14. Tracy Biel. M.S. student; Graduate School Representative 1997 – 2000.
15. Melissa Bell. M.S. candidate in Soil Science. 1999-2002. (M. Waggoner, Chair).
16. Russ Bullock. Ph.D. candidate in Plant Pathology. 1996 – 1999. (J. Ristaino, Chair).
17. Shawn Wright. Ph.D. graduate in Crop Science. 1998- 1999. (T. Rufty, Chair). (Graduate School Representative for prelims and final defense).
18. Patrick Haikal. M.S. candidate in Plant Pathology. 1998 – 1999. (S. Lommel, Chair).

III. SCHOLARSHIP IN THE REALMS OF FACULTY RESPONSIBILITY

A. SCHOLARLY ACCOMPLISHMENTS:

1) Original Research Articles in Peer-Reviewed Journals:

1. Rivard, C.L. and **F.J. Louws**. 2008. Grafting to manage soilborne diseases in heirloom tomato production. *HortScience* 43: 2104-2111.
Number 5 download (Top 10) for *HortScience* Dec 2008: *ASHS Newsletter* Vol. 25 (1) January 2009 pg 13.
2. Sydorovych, O., C.D. Safley, R.M. Welker, L.M. Ferguson, D.M. Monks, K. Jennings, J. Driver and **F.J. Louws**. 2008. Economic Evaluation of Methyl Bromide Alternatives for the Production of Tomatoes in North Carolina. *HortTechnology* 18:705-713.
3. Abad, Z.G., Abad, J.A., Coffey, M.D., Oudemans, P.V., Man in 't Veld, W.A., de Gruyter, H., Cunnington, J. and **Louws, F.J.** 2008. *Phytophthora bisheria* sp. nov., a new species identified in isolates from the Rosaceae raspberry, rose and strawberry in three continents. *Mycologia* 100: 99–110.
4. Leandro, L. F.S., L.M. Ferguson, **F.J. Louws**, and G.E. Fernandez. 2007. Strawberry growth and productivity in fumigated compared to compost-amended production systems. *HortScience* 42: 227-231.
5. Leandro, L.F.S., T. Guzman, L.M. Ferguson, G.E. Fernandez, and **F.J. Louws**. 2007. Population dynamics of *Trichoderma* in fumigated and compost-amended soil and on strawberry roots. *Applied Soil Ecology* 35:237-246.
6. Tu C, **F.J. Louws**, N.G. Creamer, J.P. Mueller, C. Brownie, K. Fager, M. Bell, S.J. Hu. 2006. Responses of soil microbial biomass and N availability to transition strategies from conventional to organic farming systems. *Agriculture Ecosystems & Environment* 113:206-215.
7. Rademaker, J.L.W. , D.J. Norman, R.L. Forster, F.J. Louws, M.H. Schultz, and F.J. de Bruijn. 2006. Classification and identification of *Xanthomonas translucens* isolates, including those pathogenic to ornamental asparagus. *Phytopathology* 96:876-884.
8. Sydorovych, O., C.D. Safley, L.M. Ferguson, E. B. Poling, G.E. Fernandez, P.M. Brannen, D.M. Monks and **F.J. Louws**. 2006. Economic evaluation of the methyl bromide alternatives for the production of strawberries in the Southeastern US. *HortTechnology* 16:118-128.
9. Cuppels, D.A., **F. J. Louws** and T. Ainsworth. 2006. Development and evaluation of PCR-based diagnostic assays for the bacterial speck and bacterial spot pathogens of tomato. *Plant Disease* 90:451-458.

10. Zhang, W., J. Wu, C. Tu, H. G. Diab, **F.J. Louws**, J.P. Mueller, N.G. Creamer, M. Bell, M. G. Waggoner and S. Hu. 2005. Responses of soil microbial community structure and diversity to agricultural deintensification. *Pedosphere* 15 (4): 440-447.
11. Rademaker, J.L.W., **F.J. Louws**, M.H. Schultz, U. Rossbach, L. Vauterin, J. Swings, F.J. de Bruijn. 2005. A comprehensive species to strain taxonomic framework for *Xanthomonas*. *Phytopathology* 95:1098-1111.
12. Gent, D. H. A. Al-Saadi, D. W. Gabriel, **F. J. Louws**, C. A. Ishimaru, and H. F. Schwartz. 2005. Pathogenic and genetic relatedness among *Xanthomonas axonopodis* pv. *allii* and other pathovars of *X. axonopodis*. *Phytopathology* 95:918-925.
13. Byrne, J.M., A.C. Dianese, P. Ji, H.L. Campbell, D.A. Cuppels, **F.J. Louws**, S.A. Miller, J.B. Jones, and M. Wilson. 2005. Biological control of bacterial spot of tomato under field conditions at several locations in North America. *Biological Control* 32: 408-418.
14. Rippy, J.F.M., M.M. Peet, **F.J. Louws**, P.V. Nelson, D. B. Orr and K.A. Sorensen. 2004. Plant development and harvest yields of greenhouse tomatoes in six organic growing systems. *HortScience* 39:1-7.
15. Gent, D. H., H. F. Schwartz, C. A. Ishimaru, **F. J. Louws**, R. A. Cramer, and C. B. Lawrence. 2004. Polyphasic characterization of *Xanthomonas* strains from onion. *Phytopathology* 94:184-195.
16. Butler, L.M., G.E. Fernandez and **F.J. Louws**. 2002. Strawberry plant growth parameters and yield among transplants of different types and from different geographic sources, grown in a plasticulture system. *HortTechnology* 12:100-103.
17. Mueller, JP, M.E. Barbercheck, M. Bell, C. Brownie, N.G. Creamer, S. Hu, L. King, H.M. Linker, **F.J. Louws**, M. Marra, C.W. Raczkowski, D. Susko, M.G. Waggoner. 2001. Development and Implementation of Long-Term Agricultural Systems Studies: Challenges and Opportunities. *HortTechnology* 12:362-368.
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47. **F.J. Louws**, W.O. Cline, and J.G. Driver. 1999. Strawberry foliar fungicide spray evaluation, 1998. *Fungicide and Nematicide Tests* 53:
48. Shoemaker, P.B. and **F.J. Louws**. 1998. Evaluation of biocontrol agents for tomato diseases. *Biological and Cultural Tests for Control of Plant Diseases* 14:115.
49. **Louws**, F.J. and J.G. Driver. 1998. Evaluation of a plant activator and phylosphere bacteria for control of bacterial spot of tomato. *Biological and Cultural Tests for Control of Plant Diseases* 13:109.
50. Kousic, C.S., D.F. Ritchie, **F.J. Louws**, and S.W. Pollard. 1998. Evaluation of peppers for resistance to *Phytophthora*. *Biological and Cultural Tests for Control of Plant Diseases* 13:170.
51. Williams, J.T., J.G. Driver, and **F.J. Louws**. 1998. Evaluation of fungicide spray application equipment for control of tomato early blight. *Fungicide and Nematicide Tests* 53:
52. **Louws**, **F.J.**, J.G. Driver, T.L. Dyson and J. Schultheis. 1997. Evaluation of watermelon cultivars for resistance to anthracnose. *Biological and Cultural Tests for Control of Plant Diseases* 12:175.
53. **Louws**, **F.J.**, J.G. Driver and T.L. Dyson. 1997. Watermelon foliar fungicide spray evaluation. *Fungicide and Nematicide Tests* 52:197.
54. Ritchie, D.F., **F. J. Louws**, C.S. Kousik, A.M. Romero, and D.W. Pollard. 1997. Evaluation of the plant activator CGA-245704 50WG for control of bacterial spot of tomato. *Fungicide and Nematicide Tests* 52:188.

6) Research Abstracts:

1. Louws, F.J., B. Liu and J.P. Mueller. 2009. Farming system impacts on plant pathogen and *Burkholderia* diversity and plant health. *Bacterial Genetics and Ecology* 10th annual Conference. Uppsala, Sweden.
2. Louws, F.J. and B. Liu. 2009. Integrated management of soilborne plant pathogens: From chemical based tactic substitution to microbial ecology based tactic development. *Multitrophic Interactions in Soils*, Uppsala, Sweden.
3. Rivard, C.L., F.J. Louws, M.M. Peet, and S. O'Connell. 2008. [High tunnels and grafting for disease management in organic tomato production](#). *Phytopathology* 98: S133.
4. Liu, B and F.J. Louws. 2008. [Burkholderia communities in soils with long-term tillage, no-tillage and successional systems](#). *Phytopathology* 98: S92.
5. Liu, B and F.J. Louws. 2008. [Characterization of Pythium communities in soils from conventional tillage, no-tillage and successional systems](#). *Phytopathology* 98: S92.

6. Rahman, M. and F.J. Louws. 2008. [Epidemiological significance of *C-gloeosporioides* infestation of nursery plants on crown rot of strawberry](#). *Phytopathology* 98: S129.
7. Rahman, M. and F.J. Louws. 2008. [Anthracnose resistance in strawberry genotypes for plasticulture systems in the Southeast](#). *Phytopathology* 98: S129.
8. O'Connell, S., M. Peet, C. Harlow, F.J. Louws, and C. Rivard. 2008. [The performance of grafted heirloom tomatoes in organic production systems: Hightunnels and the open field](#). *HortScience* 43:1260.
9. Rivard, C.L. and **F.J. Louws**. 2007. Grafting for soilborne disease management in organic heirloom tomato production. *Phytopathology* 97:S99.
10. Rivard, C.L. and **F.J. Louws**. 2007. Induction of the jasmonic acid pathway and elevation of proteinase inhibitor II (PINII) expression as a response to tomato grafting. *Phytopathology* 97:S99.
11. Bo, L. and **F.J. Louws**. 2007. Molecular diversity and phylogenetic analysis of *Burkholderia* spp. from soils in diverse farming systems in North Carolina. *Phytopathology*. 97:S66
12. Welker, R.M., J.P. Smith, G.E. Fernandez, D.W. Monks, P.M. Brannen, E.B. Poling and **F.J. Louws**. 2007. A regional training program for methyl bromide transition: Regulatory update, alternatives research, and on-farm projects. *Hortscience* 42: 441.
13. **Louws, F.J.**, L. Bo, and A. Collins. 2007. Dynamics and identity of *Burkholderia* in diverse farming systems. International *Burkholderia cepacia* working group. Ann Arbor MI. 19-22 Apr 2007.
14. **Louws, F.J.** , O. Sidorovych, C.D. Safley, L.M. Ferguson, E.B. Poling, G.E. Fernandez, P.M. Brannen and D.M. Monks. 2007. Efficacy and Economics of Methyl Bromide Alternatives. Proc. VI North American Strawberry Symposium. Ventura CA.
15. **Louws, F.J.** 2007. Integrated management of anthracnose and botrytis fruit rot in strawberries. Proc. VI North American Strawberry Symposium. Ventura CA.
16. Rivard, C.L. and **F.J. Louws**. 2006. Grafting provides a multi-strategic management tool for heirloom tomato production systems. *Phytopathology* 96:S98.
17. **Louws, F.J.** 2006. Functional Genomics Meets Bacterial Diseases, Part III: *Xanthomonas* and *Xylella* Genomics. *Xanthomonas: The pathogen*. *Phytopathology* 96:S135.
18. Rivard, C.L. and **F.J. Louws**. 2006. Grafting Provides Sustainable and Profitable Technology in Organic Heirloom Tomato Production. 2006 SARE National Conference Johnson Creek, Wisconsin Aug 15-17. (poster session).
19. Welker, R. M., J. P. Smith, G.E. Fernandez, D.W. Monks, P.M. Brannen, E.B. Poling, and F. J. Louws. 2006. A Regional Training Program for Methyl Bromide Transition: Regulatory Update, Alternatives Research, and On-Farm Projects. ASHS.???
20. Sanders DC, Reyes LM, Monks DW, Jennings KM, **Louws FJ**, Driver JG. 2006. Using compost sources as an alternative to methyl bromide in vegetable production. *HortScience* 41:1074.
21. Sanders DC, Reyes LM, Monks DW, Jennings KM, **Louws FJ**, Driver JG. 2006. Influence of compost on vegetable crop nutrient management. *HortScience* 41:508.
22. Leandro, L., L. Ferguson, G. Fernandez, and F.J. Louws. 2005. Population dynamics of fungi associated with strawberry roots in different soil management systems. *Phytopathology* 95:S57.
23. Hu, S., X. Chen, C. Tu, F.J. Louws, J. Zhou and D. Shew. 2005. High soil microbial diversity correlates with pathogen invasion but suppresses pathogen activity. *Phytopathology* 95:S45
24. Hu, S., X. Chen, C. Tu, F.J. Louws, J. Zhou, and H.D. Shew. 2005. High soil microbial diversity correlates with pathogen invasion but suppresses pathogen activity. *Institute of Ecosystem Studies*. (Need more info).
25. **Louws, F. J.**, L. M. Ferguson, N. P. Lynch, and P. B. Shoemaker. 2004. Methyl bromide alternatives in tomato production systems. *Phytopathology* 94:S63. (N=44)
26. Schwegel, R., Y. Lu, H. Ypema, L. F. S. Leandro, and **F. J. Louws**. 2004. Documentation of a severe anthracnose epidemic in strawberry plug-plant production in North Carolina and

- evaluation of *Colletotrichum acutatum* isolates for sensitivity to strobilurin fungicides. *Phytopathology* 94:S94.
27. **Louws, F. J.** 2004. Farming systems research and extension in organic agriculture: A plant pathology perspective. *Phytopathology* 94:S137.
 28. Leandro, L. F. S., L. M. Ferguson, G. E. Fernandez, and **F. J. Louws**. 2004. Population dynamics of *Trichoderma hamatum* T382 on strawberry roots and in soil. *Phytopathology* 94:S57.
 29. Leandro, L.F.S., Ferguson, L.M., Fernandez, G.E., and **Louws, F.J.** 2004. *Trichoderma* and compost for root rot management in strawberry transplant and field production systems. Proceedings of the 5th International Conference on Alternatives to Methyl Bromide, Sept 27-30, 2004, Lisbon, Portugal (http://europa.eu.int/comm/environment/ozone/lisbon_conference.htm)
 30. Ferguson, L.M., **Louws, F.J.**, Fernandez, G.E., Poling, E.B., Pestic-Van Esbroeck, Z., Abad, Z.G., Sydorovych, O.B., Safley, C.D., Monks, D.W., Brannen, P.M., Smith, P., and Leandro, L.F.S. 2004. Integrated approaches to pest management in strawberry plasticulture production in southeastern USA: Overview of the methyl bromide alternatives program. Proceedings of the 5th International Conference on Alternatives to Methyl Bromide, Sept 27-30, 2004, Lisbon, Portugal.
 31. Brannen, P. M., L. M. Ferguson, and **F. J. Louws**. 2004. Methyl bromide alternatives for control of black root rot of strawberry in Georgia. *Phytopathology* 94:S10.
 32. Chen, X., **F.J. Louws**, H. D. Shew, C. Tu, and S. Hu. 2004. Soil microbial diversity does not confer high resistance to invasion of a soilborne pathogen. Abstracts. Ecol. Soc. Am., 89th Annual Meeting. Portland, OR.
 33. Tu, C., W. Zhang, X. Chen, H. D. Shew, M. M. Barbercheck, **F. J. Louws**, and S. Hu. 2004. Fungivorous nematodes and collembolans suppress plant diseases caused by fungal pathogens. ASA-CSSA-SSSA International Annual Meeting. Poster No. 6295. Seattle, WA.
 34. Leandro, L. F. S., L. M. Ferguson, G. E. Fernandez, and **F. J. Louws**. 2003. Root rot management using biocontrol amendments in strawberry plug plant production. *Phytopathology* 93:S49.
 35. Ferguson, L.M., **F. J. Louws**, Z. G. Abad, G. E. Fernandez, E. B. Poling, and P. M. Brannen. 2003. Strawberry root colonization by pathogens in transplants and field-set plants. *Phytopathology* 93:S25.
 36. Driver, J.G. and **F. J. Louws**. 2003. Management of *Phytophthora* crown and root rot in peppers. *Phytopathology* 93:S22.
 37. Sanders D. C., D. W. Monks, **F. J. Louws**, L. M. Ferguson, and G.D. Hoyt, 2003. Controlled microbiotic compost and reactor treated swine waste compost compared to methyl bromide in plasticulture. *HortScience* 38: 822.
 38. Sanders D. C., L. M. Ferguson, D. W. Monks, and **F. J. Louws**. 2003. Fumigant and herbicide combinations for pest management in plasticulture production of fresh market tomato and cucumber. *HortScience* 38: 773.
 39. Abad, Z.G., F. J. Louws, G. E. Fernandez, and L. M. Ferguson. 2002. Predominance and pathogenicity of fungi and stramenopiles associated with Black Root Rot of strawberries. *Phytopathology* 92:S1.
 40. Collins, A. A., D. C. Fargo, and F. J. Louws. 2002. Characterization of bacterial communities in soil during the transition to organic agriculture. *Phytopathology* 92:S16.
 41. Ferguson, L. M., F. J. Louws, G. E. Fernandez, D. C. Sanders, D. W. Monks, Z. Pestic-VanEsbroeck, E. B. Poling, P. M. Brannen, J. P. Smith, C. D. Safley, and O. B. Sydorovych. 2002. Management of soilborne pests in strawberry and vegetable plasticulture systems. *Phytopathology* 92:S25.
 42. Sanders, D. C., D.W. Monks, L.M Ferguson, F.J. Louws. 2002. Methyl bromide alternatives for several vegetables – North Carolina results. Southern Region American Soc. Hort. Sci.

43. Poling, E. B. G. S. Miner, R. D. Schiavone, F. J. Louws, G. E. Fernandez, L. M. Ferguson, P. M. Brannen, O. B. Sydorovych, C. D. Safley, D. W. Monks, Z. Pesic-Van Esbroeck, D. C. Sanders and J. P. Smith. 2002. The influence of planting date and fumigant on field nursery production of 'Chandler' strawberry fresh dug plants. Abstr. Southern Association of Agricultural Scientists.
44. Collins, A.A. and **F.J. Louws**. 2001. Characterization of bacterial communities isolated from soils under diverse management practices. *Phytopathology* 91: S18.
45. Abad, Z.G., J.A. Abad, and **F.J. Louws**. 2001. Morphological and molecular characterization of *P. bisheria* sp. nov., from strawberries. *Phytopathology* 91: S1.
46. Barbercheck, M., M. Bell, C. Brownie, N. Creamer, **F. Louws**, L. King, S. Koenning, S. Hu, M. Linker, P. Mueller, C. Raczkowski, and M. Wagger. 2001. Soil ecology research at the Center for Environmental Farming Systems. Soil Ecology Society Conference. (May 20-23). pg. 33.
47. **Louws, F.J.** and A. M. Alvarez. 2000. Genetic diversity of xanthomonads isolated from aroids as determined by rep-PCR. *Phytopathology* 90:S47.
48. **Louws, F.J.** and P.B. Shoemaker. 2000. Characterization of *Pseudomonas* strains associated with widespread incidence of tomato bacterial speck in western North Carolina. *Phytopathology* 90:S47.
49. Grabowski, M.A., **F.J. Louws**, and G.E. Fernandez. 2000. A controlled microbial compost system as an alternative to fumigation with methyl bromide in annual strawberry production. *Phytopathology* 90:S30.
50. Shakya, D.D., **F.J. Louws**, and A. M. Alvarez. 2000. Diversity of *Xanthomonas campestris* pv. *campestris* (Xcc) populations in Nepal. *Phytopathology* 90:S71.
51. Bell, M.C., M.E. Barbercheck, F.J. Louws, and M.G. Wagger. 2000. Qualitative and quantitative indicators of soil quality. *Agronomy Abstracts*. ASA, MN p. 316.
52. Rademaker, J.L.W. , B. Hoste, **F.J. Louws**, K. Kersters, J. Swings , L. Vauterin, P. Vauterin and F.J. de Bruijn. Comparison of AFLP and rep-PCR genomic fingerprinting with DNA-DNA homology studies: *Xanthomonas* as a model system. "Voorjaarsvergadering NVMM/NVvM" Veldhoven, The Netherlands, April 17-19, 2000.
53. Abad, Z.G., **F.J. Louws**, and G.E. Fernandez. 1999. *Rhizoctonia* and *Pythium* species associated with black root rot of strawberries in North Carolina. *Phytopathology* 89:S1.
54. Grabowski, M.A., **F.J. Louws**, and G.E. Fernandez. 1999. Use of VA mycorrhizae in annual strawberry production systems. *Phytopathology* 88:S29.
55. **Louws, F.J.** 1998. Evaluation of a plant activator for control of bacterial spot of tomato. *Phytopathology* 88:S55.
56. **Louws, F.J.**, J.P. Smith and A.P. Keinath. 1998. *Xanthomonas campestris* pv. *campestris* lineages in commercial cole-crop fields. *Phytopathology* 88:S56.
57. Butler Carver, L.M, **F.J. Louws**, and G.E. Fernandez. 1998. In vitro resistance of *Botrytis cinerea* from strawberry to the fungicides benomyl, iprodione, and vinclozolin. *Phytopathology* 88:S13.
58. Butler Carver, L.M, **F.J. Louws**, and G.E. Fernandez. 1998. Strawberry plant phenology and progression of gray mold in annual systems. *Phytopathology* 88:S13.
59. Carver, L.M., G. E. Fernandez, and **F.J. Louws**. 1998. Phenological aspects of strawberry growth influencing gray mold development in annual systems. *HortScience* 33: 538.
60. Carver, L.M., **F.J. Louws** and G. E. Fernandez. 1998. Gray mold development in annual strawberry production systems. *Phytopathology* 88:9.
61. **Louws, F.J.**, J.L.W. Rademaker, V.K. Stromberg, R.L. Gherna, F.J. de Bruijn and G.H. Lacy. 1997. Rep-PCR genomic fingerprinting of 123 ATCC xanthomonad strains. *Phytopathology* 87:S60.
62. Rademaker, J.L.W., **F.J. Louws**, M.H. Schultz, U. Rossbach, L. Vauterin, J. Swings, and F.J. de Bruijn. 1997. Molecular systematics of xanthomonads by rep-PCR genomic fingerprinting and computer-assisted pattern analysis. *Phytopathology* 87:S81.

63. Rademaker, J.L.W., **F.J. Louws**, F.N. Tuang, M.H. Schultz, U. Rossbach, L. Vauterin, J. Swings, E. Alocilja and F.J. de Bruijn. 1997. Computer-assisted “on-line” identification of xanthomonads by a rep-PCR database or artificial neural network. *Phytopathology* 87:S81.
64. Carver, L.M., G.E. Fernandez and **F.J. Louws**. 1997. Strawberry plant phenology and incidence of latent infection of *Botrytis cinerea*. *Phytopathology* 87:S15
65. Jones, J.B., H. Bouzar, **F.J. Louws**, J. Rademaker, M. Schneider, F.J. de Bruijn, and R.E. Stall. 1997. Genetic variation of xanthomonads isolated from tomato in the Caribbean and Central America as determined by rep-PCR. *Phytopathology* 87:S49.
66. Rademaker, J.L.W., **F.J. Louws**, U. Rossbach, L. Vauterin, J. Swings, and F.J. de Bruijn. 1997. Classification and identification of *Xanthomonas* by rep-PCR genomic fingerprinting and computer-assisted pattern analysis. ASM General Meeting, Miami, FL.
67. Carver, L.M. and **F.J. Louws**. 1997. Evaluation of strawberry leaves for latent infection of *Botrytis cinerea*. *Phytopathology* 87: S111.
68. **Louws, F.J.**, J.L.W. Rademaker, U. Rossbach, L. Vauterin, J. Swings, and F.J. de Bruijn. 1996. Genomic fingerprinting and computer-assisted pattern analysis of inter- and intra-subspecies diversity of *Xanthomonas*. *Phytopathology* 86: S78.

7) Invited Speaker; Workshops And Presentations (Research):

a) Invitational Workshops/Research Presentations:

1. **Louws, F.J.** Soil health workshop. Panel speaker. AUSVEG – 2009 Vegetable Industry Conference. Melbourne Australia. 5 May 2009.
2. **Louws, F.J.** Integrated management of vegetable diseases and soil health. Keynote speaker. AUSVEG – 2009 Vegetable Industry Conference. Melbourne Australia. 4 May 2009.
3. **Louws, F.J.** Tomato Grafting and High Tunnel Production: Pathology Problems and Horticultural Solutions. Department of Horticultural Science, NCSU. April 20, 2009.
4. **Louws, F.J.** Plant Disease Management: Unearthing Links Between Soil, Plants and Microbes. 6th International IPM Symposium. Portland Oregon. March 24, 2009.
5. **Louws, F.J.** “Fight Crop Disease: Soil Amendments and Biofumigation”. National Sustainable Agriculture and Research Education (SARE) 20th Anniversary “New American Farm Conference”. 26 Mar 2008. Kansas City MO. (SARE has funded over 3700 projects nationally and selected key people from that group to lead workshops. I was most honored to be invited. Attendance 800 people).
6. **Louws, F.J.** New Jersey 52nd Annual Vegetable Meeting, Atlantic City, NJ. “Grafting for soilborne disease management”. January 16, 2008.
7. 2008 Southeast Regional Fruit and Vegetable Conference. Savannah, GA. “Integrated disease control in strawberries”. 11-13 Jan.
8. 2008 Southeast Regional Fruit and Vegetable Conference. Savannah, GA. “Methyl bromide replacements for strawberries”. 11-13 Jan.
9. 2007. Farming without fumigants. Invited Talk at a private California Strawberry Commission roundtable dealing with the same topic: “Farming without fumigants Round Table”. San Diego CA. 28 Oct 2007.
10. 2007 Mid-Atlantic Fruit and Vegetable Convention. Hershey, PA. “Bio-Fumigation”. 30 Jan.
11. 2007 Mid-Atlantic Fruit and Vegetable Convention. Hershey, PA. “Methyl Bromide Alternatives Update”. 31 Jan.

12. 2007 Mid-Atlantic Fruit and Vegetable Convention. Hershey, PA. "Rivard, C. and **F.J. Louws**. Grafting of tomatoes for disease resistance". 31 Jan.
13. Duke University. "Bacterial diseases and pathogen diversity in NC". Xinnian Dong Lab. Mar 23, 2007.
14. UNC-Chapel Hill. "Pseudomonas Diseases in the Southeast". Jeff Dangle Lab. Jan 18, 2007.
15. 2006. Sustainable Organic No-Till Systems: A Training Program for CES and NRCS Field Professionals, Blacksburg VA. "Disease Diagnosis". 7 June.
16. 2006. Sustainable Organic No-Till Systems: A Training Program for CES and NRCS Field Professionals, Blacksburg VA. "Organic Disease Management". 7 June.
17. 2006 Strawberry School and Trade Show, Virginia Beach, NC. Strawberry diseases and control (2hrs). 23 February.
18. 2006 Strawberry School and Trade Show, Virginia Beach, NC. Strawberry field walk: Disease diagnosis and management (4hrs). 22 February.
19. 2006 Ontario Fruit and Vegetable Convention. "Integrated management of foliar and fruit diseases of strawberry". 17 February.
20. 2006 Ontario Fruit and Vegetable Convention. "Biological and chemical based alternatives to methyl bromide in strawberry and vegetable production". 16 February.
21. 2006 Ontario Fruit and Vegetable Convention. "Management of bacterial disease in tomato". 16 February.
22. 2006 Ontario Fruit and Vegetable Convention. "Understanding Phytophthora (in peppers and cucurbits)". 16 February.
23. 2006 Ohio Fruit and Vegetable Growers Congress. "Biofumigation: Cover cropping to reduce weed and disease problems". 16 January.
24. 2006 Ohio Fruit and Vegetable Growers Congress. "Panel Member: Organic Production Practices". 16 January.
25. 2006 Ohio Fruit and Vegetable Growers Congress. "Panel Member: No-till vegetable production". 16 January.
26. 2006 Ohio Fruit and Vegetable Growers Congress. "Disease control in plasticulture strawberry: From plugs to fruit". 17 January.
27. **Louws, F.J.** Research and Extension in Methyl Bromide Alternatives: Dynamics of Root Associated Fungi in Strawberry. Southern Crop Protection and Food Research Center, Agriculture Canada. London, Canada. 29 April 2005.
28. **Louws, F.J.** Methyl Bromide Alternatives: Research Overview. North Carolina Department of Agriculture Regional Agronomist Meeting. Raleigh, NC. 05 May 2005.
29. **Louws, F.J.** Fumigation Technology and Methyl Bromide Alternatives. 23rd Annual Weed Science Society of North Carolina. 2005 Raleigh, NC. March 10, 2005.
30. **Louws, F.J.** IPM from Local to Regional Approach. Plant Pathology Society of North Carolina Annual Meeting. Research Triangle, NC. February 22, 2005.
31. **Louws, F.J.** Methyl Bromide Alternatives. 2005 North American Berry Conference, North American Strawberry Growers Association. Nashville, TN. February 17, 2005.
32. **Louws F.J.** Phytophthora trials in North Carolina. IR-4 Working group on *Phytophthora capsici*. Little Rock, AR. February 4, 2005.
33. **Louws, F. J.** Fungicide treatment of strawberries during propagation and fruiting. IN: New Jersey 50th Annual Vegetable Meeting, Atlantic City, NJ. January 12, 2005.
34. **Louws, F.J.** The future of methyl bromide and its alternatives. North Carolina Horticultural Council, Inc. Raleigh NC December 8, 2004.
35. **Louws, F. J.** Farming systems research and extension in organic agriculture: A plant pathology perspective. IN SYMPOSIUM: **Organic Foods – From Production to Market**. American Phytopathology Society Annual Meeting. Anaheim, CA, August, 2004.

36. Brannen, P.M., L.M. Ferguson and F.J. Louws. Methyl Bromide Alternatives for Strawberries. Southern Professional Fruit Workers Conference. Tennessee State University Nursery Experiment Station. McMinnville, TN October 12 – 14, 2004.
37. **Louws, F.J.** The role of Extension in leading the changing face of agriculture and crop protection. *IN: The Changing Face of Agriculture and Crop Protection Symposium.* Southern Division, American Phytopathology Society. Tulsa, OK. 16 February 2004.
38. **Louws, F.J.** Integrated management of gray mold and anthracnose of strawberries. 2004 Mid-Atlantic Fruit and Vegetable Convention Program. Hershey PA. January 29, 2004.
39. **Louws, F.J.** Management of foliar diseases and post harvest rot in tomato. SixL's Tomato Farm Managers Annual Meeting, Naples Florida. January 28, 2004.
40. **Louws, F.J.** Methyl bromide alternatives in tomato production systems in North Carolina. SixL's Tomato Farm Managers Annual Meeting, Naples Florida. January 27, 2004.
41. **Louws, F.J.** Diagnosis of Vegetable Diseases and Disorders: Workshop. Practical Tools and Solutions for Sustaining Family Farms Conference. Southern Sustainable Agriculture Working Group Annual Convention. Gainesville, FL. January 23, 2004.
42. **Louws, F.J.** Population structure and diversity of Phytobacteria: Implications for disease management. Department of Plant Pathology, University of Georgia, Athens, GA. October 6, 2003.
43. **Louws, F.J.** and T. Melton. Rating systems for root diseases. APS pre-meeting Workshop and Disease Rating Systems. August 8, 2003. Fletcher NC.
44. **Louws, F.J.** Management of greenhouse vegetable diseases. Greenhouse Vegetable Production Conference. Puerto Rico. June 17. 2003.
45. **Louws, F.J.** Diagnosis of greenhouse vegetable diseases. Greenhouse Vegetable Production Conference. Puerto Rico. June 16. 2003.
46. **Louws, F.J.** Management of fruit rots and foliar disease in plasticulture strawberries. Arkansas Strawberry Growers Association, Strawberry Plasticulture Pre-Harvest Workshop, Mar 4-5, 2003. Little Rock, AR.
47. **Louws, F.J.** Biologically-based alternatives. *IN: Methyl Bromide Alternatives Symposium International Society of Horticultural Sciences Annual Meeting, Toronto, Canada, August, 2002.*
48. **Louws, F.J.** CEFS Research on Microbial Communities. On The Road to Sustainable Agriculture: A National Conference with a Southern Perspective. 24 October, 2002. (500 people).
49. **Louws, F.J.** Characterization of microbial communities at the Center for Environmental Systems in North Carolina. ERCIRIM and APS-Potomac Division joint meeting. Williamsburg, VA. March 4, 2002.
50. **Louws, F.J.** The situation in North Carolina regarding management of Phytophthora blight of peppers. New Jersey Annual Vegetable Meeting. Atlantic City, NJ. January 15, 2002.
51. **Louws, F.J.** Disease management strategies: Extension plant pathology from the lab bench to county hall. Department of Plant Pathology, University of Hawaii, Honolulu, HI. March 16, 2000.
52. **Louws, F.J.** Population structure and diversity of phytobacteria: Implications for disease management. Department of Plant Pathology, University of Hawaii, Honolulu, HI. March 2, 2000.
53. **Louws, F.J.** PCR-based genome analysis to assess genetic diversity and classify phytobacteria. *IN: Discussion: The Fine Line of Species Determination.* American Phytopathology Society Annual Meeting. Montreal, Quebec, August 9, 1999.
54. **Louws, F.J.** and G. Holmes. Remote Diagnosis *IN: Workshop – Disease Management Products – Supporting Decision Making in IPM.* American Phytopathology Society Annual Meeting. Montreal, Quebec, August 7, 1999.
55. A workshop for Plant Pathology scientists and other professionals; 2 concurrent workshops with ~ 100 people in attendance; handouts provided.

56. **Louws, F.J.**, and J.L.W. Rademaker. Rep-PCR: a rapid technique for bacterial identification and assessment of genetic diversity. American Phytopathology Meetings workshop on "Rapid diagnostic assays for plant pathogens". Rochester, NY, August 12, 1997. [A workshop for Plant Pathology scientists and other professionals; Edited an Associated Workshop Manual (80 copies)].
57. **Louws, F.J.** and J.L.W. Rademaker. Rep-PCR for rapid identification of tomato pathogens. H.J. Heinz Co. Bowling Green, OH. Dec 3-4, 1996.
58. **Louws, F.J.**, J.L.W. Rademaker, and F.J. de Bruijn. Rep-PCR: a rapid technique for bacterial identification and assessment of genetic diversity. American Phytopathology Meetings workshop on "Rapid diagnostic assays for plant pathogens". Indianapolis, IN, 1996
59. **Louws, F.J.**, DNA fingerprinting phytopathogenic bacteria. Rogers Seed Co. Gilroy, CA. Sept. 19, 1996.

b) Other Research Presentations (and not listed in Proceedings etc):

1. **Louws, F.J.** IPM of Strawberry Diseases: Discovery Research and Regional Impacts. Dept. Plant Pathology Seminar Series, NCSU. 6 October 2008.
2. **Louws, F.J.** Methyl Bromide Alternatives In Specialty Crops: Research-based Solutions and Large Scale Farm Trials. Dept. Plant Pathology Seminar Series, NCSU. 14 April 2008.
3. **Louws, F.J.**, R. Welker, J.G. Driver. Methyl Bromide Alternatives for Tomato Production. 22nd Annual Tomato Disease Workshop. 25-26 Oct 2007. Williamsburg VA.
4. Rivard, C., S. O'Connell, M. Peet and **F.J. Louws**. High tunnel research and grafting tomatoes. 22nd Annual Tomato Disease Workshop. 25-26 Oct 2007. Williamsburg VA.
5. **Louws, F.J.**, R. Welker, J.G. Driver, K. Jennings, and D. Monks. Methyl Bromide Alternatives in Tomato Production. Frank J. Louws, Rob Welker, Jim Driver, Katie Jennings, and David Monks. 21st Annual Tomato Disease Workshop. 9-10 November 2006. Fletcher NC.
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7. **Louws, F.J.** Research and Extension in Methyl Bromide Alternatives: Dynamics of Root Associated Fungi in Strawberry. Dept. Plant Pathology, NCSU. 18 April 2005.
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9. **Louws, F.J.**, L. M. Ferguson, J.G. Driver, N. P. Lynch, and P. B. Shoemaker. Methyl bromide alternative for tomato production. ISHS 1st International Symposium on Tomato Diseases and 19th Annual Tomato Disease Workshop. 20-24 June 2004, Grosvenor Resort (Hotel), Orlando, Florida, USA
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B. EXTERNALLY AND INTERNALLY SPONSORED GRANTS:

1) Summary of Funds Generated to Support Extension, Research and Teaching (outreach):

Our work is supported primarily through competitive grants. Grower associations contribute 1.6%, grants-in-aid and other commodity related support generates 4.4% and competitive grants generate 93.9% of our total program funds (total of \$6,972,335.00 or ~ \$500,000.00/yr $R^2 = 0.98$). Our program comprises the following components with

a) Microbial ecology:

Mission: To assess the population structure and dynamics of targeted soil microbial communities and their impact on disease incidence or beneficial plant health effects within the context of an ecologically-based agriculture. PI & CO-PI: \$276,599.

b) Farming Systems Research and Extension:

Mission: To implement diverse farming systems and generate discovery knowledge of polyphasic impacts/indicators (biological, physical, economical) and generate practical information to enhance sustainable viability of NC farms. PI & CO-PI: \$1,822,809.00.

c) Training Programs:

Mission: To train agents and other stakeholders (trainers) with applied information to manage diseases and enhance plant health/production consistent with a sustainable agriculture; PI & CO-PI: \$359,259.00.

d) Strawberry Disease Management:

Mission: To develop fundamental knowledge and implement applied recommendations to enable commercial growers to successfully manage diseases of strawberry; PI & CO-PI: \$409,675.

e) Methyl Bromide Alternatives Research and Extension:

Mission: To conduct discovery and applied research (biologically based knowledge) and to implement applied recommendations to enable commercial strawberry and vegetable growers to successfully transition from methyl bromide to alternative fumigants or alternative farming systems; PI & CO-PI: \$2,570,916.

f) Tomato Disease Management:

Mission: To develop fundamental knowledge and implement applied recommendations to enable commercial growers to successfully manage diseases of tomato with emphasis on bacterial diseases, TSWV, and Grafting/soilborne disease management); PI & CO-PI: \$1,318,140.

e) Pepper Disease Management:

Mission: To develop disease management tactics and implement applied recommendations to enable commercial growers to successfully manage diseases of pepper with emphasis on Phytophthora and TSWV; PI & CO-PI: \$58,188.

f) Other:

Mission: To address critical extension issues faced by our clientele to offset economic hardship or prioritized challenges; PI & CO-PI: \$156,749.00.

IV. EXTENSION AND ENGAGEMENT WITH CONSTITUENCIES OUTSIDE THE UNIVERSITY:

The objectives of my extension program are:

- to initiate applied research programs to address key industry disease problems in strawberry, pepper, tomato, greenhouse vegetable production, and organic production.
- to publish (Journal Articles; Bulletins, WWW; EMAIL; Newsletters; Pest Alerts etc.) and present time-sensitive disease management options and strategies for our growers;
- to train and equip CES field faculty personnel through training programs, telephone interactions and, one-on-one interactions in grower fields/county projects;
- to enhance disease management and crop production strategies consistent with IPM and a sustainable agriculture;
- to do this within a framework of developing a strong state-wide program that leads to national and international recognition.

A. ACCOMPLISHMENTS

1) Extension Bulletins Publications

1. Rivard, C. and **F.J. Louws**. 2006. Grafting for disease resistance in heirloom tomatoes. NC cooperative Extension Service Bulletin AG-675.
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4. **Louws, F.J.** 2001-2008. Relative effectiveness of various fungicides for strawberry disease control. *IN*: North Carolina Agricultural Chemicals Manual. (Annual Updates).
5. **Louws, F.J.** 1997-2008. Greenhouse vegetable crop disease control schedule. *IN*: North Carolina Agricultural Chemicals Manual. (Annual Updates)
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 15. Sanders, D. C., editor, J.M.Kemble, E. J. Sikora, M.G. Patterson, R. L. Hassel*, T. Keinath, G. Miller, J.K. Norsworthy, P. Smith, W.T. Kelley*, G.E. Boyhan, A. S. Culpepper, D. B. Langston, A. S. Sparks, R. G. Snyder*, J. D. Byrd, K. E. Cushman, D. Ingram, B.O. Layton, D. H. Nagel, M. W. Shankle, M. R. Williams, C.D. Parker, J. Byrd, C. W. Averre, R. B. Batts, N.G. Creamer, C. R. Crozier, M. A. Cubeta, J.M. Davis, G. J. Holmes, G. D. Hoyt, W. R. Jesters, **F.J. Louws**, D. W. Monks, D.B.Orr, D.F. Ritchie, and G. T. Roberson, J. R. Schultheis, K.A. Sorensen, and J.F. Walgenbach, R. S. Mylavarapu, H. J. Savoy. 2004. 2004-2005 Commercial Vegetable Recommendations for the Southeastern U.S. Published by NC Vegetable Growers Association pp 215.
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2) Articles in Extension Publications or Industry Publications:

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2. Rahman, M. and F.J. Louws. 2009. Pre-plant disease alert for 2008-2009 strawberry season. *The Strawberry Grower* ????. *Small Fruit News* 9(1):5-8. <http://www.smallfruits.org/Newsletter/Vol9-Issue1.pdf>
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21. Welker, R.M., J.G. Driver and F.J. Louws. 2006. Methyl bromide alternatives in strawberry. *Proceedings Southeast Strawberry Expo*. Pg. 12-13.
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26. **Louws, F.J.** and R.M. Welker. 2005. Status of methyl bromide and substitutes. 2005. Proc. Southeastern Vegetable and Fruit Expo. Pg. 31-32.
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90. **Louws, F.J.** 1997. Black rot: Is it coming back? IN: Proceedings Annual Southeast Vegetable and Fruit Expo. Pg 35-36.
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92. Carver, L.B., G.E. Fernandez and **F.J. Louws**. 1997. Gray mold development and strawberry plant phenology throughout the Southeastern production season. IN: Proceedings Southeast Strawberry Expo. pg3-8.
93. **Louws, F.J.** 1997. Inspecting your strawberry plants and post-planting considerations. North Carolina Strawberry Growers Newsletter. Vol 4 (8):2.
94. **Louws, F.J.** 1997. A call for Posters: Sustainable Agriculture Conference November 14-16, 1997. Stewardship News Volume 17 (1).
95. **Louws, F.J.** 1996. DNA forensics: Identifying criminal bacteria. IN: Proceedings 1st Annual Southeast Vegetable and Fruit Expo. Pg 37-38.
96. **Louws, F.J.** 1996. Control of angular leafspot of strawberry. IN: Proceedings of the Southeastern Strawberry Expo. Pg. 7.
97. **Louws, F.J.** 1996. Disease management in intensive vegetable production systems. 7 pg. For "In service training" manual.
98. **Louws, F.J.** 1996. Disease management for greenhouse and field herb production. 8 pg. For "In service training" manual.

3) North Carolina Pest News Articles:

Timely crop disease information for agents distributed by EMAIL and posted on the WWW (ipmwww.ncsu.edu/current_ipm/pest_news.html). In, Stephen J. Toth (ed) North Carolina Pest News

1. Holmes, G. and **F. J. Louws**. 2008. Agrian.com: A Free, Comprehensive, Searchable Pesticide Label Database, and More. Volume 23# 13.
2. Welker, R., K. Jennings and **F.J. Louws**. 2008. Choosing Alternatives to Methyl Bromide for Strawberries. *Volume 23 #12*.
3. **Louws, F.J.** and Mahfuzur Rahman. 2008. Strawberry Disease Management: Colletotrichum Crown Rot and Anthracnose Ripe Fruit Rot. *Volume 23 #3*.
4. Welker, R. and **F.J. Louws**. 2008. Strawberry Regional Fumigation Trials: Take Time to View Them in the Field during May. *Volume 23 #3*
5. Holmes, G., K. Ivors and **Louws, F.J.** 2008. New fungicides for vegetables in 2008. *Volume 23#1*.
6. **Louws, F.J.** 2004. Disease Management Considerations for Producing Strawberry Plug Plants. *Volume 19, #12*.
7. **Louws, F.J.** 2004. Late Blight Alert in Western North Carolina. *Volume 19, #12*.
http://ipm.ncsu.edu/current_ipm/04PestNews/04News12/fruitveg.html
8. **Louws, F.J.** 2004. Phytophthora Crown Rot Widespread in 2004. *Volume 19, #2*. (also published in BerryAlert and Small Fruit Consortium).
9. **Louws, F.J.** 2003. Strawberry Diseases: Phytophthora, Anthracnose and Botrytis Update. *Volume 18 #3*.
10. **Louws, F.J.** 2003. North Carolina Strawberry Field Day. *Volume 18 #3*.
11. **Louws, F.J.** 2003. Anthracnose Symptoms in Strawberry Fields, Botrytis and Current Management Thoughts. *Volume 18 #1*.
12. **Louws, F.J.** 2002. Anthracnose Ripe fruit rot widespread in North Carolina. *Volume 17#1*.
http://ipm.ncsu.edu/current_ipm/02PestNews/02News1/fruitveg.html
13. **Louws, F.J.** 2001. Quadris Cleared for Use by North Carolina Strawberry Growers for Anthracnose Control. *Volume 15#3*.
14. **Louws, F.J.** 2001. Anthracnose Diagnosed on Strawberries in the State. *Volume 16#2*.
15. **Louws, F.J.** 2001. Crown rot prevalent on strawberries in 2001. *Volume 16#2*.
16. **Louws, F.J.** 2000. Quadris Cleared for Use by North Carolina Strawberry Growers for Anthracnose Control. *Volume 15#4*.
17. **Louws, F.J.** 2000. Anthracnose Diagnosed. *Volume 15#1*.
18. **Louws, F.J.** 2000. Bacterial angular leaf spot sporadic in North Carolina strawberry plantings. *Volume 15#1*.
19. **Louws, F.J.** 2000. Phytophthora crown rot in strawberry fields prevalent this year. *Volume 15#1*.
20. **Louws F.J.** 1999. Integrated Pest Management Considerations for Producing Strawberry Plug Plants. *Volume 14#15*.
21. **Louws F.J.** 1999. New Fungicide Registered for Botrytis Control in Strawberries. *Volume 14#15*.
22. **Louws F.J.** 1999. Tomato Spotted Wilt Virus Expected to be a Serious Problem This Year. *Vol 14#6*.
23. **Louws F.J.** 1999. Phytophthora on Peppers: Current Recommendations. *Vol 14#6*.
24. Holmes, G.J. and **F.J. Louws**. 1999. Ozone Injury Hits Vegetable Crops. *Vol 14#4*.
25. **Louws F.J.** 1999. Anthracnose of Strawberries. *Vol 14#1*.
26. **Louws F.J.** 1999. Botrytis Crown Rot and Phytophthora Crown Rot of Strawberries. *Vol 14#1*.
27. **Louws F.J.** 1998. Quadris Receives Special Local Needs Registration on Tomatoes in North Carolina. *North Carolina. Pest News Volume 13#15*.
28. **Louws F.J.** 1998. Strawberry Plug Production: Integrated Pest Management Considerations. *Pest News Volume 13#15*.
29. **Louws, F.J.,** G. Holmes and J. Ristaino. 1998. Phytophthora Blight in Peppers and Cucurbits.

North Carolina Pest News Volume 13 #1.

30. **Louws, F.J.** 1997. Captan Labeling For Strawberries. Volume 12#2.
31. **Louws, F.J.** 1997. Anthracnose Strawberry Fruit Rot. Volume 12#2.
32. **Louws, F.J.** 1997. Stunting Of Strawberry Plants. Volume 12#2.
33. **Louws, F.J.** 1996. Bacterial Angular Leafspot in Strawberries. Vol 11 #1.
34. **Louws, F.J.** 1996. Botrytis Gray Mold in strawberries. Volume 11 #1.
35. **Louws, F.J.** 1996. Watermelon Fruit Blotch on Transplants. Volume 11 # 1.
36. **Louws, F.J.**, and P. B. Shoemaker. 1996. Tomatoes: Foliar Diseases in North Carolina. Vo. 11 #4.
37. **Louws, F.J.** 1996. Watermelon Fruit Blotch. Volume 11 #9.
38. **Louws, F.J.** 1996. Management of Cucurbit Diseases. Volume 11 #9.
39. Poling, B., G. Fernandez and **F.J. Louws, F.J.** 1996. Carry Over of Strawberries. Volume 11 #9.
40. **Louws, F.J.** 1996. Downey Mildew Alert. Volume 11 #13.
41. **Louws, F.J.** 1996. Soil Solarization of Greenhouses. Volume 11 #18.

4) NC-CES PEST Alerts

(To all agents with horticultural crop responsibilities).

1. F.J. Louws. Find of Golden Nematode in Quebec Canada could affect NC Strawberry Growers. Sept 9. 2006. http://ipm.ncsu.edu/current_ipm/palert49.html
2. **F.J. Louws**, L. Leandro, R. Schwagel and J. Driver. 2003. Anthracnose problems in 2003: Current data, research and recommendations. (http://ipmwww.ncsu.edu/current_ipm/palert43.html). (also posted at the Small Fruit Consortium website).
3. G. Holmes, **F.J. Louws** and Marc Cubeta. 2001. Quadris Label Expanded to Leafy Greens, Pepper, Eggplant, Okra and Strawberry. December 5. (http://ipmwww.ncsu.edu/current_ipm/palert36.html).
4. **Louws, F.J.** 2001. Disease Alert Concerning Anthracnose in Strawberry Plug Plants. September 27. (http://ipmwww.ncsu.edu/current_ipm/palert35.html).
5. **Louws, F.J.** 2000. Quadris Cleared for Use by North Carolina Strawberry Growers for Anthracnose Control, May 8. (http://ipmwww.ncsu.edu/current_ipm/palert27.html)
6. **Louws, F.J.** 1999. Emergency Exemption of Quadris for Control of Anthracnose of Strawberries. (http://ipmwww.ncsu.edu/current_ipm/alert14.html). April 13.
7. **Louws, F.J.** 1999. Anthracnose of Strawberries. (http://ipmwww.ncsu.edu/current_ipm/alert13.html). March 31.
8. **Louws, F.J.** 1996. Downey Mildew Alert. July 11.
9. **Louws, F.J.**, B. Poling and G. Fernandez 1996. Carryover Strawberries. Jun 12.
10. **Louws, F.J.** 1996. Gray Mold in strawberries. March 4.

5) BerryAgent Strawberry Advisories. Written by F.J. Louws and/or compiled by E.B. Poling.

Electronic newsletter and at <http://intra.ces.ncsu.edu/depts/hort/berrydoc/strawadv/>; then distributed through Email directly to a large clientele base. 2008=5, 2007=2, 2005=3, 2004=4; 2003=12, 2002=8, 2001=12.

6) Extension or Research activities were featured in:

1. Methyl Bromide Alternatives Indicated For North Carolina Tomato Production

ScienceDaily (Feb. 3, 2009)

<http://www.sciencedaily.com/releases/2009/02/090203142514.htm>

http://www.eurekalert.org/pub_releases/2009-02/asfh-mba020309.php

www.biology-blog.com/blogs/permalinks/2-2009/methyl-bromide-for-tomato-production.html - 9k

- 2.
3. Grafting tomato seedlings could enhance field production. Dec 2008. *In* The Tomato Magazine. Pg 4-5.
4. Grafting Heirloom Tomatoes. Spring 2008. *IN*: Common Ground pg. 5. (Southern SARE magazine).
5. **Multistate Tomato Grafting Project has Potential for Growers. 2008. Vegetable Grower News.**
6. Extension helps strawberry growers fight aggressive disease. Mar 18 2008. Multiple outlets.
7. Methyl bromide alternatives agent training workshop. Southern IPM Center Newsletter March 2005. Volume 2 Issue 3 p. 4. <http://www.sripmc.org/newsalerts/newsletter/March05.pdf>.
8. Anthracnose problems in 2003. *In*: North American Strawberry Grower News. November 2003.
9. Alternative Soil Treatments for Strawberries in the Southeastern United States. *In*: The Grower Vol. 35. No.7. Aug 2002.
10. Southeast Farm Press.....article of conference.....
11. Plant virus takes toll on area's tomato crop in The Daily Reflector, 3 Jun 2002
<http://www.agnic.org/pmp/2002/tsw062202.html>
12. Compost As An Alternative To Methyl Bromide. Biocycle. September 2001. pg 57.
<http://www.jgpress.com/BCArticles/2001/090157.html> OR <http://www.environmental-center.com/articles/article1030/article1030.htm#article3>.
13. "Phytophthora Crown Rot Resistant Cultivars Available". Farm Chronicle of North Carolina. 11 December, 2000. Section B p.8.
14. *In* Vegetables: (Methyl bromide alternatives research). *In*: Southeast Farm Press. 4 Oct, 2000.
15. EXPO/AGTECH topics diversified (Soilborne Diseases). *In*: Southeast Farm Press. 6 Dec, 2000.
16. "Alternatives to Methyl Bromide in NC". The Strawberry Grower Vol 7 #7. June 2000.
17. "It all starts in the soil." by Mark Schonbeck *IN*: The Virginia Biological Farmer (The Newsletter of the Virginia Association for Biological Farmers). Volume 22#6 pg 5-9; also featured in the Virginia Gardener (Virginia Tech) Vol19 No. 5/6. June 2000.
18. "Franklin farm a test site for pesticide alternatives" by: John Carson *IN*: The Franklin Times, Louisburg NC. May 23, 1998. Featured our Methyl Bromide alternative research).
19. "Greenhouse Disease Roundup:Common greenhouse diseases- causes, symptoms, and controls" by: Laurie Grubich *IN*: American Vegetable Grower 46(4): 6-11. Provided major editorial and content information.
20. "Grower Trials Methyl Bromide Alternatives". North Carolina Strawberry Growers Newsletter. Vol 4 (9):1. 1997.
21. "NC Strawberry Experts Visit Canadian Plant Producers". North Carolina Strawberry Growers Newsletter. Vol 4 (8):2. 1997.

7) Training Programs and Extension Presentations

a) North Carolina Cooperative Extension Field Faculty Training Activity (n=64)

2008:

1. Methyl Bromide alternatives in strawberry production. R.M. Welker, P. Smith and F.J. Louws. Sothern Region Small Fruit Center Agent Training. Charlotte, NC. Nov 2-6, 2008.
2. Strawberry disease management, diagnosis and hands-on identification. M. Rahman and F.J. Louws. Sothern Region Small Fruit Center Agent Training. Charlotte, NC. Nov 2-6, 2008.
3. Implementing methyl bromide alternatives in strawberries. Special Strawberry Training Field Day. Clayton, NC. Aug 4, 2008.
4. "Grafting Heirloom Tomatoes for Disease Resistance in Intensive Farming Systems" – SARE-sponsored lunch seminar showcasing SR-SARE research projects. National Extension Agents Conference – 07/15/2008. Greensboro, NC. (C. Rivard and S. O'Connell).
5. Methyl bromide alternatives research and extension in NC. Southeast Regional Methyl Bromide Alternatives Agent training program. Tifton, GA. 7 May 20008.

2007:

6. Hands-on training and background in methyl bromide alternatives. NRCS and Agent training program. Fletcher, NC, 18 April 2008.
7. Demonstration of field equipment for applying methyl bromide alternatives. Agent training and grower training. Creedmoor, NC. 11 Nov. 2007.
8. Resources for teaching plant pathology. Vocational Agriculture Teacher Training. Goldsboro, NC. 18 July, 2007.
9. Disease diagnosis and organic disease management. CEFS Seasons in Sustainability Series. Goldsboro, NC. 23 Aug, 2007.

2006:

10. Organic disease Management. Southern Region SARE-PDP Train-The-Trainer. Blacksburg, VA. 7 June 2006. (redundant with invited talks above!!!!).
11. Disease Diagnosis. Southern Region SARE-PDP Train-The-Trainer. Blacksburg, VA. 7 June 2006.
12. Southeast Regional Methyl Bromide Alternatives Training. 21-22 March 2006. 25 agents from the Southeast region. F.J. Louws and R. Welker.

2005:

13. Disease management in organic strawberry production systems. Southeastern Small Fruit Center Regional Agent Training Program in Organic Small Fruit Production. 6 November 2005. 22 agents.
14. Multi-state (AL, GA, NC, MS, FL) In-Service Training on the Management of Tomato Diseases. Co-organizer and speaker "Diagnosis and Management of Soil-borne Diseases". 18-19 October, 2005. NNN agents...?????
15. Southeast Regional Methyl Bromide Alternatives Training. 23-24 February 2005. 25 agents from the Southeast region. F.J. Louws and R. Welker.
16. Soil Ecosystem and Biology. 26 January. 2005. For advanced Soils Course through Southern SARE Train-the-Trainer (K. Baldwin PI). Fletcher NC.
17. Soil Biology and Plant Disease Management. 26 January 2005. An advanced Course in PDP Soils (K. Baldwin PI). Fletcher NC.

2004:

18. Introductory IPM Training - Disease Management. Horticulture Agent Training. NCSU. Sept 22, 2004.

2003:

19. Soil Biology and Plant Disease Management. 16 December 2003. for advanced Course in PDP Soils (K. Baldwin PI). Fletcher NC.
20. Anthracnose Workshop for County Agents. 11 November, 2003. (Co-organized with Dr. Tom Monaco as lead). 34 agents from the Southeast region. RTP, NC.
21. Field diagnosis and management. C. Averre and F.J. Louws
22. Hands on Demo for anthracnose diagnosis. F.J. Louws and L. Leandro.
23. Strawberry Disease Diagnosis and Management. 7 May 2003. (Lead organizer with 21 agents with detailed training and hands-on experience). Wilmington, NC
24. Strawberry Field Tours and Disease Diagnosis. Washington Co. 5 February, 2003.

2002:

25. Strawberry Field Tours and Disease Diagnosis. Alamance, Caswell, Guilford Counties. 18 October, 2002.
26. Introductory IPM Training - Disease Management. Horticulture Agent Training. NCSU. Sept 13, 2002.
27. Tomato Spotted Wilt Virus Agent Training: Diagnosis and Management. Fletcher, NC. July 9, 2002.
28. Tomato Spotted Wilt Virus Agent Training. Diagnosis and Management. Kinston, NC. June 17, 2002.
29. Review of disease problems in 2001-2002. In-Service Training in Plasticulture Strawberries: Session Number 549 Intermediate Training. June 4, 2002.

2001:

30. Methyl Bromide alternatives for strawberry production and field diagnosis of diseases. Lincoln Co. SC. April 27, 2001.
31. Methyl bromide alternatives for Eastern NC". April 24, 2001. Plymouth. (Fernandez lead PI).
32. Alternative Research Strategies For Sustainable Farming Systems. (see C.1.).

2000:

33. Strawberry Disease Management. Second Strawberry Plasticulture Extension Agent Training Short Course. Columbia, SC. Oct 25, 2000.
34. Methyl Bromide Alternatives. Second Strawberry Plasticulture Extension Agent Training Short Course. Columbia, SC. Oct 25, 2000.
35. Introductory IPM Training - Disease Management. Horticulture Agent Training. NCSU. Sept 5, 2000.
36. Methyl bromide alternatives for Eastern NC, method of application, 2-day agent training. August 2000.
37. Disease management in intensive vegetable production systems. Horticulture Agent Training; A&T. June 15, 2000.

1999:

38. Research and Extension Priorities for vegetables in North Carolina. (facilitator) Phase I training November 16, 1999.
39. "Strawberry pest management for the next century." Session chair and presenter with Dr. K. Sorensen for two 1 ½ hr. concurrent sessions for Regional Extension Plasticulture Strawberry Short Course. (~50 agents/specialists). November 3, 1999.
40. Disease Management of Greenhouse Vegetable Crops. Agent and New Grower Training. October 26, 1999. Raleigh, NC.
41. Strawberry production short course-update on methyl bromide alternatives". Regional Agent training. October. 1999.
42. "Compost Demonstration – Impacts of composting on soil quality". M. Grabowski and F.J. Louws. Southern Region SARE-PDP Soil Management Train-the-Trainer Workshop. (Regional Training ~ 120 in attendance). September 23, 1999.
43. "Pests and Beneficial Organisms – insects, nematodes, pathogens and diseases." (With Dr. M. Barbercheck and graduate students M. Grabowski and A. Collins). Southern Region SARE-PDP Soil Management Train-the-Trainer Workshop. (Regional Training ~ 120 in attendance). September 23, 1999.
 - a. Provided a draft handout on "Disease management through suppressive soils" by U.J. Harrison and F.J. Louws. 14 pages.
 - b. Provided a handout on "Resources for mycorrhizae" by M.A. Grabowski and F.J. Louws.
 - c. Provided a handout on "Available products for biological control of diseases" by A. Collins and F.J. Louws.

1998:

44. Research and Extension Priorities for vegetables in North Carolina. (facilitator) Phase I training November 17&19, 1998.
45. "Genetic engineering: Implications for organic agriculture". Aug 5, 1998.
46. "Soil Biology" – set-up a demonstration using dissecting and compound microscopes to observe soil microbes and arthropods. July 21, 1998.
47. "Principles of disease management in organic farming systems". June 2, 1998.
48. "Evaluation of biologically induced systemic acquired resistance". June 2, 1998.
49. "A total systems approach to sustainable pest management". (Presentation and discussion session). June 2, 1998.
50. "A comparison of three systems for growing greenhouse tomatoes in bag culture: Disease management". May 13, 1998.
51. "SunnySlope Greenhouses: A systems approach to disease management". May 12, 1998.
52. "Systems Approach to farm Management and Outline of Exercise". (with N.G. Creamer). April 1, 1998.
53. Small Fruit Pest Management; Phase II Training Course #438. Primary Leader. Held at the Clayton Research Station.
54. "Disease ID in the field". May 6, 1998 (an in-field training session).
55. "Methyl bromide alternatives research". May 6, 1998.
56. "Biology of Botrytis". L. Carver and F.J. Louws. May 5, 1998.
57. "Disease management: Biology and disease management strategies". May 5, 1998.

1997:

58. "Evaluation of backpack sprayers for foliar disease control on staked tomatoes". Taylor Williams and F.J. Louws. Southeast Vegetable and Fruit Expo. Dec. 17, 1997.
59. "Impact of food quality protection act (FQPA) on new chemical registration". State Extension Conference, Wake Co. November 20, 1997.
60. "Issues in organic production and field tours". In service training. Chatham/Orange Co. July 1, 1997
61. "Integrated pest management: Plant Diseases". In service training. Raleigh, NC. March 25-26, 1997.

1996:

62. "Managing Cover Crops and Vegetable Diseases". In service Training. Goldsboro. Aug 21.
63. "Identification and management of diseases in plasticulture strawberries". Strawberry plasticulture training session, Vernon James Research and Extension Center. Aug 9. (including 12 people from South Carolina).
64. "Management of cucurbit diseases". In service Training. Clinton. July 22.
65. "Disease management for greenhouse and field herb production". In service Training. Fletcher, NC. July 17.
66. "Disease management for greenhouse and field herb production". In service Training. NCSU. June 19.
67. "Disease management in intensive vegetable production systems". In service Training. Cunningham Research and Extension Center, Kinston. June 6.

b) Lead PI in Field Days:

- Methyl Bromide Alternatives Field Day. (Organized local field days based on On-Farm-Research Projects): 9 Apr 2009 – Sandford NC (Steve McNeill Farm). Organized by R. Welker and Stephanie Romeczyk (Co. agent).
- Strawberry Conservation and Fumigant Alternatives Field Day. (Organized local field days based on On-Farm-Research Projects): 27 Mar 2009 – Edgecombe Co. NC (Scott Dail Farm). Organized by R. Welker, NC-Strawberry Assn and Center for Agricultural Partnerships.
- Methyl Bromide Alternatives Field Day. (Organized local field days based on On-Farm-Research Projects): 1 Apr 2008 – South Carolina; Organized by R. Welker and P. Smith.
- Methyl Bromide Alternatives Field Day. 9 Apr 2008 – Piedmont; Organized by R. Welker and T. Garwood.
- Methyl Bromide Alternatives Field Day. 22 Apr 2008 - Coastal Plain. Organized by R. Welker and R. Morris.
- Strawberry Field Day. Clayton NC. May 7, 2008. Co-organized with Dr. Poling.
- Strawberry Field Day. Clayton NC. May 2, 2007. Co-organized with Dr. Poling.
- Strawberry Field Day. Clayton NC. May 3, 2006. Co-organized with Dr. Poling.
- Strawberry Field Day. Clayton, NC. May 5, 2005. Co-organized with Dr. Poling.
- Western NC Strawberry Field Day, Leicester NC. May 15 2003. (D. Ducharme NCCES agent was primary lead person).

- Strawberry Field Day, Castle Hayne NC. May 8 2003. (With L. Ferguson, L. Leandro, J. Driver).
- Greenhouse Vegetable Field Day. Horticulture Field Laboratory. Raleigh, NC. March 16, 1999.
- Organic Field Day. Center for Environmental Farming Systems. June 3, 1998.
- North Carolina Small Fruit Field Day: Mountain Horticultural Crops Research Station. May 21, 1998.
- Vollmer Farms Field Day, (Biologically-based methyl bromide alternatives); Vollmer Farms, Franklin Co. May 20, 1998.

c) Clientele Training; Teaching and Outreach Presentations:

SUMMARY: A total of 229 presentations have been given; most included original and current information with handouts. Presentations were conducted primarily in support of county, regional or statewide programs to deliver applied research results integrated with the current state of knowledge. Presentations are arranged by category:

VEGETABLE DISEASE MANAGEMENT

1. Louws, F.J. and R. Welker. Methyl Bromide Alternatives. 41st Annual Mtg North Carolina Tomato Growers Assn. and Winter Vegetable Conference. Asheville, NC. 19 Feb 2009.
2. Louws, F.J. Principles of diagnosis and disease management. Orange Co. Education Program. Hillsborough NC. 4 Feb 2009.
3. Rivard, C. and F.J. Louws. Grafting with Maxifort as an Alternative to Methyl Bromide for Tomato Production. Page 8 in Proc 2008 Fresh Market Tomato and Vegetable Field Day, Fletcher, NC. Aug 7, 2008.
4. R. Welker, J. Driver, D. Walker, R. Eckhart and F.J. Louws. Paladin Fumigation as an Alternative to Methyl Bromide for Tomato Production. Page 9 in Proc 2008 Fresh Market Tomato and Vegetable Field Day, Fletcher, NC. Aug 7, 2008.
5. R. Welker, J. Driver, D. Walker, R. Eckhart and F.J. Louws. Acrolein Fumigation as an Alternative to Methyl Bromide for Tomato Production. Page 10 in Proc 2008 Fresh Market Tomato and Vegetable Field Day, Fletcher, NC. Aug 7, 2008.
6. Louws, F.J. Principles of diagnosis and disease management. Orange Co. Education Program. Hillsborough NC. 23 Jan, 2008.
7. Louws, F.J. Grafting: A Viable tool for large scale field production? 22nd Annual Southeast Vegetable and Fruit Expo, Myrtle Beach, SC. December 12, 2007.
8. Welker, R.M., Louws, F.J. and Driver, J.G. 2007. Fall and Spring Fumigation for Tomato Production. Page 5 to 6 in Proc 2007 Fresh Market Tomato and Vegetable Field Day, Fletcher, NC.
9. "Tomato Grafting for Soilborne Disease Resistance" – Cultivar Showcase. Mid-Atlantic Fruit and Vegetable Convention – 01/31/2007. Hershey, PA. (C. Rivard)
10. Welker, R.M., Louws, F.J. and Driver, J.G. 2007. Acrolein and DMDS Fumigation for Tomato Production. Page 10 in Proc 2007 Fresh Market Tomato and Vegetable Field Day, Fletcher, NC.
11. Anthracnose of immature fruit in peppers. 21st Annual Southeast Vegetable and Fruit Expo, Myrtle Beach, SC. December 13, 2006.

12. "Tomato Grafting: Benefits and Techniques of and Emerging Technology" – New Vegetable Technologies Session. 21st Annual Southeast Vegetable & Fruit Expo – 12/13/2006. Myrtle Beach, SC. (C. Rivard).
13. Welker, R. J. Chalnack, F.J. Louws. Fall/spring fumigation trial for tomatoes. Fresh market tomato and vegetable field day. Aug 3, 2006. Fletcher NC.
14. Welker, R. J. Chalnack, D. Monks, F.J. Louws. Weed fumigation trial for tomatoes. Fresh market tomato and vegetable field day. Aug 3, 2006. Fletcher NC.
15. Welker, R. J. Chalnack, F.J. Louws. Acrolein and DMDS fumigation trial for tomatoes. Fresh market tomato and vegetable field day. Aug 3, 2006. Fletcher NC.
16. Rivard. C. and F.J. Louws. Evaluation of Grafted Tomato Under Various Management Regimes" – Research Trial Update. . Fresh market tomato and vegetable field day. Aug 3, 2006. Fletcher NC.
17. Status of methyl bromide and alternatives. 20th Annual Southeast Vegetable and Fruit Expo, Myrtle Beach, SC. December 12, 2005.
18. Western North Carolina tomato research on methyl bromide alternatives. Tomato field day. Fletcher, NC. August 4, 2005.
19. Disease Diagnosis. Graduate Student training in the Plant Disease and Insect Clinic. July 7, 2005.
20. Disease management in cantaloupes and methyl bromide alternatives. (Gerald Holmes and Frank Louws). Central America Vegetable Growers @ L&M Packaging, Garner, NC. 14 June 2006.
21. Soil Pathogens and Management Issues: Why fumigate? Southeast Regional Methyl Bromide Alternatives Agent Training Workshop. Raleigh, NC. 23 February 2005.
22. Methyl Bromide Alternatives: Equipment Issues, Rate Calculations, Non-Registered Chemicals to be Aware of. Southeast Regional Methyl Bromide Alternatives Agent Training Workshop. Raleigh, NC. 23 February 2005.
23. Methyl bromide alternatives update. 37th Annual Winter Vegetable Conference, Asheville, NC. February 16, 2005. (R. Welker and F.J. Louws).
24. Management of Phytophthora on peppers/cucurbits. 37th Annual Winter Vegetable Conference, Asheville, NC. February 16, 2005.
25. Research on methyl bromide alternatives. 56th Annual Crop Protection School. Raleigh, NC, December 7, 2004.
26. Phytophthora crown and root rot management. 19th Annual Southeast Vegetable and Fruit Expo, Greenville, NC. December 1, 2004.
27. Methyl bromide alternatives: Current research, extension, and critical use exemptions. 19th Annual Southeast Vegetable and Fruit Expo, Greenville, NC. December 1, 2004.
28. Management of bacterial diseases in tomato. 19th Annual Southeast Vegetable and Fruit Expo, Greenville, NC. November 30, 2004.
29. Western North Carolina tomato research on methyl bromide alternatives and management of bacterial speck. Tomato field day. Fletcher, NC. August 5, 2004.
30. Methyl Bromide Alternative Update. North Carolina Tomato Growers Association 36th Annual meeting. Asheville, NC. February 19, 2004.
31. Research on Methyl Bromide Alternatives. Six L's Farm Manager Annual Workshop. Naples FL. January 28, 2004.
32. Western North Carolina tomato research on methyl bromide alternatives. Tomato field day. Fletcher, NC. August 7, 2001???. (F.J. Louws, L.M. Ferguson and P.B. Shoemaker).
33. Bacterial canker management studies. Tomato field day. Fletcher, NC. August 7, 2001???. (P.B. Shoemaker and F.J. Louws).
34. Disease Management in transplant production systems. Rowan Co. Field Day. 13 Mar 2003. (J.G. Driver and F.J. Louws).
35. Tomato Spotted Wilt Virus. 21st Annual Eastern North Carolina Vegetable School. Kinston, NC. 24 January, 2003.
36. Tomato Spotted Wilt Virus: Why it is still a problem. CCA Training, New Bern, NC. December

- 4, 2002. (F.J. Louws and J. Moyer).
37. Tomato Spotted Wilt Virus: Why it is still a problem. 17th Annual Southeast Vegetable and Fruit Expo, Greensboro, NC. December 3, 2002. (F.J. Louws and J. Moyer).
 38. Alternatives to Methyl Bromide. 17th Annual Southeast Vegetable and Fruit Expo, Greensboro, NC. December 2, 2002. (F.J. Louws and L.M. Ferguson).
 39. Fumigation alternatives for methyl bromide. North Carolina Tomato Growers Association 34th Annual meeting. Asheville, NC. February 21, 2002.
 40. Methyl bromide alternatives research and current recommendations. Regional growers meeting. Tidewater Agriculture Research and Extension Center, Suffolk, VA. February 7, 2002.
 41. Summary of methyl bromide alternatives research and discussion of options. South Georgia grower discussion group. November 27, 2001. (F.J. Louws and L.M. Ferguson).
 42. Methyl bromide alternatives research trial results. Tomato field day. Fletcher, NC. August 2, 2001. (Lisa Ferguson and F.J. Louws).
 43. Integrated management of bacterial speck and research results. Tomato field day. Fletcher, NC. August 2, 2001.
 44. Disease Diagnosis. Graduate Student training in the Plant Disease and Insect Clinic. July 16, 2001.
 45. Biology and management of TSWV in tomato. Annual Tomato Growers Meeting, Ashville, NC. February 15, 2001. (with Jim Walgenbach).
 46. Survey and management of bacterial speck of tomatoes. Annual Tomato Growers Meeting, Ashville, NC. February 15, 2001. (with Paul Shoemaker).
 47. Long Distance Diagnosis. Hamilton, Canada. Ontario Horticultural Crops Conference. February 12, 2001. (with Tom Dyson and Gerald Holmes).
 48. Alternatives to methyl bromide in vegetable production systems. CES Chowan County meeting. February 27, 2001. (remote Presentation).
 49. Vegetable Disease Diagnosis and Management: Putting it all Together. 52nd Annual Crop Protection School. Raleigh, NC. January 5, 2001. (F.J. Louws and G.Holmes).
 50. Pepper: Phytophthora crown rot resistant cultivars. 15th Annual Southeast Vegetable and Fruit Expo, Greensboro, NC. December 12, 2000.
 51. Tomatoes: Real World Soil-Borne Disease Management for the Future. 15th Annual Southeast Vegetable and Fruit Expo, Greensboro, NC. December 12, 2000.
 52. Alternatives to methyl bromide for weed control in tomato. 15th Annual Southeast Vegetable and Fruit Expo, Greensboro, NC. December 12, 2000. (Poster: J. Leindecker, D. Monks, D. Sanders and F.J. Louws).
 53. Results from bacterial spot and speck research program. Southeastern Vegetable Recommendation Meeting. Fletcher, NC. September 20, 2000.
 54. Disease management and identification in potato, tomato, and pepper production. Southern States Cooperative Training Series. Cunningham Res. Station, Kinston, NC. July 12, 2000.
 55. Field Study of disease and insect pest infestations: Monitoring and forecasting. Southern States Cooperative Training Series. Cunningham Res. Station, Kinston, NC. July 12, 2000.
 56. Field Study of specialized tillage and spray equipment. Southern States Cooperative Training Series. Cunningham Res. Station, Kinston, NC. July 12, 2000.
 57. Alternatives to methyl bromide for the production of plasticulture tomatoes in North Carolina. Rowan Co. Tomato Field Day. June 15, 2000.
 58. Diagnosis of vegetable diseases. Plant Pathology Graduate Student/ Plant Disease and Insect Clinic Training Series. June 8, 2000.
 59. Development of integrated management strategies to control Phytophthora in pepper. NSF Center for Integrated Pest Management. Semi-annual meeting. April 12, 2000.
 60. New fungicides for cucurbits and tomatoes and the management of resistance. Eighteenth Annual Eastern North Carolina Vegetable School. Lenoir Co. February 4, 2000.
 61. Diagnosis of vegetable and strawberry diseases. Plant Pathology Graduate Student/ Plant

- Disease and Insect Clinic Training Series. June 18, 1999.
62. Bacterial Disease Control. Tomato Extension Meeting. Rowan Co. Feb 3, 1999.
 63. Principles of Vegetable Foliar Disease Control. 17th Annual Eastern North Carolina Vegetable School. Lenoir Co. Jan 29, 1999.
 64. Transplant Production: Disease Considerations. Southeast Vegetable & Fruit Expo. Greensboro, NC, Dec. 16, 1998. (with G. Holmes).
 65. Peppers: Management tools for Phytophthora. Southeast Vegetable & Fruit Expo. Greensboro, NC, Dec. 14, 1998.
 66. Diagnosis of wilt diseases of tomato and pepper. F. Louws. Plant Pathology Graduate Student/ Plant Disease and Insect Clinic Training Series. July 31, 1998.
 67. Comparison of Biocontrol Agents for Tomato Foliar Diseases. P. Shoemaker and F. Louws. Fresh Market Tomato Field Day, Mountain Horticultural Crops Research Station, Fletcher, NC. August 4, 1998.
 68. Integrated Disease Management in Vegetable Production. Columbus Co. Vegetable growers meeting (CES-sponsored). May 7, 1998.
 69. Phytophthora Management in Peppers and Cucurbits. F.J. Louws and G. Holmes. Mar 3, 1998. Duplin Co. (A regional pepper meeting and discussion time).
 70. Principles of Fungicide Resistance Management. Western North Carolina Vegetable Conference. Asheville, NC. February 18, 1998.
 71. Vegetable grower needs and priorities. Roundtable discussion. Graham, Alamance Co. NC January 21, 1998.
 72. Black rot: Is it coming back?. Southeast Vegetable & Fruit Expo. Greensboro, NC, Dec. 17, 1997.
 73. Update on bacterial fruit blotch of watermelon and the Food Quality Protection Act. Southeast Vegetable & Fruit Expo. Greensboro, NC, Dec. 15, 1997.
 74. Identification and management of tomato diseases. Tomato Field Day, Rowan Co. June 24, 1997.
 75. Disease Management Strategies. Area Cabbage Field Day. Tabor City, NC. May 22, 1997.
 76. Watermelon disease ID and control. Chowan, Co. Mar 13, 1997.
 77. Managing diseases of cucurbits. Regional Cucurbit, melon and pepper meeting. Wilson, Co. Mar 10, 1997.
 78. Bacterial fruit blotch and disease update. 16th annual NC Watermelon Convention. Mar 8, 1997.
 79. Black rot IPM. Elizabeth City, NC. February 24, 1997.
 80. Vegetable grower needs and priorities. Roundtable discussion. Graham, Alamance Co. NC February 15, 1997.
 81. Phytophthora crown and root rot of peppers. Eastern North Carolina Vegetable School, Kinston, NC February 7, 1997.
 82. Managing diseases of vegetables. Sanford, Lee Co., NC February 6, 1997.
 83. Managing diseases of vegetables. Derby, Richmond Co., NC February 4, 1997.
 84. Managing diseases of tomatoes. Salisbury, Rowan Co., NC February 3, 1997
 85. Black rot of cabbage and other crucifers. Tabor City, NC. January 30, 1997.
 86. DNA forensics: Identifying criminal bacteria. Annual Southeast Vegetable and Fruit Expo. Greensboro, NC, Dec 11, 1996.
 87. Watermelon Field Day. Chowan Co. July 24, 1996. Co-organized by J. Schultheis and T. Dyson.
 88. Brown bag lunch plant disease clinic session with graduate students. July 12, 1996.
 89. Management of vegetable diseases. Lenoir Co. vegetable tour. June 20, 1996.
 90. Reduced tillage, cover crop use and disease management in tomato. Chowan Co. Vegetable meeting. Mar 12, 1996.
 91. Watermelon bacterial fruit blotch and disease update. 15th annual NC Watermelon Convention. Mar 9, 1996.

92. Integrated management of Herb diseases. NC Annual Herb Conference. Wake Co. Feb 24, 1996.
93. Cucumber disease update. Nash Co. Feb 21, 1996.
94. Reduced tillage, cover crop use and disease management in tomato. Lee County Vegetable meeting. Feb 1, 1996.

STRAWBERRY DISEASE MANAGEMENT

1. Diagnosis and integrated management of Strawberry Diseases. Southeast Strawberry Expo. Charlotte, NC. 7 November, 2008.
2. Current status of Methyl Bromide alternatives. (RM Welker). Southeast Strawberry Expo. Charlotte, NC. 7 November, 2008.
3. Strawberry preplant meeting: Pre-plant disease alert for 2008-2009 strawberry season. Davidson County, NC. August 6, 2008. (M. Rahman and F.J. Louws).
4. Integrated management of strawberry diseases. FOR: Small Fruit conference for small-scale Mountain farmers. Fletcher, NC. 9 May 2008.
5. Update on major strawberry diseases. Strawberry Field Day, Clayton NC. May 7, 2008. (M. Rahman and F.J. Louws)
6. Disease control 101: Use of fungicides and their activity. Southeast Strawberry Expo. RTP, NC. 12 November, 2007.
7. Methyl bromide alternatives in strawberry. (Welker, R.M. and F.J. Louws). RTP, NC. 12 November, 2007.
8. Strawberry preplant meeting. Preventive measures against Colletotrichum crown rot. Nash County, NC. August 9, 2007. (M. Rahman and F.J. Louws).
9. Disease Update. Strawberry Field Day, Clayton NC. May 2, 2007.
10. Disease management of strawberry fruit diseases. Lillington, NC (tri-county grower meeting). 23 Jan, 2007.
11. Recommendations for methyl bromide alternatives. (Welker). Lillington, NC (tri-county grower meeting). 23 Jan, 2007.
12. Methyl Bromide: On-Farm Trials and research. (Welker, Driver and Louws). Southeast Strawberry Expo. Sunset Beach, NC. 10 November, 2006.
13. Strawberry Diseases. Southeast Strawberry Expo. Sunset Beach, NC. 10 November, 2006.
14. Small Sprayers. (Driver and Louws). Southeast Strawberry Expo. Sunset Beach, NC. 10 November, 2006.
15. Plant Health Program Strawberry. Strawberry Plant Health Working group. Raleigh, NC. March 9, 2006.
16. Current research in methyl bromide alternatives. Strawberry Field Day, Clayton NC. May 3, 2006.
17. Foliar and Fruit Diseases of Strawberry. Strawberry Field Day, Clayton NC. May 3, 2006.
18. Anthracnose problems and management options in the nursery. Workshop for Certified Strawberry Plant Growers. Raleigh NC. December 1, 2005.
19. Current disease issues. Southeast Strawberry Expo. RTP, NC. 7 November, 2005.
20. Diagnosis of plant problems. Southeast Strawberry Expo. RTP, NC. 7 November, 2005.
21. Methyl bromide alternatives and management of soilborne pests. Southeast Strawberry Expo. RTP, NC. 7 November, 2005.
22. Disease management and methyl bromide alternatives update. Clayton Research Station Strawberry Field Day. May 4, 2005.
23. Methyl Bromide Alternatives: Research Overview. Southeast Regional Methyl Bromide

- Alternatives Agent Training Workshop. Raleigh, NC. 24 February 2005.
24. Methyl Bromide Alternatives: On-Farm Research. Southeast Regional Methyl Bromide Alternatives Agent Training Workshop. Raleigh, NC. 23 February 2005.
 25. Issues and advances in pest and disease management. Southeast Strawberry Expo. High Point, NC. 3 November, 2004.
 26. On-farm methyl bromide alternative trials. Southeast Strawberry Expo. High Point, NC. 3 November, 2004. (J.G. Driver and F.J. Louws).
 27. Strawberry Preplant Meeting: Disease Management Recommendations. Kinston, NC. July 29, 2004.
 28. Strawberry Preplant Meeting: Disease Management Recommendations. Sanford, NC. July 22, 2004.
 29. Current Botrytis and Anthracnose Recommendations. Piedmont Region Pre-Harvest Meeting. Guilford Co. 15 March 2004.
 30. Fruit Disease Management in Strawberry Production Systems. 2004 Strawberry School and Trade Show. Virginia Beach, VA. 3 March, 2004.
 31. Methyl bromide alternatives research. 2004 Strawberry School and Trade Show. Virginia Beach, VA. 3 March, 2004.
 32. Fresh Dug Plant Sources. Clayton Research Station Strawberry Field Day. May 5, 2004.
 33. Disease issues: Botrytis, anthracnose and Phytophthora. Southeast Strawberry Expo. RTP, NC. 10 November, 2003.
 34. Strawberry Preplant Meeting: Disease Management Recommendations. Winston Salem, NC. August 7, 2003.
 35. Strawberry Preplant Meeting: Disease Management Recommendations. Kinston, NC. July 31, 2003.
 36. Strawberry Preplant Meeting: Disease Management Recommendations. Lillington, NC. July 23, 2003.
 37. Methyl bromide alternatives research and anthracnose and Botrytis management research results. Western NC Strawberry Field Day. May 15, 2003.
 38. Anthracnose and Botrytis management research results. Clayton Research Station Strawberry Field Day. May 14, 2003.
 39. Fungicide Evaluations for Botrytis and Anthracnose Management: Products, Scheduling and Efficacy. Castle Hayne Strawberry Field Day. May 8, 2003.
 40. Disease management considerations in strawberry nurseries. Raleigh NC. January 8, 2003.
 41. Update on Diseases. Workshop for Certified Strawberry Plant Growers. Raleigh NC. November 11, 2002.
 42. Proactive pest management. Lisa Ferguson, Leonor Leandro and Frank Louws. North Carolina Strawberry Growers Association Annual Conference. Greenville, NC, November 8, 2002.
 43. Strawberry Preplant Meeting: Anthracnose problems and Disease Management Recommendations. Wilson, NC, August 20, 2002.
 44. Strawberry Preplant Meeting: Anthracnose problems and Disease Management Recommendations. Kinston, NC, August 1, 2002.
 45. Strawberry Preplant Meeting: Anthracnose problems and Disease Management Recommendations. Smithfield, NC, July 23, 2002.
 46. Strawberry Preplant Meeting: Anthracnose problems and Disease Management Recommendations. Reidsville, NC, July 9, 2002.
 47. Methyl Bromide Alternatives Research: Efficacy of drip applied products in NC. North American Strawberry Growers Association Annual Conference. Research Triangle Park, NC. February 6, 2002.
 48. What's new in disease management? North American Strawberry Growers Association Annual Conference. Research Triangle Park, NC. February 6, 2002.
 49. Disease management considerations for strawberry plugs. North American Strawberry Growers

- Association Annual Conference. Research Triangle Park, NC. February 5, 2002.
50. Incidence and management of Phytophthora crown rot in NC. North American Strawberry Growers Association Annual Conference. Research Triangle Park, NC. February 5, 2002.
 51. Strawberry disease identification and management. North American Strawberry Growers Association Annual Conference. Research Triangle Park, NC. February 5, 2002.
 52. Strawberry Preplant Meeting: Current research in MB alternatives research and disease update. Goldsboro, NC. August 9, 2001.
 53. Disease diagnosis and management in strawberry nurseries. North Carolina Micropropagation Unit and growers meeting, NCSU. August 8, 2001.
 54. Strawberry Preplant Meeting: Current research in MB alternatives research and disease update. Prospect Hill, NC. August 6, 2001.
 55. Strawberry Preplant Meeting: Current research in MB alternatives research and disease update. Whiteville, NC. July 19, 2001.
 56. Strawberry Preplant Meeting: Current research in MB alternatives research and disease update. Reidsville, NC. July 17, 2001.
 57. Methyl bromide alternatives research and disease update. Clayton, NC, Strawberry Field Day. May 3, 2001.
 58. Alternatives to Fumigation with Methyl Bromide in Annual Strawberry Production. 52nd Annual Crop Protection School. Raleigh, NC. January 4, 2001. (M.A. Grabowski, F.J. Louws and G.E. Fernandez).
 59. Research Update in Disease Management. Southeast Strawberry Expo. Raleigh, NC. November 10, 2000.
 60. Alternative to Methyl Bromide for Strawberry Production. Southeast Strawberry Expo. Raleigh, NC. November 9, 2000. (F.J. Louws and G.E. Fernandez)
 61. Current Research and Strategies to Manage Diseases of Strawberries. Southeast Strawberry Expo. Raleigh, NC. November 9, 2000. (2 sessions).
 62. Research Progress in Methyl Bromide Alternatives. Southeast Strawberry Expo Field Day. Faison, NC. November 8, 2000. (J. Driver, F.J. Louws and G.E. Fernandez)
 63. Fruit Production: Strawberries Track. 15th Annual Sustainable Agriculture Conference. Wilmington, NC. November 4, 2000. (M. A. Grabowski and F.J. Louws).
 64. Strawberry Disease Management: Preplant Considerations. Johnston Co. Regional Strawberry pre-plant meeting. August 23, 2000.
 65. Strawberry Disease Management: Preplant Considerations. Rockingham Co. Regional Strawberry pre-plant meeting. July 11, 2000.
 66. Alternatives to methyl bromide for plasticulture strawberries in NC. NSF Center for Integrated Pest Management. Semi-annual meeting. April 12, 2000. (G.E. Fernandez and F.J. Louws).
 67. Commercial strawberry & vegetable pathology. Lincolnton Citizens Center, Lincoln Co. January 27, 2000. (a 2 hr presentation composed of 3 talks: Principles of disease management, Strawberry disease management, and Vegetable disease management).
 68. Micro-propagated strawberry plants grown in Canada and North Carolina. Southeast Strawberry Expo field day, Central Crops Research Station, Clayton, Johnston Co. Nov 5, 1999. (with E. Bish).
 69. New chemistry for strawberries. Southeast Strawberry Expo. Session chair and presenter. Wake Co. Nov 5, 1999.
 70. Report on 1999 Research Trials. Southeast Strawberry Expo. Wake Co. Nov 5, 1999. (with G.E. Fernandez).
 71. Compost-based and chemical-based alternatives to methyl bromide. Field Day tour of Vollmer Farms and NCSU research plots. Southeast Strawberry Expo. Franklin Co. Nov 4, 1999. (with M.A. Grabowski, J. Vollmer and G.E. Fernandez).
 72. Plant source study. Field Day tour of Vollmer Farms and NCSU research plots. Southeast Strawberry Expo. Franklin Co. Nov 4, 1999. (with E. Bish).

73. New Grower Workshop: Disease management in strawberry production systems. Southeast Strawberry Expo. Wake Co. Nov 4, 1999.
74. Insect, Weed and Disease Clinic: Update on Disease Management in Strawberries. Southeast Strawberry Expo. Wake Co. Nov 4, 1999. (2 sequential presentations).
75. Strawberry pre-plant considerations: Disease management. Lee Co. Regional Strawberry pre-plant meeting. September 9, 1999.
76. Strawberry pre-plant considerations: Disease management. North-Central Regional Strawberry pre-plant meeting. August 19, 1999.
77. Strawberry pre-plant considerations: Disease management. Mountains Regional Strawberry pre-plant meeting. August 17, 1999.
78. Strawberry pre-plant considerations: Disease management. Lenoir Co. Regional Strawberry pre-plant meeting. August 5, 1999.
79. Current Disease Situation and Emergency Registration of Quadris. NCSU Strawberry Field Day. Clayton, NC. May 6, 1999.
80. Update on methyl bromide alternatives research. NCSU Strawberry Field Day. Clayton, NC. May 6, 1999.
 - 3) Current Research in Methyl Bromide Alternatives and Disease Management. Strawberry Field Day, Clayton, Johnston Co. Nov 6, 1998.
81. Methyl Bromide Alternatives. Southeast Strawberry Expo. Wake Co. Nov 6, 1998.
82. Gray Mold and Anthracnose Management. Southeast Strawberry Expo. Wake Co. Nov 6, 1998. (2 sequential presentations).
83. Report on 1998 Visit to Canadian Nurseries. Southeast Strawberry Expo. Wake Co. Nov 5, 1998. (with E. Bish, K. Sorenson and G. Logan).
84. Update on Disease Management in Strawberries. Southeast Strawberry Expo. Wake Co. Nov 5, 1998. (3 sequential presentations).
85. Research Results and Disease Management Recommendations for the 1998-1999 Season. Regional Strawberry Pre-Plant Meeting. Franklin Co. August 20, 1998.
86. Research Results and Disease Management Recommendations for the 1998-1999 Season. Regional Strawberry Pre-Plant Meeting. Lenoir Co. August 18, 1998.
87. Research Results and Disease Management Recommendations for the 1998-1999 Season. Regional Strawberry Pre-Plant Meeting. Caldwell Co. August 12, 1998.
88. Methyl Bromide Alternatives Research. Small Fruit Field Day, Mountain Horticultural Crops Research Station, Fletcher, NC. May 21, 1998.
89. Anthracnose And Other Diseases In Southeastern Strawberry Production Systems. South Carolina Regional Small Fruit Meeting. Charleston, SC. February 17, 1998.
90. Alternatives to methyl bromide and update on anthracnose and Botrytis. Georgia Strawberry Grower's Association. Macon, GA. January 24, 1998.
91. Identifying and managing diseases of strawberry. Insect and Disease Clinic: Southeastern Strawberry Expo, Raleigh, NC. Nov 14, 1997.
92. *Botrytis* Field Experiments. Strawberry Grower Field Day, Johnston Co. Nov 13, 1997. L. Carver and F. J. Louws.
93. Strawberry plant phenology and incidence of latent infection of *Botrytis cinerea*. Carver, L.M., G.E. Fernandez and F.J. Louws. Lenoir Co. Aug 19, 1997.
94. Botrytis Screening/Control Strategies. Strawberry field day, Clayton, NC Nov 15, 1996.
95. Identifying and managing diseases of strawberry. Insect and Disease Clinic: Southeastern Strawberry Expo, Raleigh, NC. Nov 15, 1996.
96. Control of angular leafspot of strawberry. Southeastern Strawberry Expo, Raleigh, NC. Nov 14, 1996.
97. Management of strawberry diseases. Area preplant strawberry meeting, Lenoir Co. Aug 7.

SUSTAINABLE/ORGANIC AGRICULTURE

1. “Grafting Tomatoes in Multi-bay High Tunnels to Overcome Soilborne Diseases”. Haygrove High Tunnels Owners Conference – 12/05/2008. Lancaster, PA. (C. Rivard)
2. “Tomato Grafting Technique and Demonstration”. Haygrove High Tunnels Owners Conference – 12/05/2008. Lancaster, PA. (C. Rivard).
3. “Choosing Rootstock for Soilborne Disease Management” and “Case Study: High Tunnel and Grafting Research at CEFS”. 2008 Chatham County Tomato Grafting Workshop – 11/12/2008. Pittsboro, NC. (C. Rivard).
4. “High Tunnels and Grafting for Disease Management in Organic Tomato Production” –NCSU Plant Pathology departmental tour showcasing research in NC. Jack Bailey Memorial Tour – 08/14/2008. Goldsboro, NC. (C. Rivard).
5. “High Tunnels and Grafting for Disease Management in Organic Tomato Production” –NCSU Plant Pathology departmental tour showcasing research in NC. Jack Bailey Memorial Tour – 08/14/2008. Goldsboro, NC. (C. Rivard).
6. “Grafting for Soilborne Disease Management” – IPM session. Organic Growers School – 03/08/2008. Flat Rock, NC. (C. Rivard).
7. “Grafting Tomatoes in Multi-bay High Tunnels to Overcome Soilborne Diseases” – Research trial overview and grafting discussion with local growers. Cedar Meadow Farm Field Day – 07/09/2008. Holtwood, PA. (C. Rivard).
8. Grafting tomatoes and high tunnel tomato production. Center for Environmental Center Sustainable Ag Series. Twilight Tour. May 15, 2008.
9. Organic Disease Control in Vegetable and Strawberry Crops. Johnston County extension Program. 17 Apr 2008.
10. ‘Grafting Rootstocks onto Heirloom and Locally Adapted Tomato Selections to Confer Resistance to Soil Borne Diseases and Increase Nutrient Uptake for Market Gardeners’ New American Farm Conference. Mary Peet, Suzanne O’Connell, Frank Louws, Cary Rivard, and Chris Harlow. Advancing the Frontier of Sustainable Agriculture. Kansas City, MI. March 25-27, 2008. Poster available at: <http://www.sare.org/2008Conference/posters.htm>.
11. “Using High Tunnels and Organic Practices to Produce Grafted Heirloom Tomatoes” – High Tunnel session. 22nd Annual Southeast Vegetable & Fruit Expo – 12/13/2007. Myrtle Beach, SC. (C. Rivard and F.J. Louws).
12. “Grafting and High Tunnels for Organic Heirloom Tomato Production” – SARE Extension Track. Carolina Farm Stewardship Assoc Sustainable Agriculture Conf – 11/10/2007. Durham, NC. (C. Rivard and S. O’Connell).
13. “Tomato Grafting Workshop” – Field day celebrating the Center for Environmental Farming Systems. Seasons of Sustainable Agriculture Fall Festival – 10/15/2007. Goldsboro, NC. (C. Rivard).
14. Advanced half-day grower workshop including grafting technique and research. Seasons of Sustainable Agriculture Tomato Grafting Workshop – 10/03/2007. Goldsboro, NC. (C. Rivard).
15. Chatham County Tomato Grafting Workshop; Advanced half-day grower workshop including grafting technique and research. (With C. Rivard) Pittsboro, NC 15 Mar 2007.
16. “Tomato Grafting Workshop” – Field day celebrating 10th anniversary for the Center for Environmental Farming Systems. Seasons of Sustainable Agriculture Fall Festival – 10/16/2006. Goldsboro, NC. (C. Rivard).
17. “Grafting Provides Sustainable and Profitable Technology in Organic Heirloom Tomato Production Systems” – Poster Presentation. National SARE Conference – 09/16/2006. Oconomowoc, WI. (C. Rivard).

18. “Vegetable Grafting Provides Disease Management and Increased Crop Productivity for Greenhouse Production” – Advanced Grower Workshop. NC Cooperative Extension Regional Greenhouse Workshop – 02/02/2006. Fletcher, NC. (C. Rivard).
19. “Inducing Disease Resistance and Increased Yields in Heirloom Tomato Production Systems Through Grafting” – Advanced Organic Grower Workshop. Carolina Farm Stewardship Assoc Sustainable Agriculture Conf – 11/05/2005. Durham, NC. (C. Rivard).
20. Successful Organic Tomatoes in the Coastal Plain. 2004 Coastal Organic Growers School. Wilmington NC 27 Feb, 2004.
21. Holistic Health in the Garden and Landscape. 2004 Coastal Organic Growers School. Wilmington NC 27 Feb, 2004.
22. Research in Compost and Plant Disease Management. Small Farm Organic Training Series. Chatham County. October 20, 2003.
23. Plant Disease Diagnosis and Organic Disease Management. Small Farm Organic Training Series. Chatham County. August 4, 2003.
24. Advanced Vegetable Diseases Workshop: Managing tomato and pepper diseases in organic systems. 10th Annual Organic Growers School. BlueRidge Comm. Coll. Flat Rock, NC. 15 Mar, 2003.
25. Plant Disease Identification in Organic Crop Production. FOR: Organic and Transitional Grower Workshop. Center for Env. Farming Systems. 22 July, 2002.
26. Sustainable Agriculture: Soil Biology and Beneficial Organisms. 15th Annual Southeast Vegetable and Fruit Expo, Greensboro, NC. December 12, 2000.
27. Genetic Engineering: What is it? How does it affect us? 15th Annual Sustainable Agriculture Conference. Wilmington, NC. November 5, 2000. (F.J. Louws and M.Sligh).
28. Soil Biology and Beneficial Organisms. 15th Annual Sustainable Agriculture Conference. Wilmington, NC. November 4, 2000. (F.J. Louws and M.Barbercheck).
29. Disease management in vegetable production systems. Undergraduate course in sustainable agriculture. July 5, 2000. Goldsboro, NC.
30. Ecologically-based pest management. Undergraduate course in sustainable agriculture. July 5, 2000. Goldsboro, NC.
31. Advanced biological pest management: Frontiers of biological controls research. 14th Annual Sustainable Agriculture Conference. High Point, NC. November 13, 1999.
32. Induced Resistance and Biological Control. Organic Field Day. Center for Environmental Farming Systems, Goldsboro. June 3, 1998.
33. Managing the soil food web for optimal production. 12th annual Sustainable Agriculture Conference, Flat Rock, NC. Nov 16, 1997. (Elaine Ingham was lead presenter, F.J. Louws supportive role).
34. Plant Pathology and Precision Agriculture. Poster Display. Precision Agricultural Field Day. Cherry Farm, Greensboro, NC. Jun 18, 1996.

GREENHOUSE VEGETABLE DISEASE MANAGEMENT

1. Current Disease Management Strategies and Issues for Greenhouse Tomatoes. NC-Greenhouse Growers Conference. Oct 25, 2006. Raleigh, NC
2. Managing greenhouse tomato disease and disorders. 20th Annual Southeast Vegetable and Fruit Expo, Myrtle Beach, SC. December 14, 2005.
3. Resource for Growers to Diagnose Diseases and Disorders. 18th Annual Southeast Vegetable and Fruit Expo, Greenville, NC. December 2, 2003.
4. Disease Management: New Tools and Changes in EPA Standards for Greenhouse Use. North

- Carolina Greenhouse Growers Association Annual Meeting. Raleigh, NC. October 8, 2002.
5. Trouble shooting in greenhouses. North Carolina Greenhouse Growers Association Annual Meeting. Raleigh, NC. October 23, 2001.
 6. Using Messenger in NC greenhouses to control Botrytis. J. Driver and F.J. Louws. North Carolina Greenhouse Growers Association Annual Meeting. Raleigh, NC. October 23, 2001.
 7. Greenhouse Vegetables: Methods and new products for disease control in Greenhouses. 15th Annual Southeast Vegetable and Fruit Expo, Greensboro, NC. December 12, 2000.
 8. New Options for Botrytis and Powdery Mildew Control. North Carolina Greenhouse Growers Association Annual Meeting. Raleigh, NC. October 24, 2000.
 9. Greenhouse Tomato Diseases. Virginia State University Greenhouse Tomato Disease Workshop. Petersburg, VA. September 28, 2000.
 10. New options for disease control. NC Greenhouse Vegetable Growers Association 1999 Annual Meeting. October 27-28, 1999.
 11. Managing Greenhouse Tomato Diseases. Greenhouse Vegetable Field Day. Raleigh, NC. March 16, 1999.
 12. Biorational Greenhouse Research Results. Greenhouse Vegetable Field Day. Raleigh, NC. March 16, 1999.
 13. Disease Control- What Works and What's Legal. North Carolina Vegetable Greenhouse Growers Association Annual Conference. Wake Co. Oct 29, 1998.
 14. Ecologically-based Insect, Disease, and Nutritional Management Practices in the Greenhouse. Greenhouse Research Site Visit. North Carolina Vegetable Greenhouse Growers Association Annual Conference. Wake Co. Oct 29, 1998.
 15. Biological control of *Botrytis*. NC Greenhouse Vegetable Grower's Assn. Annual Mtg. Stanly Co. Oct 30-31, 1996.

MASTER GARDENERS

1. Plant Pathology for Master Gardeners. Durham Co. Master Gardeners Program. NC. February 20, 2003.
2. Participated in long-distance education sessions as part of the Plant Pathology/Entomology MCNC-TV series. Presented timely crop disease information and conducted remote diagnosis of specimens. 2000 (4), 2001 (4), 2002 (3), 2003 (1).
3. Diagnosis and management of tomato diseases. NC Master Gardeners Conference. Goldsboro, NC. May 4, 1999.
4. Participated in long-distance education sessions as part of the Plant Pathology/Entomology MCNC-TV series. Presented timely crop disease information and conducted remote diagnosis of specimens. May 12, June 9, July 14, July 28, 1999.
5. Disease Diagnosis and Integrated Management. Cumberland Co. Master Gardeners Program. NC. March 12, 1998.
6. Disease Diagnosis and Integrated Management. Orange Co. Master Gardeners Program. Orange County, NC. March 10, 1998.
7. Participated in long-distance education sessions as part of the Plant Pathology/Entomology MCNC-TV series. Presented timely crop disease information and conducted remote diagnosis of specimens. Four sessions, 1998
8. Diagnosing Tomato Diseases. Southeast District Master Gardener Conference. Greenville, Pitt Co. NC. October 24, 1997. (4 recurrent presentations).
9. Vegetable Diseases: Identification and Control. Regional All-Day Master Gardener Volunteer Advanced Training. Raleigh, NC. June 5, 1997. (2 workshops)

10. Integrated Disease Management for Master Gardeners. Hamett Co. April 18, 1997.
11. Integrated Disease Management for Master Gardeners. Cumberland Co. Mar 12, 1997.
12. Participated in long-distance education sessions as part of the Plant Pathology/Entomology MCNC-TV series. Presented timely crop disease information and conducted remote diagnosis of specimens. May 20, July 8, Aug 5, 1997
13. Integrated Disease Management for Master Gardeners. Cumberland Co. Mar 8, 1996.
14. Integrated Disease Management for Master Gardeners. Harnett Co. Mar 5, 1996.
15. Participated in long-distance education sessions as part of the Plant Pathology-Entomology MCNC-TV series. Presented timely crop disease information and conducted remote diagnosis of specimens. May 16, June 12, July 10, Aug 7, 1996; May 20, July 8, Aug 5, 1997

d) Other Outreach Activities (Community):

- Organized campus tour for ~30 high school students and their drivers (parents) to view programs in toxicology, chemistry, fungal genomics and genomics research. May 20, 2008.
- Organized campus tour for ~17 high school students and their drivers (parents) to view programs in chemistry, fungal genomics and genomics research. May 22, 2007.
- Helped organized a 12 County-wide Science Fair and organized lab tours on campus. February 12, 2005. 44 elementary to high school kids participated; organized tours for 89 people; had 164 people attend the fair.
- The invisible world. NC-State Fair Show in Healthy Farms/Healthy Families Pavilion. October 23, 2003.
- Helped organized a 12 County-wide Science Fair and organized lab tours on campus. February, 2003. ~80 Elementary to high school kids participated.
- Helped organized a 12 County-wide Science Fair and organized lab tours on campus. February, 2002. 86 elementary to high school kids participated.
- Helped organize and judge a community Science Fair, Wake. Co. February 26-27, 1999 and February 12, 2000; February, 2001.
- Basic Microbiology. (Conducted 3 afternoons of hands-on teaching in microbiology); 14 students ages 12-15. January 14, 21 and February 5, 1999.
- How to do a Science Project for a science fair. Parents Information night. Triangle Christian Academy. October 22, 1998.

e) Plant Disease and Insect Clinic, Samples Diagnosed:

Dedicate up to 20% of my time during the busy season to conduct disease diagnosis. For graphical presentation of clinic activity see Figure 5 Appendix A pg. 70.

Crop	Number of Samples each Year					
						2008
Strawberry						77
Tomato						90

Vegetables						31
Other (herbs etc)						7
Totals (=4528)						255

Crop	Number of Samples each Year					
	2007	2006	2005	2004	2003	2002
Strawberry	105	70	77	88	106	118
Tomato	95	56	77	99	116	107
Vegetables	37	43	41	50	35	41
Other (herbs etc)	8	4	8	8	6	9
Totals (=4273)	245	173	203	245	263	275

Crop	Number of Samples each Year					
	2001	2000	1999	1998	1997	1996
Strawberry	168	169	na	na	138	63
Tomato	294	289	na	na	227	----
Vegetables	70	64	na	na	62	355
Other (herbs etc)	21	13	na	na	18	14
Totals	553	535	488	416	445	432

B. EXTENSION PROGRAM IMPACT HIGHLIGHTS: (selected)

1) Strawberry Disease Management:

Mission: To develop fundamental knowledge and implement applied recommendations to enable commercial growers to successfully manage diseases of strawberry.

The strawberry plant pathology program has emerged as a leading Plant Pathology Program throughout the Southeast and can be ranked as one of the top programs in Eastern North America, particularly as it relates to plasticulture production of annual strawberries. This is not a boast as much as it is a privilege and responsibility. I have been graced by outstanding graduate students, post-docs, colleagues, associates, stakeholder cooperators and superior funding opportunities enabling depth in research and extension to address major and minor issues in both a proactive and reactive mode. Proactive activities include projects to enhance basic biology knowledge and development of cost-effective management tactics. Reactive efforts include timely, effective and rapidly adopted recommendations when a serious disease problem occurs due to environmental conditions or plant-source problems. We have generated novel information on the biology and management of major plant pathogens including Botrytis, the two major Colletotrichum species (ripe fruit rot and crown rot pathogens), Phytophthora crown rot including the description of a new species; and the black root rot complex.

Key indicators of impact include:

- c) Invited talks to many of the major Horticultural Conferences in the Southeast and Eastern North America including: Ontario Canada (2 times), New Jersey, Pennsylvania, Arkansas, Florida, Virginia, Georgia, yearly invitations to the North Carolina Strawberry Growers Association annual meeting (functionally a Southeastern event), and invitations to the North American Strawberry Growers Association.
- ii) The development of an integrated and comprehensive management program to manage gray mold and anthracnose including direct work with local and foreign nursery suppliers, the promotion of certified plants and the implementation of effective fungicide programs. Our fungicide program is based on intensive research efforts designed to ensure efficacy against both diseases, minimize the potential of selecting populations resistant to the fungicides, and ensure economic viability.

Our recommendations have been directly incorporated into Commercial Vegetable [and strawberry] Production Recommendations in DE, MD, PA, NJ and VA. Each production guide specifically recognizes the contribution of our program in a manner as follows:

2005 Revisions Prepared by

Charles A. McClurg [Emeritus], C. Edward Beste, John C. Bouwkamp, and Robert J. Rouse [Emeritus](Horticulture); Kathryn L. Everts (Plant Pathology); James L. Linduska,[Emeritus], Amy E. Brown and Galen P. Dively (Entomology); Frank J. Louws (Plant Pathology), North Carolina State University, in cooperation with the University of Delaware; The Pennsylvania State University; Rutgers, The State University of New Jersey; and Virginia Polytechnic Institute and State University.



Likewise, our recommendations are the major source of plant pathology information for the Southeastern Regional Small Fruits Guide. (GA, SC, TN, NC).

<http://www.smallfruits.org/SmallFruitsRegGuide/Guides/2008/08StrawberryIntegMgmtGuideDec10.pdf>

Finally, states such as Arkansas, Ohio and others that practice plasticulture rely extensively on our research and recommendations.

iii) Our disease management strategies and extension recommendations are estimated to return 1.5 million dollars in net income to NC growers per year.

2) Methyl Bromide Alternatives Research and Extension:

Mission: To conduct discovery and applied research (biologically based knowledge) and to implement applied recommendations to enable commercial strawberry and vegetable growers to successfully transition from methyl bromide to alternative fumigants or alternative farming systems.

Our program has provided primary leadership. In 2000 interdisciplinary, multi-state, and (stakeholder) participatory research, extension and educational programs were implemented to evaluate, adopt, and develop alternatives to methyl bromide (MB) in strawberry and vegetable production systems.

From 2000-2008, forty nine Phase I trials (research conducted on research stations to evaluate new products or farming practices) and 40 Phase II trials (on grower farms) were implemented. The results of this research were translated into an aggressive extension effort to train agents (field faculty), growers, and other stakeholders. Over 50 research and extension articles or abstracts were published. Results were translated to key stakeholders through over 15 field and agent training programs and over 30 presentations at grower meetings and commodity conferences. Research projects focused on development of integrated approaches to manage key soilborne pests. More recently, we have conducted detailed economic analysis to develop tools that will be useful for growers, regulators, and others to make sound economic decisions.

IMPACT:

Research efforts in this project generated new knowledge about the biology, ecology, and management of soilborne pathogens associated with strawberry roots. This fundamental knowledge will provide an informed basis to develop management programs as MB use declines. Biological and chemical alternatives to MB were evaluated in multiple replicated and observational strawberry, double-cropped, and vegetable trials. Issues unique to each alternative need to be resolved through additional research but our research provides a solid scientific basis for strawberry and vegetable growers who desire to implement alternatives in site and problem specific ways. Our research and extension programs will

mitigate the possible direct loss of \$14 million per year to Southeastern US growers (GA, NC, TN, VA) if methyl bromide is phased out.

Key indicators of impact include:

i) Invited presentations to major horticultural conferences and commodity meetings including invited talks to Florida, Arkansas, Virginia, Ontario Canada, yearly invitations to the North Carolina Strawberry Growers Association annual meeting (functionally a Southeastern event), invitations to the North American Strawberry Growers Association, Southeastern Vegetable and Fruit Expo, and the North Carolina Horticultural Council, Inc.

ii) Widespread adoption of our research-based recommendations for use of alternatives in strawberry and vegetable production systems. (Transition is really commencing as of 2005).

iii) Successful competition for Critical Use Exemptions for strawberries, cucurbits, peppers and tomatoes in the Southeastern regions to enable growers more time to transition. We provided essential documentation and support.

iv) Recurrent successful competition for competitive funds in a very competitive environment (8-25% successrate).

v) Mitigation of an estimated \$14 million per year, based on detailed budgets and economic analysis, for Southeastern growers.

3) Tomato Disease Management (emphasis on bacterial diseases, TSWV and Grafting):

Mission: To develop fundamental knowledge and implement applied recommendations to enable commercial growers to successfully manage diseases of tomato with emphasis on bacterial diseases, TSWV, and Grafting/soilborne disease management)

Characterization of *Pseudomonas syringae* pv. *tomato* populations and development of IPM protocols to control bacterial speck of tomato: Bacterial speck has become a recurrent and serious concern in the Western North Carolina tomato production region. I collaborated with Dr. Paul Shoemaker and we systematically surveyed 13 to 14 different farms per year in 6 counties for incidence of speck and collected and characterized over 200 isolates over a 2 year period. All strains were found to be copper tolerant, streptomycin resistant, and race 0, with a very limited number of polymorphisms based on genomic fingerprinting protocols.

Over three years of disease management studies demonstrated a multi-tactic approach offered optimum control including the treatment of seed with bleach, two streptomycin applications during transplant production, and recurrent use of Actigard to induce systemic acquired resistance in the field. Dr. Shoemaker and I developed a program to optimize the use of Actigard for suppression of bacterial speck within a comprehensive disease management program, with no negative effects on yield. This program has been widely adopted by growers.

We initiated a grafting project focusing primarily on organic growers and heirloom tomato production. We wrote an extension Bulletin and made 2000 copies that were all requested in 2 years. Our grafting work has generated national interest and we have helped organic growers go from high risk disease pressure (and associated low yields in some cases) to reduced risk and substantially improved yields.

Key indicators of impact include:

i) Most commercial growers follow our IPM-based recommendations to manage bacterial diseases. Regretfully, in wet years control is yet inadequate.

ii) A national team of people have now organized to develop grafting protocols and technologies for the USA. Organic growers seek our expertise in workshops and on-farm trials.

iii). Invited talks to major vegetable production meetings including field days and grower meetings.

4) Other Impact Highlights:

- established a strong rapport with the NC Strawberry Grower's Assoc.; NC Greenhouse Growers Assoc.; Carolina Farm Stewardship Assoc., the NC Vegetable Growers' Assoc. and Tomato Growers' Assoc.
- function as a mentor and advisor to students and agents, enhancing extension education, applied plant pathology and fundamental concepts/techniques in pathology.

V. SERVICE TO THE UNIVERSITY AND PROFESSIONAL SOCIETIES

A) NATIONAL AND INTERNATIONAL PROFESSIONAL ACTIVITIES:

- Panel Manager: Methyl Bromide Alternatives. USDA (OSQR). Organized and managed panel. 2007 (Panel days 17-18 Sept).
- Member, National Plant Disease Recovery System (NPDRS), Ralstonia Working group. St. Louis, MO. 23 Apr 2007.
- Co-Chair. Special Bacteriology Regulation Committee, American Phytopathology Society 2005-present.

- Symposium co-organizer (with J.B. Jones). Functional Genomics Meets Bacterial Diseases, Part III: Xanthomonas and Xylella Genomics. 2006.
- Panel Member – USDA CAR/RAMP Panel May 16-20 2005, Washington DC.
- Panel Member – USDA CAR/RAMP Panel June 7-10 2004, Washington DC.
- Chair: Bacteriology Committee: American Phytopathology Society (2000-2001; 2001-2002, 2002-2003).
- Special Bacteriology Regulation Committee, American Phytopathology Society 2001-2002; 2002-2003.
- Chair: *Clavibacter* Discussion Session. 10th International Conference on Plant Pathogenic Bacteria 2000.
- Vice-President: Bacteriology Committee: American Phytopathology Society (1999-2000)
- Member of Integrated Pest Management Committee: American Phytopathology Society (1999-present)
- Co-Presided: Plant Disease Management: Cultural Session. APS Annual Meeting August 8, 1999.
- Special Bacteriology Regulation Committee, American Phytopathology Society (1998-2001)
- Plant Pathology Society of North Carolina organizing committee. 1999, 2000.
- Committee member: Center for Environmental Farming Systems: Crop Systems Research and Extension Group.
- Member IR-4 Southeast Regional Planning group.
- Member of Integrated Pest Management Committee: American Phytopathology Society (1996-1998)
- Member of NCR-178 National Bacteriology Working Group
- Member NAPIAP for Strawberries

B) UNIVERSITY/DEPARTMENTAL COMMITTEE ACTIVITIES:

- Nusbaum Symposium Committee – Plant Pathology 50th anniversary celebration (Chair). 2008-2009.
- Crop Protection Committee of North Carolina. Member. 2009-present.
- NCSU-Extension IPM Committee. 1996-2008.
- Committee member: Epidemiology Search Committee. Dept. Plant Pathology. 2007.
- Dept Gardner Hall Space Committee 2006-present.
- Diagnostic Committee 2005-present.
- NCSU Dept Plant Pathology Tailgate representative with Dr. Mila. (developed a live microscope show to attract people). Sept. 9, 2006.
- Epidemiology search committee 2005-2007.
- Departmental Ad-Hoc Non-Tenure Committee. 2005
- Member/leader in various components of the CSREES Departmental Review Committees. 2004-2005.
- North Carolina Cooperative Extension Annual Conference Organizing Committee. (Member) 2004-2005.
- Plant Pathology Department Advisory Committee DAC. (2001-2002; 2002-2003)
- Chair Departmental Seminar Committee 2002-2003; 2003-2004; member 2005-2006.
- Co-Organizer: Departmental Faculty Retreat. May 9-10, 2001.
- Bio-Based Products College Task Force. 1999
- Plant Pathology Department Advisory Committee DAC. (1997- 2000)
- Plant Pathology Department Space Committee (2000).
- Small Fruit Center Faculty Advisor (1997-2000).
- Departmental Social Committee (1996); Organizer: SPA Appreciation Luncheon (1998; 1999)

- Departmental Social Committee, chair (1999)
- Discussion Group Policy Committee (1998)
- Kellogg Endowed Chair for Sustainable Agriculture Planning Committee
- Center For Environmental Farming Systems Planning Committee
- Member of Integrated Pest Management Committee: NCSU-CALS.
- Member: Extension Vegetable Crops Committee (interdepartmental)
- Committee Member: Nausbum Committee (1996-1998)
- Departmental Equipment Committee, Chair (1996)

C) LEADERSHIP/ORGANIZATIONAL ACTIVITIES:

- Organizer: APS Symposium 2009:
- Co-organizer (with R.M. Welker) Methyl Bromide Alternatives Track (4hrs). Southeastern Strawberry Expo. RTP, NC. 12 November, 2007.
- Moderator: Methyl Bromide Alternatives Conference. 31 Oct. a.m. Session, 2007.
- Member: Southeastern Vegetable Extension Workers Group. 1998-present.
- Member: Southeastern Small Fruit Extension Workers Group. 2005-present.
- Invited to be a CORE advisor for the USDA Area Wide Pest Management Program. An allocation of 5 million dollars in the Southeast to assist growers to transition from methyl bromide to alternatives. (I am one of a few University people and the only one North of south Georgia).
- Committee member, NC-Strawberry Growers Association Plant Health Committee. 2007-
- Methyl Bromide Alternatives organizer/moderator. 19th Southeast Vegetable & Fruit Expo. Greenville, NC, Dec. 1, 2004.
- Chair and organizer: Emerging Diseases and Detection Section. ISHS 1st International Symposium on Tomato Diseases and 19th Annual Tomato Disease Workshop. 20-24 June 2004, Grosvenor Resort (Hotel), Orlando, Florida, USA.
- Member of organizing team on Disease Rating Systems. APS pre-meeting Workshop. May 8-9, 2003.
- Moderator, Small Fruit Working Group. APS breakfast meeting. Aug 10, 2003. Charlotte NC.
- Organizer of Methyl Bromide Alternatives section, Disease, Insect and Weed ID section, and What's New in Pest Management section for the North American Strawberry Growers Associations annual meeting. February 4-6, 2002.
- Chair, 16th Annual Southeast Vegetable and Fruit Expo. 2001. (Organized the entire educational program for Dec 10-12, 2001).
- Co-Chair 15th Annual Southeast Vegetable and Fruit Expo. 2000.
- Coordinated Plant Pathology Southeastern Region Report and Participated in the "FQPA Transition Strategy Meeting for Strawberries". Feb. 2-3, 2000.
- Pepper session organizer/moderator. Southeast Vegetable & Fruit Expo. Greensboro, NC, Dec. 14, 1999.
- Organizer. Plant Pathology Society of North Carolina. March 3, 1999.
- Organizer. Plant Disease and Insect Clinic. Annual NC Strawberry Grower's Meeting. November 6, 1998; November 4, 1999.
- Cucurbit session organizer/moderator. Southeast Vegetable & Fruit Expo. Greensboro, NC, Dec. 15, 1997.
- Organizer. Plant Disease and Insect Clinic. Annual NC Strawberry Grower's Meeting. November 14, 1997
- Chair, Southeast Vegetable and Fruit Expo; Cucurbit Session. Dec.15,1997
- Poster Session Coordinator - Carolina Farm Stewardship Association 12th Annual Sustainable Agricultural Conference Nov. 15, 1997
- Program Committee member - Carolina Farm Stewardship Association 11th Annual Sustainable Agricultural Conference 1996

- Program Committee Member - Southeast Vegetable and Fruit Expo; Sustainable Vegetable Production session. 1996
- Organizing Committee Member - 1996 Precision Farming Field Day.
- Advisor: North Carolina Greenhouse Vegetable Growers Assoc. Inc.
- Cucurbit session organizer/moderator. Southeast Vegetable & Fruit Expo. Greensboro, NC, Dec. 15, 1997.

D. PROFESSIONAL REVIEWER ACTIVITIES:

In addition to my role as senior editor for Phytopathology and Section Editor for the Canadian Journal of Plant Pathology, review requests from prestigious journals support the international impact of the microbial ecology component of my program and the recognized expertise of the farming systems, methyl bromide alternatives and plant pathology extension component of my program.

Over 158 manuscripts and competitive grants (ad hoc) reviewed while at NCSU including Phytopathology, Plant Disease, Applied and Environmental Microbiology, Canadian Journal of Plant Pathology, International Journal of Systematic and Molecular Bacteriology, Molecular Ecology, European Journal of Plant Pathology, HortScience, Plant Health Progress, Crop Protection, Soil Science Society of America Journal, Physiological and Molecular Plant Pathology, Agronomie, New Zealand Journal of Crop and Horticultural Sciences, HortScience, Proc. Fla. State. Hort. Soc., Advances in Strawberry Research, Journal of American Society of Horticulture, Journal of Food, Agriculture and Environment (JFAE), USDA-CSREES NRI Competitive Grants Program, National Science and Engineering Research Council (NSERC) Canada National Grants Program, Leopold Center for Sustainable Agriculture (Competitive Grants Program, Iowa State University), USDA-Tropical and Sub-Tropical Agricultural Research Program (T-STAR), IR-4 National pesticide clearance protocol, NCSU Horticulture Leaflets, NCSU departmental (PP, HS, Bot) manuscripts; Tenure packages from other institutions.