**Dr. Ze'ev Schmilovitch December, 2018**

**Part I: CURRICULUM VITAE**

1. **Personal**

Institute of Agricultural Engineering

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Web–site: <http://www.agri.gov.il/en/people/718.aspx>

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| **Dates** | **Description** | |
| 1952 | | Born in Rehovot |

1. **University Education and Additional Training**

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| **Dates** | **Description** |
| 1977 – 1982 | B.Sc. in Agricultural Machinery at The Technion, Israel Institute of Technology, Faculty of Agricultural Engineering |
| 1982 – 1988 | M.Sc. in Agricultural Machinery at The Technion, Israel Institute of Technology, Faculty of Agricultural Engineering  Title of thesis: Variation in apparent density of fluidized bed  Supervision by: Prof. D. Wolf and Dr. A. Zaltzman |
| 1994 – 2000 | Ph.D. in Agricultural Machinery at The Technion, Israel Institute of Technology, Faculty of Agricultural Engineering  Title of thesis: Near infrared spectrometry of fluid produce in its heterogeneous state  Supervision by: Prof. I. Shmulevich and Prof. A. Notea |
| 1989 – 1990 | Sabbatical leave at STI, BTC, Idaho State University, Pocatello, Idaho, USA with Prof. Harry Charyulu  Research subject: Fluidized bed sorting systems |
| 2011 – 2012 | Sabbatical leave at IVIA, Valencia, Spain with Prof. Enrique Molto  Research subject: Orange harvester and LCA of biofuel growing |

1. **Positions Held and Academic Status**

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| --- | --- |
| **Dates** | **Description** |
| 1976-1983 | Practical Engineer, the Institute of Agricultural Engineering, A.R.O. the Volcani Center, Israel |
| 1983-1988 | Promoted to Research Associate at the A.R.O. the Volcani Center, Israel. |
| 1988-1989 | Promoted to Scientist (Rank C) at the A.R.O. the Volcani Center, Israel. |
| 1996 | Promoted to Senior Scientist at the (RankB) A.R.O. the Volcani Center, Israel. |
| 2001-2002 | Head, Department of postharvest technologies and quality assurance Institute of Agricultural Engineering, A.R.O. the Volcani Center, Israel |
| 2002-2004 | Head, Department of information and mechanization engineering systems, Institute of Agricultural Engineering, A.R.O. the Volcani Center, Israel |
| 2004-2010 | Director, Institute of Agricultural Engineering, A.R.O.  the Volcani Center, Israel |
| 2007 | Promoted to Senior Scientist (Rank A) at the A.R.O. the Volcani Center, Israel |
| 2013-2017 | Head, Department of information and mechanization engineering systems, Institute of Agricultural Engineering, A.R.O. the Volcani Center, Israel |
| 2016 | Promoted to Senior Scientist (Rank A+, highest rank) at the A.R.O. the Volcani Center, Israel |

1. **Training / Teaching Experience**
2. Academic Contribution:

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| **Dates** | **Description** |
| 1976-1977 | Teaching at Techniqum ORT Givataim, Technical College.  Subjects: Control Devices; control design. |
| 1982 | Teaching at "Mikve Israel", Holon. Agro - Technical College.  Subjects: Physics. |
| 1984 | Guiding of Practical Engineer, Mr. Doron Noyman. |
| 1985 | Guiding of Practical Engineer, Mr. Aharon Hoffman. |
| 1991 | International Postgraduate Course on Agricultural Engineering  In Small Scale Farming. 1991. A.R.O. The Volcani Center, Israel. |
| 1992 | International Postgraduate Course on Agricultural Engineering  In Small Scale Farming.1992. A.R.O. The Volcani Center, Israel. |
| 1993 | Advance International Course. New Concepts in Agricultural Engineering. 1993. A.R.O. The Volcani Center, Israel. |
| 1998 | International Course in Agricultural Engineering. A.R.O. The Volcani Center, Israel. |
| 2006 | International Course in Agricultural Engineering. A.R.O. The Volcani Center, Israel. |
| 2009 | International Course in Agricultural Engineering. A.R.O. The Volcani Center, Israel. |
| 2018 | International Course in Agricultural Engineering. A.R.O. The Volcani Center, Israel. |

1. Guidance of M.Sc. Students:

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| **Graduation date** | **Name** | | | **Title of thesis** | **Guidance with** |
| 2000 | \*Mrs. Orly Ginnes | | | Determination of egg freshness and quality by NIR | Dr. Singer L. |
| 2008 | \*Mrs. Clara Shanderey | | | Determination of *Altereneria* in Apples by NIRS | Prof. I. Shmulevich |
| 2010-2012 | \*Mr Nativ Robart | | | Determination of olive tree fertilization condition by NIRS | Dr. Uri Yermiyahu |
| 2010-2011 | Ms. Julianna Nyasordzi | | | Application of nondestructive measurements for evaluation of ripening status and quality of apple | Dr. Haya Friedman and Dr. Susan Lurie |
| 2016-2018 | | \*Amir Nakar | Detection of pathogens in dairy product Prof Shlomo  By Raman Spectroscopy Sela | | | |
| 2016-present | | \*Ben Lahav | Detection pf N P k in leafs Dr. Uri  Yermiyahu | | | |

\*under my direct supervision

1. Guidance of Ph.D. Students:

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| **Graduation date** | **Name** | **Title of thesis** | **Guidance with** |
| 2008-2012 | \*Ms. Timea Ignat | Non-destructive methods for determination of quality attributes of bell peppers | Prof. József Felföldi |

\*under my direct supervision

1. Post-Docs and Visiting Scientists:

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| **Dates** | **Name** | **Research subject** |
| 2004 | MSc. Erkinbaev Chyngyz | MASHAV trainee form Kyrgyz Republic, Research subject: Apple quality detection by NIR |  |
| 2007 | Dr. Andréa Belincontront | Post Doc. University of Viterbo, Italy. Research subject: Date sorting by NIR |
| 2012-2018 | Dr. Timea Ignat | Post Doc. Research subject: Spectral detection of fruit and vegetable quality |

1. Organization of Courses

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| **Dates** | **Duration** | | **Place** | **Title** | |
| 2000 | 1 day | | Kyoto University, Japan | NTD techniques | |
| 2005 | 1 day | | CIICTA, Beijing, China | Maturity determination of fruits by NIRS | |
| 2006 21 days | | International Course in Agricultural Engineering. A.R.O. The Volcani Center, Israel. | | |
| 2009 21 days | | International Course in Agricultural Engineering. A.R.O. The Volcani Center, Israel. | | |
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1. **Activity in Scientific and Agricultural Committees**
2. International:

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| **Dates** | **Description and role** |
| 1993-1998 | Member, SAS - Society of Applied Spectroscopy |
| 1994-1996 | Appointed, Member of the Agricultural Engineering Scientific Board of BARD. |
| 1995-1998 | Appointed, Member of the scientific panel of agricultural engineering for BARD. |
| 1996-2001 | Appointed, Chairman of the agricultural engineering scientific board BARD |
| 1998-2001 | Appointed, Chairman of the scientific panel of agricultural engineering for BARD |
| 2000-present | Member, ASABE – American Society of Agricultural and Biological Engineers |
| 2002-2005 | Representative of Israel in the general assembly of CIGR |
| 2003-present | Member, Euro AGENG the European Agricultural Engineering Society |
| 2006-2010 | Representative of Israel in the general assembly of EurAgEng |
| 2010-2011 | Appointed, Chairman of the agricultural engineering scientific board of BARD |
| 2013-2015 | Appointed, Chairman of the agricultural engineering scientific board of BARD |

1. National:

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| **Dates** | **Description and role** |
| 1977-present | Member, Israeli Society of Agricultural Engineering |
| 1988 | Appointed, Member of Scientific Board, the Institute of Agricultural Engineering, Agricultural Research Organization. The Volcani  Center. Bet Dagan. |
| 1990-1995 | Appointed, Member of the Scientific Board, Agricultural Research Organization, The Volcani center, Bet Dagan |
| 1990-1995 | Appointed, Member of the directing committee of the Scientific Board, Agricultural Research Organization, The Volcani center, Bet Dagan |
| 1991-1993 | Appointed, Member of the horticulture R&D steering board of the Chief Scientist of the Ministry of Agriculture |
| 1994-1996 | Appointed, Member of the Agricultural Engineering Scientific Board of the Chief Scientist of the Ministry of Agriculture. |
| 1995-1998 | Appointed, Member of the scientific panel of agricultural engineering for the Chief Scientist of Ministry of Agriculture and Rural affairs. |
| 1996-2001 | Appointed, Chairman of the agricultural engineering scientific board of the Chief Scientist of the Ministry of Agriculture and Rural affairs, |
| 1997-2004 | Appointed, Member of the Quality R&D steering board of the Chief Scientist of the Ministry of Agriculture and Rural affairs |
| 1998-2001 | Appointed, Chairman of the scientific panel of agricultural engineering for the Chief Scientist of Ministry of Agriculture and Rural affairs |
| 2002-2004 | Elected, President of the Israeli Society of Agricultural Engineering |
| 2004-2010 | Appointed, member of the extended management board of the ARO |
| 2004-2010 | Appointed, member of the human resource committee of the ARO |
| 2004-present | Appointed, member of the committee for inventions of the Ministry of Agriculture and Rural affairs. |
| 2009-2011 | Appointed, member of the committee for youth activities of the ARO. |
| 2004-present | Appointed, member of the committee for new growing and technology of the Ministry of Agriculture |
| 2013- present | Member of the 3 strategic centers of the ARO |
| 2013- present | Appointed, Chairman of the agricultural engineering scientific board of the Chief Scientist of the Ministry of Agriculture |
| 2015- present | Chairman of strategic sub centers of the ARO, for food safety a technologies detection methods |
| 2015- present | Appointed, member of the academic committee of the ARO |

1. **Contribution to the Scientific Community**
2. International:

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| **Dates** | **Description** |
| 2000 | POSTHARVEST 2000, International symposium on postharvest, Jerusalem, Israel. Session Chairman on: Sensor Technology, NDT and quality assessment. |
| 2004 | The 2004 CIGR International Conference, Beijing Sponsored by CIGR, CSAM and CSAE Beijing, China (General assembly – representative of Israel) |
| 2005-2006 | The 2006 international conference of the ISAE - Israeli Society of Agricultural Engineering (Agritech2006, Tel Aviv, Israel May 2006) - organizing committee. |
| 2006 | ISAE international conference, Agritech 2006, Tel Aviv, Israel. Organizing committee, reviewer, session chairmen, and oral presentation. |
| 2006 | CIGR World Congress in Bonn, Germany**.** Chairman in two sessions and oral presentation. |
| 2007-2008 | Member of the Scientific Committee of the AgeEng2008 Conference. |
| 2008 | EurAgEng Intentional conference on agricultural engineering and industry exhibition. Hersissos, Crete, Greece. Chairman and two oral presentations. |
| 2011-2012 | Member of the Scientific Committee of the CIGR and AgeEng2012 Conference. |
| 2012 | CIGR – EurAgEng 2012, International conference of agricultural engineering, Valencia, Spain. Scientific committee, Chairman and two oral presentations. |
| 2013- present | Member of the Scientific Committee of the PA 2015 (Precision Agriculture) International Conference. |
| 2014- 2015 | Member of the Scientific Committee of the Frutic 2015 International Conference. |
| 2014- 2015 | Member of the Organizing Committee of the ECPA 2015 International Conference. |

1. National:

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| **Dates** | **Description** |
| 1990-1995 | Elected, Chairman of the Scientific Board, the Institute of Agricultural Engineering, Agricultural Research Organization. The Volcani center. Bet Dagan |
| 2002 | The 2002 annual meeting of the ISAE -Israeli Society of Agricultural Engineering (Bet Dagan, Israel Jan 2002) - Chairman of the organizing committee. |
| 2002 | The conference of Technologies for saving manual labor (Bet Dagan, Israel June 2002– organized by extension service of the ministry of agriculture and the ISAE – member of the organizing committee. |
| 2003 | The 2003 annual meeting of the ISAE - Israeli Society of Agricultural Engineering (Tel Aviv, Israel May 2003) - Chairman of the organizing committee. |
| 2004 | The conference of Robotic Fruit Harvesting, by the Israeli Society of Agricultural Engineering (Bet Dagan, Israel Sep. 2004) - member of organizing committee. |
| 2008 | Annual conference of ISAE (Israel Society of Agricultural Engineering), Haifa, Israel. Chairman and oral presentation. |
| 2013 | ISAE 2013 annual conference, Bet Dagan, Israel. Chairman and oral presentation. |
| 2014 | ISAE 2014 annual conference, Bet Dagan, Israel. Chairman and oral presentation. |
| 2015 | ISAE 2014 annual conference, Bet Dagan, Israel. Chairman and oral presentation. |
| 2016 | ISAE 2014 annual conference, Bet Dagan, Israel. Chairman and oral presentation. |

1. Editorial responsibilities:

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| **Dates** | **Description** |
| 1985-2008 | Editorial member, internal bulletin of agricultural Engineering Institute, Israel |
| 2007- present | Editorial member, *NIR VATELEM* journal |
| 2002- present | Occasional reviewer for: Journal of Dairy Research, Transactions of the ASAE, Applied Engineering in Agriculture, International journal of Food, Agriculture & Environment –JFAE, Food and Bioprocess Technology Journal, Biosystems Engineering Journal |
| 2016- present | Editorial Board member for the Open Access Journal of Agricultural Research (OAJAR) (ISSN: 2474-8846). |

1. Active Participation in Meetings
2. International:

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| **Date** | **Title of the Meeting** | **Place** | **Role** |
| 1988 | International Summer Meeting, ASAE-American Society of Agricultural Engineers | Rapid City, S.D. USA | Oral Presentation |
| 1991 | NIR-91 4th International conference on Near Infrared Spectroscopy | Aberdeen, Scotland | Oral Presentation |
| 1992 | Summer Meeting, American Society of Agricultural Engineers | Charlotte, North Carolina. USA | Oral Presentation |
| 1992 | International Symposium on Prospects for Automatic Milking | Wageningen. Netherlands | Invited Oral Presentation |
| 1993 | International Summer Meeting, American Society of Agricultural Engineers | Spokane. WA. USA | Oral Presentation |
| 1993 | BARD workshop on NDT methods for fruits and vegetables | Spokane. WA. USA | Invited Oral Presentation |
| 1994 | French - Israeli workshop on technology and engineering for agricultural and food industry | Paris, France | Invited Keynote speaker |
| 1997 | International Conference on Sensors for Nondestructive Testing | Orlando. FL, USA | Oral Presentation |
| 1998 | AGENG98 Annual meeting of the European Agricultural Engineering Society | Oslo, Norway | Oral Presentation |
| 1999 | NIR 99 | Verona, Italy | Oral Presentation |
| 1999 | Plenary lecture, OECD International conference Hertzelia, Israel. | | Invited lecture |
| 2000 | ASAE annual meeting of the American Agricultural Engineering Society | Milwaukee, WI, USA | Oral Presentation |
| 2000 | The XIV Memorial CIGR World congress 2000. | Tsukuba, Japan | Oral Presentation |
| 2002 | AGENG 2002 Annual meeting of the European Agricultural Engineering Society | Budapest, Hungary | Invited Oral Presentation |
| 2003 | ASAE annual meeting of the American Agricultural Engineering Society | Las-Vegas, Nevada, USA | Oral Presentation |
| 2004 | AGENG04 Annual meeting of the European Agricultural Engineering Society | Leuven, Belgium | Participant |
| 2005 | Seminar on maturity determination of fruits by NIRS. | CIICTA, Beijing, China | Invited Oral Presentation |
| 2006 | ISAE international conference, Agritech 2006 | Tel Aviv, Israel | Organizing committee, reviewer, session chairmen, oral presentation |
| 2006 | CIGR World Congress | Bonn, Germany | Chairman in two sessions, oral presentation |
| 2008 | EurAgEng Intentional conference on agricultural engineering and industry exhibition | Hersissos, Crete, Greece | Chairman and two oral presentations |
| 2009 | International Conferences in Agricultural Engineering, Synergy and Technical Development 2009 | Gödöllő, Hungary | Oral Presentation |
| 2009 | Frutic Chile 2009, Information and Technology for Sustainable Fruit and Vegetable Production, Proceeding of the “8th Fruit, Nut, and Vegetable Production Engineering Symposium” Concepción | Chile | Oral Presentation |
| 2010 | International Conference on Agricultural Engineering & Industry Exhibition EurAgEng Conference 2010 | France | Poster |
| 2011 | AGRI-SENSING International Symposium on Sensing in Agriculture | Haifa, Israel | Oral Presentation |
| 2012 | CIGR – EurAgEng 2012, International conference of agricultural engineering | Valencia, Spain | Scientific committee, Chairman and two oral presentations |
| 2013 | ICNRS 2013, 16th international conference on NIRS | Grande-Motte, France | Oral Presentation |

2015 International annual meeting of ASABE, New Orleans, USA Oral Present.

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| 2015 | Frutic2015 International meeting | Milan, Italy | Scientific committee, Chairman and oral presentations |
| 2016 | CIGR – EurAgEng 2016, International conference of agricultural engineering | Aarhus, Denmark | Scientific committee, Chairman and oral presentations |
| 2018 | Smart agriculture in the Orchard | Israel | oral presentation |
| 2018 | OSA- Light. Energy and Environment Congress | Singapore | Invited lecture |

1. National:

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| **Date** | **Title of the Meeting** | **Role** |
| 1997 | Third international Symposium on Sensors in Horticulture, Tiberias, Israel. | Oral Presentation |
| 2000 | POSTHARVEST2000, International symposium on postharvest, Jerusalem, Israel. | Session Chairman - Oral Presentation |
| 2003 | The 2003 annual meeting of the ISAE - Israeli Society of Agricultural Engineering, Bet-Dagan, Israel. Chairman of the Organizing committee. | Oral Presentation, Chairman of the Organizing committee. |
| 2003 | Plenary lecture, IMPS Annual NDT conference, Tel-Aviv, Israel. | Invited lecture |
| 2006 | Plenary lecture, IMPS Annual NDT conference, Tel-Aviv, Israel. | Invited lecture |
| 2006 | Plenary lecture, improving work efficiency- advances system. ISAE and SHAHAM conference, Bet Dagan, Israel | Invited lecture |
| 2007 | Plenary lecture, NDT of internal constituents in apples by NIR spectroscopy. Storage Operators conference, Bet Dagan, Israel | Invited lecture |
| 2008 | Annual conference of ISAE (Israel Society of Agricultural Engineering), Haifa, Israel | Chairman and oral presentation |
| 2008 | Plenary lecture, determination of avocado maturity by NIR spectroscopy. Conference in memorial of Dr. Giora Zauberman. Avocado- present and future, 27 October, Bet Dagan, Israel | Invited lecture |
| 2011 | ISAE 2011 annual conference, Bet Dagan, Israel | Oral Presentation |
|  |  |  |
| 2013 | ISAE 2011 annual conference, Bet Dagan, Israel | Oral Presentation  Chairman |
| 2014 | ISAE 2011 annual conference, Bet Dagan, Israel | Oral Presentation  Chairman |
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| 2014 | Plenary lecture, Fusion sensing techniques for determination of pepper maturity. The third conference of the Israeli scientific society of vegetables and field crops growing. January 2014, Rehovot, Israel. | Invited lecture |
| 2015 | ISAE 2011 annual conference, Tel Aviv, Israel | Oral Presentation |
| 2016 | Key note speaker, Rapid and Nondestructive Methods for Sorting Fruits and Vegetables according Internal Quality Attributes**.** Quality of agricultural products. A workshop of the Institute of Plant Sciences, ARO | Invited lecture |

1. **Research Grants**
2. International Competitive Grants:

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| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Granting Source** | **Duration (years)** | **Role\*** | **Title (short)** | **Budget (US $ / year)** | |
| **Total** | **Researcher** |
| 1980 | BARD | 3 | CI | Separation of potatoes from clods and rocks in a fluidized bed.  Project No. I - 124- 80 | 180,000 | 30,000 |
| 1987 | BARD | 3 | LPI | Nondestructive determination of moisture and sugars in dry and semi-dry fruits by near infrared spectrophotometry. Project No. US -1173-86 | 190,000 | 32,000 |
| 1989 | BARD | 3 | LPI | Nondestructive on-line determination of moisture content in nuts and dry and semi-dry fruits by dielectric properties sensing.  Project No. US 1578-88r | 190,000 | 33,000 |
| 1993 | BARD | 3 | CI | Ultrasonic body condition measurement for computerized dairy management.  Project No. IS 2181-92r | 188,000 | 32,000 |
| 2003 | BARD | 1 | LPI | Rapid detection of hazardous elements and safety attributes of fresh produce using Raman spectroscopy.  Project No. US-3296-02 | 105,000 | 45,000 |
| 2003 | CRAFT-POMEVAL | 3 | LPI | Development of system and method for extracting arils from pomegranates Project POMEVAL No. 1999-707917 (IL No. 458029402) | 2,000,000  Euro | 125,000 Euro |
| 2008 | EU | 3 | CI | ICT AGRI Eranet  Project No. 458-0490 |  |  |
| 2012 | EU | 3 | CI | Quality and safety of fresh cuts  Project No. 430-0436 | 2,000,000 | 25,000 |

\*PI = Principal Investigator; LPI =Local Principal Investigator; CI = Cooperating Investigator

1. National Competitive Grants:

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| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Granting Source** | **Duration (years)** | **Role\*** | **Title (short)** | **Budget (US $ / year)** | |
| **Total** | **Researcher** |
| 1993 | Chief Sci. | 2 | PI | Fresh date sorting by NIR. Project No. 458 3808 92/3 | 14,000 | 7,000 |
| 1993 | Chief Sci. | 2 | PI | Mechanization for gladiola net greenhouses.  Project No. 458 3810 92/3/4 | 14,000 | 7,000 |
| 1994 | Chief Sci. | 2 | PI | RF system for date moisture content measurement.  Project No. 458 0098 94/5 | 14,000 | 7,000 |
| 1995 | Chief Sci. | 2 | PI | Determination of Avocado maturity by NIR spectroscopy. Project No. 458 0100 95 | 30000 | 15,000 |
| 1995 | Chief Sci. | 2 | PI | Evaluation of food ingredients in corn seeds by NIR spectroscopy.  Project No. 458 5434 561 | 18,000 | 9,000 |
| 1999 | Chief Sci. | 2 | PI | Evaluation wheat NIR spectroscopy.  Project No. 251048800 | 14,000 | 2000 |
| 1999 | Chief Sci. | 2 | PI | Sorting and postharvest treatment of 'Madjhool' dates. Project No. 45821499 | 36,000 | 19,000 |
| 2000 | Chief Sci. | 2 | PI | Prediction of late nitrogen fertilization requirement for wheat. | 19,660 | 2,500 |
| 2002 | Chief Sci. | 2 | PI | Postharvest treatment of pomegranate. Project No. 4580245601 | 30000 | 15,000 |
| 2002 | Chief Sci. | 2 | PI | Semi-automatic machine for determination of Avocado maturity by NIR spectroscopy. Project No. 458 23802 | 28,000 | 22,000 |
| 2003 | Chief Sci. | 2 | PI | Determination of Apple internal quality indices NIR spectroscopy.  Project No. 458 026703 | 28,000 | 22,000 |
| 2005 | Chief Sci. | 2 | CI | Development of Methods to Ensure Quality of Extracted Pomegranates Arils,  Project No. 430001506 | 24,000 | 6,000 |
| 2006 | Chief Sci. | 2 | CI | Online Milk Compositions for Precision Dairy Farming,  Project No. 459 4247700 | 48,000 | 24,000 |
| 2007 | Chief Sci. | 2 | PI | On line measurement of 'Madjhool' dates water content by NIR.  Project No. 458041908 | 24,000 | 12,000 |
| 2008 | Chief Sci. | 2 | CI | New product of super fresh 'Madjhool' dates.  Project No. 203077708 | 50,000 | 12,000 |
| 2008 | Chief Sci. | 2 | PI | Detecting moldy core in apples by NIRS.  Project No. 458038408 | 24,000 | 18,000 |
| 2009 | Chief Sci. and Council of fruits | 3 | PI | Automatic sorting of dates by NIRS.  Project No. 458050909 | 90,000 | 30,000 |
| 2010 | Chief Sci. and Council of fruits | 3 | PI | Hand device for maturation of apples by NIRS.  Project No. 458051710 | 90,000 | 30,000 |
| 2011 | Chief Sci. | 3 | PI | Sorting of dates according to moisture levels by NIRS.  Project No. 458052011 | 150,000 | 50,000 |
| 2011 | Chief Sci. | 4 | PI | Systems for harvesting and sorting fresh chives.  Project No. 458055111 | 200,000 | 60,000 |
| 2013 | Peanut growing association | 1 | PI | Detecting dead heads in peanuts.  Project No. 458055111 | 9,000 | 9,000 |

2015 Chief Sci. 2 CI Date sorting according to

Special internal attributes 40,000 20,000

Project No. 458059715

2016 Chief Sci. 2 PI Detecting pathogens by Raman 80,000 20,000

in dairy produce.

Project No. 458062516

2017/18 Chief Sci. 2 CI Identification of the bacteria

cyanobacteria in fish ponds 80,000 15,000

Project No. 20-06-0044

2017/18 Chief Sci.

Nizan 3 PI Sterilization by steam for 210,000 25,000

Food processing industry

Project No. 20-07-0009

\*PI = Principal Investigator; LPI =Local Principal Investigator; CI = Cooperating Investigator

1. Other Funds:

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| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Granting Source** | **Duration (years)** | **Role\*** | **Title (short)** | **Budget (US $ / year)** | |
| **Total** | **Researcher** |
| 1998 | Vegetable growers association | 2 | PI | Automatic sampler for the pea industry. Project No. 4580233-98, 99, 2000 | 24,000 | 12,000 |
| 2001 | SAAE Afikim. (through KIDUM unit agreement) | 2 | PI | Development of NIR sensor for online milk composition determination. | 20,000 | 10,000 |
| 2001 | Poultry growers association | 2 | PI | Determination of fresh eggs quality by NIRA.  Project No. 458024200/1/2 | 12,000 | 6,000 |
| 2002 | Date Growers Association | 1 | PI | Sorting and 'Majhool' dates according to water content by NIRA.  Project No. 458021402 | 5,600 | 5,600 |
| 2005 | R&D in storage laboratories, Kirayat Shmona, (through KIDUM unit agreement) | 1 | PI | Development of NIR device for online Alternraia determination in Apples | 15,000 | 15,000 |
| 2005 | Fruit council | 1 | PI | Determination of Alternraia in Apples by NIRS | 9,000 | 9,000 |
| 2015/6 | ESHET EILON Ltd. (through Kidum) | 1 | PI | Implantation of NIRS in online sorting machines  Project No.458065315 | 40,000 | 40,000 |
| 2015 | TACTO Ltd (through Kidum) | 1 | PI | Harvester for chives | 9,000 | 9,000 |
| 2015 | Strategy of ARO for 2015 | 1 | PI | Advanced technologies for detecting food borne pathogens | 120,000 | 120,000 |
| 2017/18 | C"IL  (through KIDUM unit agreement) | 2 | COPI | Using XRF and NIR for measurements of N.P.K in leaf plants. | 100,000 | 25,000 |
| 2018 | TOGA  (through KIDUM unit agreement) | 1 |  | Detecting food borne pathogens using Raman spectroscopy | 50,000 | 50,000 |
| 2018 | Future Crops  (through KIDUM unit agreement) | 1 |  | Sanitizing substrate by steam | 50,000 | 25,000 |
| 2016/17/18 | ESHET EILON Ltd. (through Kidum) | 3 | PI | Implantation of NIRS in online sorting machines  Project No.458065317 | 40,000 | 40,000 |
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\*PI = Principal Investigator; LPI =Local Principal Investigator; CI = Cooperating Investigator

1. **Awards**

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| **Dates** | **Description** |
| 1986-1993 | Inventors awards each year for the fluidized bed potato separation system |
| 2005 | "The excellent team of 2004" of the ARO and of the Ministry of Agriculture and Rural Affairs. (Technical and engineering team under my supervision) |
| 2006 | "Mashov Chosen"- Distinction Award of AgroMashov2006, the Israeli annual agricultural exhibition, for the development of pomegranate aril extracting machine. |
| 2006 | "Namir Award"- Distinction Award of the Israeli workers Union (Hahistadroot Hahdasha), Israel annual award for excellence of teams and/or individuals members of the union, for the development of pomegranate aril extracting machine. |
| 2007 | "Juran Technologies Ltd" received the AE50 award for outstanding innovation in product of systems technology from the ASABE (American Society of Agricultural and Biological Engineers), for the pomegranate aril extracting machine - ArilSystemTM. |
| 2008 | “Superior” ASABE Paper Award, in ASABE (American Society of Agricultural and Biological Engineers) publications of *Applied Engineering in Agriculture, Transactions of the ASABE, or Journal of Agricultural Safety and Health*. The paper: “Yeast Detection in Apple Juice Using Raman Spectroscopy and Chemometric Methods” |
| 2009 | Best paper of Synergy and Technical Development- International Conference in Agricultural engineering, 2009, Godollo, Hungary. The paper: “Non-destructive methods for pepper maturity determination.” |
| 2012 | The "The excellent team of 2011" of the ARO, The Volcani Center. For the development of online milk analyzer by NIRS. |
| 2012 | The "The excellent team of 2011" of the Ministry of Agriculture and Rural Affairs. For the development of online milk analyzer by NIRS. |

2004-present Inventors awards each year for the pomegranate extracting

2007-present Inventors awards each year for the online NIR milk analyzer

**Dr. Ze'ev Schmilovitch October, 2014**

##### Part II: LIST OF PUBLICATIONS

Marks:

S Student or post-doc under my supervision

\* Equal contribution

1. **Articles in Reviewed Journals**

1. Feller, R., Mizrach, A., Zaltzman, A. and **Schmilovitch, Z. \*** (1981).

Gravity separation over a mesh belt conveyer.

*Journal of Agricultural Engineering Research* 26(5): 371-377.

IF 1.36; Category: Agricultural Engineering; Rank 5/12

IF 0.97; Category: Agricultural Multidisciplinary; Rank 11/57

2. Zaltzman, A., Feller, R., Mizrach, A. and **Schmilovitch, Z. \*** (1983).

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**Dr. Ze'ev Schmilovitch**

Part III: DESCRIPTION OF MAJOR ACHIEVEMENTS

1. **Contribution to Agricultural and/or Environmental Sciences**

My scientific activities combine basic research with a strong practical approach. I therefore address the entire gamut of research aspects, from basic research related to physical phenomena, through design, development and testing of prototype machines, to practical working applications in agriculture.

The strength of my research through the years has lain in my practical engineering approach, which evolves directly from my attitude toward agricultural R&D; the need to develop advanced methods, technologies, and systems has always been an essential part of my work. For this, I apply a combination of high-quality practical engineering with advanced research tools and mathematical modeling, such as spectral analysis and chemometrics methods, leading to innovative and unique machines and techniques.

At an early stage of my professional career, I identified the growing need for quality evaluation of agricultural products. Motivated by the conviction that product quality and safety are key issues in agriculture, I foresaw that these should be addressed by advanced non-destructive testing (NDT) methods that can provide rapid results of internal quality attributes in real time. Being aware of the emerging sensor technologies and growing data-processing power, I focused on NDT, especially on applications of near infrared (NIR) technologies, Raman spectroscopy, and radio-frequency (RF) impedance measurements; incorporating my mechanical engineering and mathematical modeling skills, I was able to assemble, develop and lead a world-recognized team that has worked on a variety of agricultural products, as extensively documented in published papers, and has yielded successful working devices (detailed below).

Through the years, my research team has collaborated with the world’s leading scientists in these fields in Israel and abroad (see all publications in list II and Research Grants list I.8), and here I must express my appreciation of and gratitude for the reciprocal contributions of all of these collaborators, as well as the technicians, students and farmers to my achievements.

Our inventions over the years have yielded substantial income from royalties to the ARO, totaling over $730,000 (I.9).

In pursuit of the RDT (Research and Development) goal, my research aims to establish basic knowledge for the application of NIR methods to the determination of maturity and internal quality indices of fruits and vegetables (II.1-7,14, 19, 21, 25, 27, 29, 30, 32, 36). Furthermore, I have overcome difficulties in the implementation of NIR spectroscopy, such as multicollinearity (II.1-16, 17) and heterogeneity of scanned samples (II.1-15), and I have advanced the application of this technology to online analysis of milk composition during milking (II.6-13, II.10-7). This newly developed sensor upgrades the dairy industry to precision management at the individual cow level, as well as milk-product processing by diverting milk during the milking process to different bulks according to its quality characteristics for processing. The principles and applications of NIR spectroscopy in advancing the dairy industry led to recognition of the feasibility of future NIR sensors that might be applied to other liquid agricultural products, including juices, concentrates and oils.

Other activities have been aimed at the development of precision agriculture, including NIR applications such as the determination of nitrogen content in wheat and corn plants in the field (II.1-19, 21, 30). Under my supervision, our team has been responsible for several unique ideas that have evolved into practical applications for several agricultural products, such as a semi-automatic system for maturity determination in fresh dates (II.1- 12, II.6-20) and a moisture detector for semi-dry dates (II.1-7, II.5-7).

Optical-sensing technologies, initially developed for agricultural applications and potentially useful for animals, have found commercial application in the medical field. A joint venture with a startup company on the detection of ear infections using VISNIR (visible - near infrared) spectroscopy has yielded an international patent application and prospects for the idea's future large-scale commercialization (II.10-7).

I initiated a project that explores the possibility of pathogen detection by Raman spectroscopy. This led to cooperation between Israeli and US teams that has yielded one of the first publications in the world in this area (II.1-20, 22). We were able to detect bacteria in liquids and on surfaces by means of a portable low-resolution Raman device that could lead to the development of a rapid *in situ* pathogen-detection instrument (II.1-23, 26).

In other advanced research, we developed a fusion of destructive reference parameters to improve pepper maturity determination, using fusion of non-destructive sensor output (II.1.32). Via the fusion of reference parameters, a new combined quality index was developed to evaluate the global quality of the produce. With this new combined quality index, the comprehensive quality of the produce can be predicted, as well as its stage of maturity.

In parallel to my research activities, I served for 6 years as Director of The Institute of Agricultural Engineering at the ARO, Volcani Center, and 3 additional years as Head of the Department of Sensing, Information and Mechanical Engineering, an office that I currently hold. I also led the resurrection of the Israeli Society of Agricultural Engineers (ISAE) after several years in 'hibernation'. I was elected Chairman of the ISAE and served as chair of three national annual conferences, and led its reacceptance as a member of the CIGR (*Commission Internationale du Génie Rural*) – the International Commission of Agricultural Engineering. At the same time, I have served over the years on many scientific committees at the ARO and the Israeli Ministry of Agriculture, and on committees for national and international conferences.

1. **Achievements in Applied Research**(Specifying major contribution to agriculture and/or the environment in Israel and abroad)

I led my team in the development of a machine for extracting pomegranate arils (seeds) for fresh consumption and for further processing (I.9, II.2-14, 13, II.5-18, II.10-8). This novel technology has generated worldwide prospects for expanding the consumption of pomegranate, a fruit whose enormous contribution to health has been recently recognized. This work won several national awards for its excellence and for encouraging introduction of the product. Through the introduction of a new "fresh-cut" fruit product, this technology has led to increased consumption and to the planting of orchards.

Developments of innovative automation techniques have yielded devices such as the pomegranate aril-extracting machine, a garlic trimmer, fluidized-bed separators, a date-firmness sorter, a mechanical system for 'Orchideola' greenhouses, and automatic mechanical samplers for the citrus juice industry (detailed below).

I have cooperated with scientists from other disciplines, such as computer sciences, horticulture, genetics and animal sciences, and with research groups in Israel to which I have contributed my expertise in various fields. Among my specific contributions to agriculture I would like to highlight the following:

**a. NIR sensor for milk-composition determination**

I am participating in a joint venture with an Israeli dairy equipment company (SAE, Afikim, Israel) dedicated to developing an inline device for use in the milking parlor (II.6-13, II.10-7). This instrument has already sold over 10,000 units with over $190,000 in royalties paid to the ARO. For this work, my team and I received the Excellent Team Award of the ARO and Excellent Team Award of the Ministry of Agriculture for 2011. The device has been applied in many dairy parlors all over the world, from Vietnam to the US.

**b. Method and technology to extract the arils (seeds) of pomegranate fruit**

The pomegranate fruit has several unique characteristics, with a potential for wide and diverse utilization ranging from fresh to processed products, including pharmaceuticals. The novel method and system developed for extracting arils (I.9, II.2-14, 13, II.5-18, II.10-8) is of worldwide significance, and it has opened a new horizon for Israeli agriculture and industry. This has already materialized in the growth of plantation areas and in the manufacturing and marketing of machines. An agricultural machinery manufacturer—Juran Metal Works Ltd.—produces the machine under license with over $500,000 in royalties paid to the ARO. The system has been applied in several countries, including the US, UK, Germany, Turkey and India.

Other topics that have recently moved to the beta-examination stage are worthy of brief mention:

**a. Application of NIR sorting methods in inline sorters**

The research into NIR sorting of fruit according to internal quality attributes is now being realized in a joint-venture R&D program with Eshet Eilon Ltd. We have developed prototypes for sorting dates, avocado and apples.

**b. Method and technology for mechanical collection in citrus crops in Valencian orchards**

During my sabbatical year at the institute IVIVA (Valencia, Spain), we developed a novel system for collecting freshly harvested citrus fruit. This new system is suitable for operation in the typical orchards of the Valencia region. My Spanish collaborators are trying to promote this method to the commercial stage.

**d. Machinery for fresh-cut watermelon and cantaloupe**

This newly developed machinery is for the production of fresh-cut, ready-to-eat watermelon and cantaloupe. The full system has been designed and major parts have been constructed and tested, demonstrating the method (II.1.36). These newly developed and tested ideas are under PCT patent pending and commercial negotiations.

**e. Grading peanuts by thermal vision**

Export in the Israeli peanut industry is based on whole-pod production, with roasting performed at the destination. Sorting systems have a hard time separating out the large pods that contain only one seed. The cortex in some of the underdeveloped pods is relatively thin, and tends to burn during roasting. Burned pods reduce quality and may cause losses. The new method is based on preheating the pods and then following the cooling process by thermal imaging. The new idea has been developed and tested (I.7.a) and is under PCT patent pending and commercial negotiations.