



## Evaluation of MAS-ICM 2015-2020

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### Summary

The Masters of Advanced Studies in Integrated Crop Management (MAS ICM) was a higher education course which ran from 2015 to 2020. The interdisciplinary course provided knowledge on ICM within a sustainable agricultural production system, and the course was offered to agricultural professionals from developing countries. This assessment aimed to determine the actual benefits experienced by the 66 graduated students, which mainly came from Africa and Asia and 40% of which were women. A questionnaire was developed that mainly focused on quantifying the longer-term impacts of the course after the students had returned home. Participants reported a variety of different impacts, including job promotion, increased confidence and respect in their opinions, as well as increased knowledge and soft skills. The study concluded that knowledge transfer might be as efficient in virtual online courses as face-to-face courses. However, the gain in soft skills, that was a key benefit for MAS ICM students, would be challenging for those participating in a virtual course to obtain. An online Certificate of Advanced Studies course is currently being rolled out by CABI and would profit from a similar evaluation in a few years' time.

## Highlights

- Of 66 participants that completed the MAS ICM course between 2015 and 2020, 59 (89%) responded to the questionnaire. This high percentage indicates the strong commitment and appreciation of the former participants for the course.
- Nearly all respondents strongly agreed or agreed that the MAS ICM course modules were very relevant in relation to their work, with some providing more new information than others.
- Respondents felt that the course had improved their understanding of more cross-cutting themes, such as the interactions between the components of the agro-ecosystem, sustainability, the importance of biodiversity, their ability to find information, and their attitude towards rational pesticide use.
- Respondents stated that the course also improved their soft skills, specifically, their writing, presentation and training skills, problem-solving skills, intercultural skills and team work.
- After course completion, 44% of the respondents were formally promoted, while 46% were given new or additional responsibilities. The majority (94%) thought that completing the MAS ICM course contributed to their promotion. However, a higher percentage of men than women were formally promoted (47% vs- 30%) and subsequently received a higher salary (48% vs. 35%).
- All respondents felt that the course made them more confident when meeting with farmers, colleagues and other stakeholders, and that their advice and opinion is more respected.
- 92% of respondents shared their knowledge gained, which had positive knock-on effects on their colleagues, farmers and even at policy level. This included for instance a change in attitudes towards pesticide use and an increased use of integrated management approaches, leading to improved yields and income.
- Nearly all respondents strongly agreed or agreed that networking activities among themselves and virtual, online courses either refreshing the MAS content, specifically IPM methods, or dealing with new topics would be useful.
- In respect to a University level CAS offered in distance learning mode, nearly 90% of respondents thought that people would be interested and willing to pay (mean: USD 250-300, max USD 1'200), but most would be unable to do so.

## Context

The Masters of Advanced Studies in Integrated Crop Management (MAS ICM) was a higher education course which ran from 2015 to 2020, and was jointly coordinated by CABI in Delémont and the University of Neuchâtel. The interdisciplinary course provided knowledge on ICM as a sustainable agricultural production system that improves overall crop health. The course offered agricultural professionals from developing countries an opportunity to develop and deepen their knowledge of modern crop management principles with the underlying

objective of bringing transformative knowledge into their respective national institutions to shape a sustainable agricultural future.

The annual course ran for 9 months and consisted of an introduction, 11 thematic modules including field visits and research demonstrations and an international workshop about sustainable agriculture. To assure continuing quality and improvement, the course was regularly evaluated through student feedback on each module, including its relevance and the quality of teaching. In addition, questionnaires were sent to students once per year to gather feedback on how the course had influenced their career, whether / how they were able to use the knowledge gained during the course in their every-day work and whether / how they have shared their thesis findings. However, the feedback received was rather qualitative in nature and did not allow a quantitative summary of responses.

The objective of the present study was therefore to prepare a new, more complete survey, covering participants of all six years of the course, and to focus on the actual benefits experienced by the graduated students, in their respective countries. We also wanted to take the opportunity to ask former participants about their view of follow up or additional activities that could further improve the long-term impact of the MAS ICM, the attractiveness of digital versions of the different modules and their willingness to pay for such online courses. The latter was triggered by the fact that in 2021, it was decided to discontinue the face-to-face course, digitize the existing content, and turn it into an online course, consisting of three Certificates of Advanced Studies (CAS) that can be combined into a Diploma of Advanced Studies (DAS), again in collaboration with the University of Neuchâtel.

## What we did

In a first step, five interviews were carried out in order to explore the participants' experiences back in their home countries. Based on these results as well as the results of the formerly carried out annual surveys, a questionnaire consisting of four parts was developed. The first one aimed to capture the existing educational background and position of the students as a baseline for comparison after completion of the course. The second part asked about the relevance of each course module and other important learnings and skills gained. The third and largest part tried to quantify the effects of the course after the students had returned to their respective home countries for an assessment of the longer-term impact. In the last part we focussed on questions to capture the interest of the students in potential future activities and in the planned online version of the MAS-ICM course. In the end, the questionnaire consisted of close to 50 individual questions.

The data were analysed to understand the respondents' views of the different elements of the MAS-ICM course. Although no statistically viable interferences can be made based on such a small sample size, we nevertheless separated certain answers by gender (and continent) where this appeared appropriate. Each question was summarized and percentages given, using the number of participants that answered this question as the total. In cases where comparisons were made between the situation before and after the course, the total number of answers considered was defined by the number of participants responding to both questions.

## What was achieved?

### Information on respondents:

Of 66 participants that completed the MAS ICM course between 2015 and 2020 and that were invited to fill the questionnaire, 59 (89%) responded. Most of them (n=56) answered all the questions while three skipped some answers. This is a very high percentage for an online survey and already shows the strong commitment and appreciation of the former participants for the course. A slightly higher percentage of male participants responded fully (90%, i.e. 36 of 40 male participants vs. 78%, i.e. 20 of 26 female participants). Of the 56 respondents, 40 were from Africa, 13 from Asia, and three from Latin America.

About 60% of respondents had completed a BSc, and close to 40% an MSc, before starting the MAS-ICM course. About 60% had done their degree in Agriculture or Agronomy, often with a specialization, for instance in economics, extension or crop science. The degree of the remaining 40% was in various related fields, such as crop or plant production and protection, crop science or environmental sciences, or in more specialized fields, for instance, biotechnology, entomology, nematology or soil sciences.

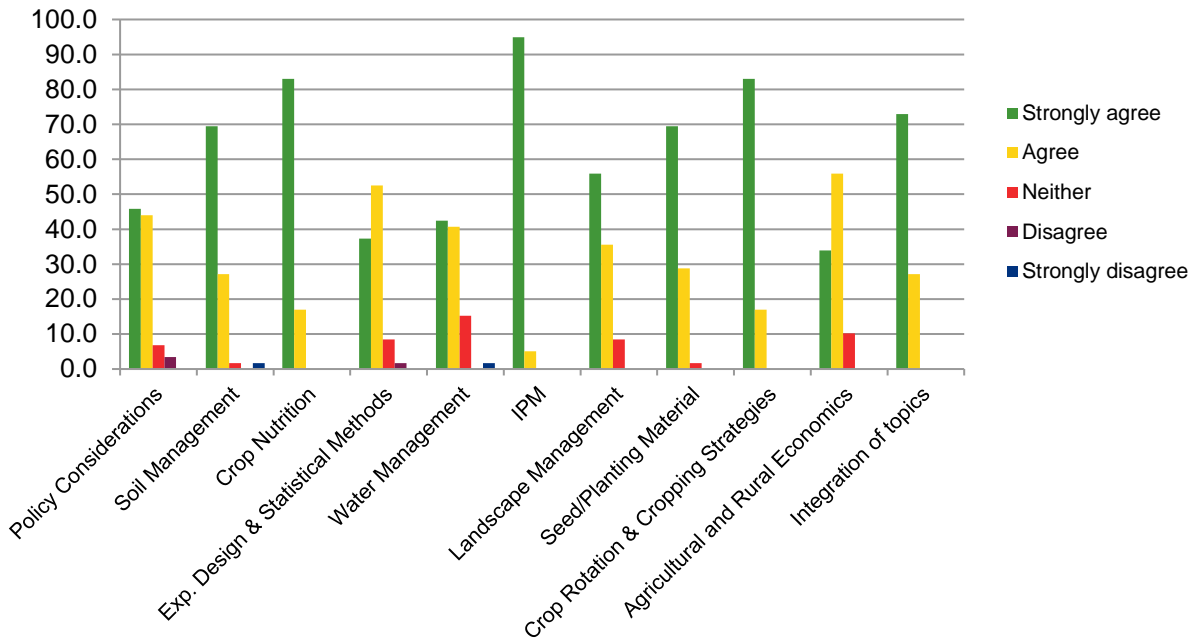
After their degree and before starting the course, the majority (> 90%) followed the plant doctor training organized by CABI, 60% had completed other technical training (on specific crops or technologies), 54% specific extension training and 24% each administrative/project management or other university courses.

Course participants had between 2-22 years of work experience (average 9.4 years). The majority of participants (88%) worked in a governmental organization before starting the course (34% in a governmental research organisation), and the others had worked in either a University, NGO, the private sector or an international organisation. About 69% of the course participants (41) described the title of their work position at a medium level as officer (in governmental jobs) or as lecturer / researcher (in science and education related jobs). Ten respondents (17% of the job titles) indicated higher responsibilities (e.g., chief officer, assistant director) while 14 % of the job title descriptions were indicating an assistant level (assistant officer: 3, assistant lecturer/scientist: 5).

Together this indicates that the level of training and work experience of participants in the MAS ICM was generally high and that most had prior knowledge and training in agricultural production methods and crop protection, including at least basic diagnosis of pests and diseases.

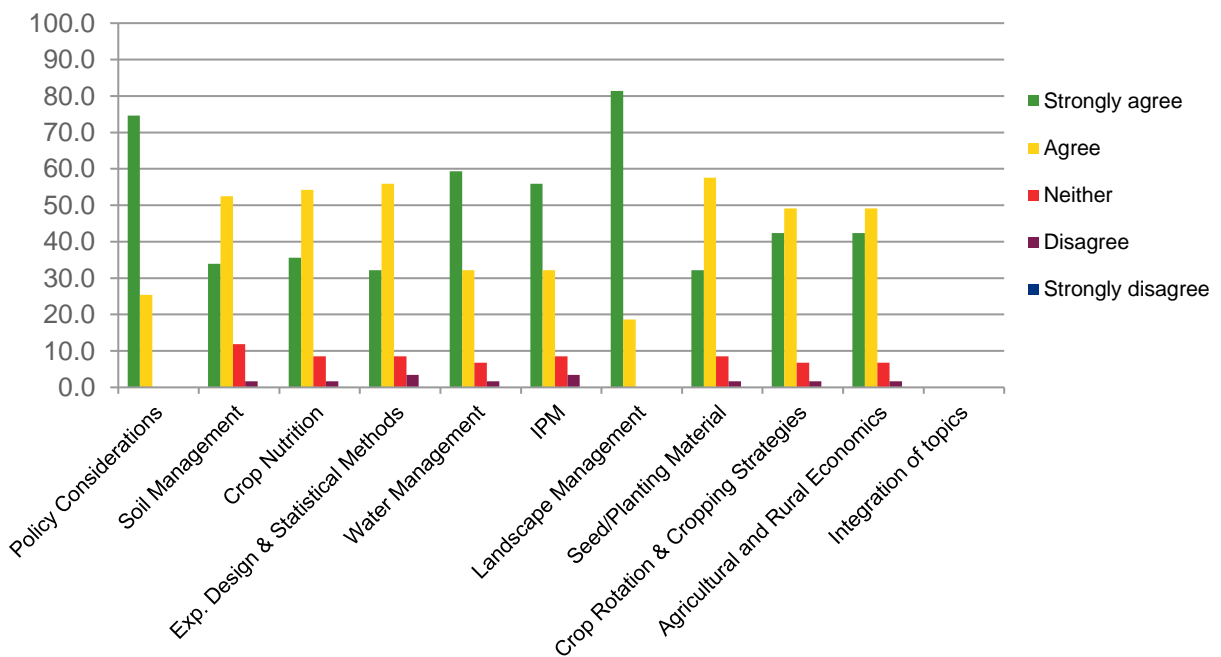
### Relevance of course modules

90-100% of all respondents strongly agreed or agreed that the modules were very relevant in relation to their work (Fig. 1). For water management the percentage was slightly lower (83%). The score was highest for the Integrated Pest Management (IPM) module, where 95% strongly agreed on its relevance for their work. With quite many of the participants being active in agricultural extension, the IPM link to their jobs probably influenced this score.



**Figure 1.** Percent of course participants who agree/disagree that content of modules has been relevant in relation to their work.

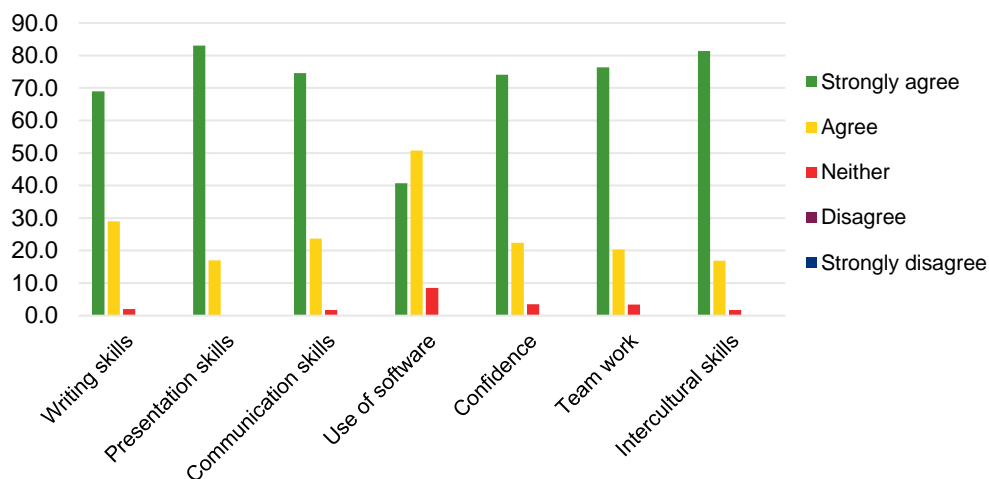
All participants strongly agreed or agreed that the modules on policy considerations and landscape management provided mostly information that was new to them (Fig. 2). For the other modules this percentage ranged from 86-91%.



**Figure 2.** Percent of course participants who agree/disagree that content of modules provided mostly information that was new to them.



Participants also reported having improved their understanding of the interactions between the components of the agro-ecosystem, finding appropriate information / literature, problem solving, addressing and solving farmers' problems using appropriate, multiple tools and techniques, research methods and their correct and appropriate use. The course also improved their understanding of sustainability, the repercussions of human action on land, the importance of biodiversity for the environment, rationale pesticide use, policy development, and the correct usage of excel for analysis and pivot tables.



**Figure 3.** Percent of course participants who agree/disagree that participation in the MAS-ICM course improved their soft skills.

Finally, course participants strongly agreed or agreed that they were able to improve many of their soft skills, especially, presentation, communication and writing skills, but also intercultural skills, team work and their overall confidence (Fig. 3). In addition to the ones listed in Fig. 3, participants also noted having improved their time management skills, their work ethics and attitude, and leadership and active listening.

### Back home

After returning home, 52 of the 59 respondents (88%) went back to work for the same institution as before obtaining the MAS degree. In the course of the following 2 – 3 years, 11 (19%) of the graduates continued studying, either aiming for a PhD or an MSc degree. From the returnees, 44% were formally promoted, while 46% were not formally promoted but were given new or additional responsibilities. This included for instance increasing involvement in project management and coordination as well as taking on more executive roles in their jobs. For others, the focus of activities was changing from the regional to the national level. In 45% of respondents this led to a higher salary. A higher percentage of men got formally promoted than women (47% vs. 30%), and subsequently received a higher salary (48% vs. 35%). This cannot be explained by a difference in the number of years of work experience, which was very similar (on average 10 years for women and 9.2 years for men) and neither by a difference in degree before starting the course.

The promotion of participants is also reflected in their position titles. The numbers of higher job titles increased from 8 to 29 (55% compared to 15% before the course), while the medium level jobs decreased from 38 (72%) to 23 (43%), and the assistant level jobs from 7 to 1 (2% compared to 13% before the course). Within the group with higher level job titles prior to the MAS, half of the participants moved up one more step. For instance, from senior to principal agricultural inspector, or from head crop protection to head of the national plant protection organisation NPPO.

Before starting the course, 42% worked at the national level, and this increased to 53% after completing the course and returning back home. Working at the district, county or sub-county level decreased accordingly. Similarly, the number of staff reporting to them increased. While prior to completion of the course 44% were responsible for 10 or more staff, this increased to 58% after the course. For women, the percentage increased from 29% to 47%, and for men the increase was 52% to 67%.

The majority of respondents (94%) were convinced that completing the MAS ICM course contributed to their step up the career ladder. Specifying what was particularly helpful the participants mentioned as one key aspect that their soft skills improved due to the course (see Fig 3.). Improved problem-solving skills using multiple, situation specific techniques, and improved training skills and access to information were mentioned to be important in this context. This is in line with scientific literature that has widely shown that soft skills, among them interpersonal and communication skills as well as problem-solving skills are significant for building up a career (e.g. Mitashree 2020).

All former participants of the MAS ICM course either strongly agreed (> 75%) or agreed that the knowledge and experience they gained during the course makes them feel more confident when meeting with farmers, government officials, their superiors, but also collaborators, colleagues, donors, politicians, NGO leaders and more particularly University students, researchers and pesticide retailers. They also strongly agree ( $\geq 70\%$ ) or agree that their advice and opinion is more respected by these groups. The percentage was consistently higher for men than for women and most striking in respect to government officials, where 89% of men felt that their advice is more respected versus 50% of women.

The large majority of participants (85%) strongly agreed that they have changed their attitude towards the use of pesticides (more specifically that they are now able to advocate more sustainable systems to increase agricultural productivity), and that their intercultural competence and soft skills have improved (80%), while two thirds (66%) strongly agreed that the course enabled them to gain access to helpful information through their extended international network (e.g. through continuing contact with other former participants).

For the impacts listed in Table 1, the responses were more varied / nuanced. The majority of participants (> 50%) agreed or strongly agreed that the impacts materialized thanks to their participation in the course. The impact was highest in terms of a positive influence on their colleagues who also changed their attitudes towards pesticide use, most probably due to a role model effect and discussions. This was followed by impact on farmers using more integrated approaches or trying new tools and technologies including more climate resilient adaptation methods, which lead to improved yields and incomes (76% and 73% agreed or strongly agreed, respectively). Not surprisingly, impacts at the policy level are harder. Nevertheless 54% still agreed or strongly agreed that they were able to at least contribute to discussions at this level.

**Table 1.** Percent of course participants who agree/disagree that the knowledge and experience they gained has had the listed impacts. (n=59)

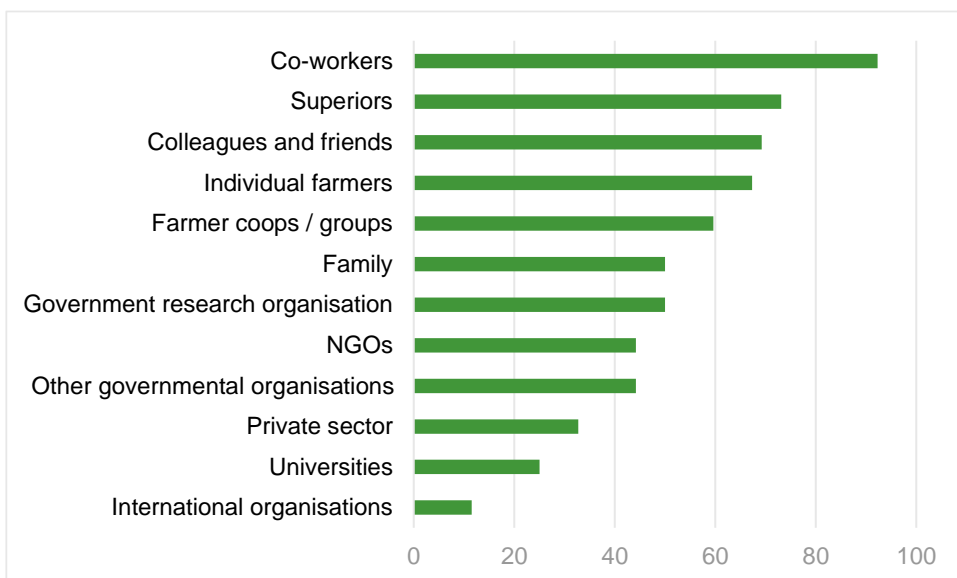
Type of impact	Strongly agree	Agree	Neither agree nor disagree	Disagree
My colleagues have changed their attitudes in terms of pesticide use	37.3	52.5	8.5	1.7
The farmers use more integrated management approaches	28.8	62.7	8.5	0.0
New tools and technologies are piloted in farmers' fields	27.1	57.6	13.6	1.7
More climate resilient adaptation methods have been applied in the field	27.1	49.2	22.0	1.7
Farmers have improved their yields	25.4	50.9	22.0	1.7
Farmers have improved their income	27.1	45.8	27.1	0.0
New tools and technologies are introduced at larger scale	18.6	40.7	33.9	6.8
The farmers use less pesticides	15.2	44.1	33.9	6.8
The knowledge contributed to new policy levels discussions	20.3	33.9	39.0	6.8

These impacts were possible due to the former course participants sharing their gained knowledge with other people, which 92% did. The six participants that did not share their knowledge either had no opportunity (n=4), no time (n=2) and/or there was no interest by others (n=1).

Answering the question about the most important learnings which the participants shared when back home, many of the respondents referred to the ICM course topics for structuring their feedback. The results showed that content on Integrated Pest Management was most often shared (n=29) followed by landscape management (n=15). Other shared learnings included technical information about soil management (n=9), crop nutrition (n=7) and cropping strategies (n=6). Almost one third of the participants responded that their thesis results were part of the most important learnings shared. Other important topics included learnings in the context of the rational and safe use of pesticides (n=13). In terms of impact, it was interesting to hear that some of the MAS topics have been included into university curricula for sharing with students.

Most participants shared their gained knowledge with co-workers, followed by superiors, colleagues and friends, individual farmers or farmer groups, government research organisations and family etc. (see Fig. 4). This indicates that the impact of the course goes further than just the participants' work place.





**Figure 4.** Percent of course participants sharing their gained knowledge with different groups once back home.

Independent from the counterpart with whom the knowledge was shared (see categories in Figure 4 above), it was predominantly the respondent who initiated the sharing. Percentages ranged from 81% (with superiors, co-workers) to 92% of the cases (with family) for exchange initiated by the graduates returning home.

The gained knowledge was mostly shared through personal advice and discussions, presentations, during the training of farmers, sharing of their thesis, workshops, participation in working groups but also demonstration plots (Fig. 5).



**Figure 5.** The different ways the course participants shared their gained knowledge once back home (%).

Of the 31 respondents that shared their knowledge using workshops (Fig. 5), 63.5% did that with officials, 52% with farmers, 46% with scientists, and 31% with NGO's. Of the 20 participants that shared their knowledge using demonstration plots, most used other farms or institutionally owned plots (around 30% each), 23% used their own farm, 19% the land of a cooperative, and 13.5% communal land.

The majority of respondents (64.6%) reported that there was a follow up of their thesis findings, while a minority of respondents (13.5%) published their thesis. Nearly two thirds (61.5%) indicated that some or all of their thesis findings have been implemented, mostly (71%) at the farm level, but a surprisingly high percentage (36%, 15 respondents) also indicated that their thesis findings have been implemented at the policy level. Other ways thesis findings have been implemented was through incorporation in agricultural programme design, and through training of extension staff about the thesis outcomes.

## The future

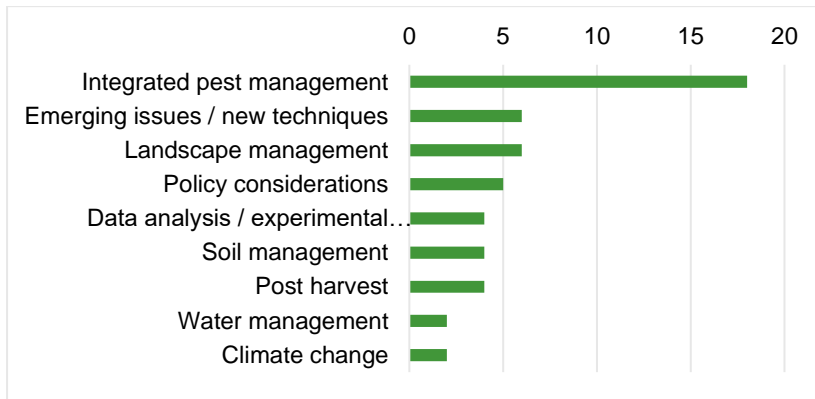
Nearly all respondents (98%) strongly agreed or agreed that networking activities among themselves have the potential to improve the positive long-term impact of the MAS ICM course, and the potential of a virtual, online refresher course of 1-2 weeks was rated to be at a similar, high level (96%) (Table 2). The other four proposed activities also received strong support with close to or over 90%.

Topics of interest for an online refresher course mostly included topics taught during the MAS ICM course (see Fig. 6). Two topics were mentioned more than once that are not covered by the MAS: climate change and post-harvest management. Other topics (only mentioned once, not shown in the table) included for instance greenhouse management, invasive species or pest surveillance and forecasting.

Other activities to improve the MAS impact were suggested to be initiated at the local level. A good potential was attributed to the development of partnerships with other universities to teach MAS ICM course content. Another promising approach was to hold local debates or panel discussions, for instance on current governmental pesticide policy and the use and reduction of pesticides, or the success and sustainability of locally implemented development programs.

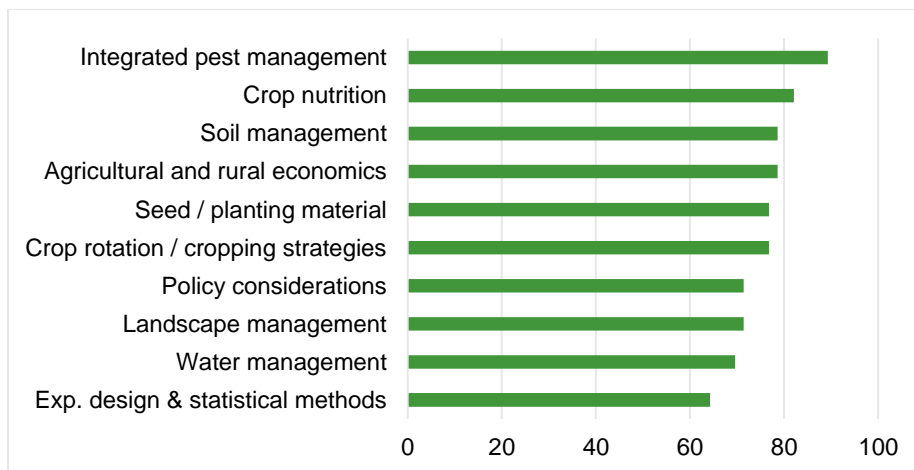
**Table 2.** Percent of course participants who agree/disagree that the following additional courses and activities have potential to improve the positive long-term impact of the MAS ICM course. (n=56)

Type of course / activity	Strongly agree	Agree	Neither agree nor disagree	Disagree
Networking activities among MAS ICM participants	66.7	31.5	1.8	0.0
Virtual, online refresher course	67.9	28.5	1.8	1.8
Webinars addressing new topics	63.0	29.6	5.6	1.8
Knowledge sharing / joint knowledge production	52.8	39.6	5.7	1.9
Webinars refreshing MAS-ICM topics	51.9	36.6	9.6	1.9
Lobbying and negotiations at political level	46.4	41.1	10.7	1.8



**Figure 6.** Topics of interest for online (refresher) course of former MAS ICM participants (frequency; n=50 respondents; topics only mentioned once are not listed).

Nearly 90% of former participants thought that people, for instance their colleagues, would be willing to pay to obtain a distance learning, University level CAS in IPM, while only 64% thought this would be the case for experimental design & statistical methods (Fig. 7). Overall the perception that people would be willing to pay for a certain module was very high. The sequence of the six most likely subjects people would pay for, more or less follows the sequence of subjects participants found most relevant for their work (see Fig. 1).



**Figure 7.** Willingness to pay in order to obtain a Swiss University level, distance learning Certificate of Advanced Studies (CAS) degree in different topics (n=56).

Subsequently, three different CAS courses were suggested (see Table 3), and participants asked how much people would likely be willing to pay.

**Table 3.** Amount assumed people would pay for three different CAS courses.

CAS theme	Origin of course participants		Average
	Africa	Asia	
CAS1: ICM (IPM, cropping strategies, water/soil management, planting material)	310.-	158.-	288.-
CAS2: Implementing ICM (policy considerations, rural economics, gender, extension, experimental design)	282.-	114.-	248.-
CAS3: Biological Control and Ecosystem Services (Landscape management, conservation-augmentation-classical biocontrol, invasive species)	338.-	173.-	314.-

Answers ranged from zero to USD 1'200 for all three listed CAS. Averages were in the range of USD 250-300, and highest for the CAS covering 'Biological Control and Ecosystem Services'. Interestingly, amounts were consistently higher for participants originating from African countries compared to Asian countries (Table 3). It was felt that most people would be interested and willing to participate in a CAS, but most would be unable to pay (low salaries, exchange rate). The motivation to pay would likely be higher if obtaining the degree would result in financial benefit (e.g. promotion, better paying job).

Only participants from African countries (37.5%) thought that the organization they are working for would be able and/or willing to cover such costs. The majority (76.8%) did not know institutions where one could apply for getting support to participate in such a course. Of the 13 participants that did know, 12 (92%) were from African countries. Thus, it will be important to offer scholarships and/or access to information where to apply for funding to participate.

Other potential problems for the realization of distance learning courses that were mentioned were the mode of payment, access to USD or Euros, access to a good internet connection, and the fact that most of the extension workers already have degrees and diplomas.

Finally, 55 of 56 respondents would 'definitely' recommend the MAS ICM course and one person would do so 'probably'.

## Conclusions, and the way forward

This survey of previous MAS ICM course participants, up to six years after the completion of their course, showed the value of the course both in terms of direct knowledge gains to the participants, and also in relation to how participants had been able to use that knowledge as they returned to their jobs. It also quantified how the course had translated into specific gains for the participants in terms of promotion, additional responsibilities and respect for their opinions.

Although the relatively small number of respondents to the survey (n=59), only allows for qualitative statements to be made, the high return rate of 89% supports the validity of conclusions drawn, as well as the overall appreciation of participants for the MAS ICM course.

The majority of course topics were regarded as relevant to the participants' jobs and provided new information. Apart from a pure improvement of their technical knowledge, it is important to note that participants also improved many of their soft skills, such as presentation, writing and communication skills, plus problem-solving skills, intercultural skills and team work, and very importantly, their overall confidence. Improved technical knowledge and soft skills made

participants feel more confident when meeting with stakeholders, superiors or colleagues, and they also felt that their advice and opinion is more respected. Keeping in mind the societal challenges that urgently need to be tackled (e.g. global food insecurity), the respondents also gained skills for participating actively in processes of knowledge sharing and co-production of transformative knowledge: a key step in addressing “wicked” problems according to sustainability research (see among others Norström et al. 2020).

Interestingly, the view that the contribution of the knowledge obtained supports participants’ career progression was consistently supported by men more often than by women, especially in respect to government officials. While this could be interpreted as men profiting more from the course than women, we rather believe that this difference in career steps needs to be understood within its social and cultural context. In accordance with Tarjem et al (2021) we argue that this might be due to the position of the female participants in their institutions and society as a whole, and therefore their recognition within their working environment. Although such conditions do not easily change within short time frames, we nevertheless believe that the participants’ new knowledge and soft skills can contribute to transformation in the long run, including increased recognition and improved female positions within their institutions.

A large majority of students shared their knowledge after return through personal discussion, presentations, workshops and training of farmers. We assume that the gain in knowledge, combined with the ability to transmit and share this knowledge in a more effective way and with more confidence, led to concrete impacts. For instance, over 80% of course participants strongly agreed or agreed that their colleagues have changed their attitudes towards pesticide use, that farmers use more integrated management approaches, and that new tools and technologies are piloted in farmers’ fields, which led to improved yields and income, and to the adaptation of more climate resilient methods (ca 75% of participants agreed).

We believe that compared to a face-to-face course, pure knowledge transfer might be as efficient in virtual online courses (e.g. Johnson et al. 2000). In addition, a distance learning format would make the knowledge transfer more accessible and affordable and has for this reason great potential to reach a far wider audience compared to the face-to-face format. However, the gain in soft skills, intercultural interactions, the understanding of the global dimensions of complex challenges by learning from and working together with peers from all over the world, as well as the pure experience of being in a new environment are key learnings for leading and contributing to processes of co-production of knowledge in agriculture that are increasingly gaining importance facing societal changes- including climate change - and will unlikely be replaceable. As one MAS ICM participant wrote: “I deeply regret that the face-to-face learning opportunity I have received would be virtual. Being out of my usual environment allowed me to be more focused and fostered a richer learning environment and networking opportunities with both lecturers / CABI researchers and also with fellow students. The value would be much less in the virtual experience.”

With this in mind, the initial number of participants for the online learning CAS degree courses will be limited to around 25 per course. This format will allow regular group sessions as well as one-to-one written and live support by the tutoring team. Another aspect to consider are the cultural as well as gender differences and commonalities in participating and communicating, as well as tools for knowledge sharing and co-creation that will need to be addressed in an online course (see Chase et al. 2002). Once the CAS courses have been running for a couple of years, a similar evaluation as for the MAS ICM course should be envisioned to ultimately compare the impact of both course types.

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