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

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10 *change; integrated pest management; stakeholder engagement.*

11

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

13 Agriculture must play a leading role in tackling the twin crisis of biodiversity loss and climate change whilst
14 striving for food security and food safety. The decisions made by farmers and the reasons behind those
15 decisions are critical to delivering societal ambitions for our food, landscapes and the environment and
16 human health generally. Farmer behaviour is a growing field of investigation and numerous studies have
17 investigated the factors influencing farmer decision with regards to crop production and crop protection
18 practices (Lefebvre et al. 2015; Parsa et al 2014; Sawinska et al. 2020; Creissen et al. 2021; Thompson et al.
19 2022). Integrated pest management (IPM; Barzman et al. 2015) is the result of changes in attitudes that may
20 themselves be the result of personal desires shaped by messages from policies, markets, other farmers and
21 family members (Despotovic et al. 2019; Jørs et al. 2017). Within this, the switch to IPM may be limited or
22 indeed enabled by diverse and numerous drivers including economic, institutional, financial, agronomical,

23 technological, psychological, social, informational ones (Teklewold et al. 2013; Midingoyi et al. 2018) and
24 these barriers or enablers will vary considerably between individuals and organisations (Parsa et al. 2014).

25 Four major facets have been found to affect farmers' decision to adopt or not to adopt IPM (Lamichhane et al
26 2019; Lefebvre et al. 2015; Parsa et al. 2014): i) farm and household facets (e.g. age, educational level,
27 experience); ii) contextual factors specific to the sector (e.g. economic context, protection zones); or geography
28 (topography, value chains, nearness to markets); iii) individual biographical or factual facets (e.g.
29 intergenerational ties with family farms, health concerns related to IPM, sensitivity to environmental issues);
30 and iv) relational facets (e.g. the closeness of a farmer with other farmers and thus their practices or their
31 involvement with agricultural and non-agricultural networks). Consequently, studies based on farmer's
32 surveys (questionnaires, interviews) can markedly aid our understandings of the farmers' needs, their
33 motivations and potential interventions that might encourage behavioural change towards the adoption or
34 not of IPM. This information can be valuable for designing effective knowledge transfer and exchange
35 programmes boosting an effective uptake of IPM (Creissen et al. 2021; Rust et al. 2022).

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

37 As mentioned above, adoption of new practices and technologies can be influenced by many factors including
38 farmer's age (Lefebvre et al. 2015; Parsa et al. 2014), level of education (Creissen et al. 2021), and size of
39 farming enterprise (Sawinska et al. 2020; Creissen et al. 2021). Technological and innovative solutions can
40 be attractive to researchers, farmers and policy makers, particularly because they often require very little action
41 from the users (Rose et al. 2021) and therefore they receive a lot of attention and financial support. The notion
42 of a technological 'fix' however, is rarely achieved in agriculture. Technology adoption rates are often slow,
43 especially for 'fixes' that require significant change to the farming system and farming practice requiring
44 larger levels of investment in terms of time, financial resource, effort and ultimately risk. Technology and
45 innovation can provide the necessary tools for change but with no guarantee that they will be used or adopted

46 properly (Barnes et al. 2019). Some technologies may only appeal to the top few percent of the farming
47 community who are regarded as early adopters/innovators with others maybe following suit over time (Rogers
48 2003). Most success stories around technology adoption are collaborative in nature. Relevant stakeholders
49 are consulted and involved from the start of the project and this co-development ensures that all parties have
50 a degree of ownership, and the project delivers what is intended and for those who need it (Wigboldus et al.
51 2016).

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

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

75 **3. A 4C approach for IPM: Coordination, communication, collaboration, and cooperation among** 76 **key stakeholders**

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

83 Government schemes and industry incentives for farmers to adopt IPM and to tackle the twin crisis of
84 biodiversity loss and climate change, whilst also delivering food security and food safety, must be carefully
85 developed to motivate farmer decision making. Policy makers are beginning to recognise that coordinated
86 stakeholder engagement can improve the design and attractiveness of schemes resulting in greater uptake
87 and their success (Toffolini et al. 2021, Bouma et al. 2022). Consequently, they have embedded frequent
88 stakeholder engagement activities (especially with farmers) into the development of support schemes
89 including those supporting IPM and Agri-environmental measures (Hurley et al. 2022). Coupling economic
90 and sociological analysis within agronomy has proven particularly fruitful in understanding the behavioural

91 drivers for IPM adoption (Way et al. 2000; Buurma et al. 2017; Deguine et al. 2021). These studies imply
92 collaborations between multiple disciplines. Hence, the crop protection sector (researchers, policy makers,
93 farmers and industries) needs to effectively coordinate, communicate, collaborate and cooperate.

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

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

107

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