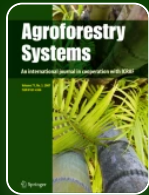


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Farm-SAFE: the process of developing a plot- and farm-scale model of arable, forestry, and silvoarable economics

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Abstract

Financial feasibility and financial return are two key issues that farmers and land owners consider when deciding between alternative land uses such as arable farming, forestry and agroforestry. Moreover regional variations in yields, prices and government grants mean that the relative revenue and cost of such systems can vary substantially within Europe. To aid our understanding of these variations, the European Commission sponsored a research project called “Silvoarable Agroforestry For Europe” (SAFE). This paper describes the process of developing a new economic model within that project. The initial stages included establishing criteria for the model with end-users and reviewing the literature and existing models. This indicated that the economic model needed to allow comparison of

arable farming, forestry and agroforestry systems at a plot- and a farm-scale. The form of comparisons included net margins, net present values, infinite net present values, equivalent annual values, and labour requirements. It was decided that the model would operate in a spreadsheet format, and the effect of phased planting patterns would be included at a farm-scale. Following initial development, additional user feedback led to a final choice on a model name, a final method of collating input data, and the inclusion of field-based operations such as varying the cropped area, replacing dead trees, and pruning. In addition options in terms of improved graphical outputs and the ability to undertake sensitivity analysis were developed. Some of the key lessons learnt include the need to establish clear model criteria and the benefits of developing a working prototype at an early stage to gain user-feedback.

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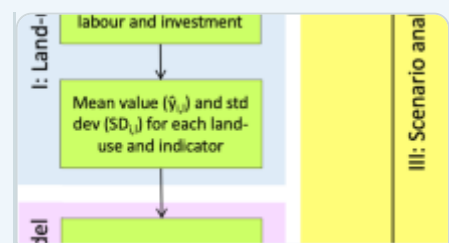
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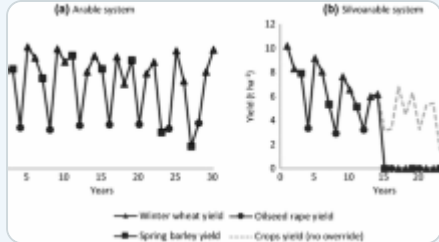
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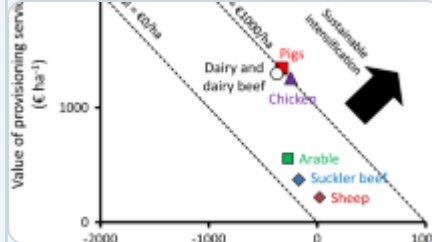
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References

Agbenyega O, Burgess PJ, Cook M, Morris J (2009) Application of the ecosystem function framework to perceptions of community woodlands. *Land Use Policy* 26:551-557

[Article](#) [Google Scholar](#)

Agriculture Western Australia and Campbell White and Associates Pty Ltd. (2000) Agroforestry calculator user manual. A report for the Rural Industries Research and Development Corporation (RIRDC), Land and Water Resource Research and Development Corporation (LWRRDC), and Forest and Wood Products Research and Development Corporation (FWPRDC). RIRDC Publication No 99/154. RIRDC Project No DAW-84A. Department of Agriculture, Western Australia, Australia, 24 pp

Burgess PJ, Brierley EDR, Goodall GR (1999) The financial costs of farm woodland establishment at four sites in Bedfordshire, England. In: Burgess PJ, Brierley EDR, Morris J, Evans J (eds) *Farm woodlands for the future*. BIOS Scientific, Oxford, pp 81-94

[Google Scholar](#)

Burgess PJ, Incoll LD, Hart BJ, Beaton A, Piper RW, Seymour I, Reynolds FH, Wright C, Pilbeam D, Graves AR (2003) The impact of silvoarable agroforestry with poplar on farm profitability and biological diversity. Final report to DEFRA. Project code: AF0105. Cranfield University, Silsoe, Bedfordshire, 63 pp

Burgess PJ, Incoll LD, Corry DT, Beaton A, Hart BJ (2004) Poplar (*Populus* spp) growth and crop yields in a silvoarable experiment at three lowland sites in England. *Agrofor Syst* 63:157-169

[Article](#) [Google Scholar](#)

Decisioneering[®] Inc (2005) Crystal Ball 7 risk analysis software and solutions. Modelling software for spreadsheets, developed by Decisioneering[®], Denver, United States of America. <http://www.decisioneering.com/>. Accessed 9 Oct 2008

Dupraz C, Newman S (1997) Temperate agroforestry: the European way. In: Gordon AM, Newman SM (eds) *Temperate agroforestry systems*. CAB International, Wallingford, UK, pp 181-236

[Google Scholar](#)

Dupraz C, Lagacherie M, Liagre F, Boutland A (1995) Perspectives de diversification des exploitation agricoles de la région Midi-Pyrénées par l'agroforesterie. Rapport de fin d'études commandité par le Conseil Régional Midi-Pyrénées. Institute National de la Recherche Agronomique, Montpellier. Contract AIR3 CT92-0134, 253 pp

Dupraz C, Burgess PJ, Gavaland A, Graves AR, Herzog F, Incoll LD, Jackson N, Keesman K, Lawson G, Lecomte I, Mantzanas K, Mayus M, Palma J, Papanastasis V, Paris P, Pilbeam DJ, Reisner Y, van Noordwijk M, Vincent G, van der Werf W (2005) SAFE (Silvoarable Agroforestry for Europe) Synthesis report. SAFE project. August 2001-January 2005. <http://www.ensam.inra.fr/safe/>

Faustmann M (1849) Berechnung des Wertes Waldboden sowie noch nicht haubare Holzbestände für die Waldwirtschaft besitzen. *Allgemeine Forst und Jagd-Zeitung* 25:411-455

[Google Scholar](#)

Graves AR, Matthew RB, Waldie K (2004) Low external input technologies for livelihood improvement in subsistence agriculture. *Adv Agron* 82:473–555

[Article](#) [Google Scholar](#)

Graves AR, Burgess PJ, Liagre F, Terreaux JP, Dupraz C (2005) Development and use of a framework for characterising computer models of silvoarable economics. *Agrofor Syst* 65:53–65

[Article](#) [Google Scholar](#)

Graves AR, Burgess PJ, Palma JHN, Herzog F, Moreno G, Bertomeu M, Dupraz C, Liagre F, Keesman K, van der Werf W, Koeffeman de Nooy A, van den Briel JP (2007) Development and application of bio-economic modelling to compare silvoarable, arable and forestry systems in three European countries. *Ecol Eng* 29:434–449

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Graves AR, Burgess PJ, Liagre F, Pisanelli A, Paris P, Moreno GM, Bellido M, Mayus M, Postma M, Schlindler B, Mantzanas K, Papanastasis VP, Dupraz C (2009) Farmer perceptions of silvoarable systems in seven European countries. In: Rigueiro-Rodríguez A, McAdam JH, Mosquera-Losada MR (eds) *Advances in agroforestry, vol 6: agroforestry in Europe: current status and future prospects*. Springer, Dordrecht, pp 67–86

[Google Scholar](#)

Graves AR, Burgess PJ, Palma J, Keesman K, van der Werf W, Dupraz C, van Keulen H, Herzog F, Mayus M (2010) Implementation and calibration of the parameter-sparse Yield-SAFE model to predict production and land equivalent ratio in mixed tree and crop systems under two contrasting production situations in Europe. *Ecol Modell* 221:1744–1756

[Article](#) [Google Scholar](#)

Hart C (1994) Practical forestry for the agent and surveyor. Sutton Publishing Ltd., Stroud, Gloucestershire, UK, 688 pp

Knowles L, Middlemiss P (1999) Evaluating agroforestry options: a continuing professional development course. Forest Research, Rotorua, New Zealand

[Google Scholar](#)

Liagre F (1997) ARBUSTRAS Manuel de l'utilisateur. User manual for ARBUSTRAS, Centre Régional de la Propriété Forestière (CRPF) and l'Institut National de la Recherche Agronomique (INRA) Montpellier, France, 71 pp

Mercer DE, Miller RP, Nair PKR, Latt CR (1998) Socioeconomic research in agroforestry: progress, prospects, priorities. Agrofor Syst 38:177-193

[Article](#) [Google Scholar](#)

Millennium Ecosystem Assessment (2005) Ecosystems and human well-being synthesis. Island Press, Washington, DC, 137 pp

ModelKinetixTM (2005) ModelMaker[®] 4.0. Modelling software developed by ModelKinetixTM, a trade name for FamilyGenetix[©] managed by A.P. Bensen, Wallingford, Oxfordshire, England. <http://www.modelkinetix.com/>. Accessed 9 Oct 2008

Nelson RA, Cramb RA (1998) Economic incentives for farmers in the Philippine uplands to adopt hedgerow intercropping. J Environ Manag 54(2):83-100

[Article](#) [Google Scholar](#)

Pannell DJ (1999) Social and economic challenges in the development of complex

farming systems. *Agrofor Syst* 45(1/3):393–409

[Article](#) [Google Scholar](#)

Savage SL (2003) *Decision making with insight*. Thomson Learning, London, UK

[Google Scholar](#)

Systems Thinking Software™ (2005) *Stella™*. Modelling software developed by ISEE, Systems Thinking Software™, Lebanon, United States of America.

<http://www.hps-inc.com/>. Accessed 9 Oct 2008

Thomas TH (1991) A spreadsheet approach to the economic modelling of agroforestry systems. *For Ecol Manag* 45:207–235

[Article](#) [Google Scholar](#)

van der Werf W, Keesman K, Burgess PJ, Graves AR, Pilbeam D, Incoll LD, Metselaar K, Mayus M, Stappers R, van Keulen H, Palma J, Dupraz C (2007) Yield-SAFE: a parameter-sparse process-based dynamic model for predicting resource capture, growth and production in agroforestry systems. *Ecol Eng* 29:419–433

[Article](#) [Google Scholar](#)

Van Noordwijk M, Lusiana B (1999) *WaNuLCAS 1.0*. A model of water, nutrient and light capture in agroforestry systems. *Agrofor Syst* 45:131–158

[Article](#) [Google Scholar](#)

Van Noordwijk M, Lusiana B (2000) *WaNuLCAS 2.0*. Background on a model of water, nutrient and light capture in agroforestry systems. International Centre for Research in Agroforestry (ICRAF), Bogor, Indonesia

[Google Scholar](#)

Van Noordwijk M, Lusiana B (2003) Welcome to the world of WaNuLCAS. A model of water nutrient and light capture in Agroforestry Systems. ICRAF South East Asia Programme, Bogor, Indonesia.

<http://www.worldagroforestrycentre.org/sea/Products/AFModels/WaNuLCAS/>.

Accessed 9 Oct 2008

Whiteman A, Insley H, Watt G (1991) Price-size curves for broadleaves. Occasional Paper Forestry Commission. 32:1, 36 pp

Willis RW, Thomas TH, van Slycken J (1993) Poplar agroforestry: a re-evaluation of its economic potential on arable land in the United Kingdom. For Ecol Manag 57:85-97

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Wojtkowski PA, Jordan CF, Cubbage FW (1990) Bio-economic modelling in agroforestry: a rubber-cacao example. Agrofor Syst 14:163-177

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