The value of socio-behavioural, farmer's surveys and participatory research for crop protection

Henry Creissen, Jay Ram Lamichhane

Editorial: The value of socio-behavioural, farmer's surveys and participatory research for crop protection

Henry E. Creissen[a] and Jay Ram Lamichhane[b*]

[a]Department of Agriculture, Horticulture and Engineering Sciences, Scotland's Rural College, Edinburgh, UK

[b]University of Toulouse, INRAE, UMR AGIR, F-31326 Castanet-Tolosan, France

*Corresponding author: jay-ram.lamichhane@inrae.fr; ORCID: 0000-0001-9780-0941
Tel: +33 (0)5 61 28 52 50; Fax: +33 (0)5 61 28 55 37

Keywords: Agroecological crop protection; barriers; behavioural drivers; behavioural intention; behavioural change; integrated pest management; stakeholder engagement.

1. The increasing need to understand drivers of and barriers to adoption of IPM practices

Agriculture must play a leading role in tackling the twin crisis of biodiversity loss and climate change whilst striving for food security and food safety. The decisions made by farmers and the reasons behind those decisions are critical to delivering societal ambitions for our food, landscapes and the environment and human health generally. Farmer behaviour is a growing field of investigation and numerous studies have investigated the factors influencing farmer decision with regards to crop production and crop protection practices (Lefebvre et al. 2015; Parsa et al 2014; Sawinska et al. 2020; Creissen et al. 2021; Thompson et al. 2022). Integrated pest management (IPM; Barzman et al. 2015) is the result of changes in attitudes that may themselves be the result of personal desires shaped by messages from policies, markets, other farmers and family members (Despotovic et al. 2019; Jørs et al. 2017). Within this, the switch to IPM may be limited or indeed enabled by diverse and numerous drivers including economic, institutional, financial, agronomical, technological, psychological, social, informational ones (Teklewold et al. 2013; Midingoyi et al. 2018) and these barriers or enablers will vary considerably between individuals and organisations (Parsa et al. 2014).

Four major facets have been found to affect farmers' decision to adopt or not to adopt IPM (Lamichhane et al 2019; Lefebvre et al. 2015; Parsa et al. 2014): i) farm and household facets (e.g. age, educational level, experience); ii) contextual factors specific to the sector (e.g. economic context, protection zones); or geography (topography, value chains, nearness to markets); iii) individual biographical or factual facets (e.g. intergenerational ties with family farms, health concerns related to IPM, sensitivity to environmental issues); and iv) relational facets (e.g. the closeness of a farmer with other farmers and thus their practices or their involvement with agricultural and non-agricultural networks). Consequently, studies based on farmer's surveys (questionnaires, interviews) can markedly aid our understandings of the farmers' needs, their motivations and potential interventions that might encourage behavioural change towards the adoption or not of IPM. This information can be valuable for designing effective knowledge transfer and exchange programmes boosting an effective uptake of IPM (Creissen et al. 2021; Rust et al. 2022).

2. Participatory research as an important driver for adoption of IPM practices

As mentioned above, adoption of new practices and technologies can be influenced by many factors including farmer's age (Lefebvre et al. 2015; Parsa et al. 2014), level of education (Creissen et al. 2021), and size of farming enterprise (Sawinska et al. 2020; Creissen et al. 2021). Technological and innovative solutions can be attractive to researchers, farmers and policy makers, particularly because they often require very little action from the users (Rose et al. 2021) and therefore they receive a lot of attention and financial support. The notion of a technological 'fix' however, is rarely achieved in agriculture. Technology adoption rates are often slow, especially for 'fixes' that require significant change to the farming system and farming practice requiring larger levels of investment in terms of time, financial resource, effort and ultimately risk. Technology and innovation can provide the necessary tools for change but with no guarantee that they will be used or adopted properly (Barnes et al. 2019). Some technologies may only appeal to the top few percent of the farming community who are regarded as early adopters/innovators with others maybe following suit over time (Rogers 2003). Most success stories around technology adoption are collaborative in nature. Relevant stakeholders are consulted and involved from the start of the project and this co-development ensures that all parties have a degree of ownership, and the project delivers what is intended and for those who need it (Wigboldus et al. 2016).

Initiatives that aim to promote the uptake of IPM measures can fail because of a lack of farmer engagement at the development stage (Deguine et al. 2021). New pest and disease monitoring techniques developed without participatory approaches may not be considered fit for purpose, or offer an appropriate return to the producer. In addition, regulation may prevent or restrict the adoption of some practices, as is the case in the European Union, for growing genetically modified crops or for using certain plant protection products (Miller et al. 2022). New crop varieties may not be adopted simply due to market conditions (Barnes et al., 2022). Moreover, current socio-technical systems may induce a 'lock-in' effect in which producers are unable to fully adapt within the agri-food system (Cowan and Gumby, 1996; Meynard et al. 2018). In other cases, lack of experience dictates non-adoption. Indeed, a great deal of research is invested into developing IPM decision support systems/tools (DSS/DST) which then fail to be adopted by farmers. Further reasons for not adopting include financial cost, time investment, lack of trust, lack of information technology skills, and lack of awareness of relevant DSS/DST (Marinko et al. 2023; Parsa et al. 2014). However, the main barrier to adoption of DSS/DST by farmers is a lack of using the participatory approach involving end users (farmers/agronomists) in the process of development (McCown, 2002, Marinko et al. 2022). The recent widespread adoption of a universal metric to assess IPM uptake in the UK was only achievable because IPM practitioners (famers, agronomists) were very much involved in its creation and development (Creissen et al. 2019).

IPM is often regarded as a more knowledge intensive process for farmers compared to alternative approaches (Barzman et al. 2015; Byerlee 1996). This is partially due to the lack of farmers' awareness about the many available levers to be combined into the IPM framework. Farmer participation in the production of evidence/knowledge could help to address the knowledge intensiveness associated with some IPM practices. This ensures that the right type of knowledge is produced and is presented in a user accessible format. Moreover, lack of participation can also be addressed in these frameworks for adoption of IPM at scale (Wigboldus et al. 2016).

3. A 4C approach for IPM: Coordination, communication, collaboration, and cooperation among key stakeholders

Farmers may have different attitudes and perceptions, so their behaviour toward adopting IPM will also differ. These attitudinal differences can be identified through structured questionnaires or in-depth interviews that can reveal information about the challenges farmers face while adopting potential solutions. A mixed methods approach that consists of questionnaires supplemented by follow-up on qualitative interaction has been found to be particularly useful in revealing information related to adoption or non-adoption of IPM (Harris and Brown, 2010).

Government schemes and industry incentives for farmers to adopt IPM and to tackle the twin crisis of biodiversity loss and climate change, whilst also delivering food security and food safety, must be carefully developed to motivate farmer decision making. Policy makers are beginning to recognise that coordinated stakeholder engagement can improve the design and attractiveness of schemes resulting in greater uptake and their success (Toffolini et al. 2021, Bouma et al. 2022). Consequently, they have embedded frequent stakeholder engagement activities (especially with farmers) into the development of support schemes including those supporting IPM and Agri-environmental measures (Hurley et al. 2022). Coupling economic and sociological analysis within agronomy has proven particularly fruitful in understanding the behavioural drivers for IPM adoption (Way et al. 2000; Buurma et al. 2017; Deguine et al. 2021). These studies imply collaborations between multiple disciplines. Hence, the crop protection sector (researchers, policy makers, farmers and industries) needs to effectively coordinate, communicate, collaborate and cooperate.

4. Re-inclusion of socio-behavioural, farmer's surveys and participatory research in the aims and scope of the Crop Protection journal

Participatory research and farmer surveys can identify actual behaviour (self-reported or observed) and behavioural intention (willingness, intent to act). By better understanding current IPM and the behavioural drivers, barriers, and enablers to IPM adoption, research and education could better target triggers for changing behaviour within farmers. We bring to the attention of our readership the fact that, in the past, the Crop Protection journal used to consider these types of research for publication but, over the years, the Editorial Board changed and did not have expertise to consider such types of research for publication in the journal. However, in light of the importance of social science, including economics, as well as wider humanities-based research for effective development and implementation of IPM, we are pleased to announce that the Editorial Board of the journal now reconsiders social or behavioural research including participatory research and research based on farmer's surveys for publication. We look, forward to handle an important number of submissions in the future from this field of research.

Acknowledgements

HEC is partially supported by Scotland's Centre of Expertise for Plant Health Funded by Scottish Government while JRL is partially supported by the CASDAR Fonte des semis project. The authors thank Prof. Andrew Barnes of Scotland's Rural College for his precious feedback on the previous draft of this editorial.

References

Barnes, A.P. Soto, I., Eory, V., Beck, B., Balafoutis, A.T., Sanchez, B., Vangeyte, J., Fountas, S., van der Wal, T., Gómez-Barbero, M. 2019. Influencing incentives for precision agricultural technologies within European arable farming systems, Environmental Science & Policy,93,66-74, https://doi.org/10.1016/j.envsci.2018.12.014.

Barnes, A.P., McMillan, J., Sutherland, L.-A., Hopkins, J., Thomson, S.G. 2022. Farmer intentional pathways for net zero carbon: Exploring the lock-in effects of forestry and renewables. Land Use Policy, 112,105861, https://doi.org/10.1016/j.landusepol.2021.105861.

Barzman, M., Barberi, P., Birch, A.N.E., Boonekamp, P., Dachbrodt-Saaydeh, S. 2015. Eight principles of integrated pest management. Agron Sustain Dev 35:1199–1215. https://doi.org/10.1007/s13593-015-0327-9.

Bouma, J. 2022. Transforming living labs into lighthouses: a promising policy to achieve land-related sustainable development, SOIL, 8, 751–759, https://doi.org/10.5194/soil-8-751-2022

Buurma, J. S., & Van Der Velden, N. J. A. (2017). New approach to Integrated Pest Management research with and for horticulture. A vision from and beyond economics. Crop protection, 97, 94-100.

Byerlee, D. 1996. Modern varieties, productivity, and sustainability – recent experience and emerging challenges. World Dev 24:697–718. https://doi.org/10.1016/0305-750X(95)00162-6.

Cowan, R., Gunby, P. 1996. Sprayed to death: path dependence, lock-in and pest control strategies. The economic journal, 106(436), 521-542.

Creissen, H.E., Jones, P.J., Tranter, R.B., Girling, R.D., Jess, S., Burnett F.J. Gaffney, M., Thorne, F. S., Kildea, S. 2019. Measuring the unmeasurable? A method to quantify adoption of integrated pest management in temperate arable farming systems. Pest Manag Sci 75: 3144–3152. https://doi.org/10.1002/ps.5428.

Creissen, H. E., Jones, P. J., Tranter, R. B., Girling, R. D., Jess, S., Burnett, F. J., Gaffney, M., Thorne, F. S., Kildea, S. 2021. Identifying the drivers and constraints to adoption of IPM among arable farmers in the UK and Ireland. Pest Man Sci 77: 4148–4158. https://doi.org/10.1002/ps.6452.

Deguine, J.P., Aubertot, J.N., Flor, R.J., Lescourret, F., Wyckhuys K. A.G., Ratnadass, A. 2021. Integrated pest management: good intentions, hard realities. A review. Agron. Sustain. Dev. 41: 38. https://doi.org/10.1007/s13593-021-00689-w.

Deguine, J.-P., Aubertot, J.-N., Bellon, S., Côte, F., Lauri, P.-E., Lescourret, F., Ratnadass, A., Scopel, E., Andrieu, N., Bàrberi, P., Becker, N., Bouyer, J., Brévault, T., Cerdan, C., Cortesero, A.-M., Dangles, O., Delatte, H., Dinh, P.T.Y., Dreyer, H., Duru, M., Flor, R.J., Gardarin, A., Husson, O., Jacquot, M., Javelle, A., Justes, E., Lam, M.T.X., Launay, M., Le, V. Van, Longis, S., Martin, J., Munier-Jolain, N., Nguyen, N.T.T., Nguyen, T.T.N., Penvern, S., Petit, S., Poisot, A.-S., Robin, M.-H., Rolland, B., Rusch, A., Sabourin, E., Sanguin, H., Sarthou, J.-P., Sester, M., Simon, S., Sourisseau, J.-M., Steinberg, C., Tchamitchian, M., Thoumazeau, A., Tibi, A., Tivet, F., Tixier, P., Trinh, X.T., Vialatte, A., Wyckhuys, K., Lamichhane, J.R., 2023. Agroecological crop protection for sustainable agriculture, in: Advan Agron 178: 1-59. https://doi.org/https://doi.org/10.1016/bs.agron.2022.11.002.

Despotovic, J., Rodi, V., Caracciolo, F. 2019. Factors affecting farmers' adoption of integrated pest management in Serbia: an application of the theory of planned behaviour. J Clean Prod 228:1196–1205. https://doi.org/10.1016/j.jclepro.2019.04.149

Harris, L., Brown, G., 2010. Mixing interview and questionnaire methods: Practical problems in aligning data. Pract. Assess. Res. Eval. 15. https://doi.org/10.7275/959j-ky83.

Hurley, P., Lyon, J., Hall, J., Little, R., Tsouvalis, J., White, V., Rose, D.C., 2022. Co-designing the environmental land management scheme in England: The why, who and how of engaging 'harder to reach' stakeholders. People Nat. 4: 744-757. https://doi.org/10.1002/pan3.10313.

Jørs, E., Aramayo, A., Huici, O., Konradsen, F., Gulis, G. 2017. Obstacles and opportunities for diffusion of integrated pest management strategies reported by Bolivian small-scale farmers and agronomists. Environ Health Insights, 11. https://doi.org/10.1177/117863021770339

Lamichhane, J.R., Messéan, A., Ricci, P., 2019. Research and innovation priorities as defined by the Ecophyto plan to address current crop protection transformation challenges in France. Advan Agron 154: 81–152. https://doi.org/10.1016/bs.agron.2018.11.003.

Lefebvre, M., Langrell, S.R.H., Gomez-Y-Paloma, S., 2015. Incentives and policies for integrated pest management in Europe: a review. Agron Sustain Dev 35:27–45. https://doi.org/10.1007/s13593-014-0237-2.

Marinko, J., Ivanovska, A., Marzidovšek, M., Ramsden, M., & Debeljak, M., 2023. Incentives and barriers to adoption of decision support systems in integrated pest management among farmers and farm advisors in Europe. Int J Pest Manag. https://doi.org/10.1080/09670874.2023.2244912.

McCown, R. L., 2002. Changing systems for supporting farmers' decisions: Problems, paradigms, and prospects. Agricultural Systems, 74. https://doi.org/10.1016/S0308-521X(02)00026-4.

Meynard, J.-M., Charrier, F., Fares, M., Le Bail, M., Magrini, M.-B., Charlier, A., Messéan, A., 2018. Socio-technical lock-in hinders crop diversification in France. Agron. Sustain. Dev. 38: 54. https://doi.org/10.1007/s13593-018-0535-1.

Midingoyi, S.K.G., Kassie, M., Muriithi, B., Diiro, G., Ekesi, S. 2019. Do farmers and the environment benefit from adopting integrated pest management practices? Evidence from Kenya. J. Agric. Econ. 70, 452–470.

Miller, D., Legras, S., Barnes A., Cazacu, M., Gava, O., Helin, J., Irvine, K., Kantelhardt, J., Landert, J., Latruffe, L., Mayer, A., Niedermayr, A., Povellato, A., Schaller, A., Schwarz, G., Smith, P., Vanni, F., Védrine, L., Viaggi, D., Vincent, A., Vlahos, G. 2022. Harnessing the potential of transitions to agroecology in Europe and requirements for policy. EuroChoices, 21(3), 72-79.

Parsa, S., Morse, S., Bonifacio, A., Chancellor, T.C.B., Condori, B., Crespo-Pérez V., Hobbs, S.L.A., Kroschel, J., Ba M.N., Rebaudo, F., Sherwood, S.G., Vanek S.J., Faye, E., Herrera, M.A. Dangles, O., 2014. Obstacles to integrated pest management adoption in developing countries. Proc. Natl. Acad. Sci. U. S. A. 111: 3889–3894. https://doi.org/10.1073/pnas.1312693111.

Rose, D.C., Wheeler, R., Winter. M., Lobley, M., Chivers, C.A, 2021. Agriculture 4.0: Making it work for people, production, and the planet, Land Use Policy, Volume 100, 104933. https://doi.org/10.1016/j.landusepol.2020.104933.

Rust, N.A., Stankovics, P., Jarvis, R.M., Morris-Trainor Z., de Vries, J.R., Ingram, J, Mills, J., Glikman, J.A., Parkinson, J., Toth, Z., Hansda, R., McMorran, R., Glass, J., Reed, M.S., 2022. Have farmers had enough of experts? Environ Manage.69:31-44. https://doi.org/10.1007/s00267-021-01546-y.

Rogers, E. M., 2003. Diffusion of innovations. 5th ed. Simon and Schuster, New York. 576 p.

Sawinska, Z., Świtek, S., Głowicka-Wołoszyn, R., Kowalczewski, P.Ł., 2020. Agricultural practice in Poland before and after mandatory IPM implementation by the European Union. Sustainability 12:1107. https://doi.org/10.3390/su12031107.

Teklewold, H.; Kassie, M.; Shiferaw, B. 2013. Adoption of Multiple Sustainable Agricultural Practices in Rural Ethiopia. J. Agric. Econ. 2013, 64, 597–623. https://doi.org/10.1111/1477-9552.12011

Toffolini, Q., Capitaine, M., Hannachi, M., Cerf, M. 2021. Implementing agricultural living labs that renew actors' roles within existing innovation systems: A case study in France. Journal of Rural Studies, 88, 157-168. https://doi.org/10.1016/j.jrurstud.2021.10.015

Thompson, B., Barnes, A. P., Toma, L. 2022. Increasing the adoption intensity of sustainable agricultural practices in Europe: Farm and practice level insights. Journal of Environmental Management, 320, 115663. https://doi.org/10.1016/j.jenvman.2022.11566

Thompson, B., Leduc, G., Manevska‐Tasevska, G., Toma, L., & Hansson, H. (2023). Farmers' adoption of ecological practices: A systematic literature map. Journal of Agricultural Economics. https://doi.org/10.1111/1477-9552.12545

Way, M. J., & Van Emden, H. F. 2000. Integrated pest management in practice–pathways towards successful application. Crop protection, 19(2), 81-103.

Wigboldus, S., Klerkx, L., Leeuwis, C., Schut, M., Muilerman, S., Jochemsen H. 2016. Systemic perspectives on scaling agricultural innovations. A review. Agron. Sustain. Dev. 36, 46. https://doi.org/10.1007/s13593-016-0380-z