

ORIGINAL RESEARCH ARTICLE

Agroecology or modern conventional agriculture? Positions of Argentine rural extensionists

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ABSTRACT

At a global level, there is a growing concern about the sustainability of agricultural production models. In particular, the impacts and environmental passives derived from the implementation of the principles of the so-called Green Revolution. In contrast, agroecology gains supporters in the context of a different productive model, though limited due to lower levels of agricultural productivity. Nevertheless, for any of these models to come into practice, it has to go through farmers' decision-making. Thus, acknowledging the key role played by rural extensionists in farmers' decision-making process, in this article the extensionists' personal positioning and that of their institutions are analyzed in the context of the contrast between agroecology and conventional agriculture. A total of 583 rural extensionists who work in the National Institute of Agricultural Technology, the Subsecretariat of Family Farming and Territorial Development, and other Argentine institutions replied to an online questionnaire. It included sociodemographic questions and asked to position oneself and one's institution using a five-level Likert-type item, in which agroecology and conventional agriculture were the poles. Results show that, on average, extensionists have a tendency towards the agroecological pole, while they situate their institutions halfway between both agricultural models. In general, women, who have no university degree, and who hold a degree in social sciences, are more oriented to the agroecological pole.

Keywords: organic agriculture; perceptions; pesticides; sustainability

1. Introduction

Both in Argentina and globally, there is a growing concern about the sustainability of agricultural production models^[1], in particular about the negative impacts and environmental liabilities derived from the implementation of the conventional agricultural model^[2-5].

Conventional agriculture is understood as the productive model derived from the implementation of the principles of the green revolution^[1,6]. This model is characterized by the predominance of monoculture, the use of varieties with high yield potential (generally hybrids or transgenics), a high level of mechanization, and the intensive use of external agricultural inputs (seeds, fertilizers, and agrochemicals for pest, disease, and weed control)^[1,7,8].

ARTICLE INFO

Received: 13 July 2020 | Accepted: 30 August 2020 | Available online: 20 September 2020

CITATION

Landini F, Beramendi MR. Agroecology or modern conventional agriculture? Positions of Argentine rural extensionists. *Advances in Modern Agriculture* 2020; 1(1): 1984. doi: 10.54517/ama.v1i1.1985

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In this context, it has been argued that, although the green revolution and conventional agriculture have radically increased agricultural production and productivity^[1,4,6], they have also generated multiple environmental and social problems. Among them, at the environmental level, are erosion and loss of soil fertility; pesticide contamination of soil, water, and food; deforestation, energy inefficiency, dependence on fossil fuels, and contribution to global warming; loss of biodiversity, genetic variability, elimination of beneficial insects, and decreased ecosystem resilience; and the development of resistance to pesticides^[1,3,4,7-10]. For their part, different authors have also warned about the negative social impacts of the green revolution and conventional agriculture, including land concentration^[6], the transfer of resources from farmers to large agroindustrial complexes^[8], its exclusionary nature, as it cannot be applied by the vast majority of producers^[10] and its impact on farmers' health due to intoxications derived from the use of agrochemicals^[11].

In this framework, different authors and institutions have proposed the need to implement a different production model, strongly committed to environmental sustainability^[1,4]. In particular, agroecology and organic agriculture have been proposed as alternatives to the production model of conventional agriculture^[10]. Although agroecology can have different meanings depending on who uses the concept^[12], in general it refers to a productive model developed in harmony with nature that seeks to minimize the impact on the environment^[6] based on the strengthening of agrobiodiversity and the use of its ecosystem services, the implementation of practices such as intercropping, the design of mixed livestock and agricultural systems, and crop rotation^[7], and the replacement of external inputs by naturally developed internal inputs^[8]. Altieri and Nicholls^[13] define agroecology as “the scientific discipline that approaches the study of agriculture from an ecological perspective [...] whose purpose is to analyze agricultural processes more broadly [...] [considering] agricultural ecosystems as the fundamental units of study [...] [which] are investigated and analyzed as a whole” (p. 14). Thus, in contrast to the linear and simplistic perspective of the conventional model, the agroecological perspective proposes a systemic understanding of the complexity of ecosystems^[9]. Finally, it should be noted that agroecology, in contrast to organic agriculture, which has a strictly productive focus, also relies on a political ethical positioning that generally includes dimensions such as fair marketing^[2], social equity^[1] and the recognition of small farmers as social subjects, in contrast to large industrial conglomerates^[10]. Now, along with the evident environmental benefits of the agroecological proposal, it is clear that its main counterpoint is its lower yield per unit area^[6,14], which limits its possibility to respond to the growing demand for food^[1].

Thus, it is observed that conventional agriculture and agroecology appear as contrasting models of agricultural production. In this line, it would be possible to refer to other productive models closer to conventional practice, such as precision agriculture or sustainable intensification^[1,5,12,15], which propose to maintain the productivity of the conventional model while minimizing environmental costs. In parallel, different forms of alternative agriculture can also be identified, which aim to promote balanced and diversified environments using natural pest control strategies and sustainable technologies^[13], such as biodynamic agriculture, permaculture, and organic agriculture^[16]. However, it is observed that, as conceptual references, conventional agriculture and agroecology constitute the two most contrasting productive models.

However, for theoretical models to become productive practices, it is necessary for them to pass through the sieve of the actors' decision-making, which requires paying attention to the beliefs, values, and rationalities of the subjects themselves who make these decisions^[17]. There are multiple research and studies that have addressed different attitudinal and cognitive aspects related to productive decision making related to the implementation of sustainable productive practices. Thus, for example, the attitudes of producers towards sustainable agriculture have been studied^[7,18], the willingness to adopt conservation practices^[19] and the valuation of conventional production practices, including the use of agrochemicals^[20].

In this context, it is striking that the vast majority of research has focused on the study of farmers’ beliefs and attitudes, leaving aside the role played by both rural extensionists and technical advisors. Indeed, extensionists and advisors influence producers’ decision making by providing information, giving recommendations^[21] and acting as facilitators of processes of reflection and critical analysis of practices^[22], which implies that their beliefs and attitudes will have multiplier value, reaching a large number of producers.

At the same time, it is also important to take into account that rural extensionists usually work for different types of institutions, generally public, which frame and may influence the content of the advice provided to producers. Thus, this article presents the results of research that allowed us to analyze how rural extensionists position themselves within the framework of agroecological and conventional production models, and where they locate their institutions of belonging.

2. Materials and methods

A self-administered questionnaire was applied to rural extensionists within the framework of broader research aimed at investigating objectives, methodologies, and approaches to rural extension. In addition to questions related to sociodemographic information, the questionnaire included two Likert-type items on the evaluation of agroecological and conventional production approaches (these were included in an independent block of the questionnaire, unrelated to other blocks). These items are presented below:

- Below are two opposing production approaches: agroecology and modern conventional agriculture. Indicate on the following scale which approach characterizes the institution or company in which you work (if you work in several, please think of the one to which you dedicate more time). If the option is “Agroecology”, check 1, if it is an intermediate position, check 3, and if it is “Modern conventional agriculture”, check 5. You can also use the numbers 2 and 4 to show greater proximity to one of the two poles.

Agroecology	Modern conventional agriculture
1	5

- Using the same procedure, now indicate the productive approach with which you feel most identified on a personal level.

Agroecology	Modern conventional agriculture
1	5

No definition of each approach was offered to the participants, as it is assumed that any definition of these issues would be marked by a specific positioning, which could bias the responses. In addition, it is recognized that the respondents have knowledge of agriculture because of the work they do.

The online survey platform SurveyMonkey® was used to send the questionnaire. The responses were received between August and September 2017. This process was supported by authorities from the National Institute of Agricultural Technology (INTA) and the Undersecretariat of Family Agriculture and Territorial Development (SsAFyDT) of the current National Ministry of Agriculture, Livestock, and Fisheries. In the case of INTA, the questionnaires were sent by e-mail to heads of Rural Extension Agencies, heads of PROFEDER

projects (the Federal Program to Support Sustainable Rural Development), technicians of the ProHuerta Program, and promoters and project agents of the Rural Change Program. In the case of the SsAFyDT, the questionnaire was sent to its provincial coordinators, who forwarded it to the field technicians in each jurisdiction.

A total of 583 responses were received to the questions related to the productive approach: 65.4% men and 34.6% women, 56.1% from people linked to INTA, 18.4% from SsAFyDT field technicians, and 14.6% from other institutions (mostly public), while the rest (11%) did not respond to the question related to the institution to which they belonged. The average age of the members of the sample was 43.5 years, while the average number of years of experience as an extensionist or advisor was 12.7 years (in the latter case, 0 years was considered for those who indicated 'less than 1 year' as this did not refer to an exact period).

In terms of the highest level of education completed, the distribution is as follows: primary 0.5%, secondary 4%, tertiary (non-university) 13.2%, university 66.2%, master's degree 14.8%, and doctorate 1.4%. As for the distribution of university degrees, three areas were identified: productive (agricultural engineer, veterinarian, zootechnician, and forestry engineer), which reached 66.9% of the sample; social (social worker, sociologist, psychologist, economist, and education science graduate), corresponding to 6.2%; and other areas (biologist, natural resources engineer, industrial engineer, tourism graduate, or any other not specified in the previous areas) equivalent to 9.1%, while the rest reported not having a university degree or did not answer the question.

It was considered important to differentiate the valuation of the different productive approaches according to the regions of the country. The regions, their constituent provinces, and the percentage of extensionists in the sample working in each of them are shown below: Cuyo (La Rioja, Mendoza, San Juan, and San Luis) 19.6%; Northeast (Corrientes, Chaco, Formosa, and Misiones) 18%; Northwest (Catamarca, Jujuy, Salta, Santiago del Estero, and Tucumán) 19.9%; Pampeana (Buenos Aires, Córdoba, and Entre Ríos Santa Fe) 29.7%; and Patagonia (Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, and Tierra del Fuego) 12.9%.

SPSS software was used to study the relationship between sociodemographic variables and the productive orientation of the participants and their institutions. The statistical tests used are reported in each case and adjusted to the respective levels of measurement. We chose to consider $p < 0.05$ as the criterion for statistical significance. In view of the existence of possible relationships between the independent variables associated with the productive orientation of the extensionists and their institutions, it was decided to explore the relationships between them and their possible functioning as confounding variables, understanding them as third variables that alter the relationship between an independent variable and a dependent variable (for example, showing relationships when there are none).

3. Results

3.1. Assessment of the different productive approaches at the individual and institutional level

Personal identification with the different approaches obtained a median of 2 (Interquartile Range [IR] = 2), which would indicate a tendency to value an agroecological approach more positively than a conventional one. In relation to how extensionists characterize the approach used by the institutions or companies where they work, a median of 3 (RI = 1) was obtained, which would imply that participants do not tend to recognize a particular model in their organization.

Figure 1 shows the distribution of responses for both variables (personal identification and institutional focus). They are presented in the same figure to show how the two differ and contrast.

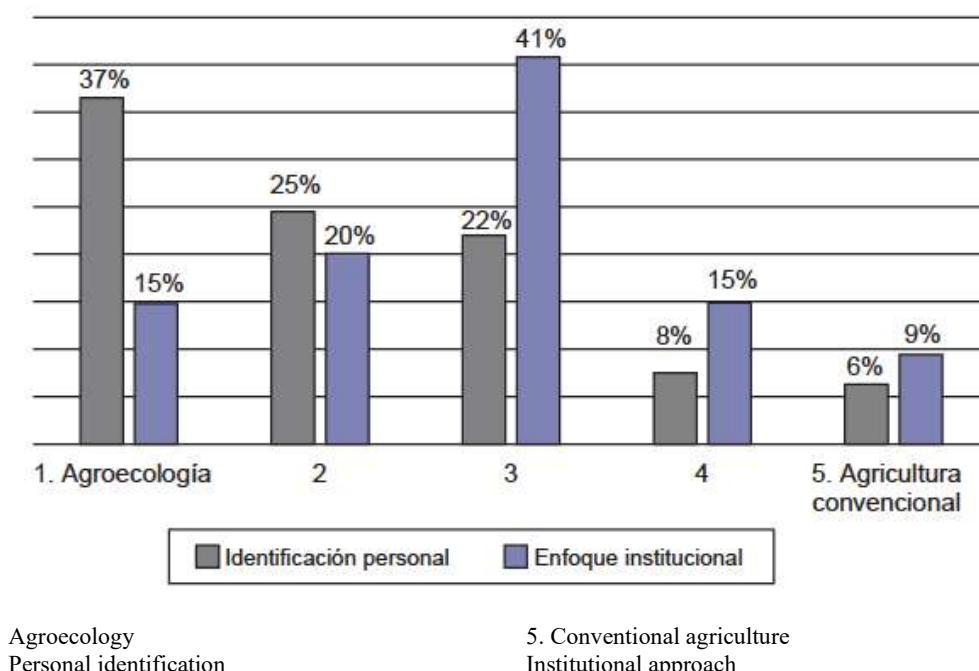


Figure 1. Assessment of productive approaches.

Additionally, it is also important to note that although the distribution of both variables is different, the data analyzed indicate that there is a moderate and positive correlation between them ($R_s(583) = 0.46; p < 0.001$). This indicates that there is some concordance between the productive orientation of the participants and the models through which they describe the organizations in which they work.

3.2. Production models and sociodemographic variables

We also chose to study the relationship between the personal productive model and the one used to characterize the institution where we work with different socio-demographic variables. **Table 1** shows the results of the correlation and group comparison analyses.

Table 1. Production models and their relationship with different sociodemographic variables.

Variables	Personal identification	Characterization of the institution
Sex	MW: $Z = -3.71; p < 0.001$	MW: $Z = -0.52; p = 0.605$
Age	$R_s = -0.07; p = 0.072$	$R_s = -0.08; p = 0.056$
Experience	$R_s = -0.05; p = 0.209$	$R_s = -0.08; p = 0.061$
Institution	KW: $\chi^2 = 1.39 (2); p = 0.499$	KW: $\chi^2 = 16.56 (2); p < 0.001$
Regions	KW: $\chi^2 = 12.16 (4); p = 0.016$	KW: $\chi^2 = 11.50 (4); p = 0.021$
University education	KW: $\chi^2 = 9.05 (2); p = 0.011$	KW: $\chi^2 = 0.50 (2); p = 0.501$
Educational level	$R_s = 0.11; p = 0.008$	$R_s = 0.11; p = 0.006$

Notes: KW = Kuskal-Wallis test; MW = Mann-Whitney U test; R' = Spearman's Rho.

3.3. Personal identification with the different production models

Table 1 shows that the productive orientation of the participants is related to different variables. First, it is observed that women have a greater orientation towards agroecology than men (Mean Range [PR] women = 257; PR men = 310). In fact, 46.5% of women identify with an agroecological model (response value 1 in the respective Likert-type item), while only 31.2% of men do so.

Table 1 also shows differences in the productive orientation of extensionists by region. To study differences between specific regions, the post-hoc Dunn statistic was used without Bonferroni adjustment. The analyses indicate that there is a statistically significant difference between the Northwest (PR = 256) and three other regions: Northeast (PR = 308), Cuyo (PR = 316), and Patagonia (PR = 318), but not among the rest, which implies that extensionists from the Northwest tend to identify more with an agroecological model compared to the three other regions.

On the other hand, when comparing the academic training of the participants and their productive orientation, it was observed that there is a different evaluation according to the career studied. Comparing pairs with the post-hoc Dunn statistic without Bonferroni, significant differences were found between the disciplines of the productive area (PR = 249), on the one hand, and those of the social sciences area (PR = 195) and those classified as other disciplines (PR = 207), on the other. On the other hand, no significant differences were observed between the latter two. Thus, the results show that graduates from the social area and from disciplines categorized as 'other' have a more agroecological orientation than graduates from agricultural disciplines.

The results presented in **Table 1** also show that there is a low, positive, and statistically significant correlation between the educational level of extensionists and personal identification with the conventional production model. In other words, the higher the level of education, the greater the tendency to identify with a conventional production model. In an attempt to interpret these results, we chose to explore the average ranges of the different educational levels, which led us to consider the possibility that the relationship between the two variables was not strictly linear. Thus, for the following analysis, the three cases of extensionists who had only primary education were excluded, and those whose maximum educational level was intermediate or tertiary were unified, creating a new category called Non-University Educational Level. A comparison was made using Kruskal-Wallis analysis, and it was found that there were differences in the productive model of the extensionists according to their educational level (KW: $\chi^2(3) = 13.4$; $p = 0.011$). After performing Dunn's post-hoc analysis without Bonferroni, it was found that those without university education (PR = 241) have a more agroecological orientation than those who only have a university degree (PR = 301) or who have a master's degree (PR = 290) or doctorate (PR = 379), with no significant differences among the latter three. This result supports the interpretation that it is not the level of education per se that affects the productive orientation of the extensionists, but the fact of having completed university studies or not.

In abstract, following **Table 1**, four variables associated with the productive orientation of extensionists were identified: gender, the region where they work, their university education, and their level of education. Next, we chose to explore the existence of relationships between these four variables in order to evaluate whether any of them could be acting as a confounding variable. It was observed that there is a relationship between the variables sex and university education ($\chi^2(2) = 34$; $p < 0.001$) and between the regions where extensionists work and their educational level (KW: $\chi^2(4) = 111$; $p = 0.026$). In contrast, it was concluded that there was no association in the crossing of the rest of the variables analyzed (sex and region: $\chi^2(4) = 3.95$ [$p = 0.413$]; sex and educational level: $U = 40280$; $p = 0.241$; region and university training: $\chi^2(8) = 6.71$; $p = 0.568$; and university training and educational level: KW: $\chi^2(2) = 1.13$; $p = 0.568$). Consequently, it was decided to evaluate the existence of confounding variables based on the link identified between sex and university education and between regions and educational level.

Regarding the relationship between sex and university education, it was observed that 70.5% of those with agricultural education were men and 29.5% were women, 25% of those with social education were men and 75% were women, and those with other university education were 52.8% men and 47.2% women. The Mantel-Haenszel (MH) test was used to evaluate whether sex was a confounding variable between university education and the productive orientation of the participants. As a preliminary step to the analysis, the personal

production model variable was recategorized as a dichotomous variable: model oriented to agroecology (values 1 and 2) and model oriented to conventional agriculture (values 4 and 5), excluding value 3. In view of this, it was decided to exclude from the analysis the titles categorized as ‘other’ since they have a similar distribution among the participants of both sexes and refer to diverse and heterogeneous knowledge. The results indicate that the null hypothesis indicating that sex is not a covariate associated with academic training and the personal productive model is sustained (MH: $\chi^2(1) = 2.71; p = 0.100$). This means that the productive model with which the extensionists identify themselves will vary according to whether they have a social or technical academic background, and that sex is not functioning as a confounding variable.

Conversely, we also studied the possibility that the type of university education was acting as a confounding variable in the link between sex and productive orientation. The results show that, both excluding the disciplines categorized as ‘other’ (MH: $\chi^2(1) = 2.36; p = 0.124$) and maintaining this variable value (MH: $\chi^2(1) = 1.17; p = 0.280$), it cannot be concluded that university education is functioning as a confounder in the link between sex and the productive model with which extensionists identify themselves.

On the other hand, taking into account the different educational levels of the participants according to the region in which they work, it was also decided to analyze whether these could function as confounding variables. Thus, in the first place, it was evaluated whether the educational level could be a confounding variable in the link between the region and the productive orientation of the extensionists. However, the diversity of regions and the impossibility of regrouping did not allow the Mantel-Haenszel test to be used. In parallel, we also analyzed whether the region variable could function as a confounder in the link between the educational level and the productive model of the extensionists. To carry out the analysis, it was necessary to recode the educational level as a dichotomous variable with values “has” and “does not have a university degree.” The results show that the region does not constitute a confounding variable in the link between the educational level and the productive model of the extensionists (MH: $\chi^2(1) = 0.00; p = 0.969$).

3.4. Productive orientation of the institutions where the extensionists work

Table 1 shows that the productive focus of extension institutions, as characterized by extensionists, varies according to the organization concerned. Dunn’s post-hoc analysis without Bonferroni shows that there are differences between SsAFyDT (PR = 210) on the one hand and INTA (PR = 272) and institutions categorized as other (PR = 276) on the other hand, but not between the latter two. This implies that, from the point of view of the extensionists working in each institution, the SsAFyDT has a more agroecological orientation than INTA and the group of other institutions.

Another variable that marked differences in the evaluation of the productive model of the institution in which the extensionists work is the region where they work (**Table 1**). Dunn’s post-hoc analyses show that there are statistically significant differences between the Northwest region (PR = 251) and the Northeast (PR = 295.8), Cuyo (PR = 315) and Patagonia (PR = 316) regions, but not among the rest, which implies that extensionists working in the Northwest tend to describe their institutions as more agroecological compared to those in the other three regions.

Finally, it was also observed that there is a low and positive correlation between the educational level of extensionists and the way in which they characterize their institutions. Specifically, the higher the level of education, the greater the tendency to indicate that their institution has a more conventional modern productive orientation. The post hoc Dunn without Bonferroni analyses show that people with a medium or tertiary level of education (PR = 262) have the perception that the institution where they work has a more agroecological model than those who have a master’s degree (PR = 315) or a doctorate (PR = 389), but they do not differ in their evaluation from those who only have a university degree (PR = 290).

In order to evaluate the existence of possible confounding variables, the relationship between the three socio-demographic variables associated with the way in which extensionists characterize the productive model of the institution where they work was studied. It had already been indicated that the regions and the educational level of the extensionists are associated (KW: $\chi^2(4) = 11.1$; $p = 0.026$). After the analysis, it is also observed that the institution of belonging is unequally distributed according to regions ($\chi^2(8) = 68.9$; $p < 0.001$) and that the educational level is different according to the institutions (KW: $\chi^2(2) = 29.3$; $p < 0.001$).

Based on the existing differences in the educational level of extensionists in the different regions, it was explored whether educational level could be a confounding variable in the association between regions and the productive model of extension institutions (as described by extensionists). However, even when using educational level as a dichotomous variable (having or not having a university degree), the analysis could not be performed. In parallel, region was also evaluated as a possible confounding variable. Here the results show that the region would not be influencing the association between educational level and the characterization of the productive model of the institutions (MH: $\chi^2(1) = 0.69$; $p = 0.410$).

Based on the existence of different educational levels among the extensionists according to the organizations in which they work and the relationship between both variables and the productive model of the institutions, their possible incidence as confounding variables was analyzed. The results show that although the organization of the extensionists does not act as a confounder in the association between educational level and the productive model of the institutions (MH: $\chi^2(1) = 1.85$; $p = 0.173$), the educational level does act as a confounder in the association between institution and institutional productive model (MH: $\chi^2(1) = 17.4$; $p < 0.001$). This implies that the educational level is conditioning the participants' assessment of the productive model of their institution, depending on whether they work in INTA or in the SsAFyDT. It is important to note that confounding depends on how the confounding factor is distributed among the analysis groups, so that a characteristic or variable can be a confounding factor in one study and not be so in another. We cannot control the confounder, but it can be interpreted at the time of analysis.

The existence of possible confounding variables was also evaluated based on the existence of an unequal distribution of extensionists' institutions according to regions. **Table 2** shows the distribution of former INTA and SsAFyDT extensionists according to regions.

Table 2. Distribution of extensionists by institution according to regions.

Institution	Regions				
	Whose	Northeast	Northwest	Pampeana	Patagonia
INTA	55,8%	91,4%	67,4%	94,1%	61,5%
SsAFyDT	44,2%	8,6%	32,6%	5,9%	38,5%

When an attempt was made to study the possible confounding role of the membership organization in the link between the regions and the productive model of the extension institutions, the Mantel-Haenszel analysis could not be computed. On the other hand, when the role of the region was explored, it was observed that this indeed constitutes a confounding variable that influences the association between the productive model of the institutions and the region where the extensionists work (MH: $\chi^2(1) = 19.6$; $p < 0.001$). This implies that differences in the productive model adopted by the institutions could be explained (at least in part) not by the institutions themselves but by the region where they operate.

4. Discussion and conclusions

In the present study, it was observed that the extensionists surveyed (a large sample of 583 cases) have, on average, a moderate orientation towards agroecology. In fact, while 37% are positioned in agroecology, only 6% do so from a conventional paradigm, which is of great importance considering the environmental impact of the conventional productive approach. At the same time, this result also calls into question the assumption that professionals in the agricultural sciences generally have a conventional productive orientation as a consequence of a university education structured according to productivist principles that have little capacity to account for complex agroecosystemic relationships^[23]. In contrast, a questioning of the productive models derived from their university training seems to be observed among the extensionists surveyed. In any case, it is clear that this research does not allow us to know exactly what the respondents understand by agroecology and modern conventional agriculture, but it does clearly show a positive evaluation of agroecology as an idea, to the point that 36.5% of the respondents identified themselves with agroecology and 24.5% with a tendency towards it.

A second result shows that extensionists tend to have a greater orientation towards agroecology than what they observe in the institutions of which they are part, which tend to be located in an intermediate position between both models (median 2 at the level of identification and 3 with respect to institutional characterization). On the one hand, this evidences a mismatch between what the institutions propose (as interpreted by the extensionists) and what the technicians themselves value independently, without it being clear which perspective tends to predominate at the moment of carrying out extension actions. On the other hand, this also suggests that extensionists can play an important role in promoting institutional changes oriented towards a growing appreciation of agroecology in the institutions of which they are part.

A third finding of this study is that there is an important association between the productive model with which extensionists identify themselves and that with which they characterize their institution. That is, the fact that these two variables are moderately and positively correlated stands out. In practical terms, this means that, if an extensionist tends to see himself close to an agroecological model, he also tends to see his institution closer to that model, and if he identifies with a more conventional model, he also tends to characterize his institution along these lines. Neither the causes nor the implications of this are clear, but it is important to note for future analysis. Possibly, this could be suggesting that, at the time of answering, both questions are not thought of independently, being answered based on an implicit comparison between personal and institutional positioning, in a framework where they are not perceived to be so distant.

Regarding the relationship between the personal valuation of agroecological and conventional models and different sociodemographic variables, the present study also allowed us to arrive at interesting results. With respect to gender, different studies have specifically linked women farmers with agroecological practices^[24,25]. However, this is possibly the first research that indicates that female extensionists tend to have a more agroecological orientation than men, without the reasons for this evident statistical difference being clear.

The results of the study do not indicate that there is a relationship between personal positioning in the agroecology-conventional agriculture continuum and the age or years of experience of the extensionists. However, an analysis of the *p*-values shows that, although they are not statistically significant, they are not far from being so, so it would be convenient to explore this possibility in future studies.

Regarding the relationship between types of university careers and self-positioning within the agroecology-conventional agriculture continuum, it is observed that those professionals from social sciences and disciplines classified as other tend to have a more agroecological orientation than those from agricultural

sciences. This is interesting, as it insists on the interest of generating interdisciplinary rural extension teams that can think about problems from multiple perspectives^[26]. But beyond this, the results invite us to reflect on the reasons for this difference. In particular, it is possible to think that training in social sciences, due to its search for a complex and multidetermined understanding of social phenomena, is more easily identified with the complex vision of agroecosystems proposed by agroecology. In contrast, it could also be argued that it is easier for social science graduates to present themselves as agroecologists because they do not feel responsible for complying with criteria of increased production and productivity, as is usually required of agricultural science professionals. Additionally, it could also be thought that agricultural professionals tend to support a more conventional production model, given that this is what they have learned in their university education.

Finally, the study of the relationship between educational level and the personal positioning of extensionists in the agroecology-conventional agriculture continuum has also yielded interesting results. In particular, it is observed that there is a slight correlation between both variables, which implies that the higher the educational level, the greater the tendency to identify with a conventional model. At the same time, the results also show a statistically significant difference between those who do not have a university degree and those who do, which could be due to the fact that those who do not have a degree have not been structured by the logic of thought typical of universities, especially in the agricultural sciences, which would allow them a more comprehensive or systemic approach to the phenomena, rather than one focused on specific items or crops characteristic of conventional agriculture. In this sense, it would be possible to argue that the relationship between educational level and identification with a productive model would not be strictly linear but would simply refer to the impact of university training on moving extensionists towards a conventional productive approach from their previous position.

4.1. Contributions and implications

This article proposes a simple strategy to evaluate the positioning of different professionals and actors with agricultural training or knowledge in the framework of agroecological and conventional production approaches, based on a Likert-type item. This methodology constitutes a contribution in itself since it allows evaluating personal positioning or characterizing institutions in a simple way from the point of view of their extensionists. At the same time, the results obtained serve as a baseline to compare the perspective of rural extensionists with other actors (e.g., university graduates in the field of agricultural sciences or researchers) or of the same actor over time in order to capture historical changes.

At the same time, this article also concluded that the extensionists surveyed have a moderate orientation towards agroecology, in contrast to what might be expected from their training and in contrast to the institutions of which they are part, which are located in an intermediate place on the continuum between agroecology and conventional agriculture. This leads to recognizing both the critical capacity of extensionists regarding their own training and their potential to promote changes at the level of productive approaches in their institutions.

This study also identified a series of factors that are related to a more agroecological orientation, highlighting aspects such as being a woman, coming from the field of social sciences, or not having a university degree.

4.2. Limitations and directions for future research

Along with the contributions, this article also has limitations and open questions. In particular, it is a study focused on extensionists working in the public sphere, based on a purposive sample. In particular, this means that the results are not necessarily generalizable to all extensionists and that it is quite likely that other types of actors involved in advising producers, such as private advisors or agricultural input suppliers (who play a very important role in the advisory process), have different positions. At the same time, it is important to

remember that multiple comparisons between different variables and groups increase the probability of Type 1 errors (false positives), which invites us to take the results obtained with caution, always remembering that this is an exploratory study.

On the one hand, this study also analyzed the possible confounding role of different variables in the statistical associations identified. In most cases, it was observed that the variables analyzed could not be considered confounders. However, this evaluation could not be carried out in all cases (due to the characteristics of the variables and the size of the sample), and in specific cases, variables that did act as confounders were identified. This situation invites us to expand the sample in future studies and to pay particular attention to the role of confounding variables in the future.

On the other hand, this research relied on the respondents' own conceptions of agroecology and conventional agriculture in order to avoid definitions that were positioned from specific perspectives. Although this makes sense at the methodological level, it also implies that it is not clear what meaning the respondents assign to each concept. At the same time, since this is a self-identification study, it is not clear to what extent the self-identifications have a correlation with concrete extension practices.

Finally, this study also opens the door for future research. In particular, it would be interesting to compare the results achieved in this work with those of other actors such as private consultants, input suppliers, researchers, or extensionists in other countries. It would even be possible to carry out in-depth studies within specific institutions, differentiating productive models according to the institutional role and the program in which they work. At the same time, it would be valuable to be able to complement these results with research aimed at understanding the definition that the actors themselves have of agroecology and conventional agriculture and to compare self-identifications with the practices of those surveyed in order to check for possible inconsistencies. In this line, rural environmental psychology has important contributions to make^[27].

Acknowledgments

This research was financed by the Universidad de la Cuenca del Plata in the framework of the project "Evaluation of rural extension conceptions of extensionists from different countries" (Resolutions 350/16 and 436/17), based on an agreement with the Global Forum for Rural Advisory Services (GFRAS).

Conflict of interest

The authors declare no conflict of interest.

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