Asia Pacific
Academy of Science Pte. Ltd.

Agroecology or modern conventional agriculture? Positions of Argentine rural extensionists

ABSTRACT

Globally, there is growing concern about the sustainability of agricultural production models. In particular, the environmental impacts and liabilities of the application of the principles of the so-called green revolution. In contrast, agroecology is gaining followers within the framework of a different production model, albeit limited by its lower level of production per unit area. But for any of these models to become a productive practice, it is necessary for it to pass through the sieve of producers' decision-making. Thus, taking into account the key role played by extensionists in producers' decision-making, this article analyzes their personal positioning and that of the institutions they belong to in the context of the contrast between agroecology and conventional agriculture. An online questionnaire was used to survey 583 extensionists working at the National Institute of Agricultural Technology, the Undersecretariat of Family Agriculture and Territorial Development and other institutions in our country. The questionnaire included sociodemographic questions and asked to position oneself and the institution to which one belongs in a five-level Likert-type item in which agroecology and modern conventional agriculture constituted the poles. The results show that, on average, extensionists have a tendency towards the agroecological pole, while they place their institutions in an intermediate position between the two production models. In general, women, those with a degree in the social sciences and those without a university degree have a greater orientation towards agroecology.

Keywords: organic agriculture, perceptions, pesticides, sustainability.

INTRODUCTION

Both in Argentina and globally there is a -growing concern about the sustainability of agricultural production models (Silva et al., 2017), in particular, about the negative impacts and environmental liabilities -derived from the implementation of the -conventional- agricultural model -(Betancur et al. , 2018; Capellesso and Cazella, 2013; Ka- vitha and Chandran, 2017; Kovács-Hostyánszki et al., 2017; Sarandón and Flores, 2014).

Conventional agriculture is understood as the -productive model -derived from the implementation of the principles of the green revolution (Sarandón and Flores, 2014; Silva et al. , 2017; Vásquez and Vignolles, 2015). This model is -characterized by the predominance of monoculture, the use of -varieties with high yield potential (generally hybrids -or transgenic), a high level of mechanization and intensive use of external agricultural inputs (seeds, fertilizers and agrochemicals for pest, -disease and weed -control-) (Blesh and Barrett, 2006; Capellesso et al., 2016; Sarandón and Flores, 2014; Silva et al., 2017).

In this context, it has been argued that, although the -green revolution and conventional agriculture have radically increased agricultural production and productivity (Kavitha and Chandran, 2017; Silva et al. , 2017; Vásquez and Vignolles, 2015), they have also generated -multiple environmental and social problems. Among them, at the environmental level, 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 biodi- versity, genetic variability, elimination of -beneficial insects and decreased -ecosystem- resilience-; and the development of resistance to pesticides (Blesh and Barrett, 2006; Capellesso et al. , 2016; Capellesso and Cazella, 2013; Kavitha and Chandran, 2017; Paleologos et al., 2017; Sarandon and Flores, 2014; Sarandon and Marasas,

2015; Silva et al., 2017). For their part, different authors have also warned about the negative social impacts of the green revolution and conventional agriculture, including land concentration (Vás- quez and Vignolles, 2015), the transfer of resources from farmers to large agroindustrial complexes (Ca- pellesso et al. , 2016), its exclusionary nature, as it cannot be applied by the vast majority of producers (Sa- randón and Marasas, 2015) and its impact on farmers' health due to intoxications derived from the use of agrochemicals (Landini, Beramendi and Vargas, 2019).

In this framework, different authors and institutions have proposed the need to implement a -different production model-, strongly committed to environmental sustainability (Kavitha and Chandran, 2017; Sarandón and Flores, 2014; Silva et al., 2017). In particular, agroecology and organic agriculture have been proposed as alternatives to the production model of conventional agriculture (Sarandón and Marasas, 2015). Although agro- ecology can have different meanings depending on who uses the concept (Pimbert, 2015), in general it -refers to a productive model developed in harmony with nature that seeks to minimize the impact on the environment (Vázquez and Vignolles, 2015) 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 (Blesh and Barrett, 2006), and the replacement of external inputs by naturally developed internal inputs (Capellesso et al., 2016). Altieri and Nicholls (2000) 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 -(Paleologos et al. , 2017; Sarandón and Flores, 2014). 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 (Bentacur et al. , 2018), social equity (Silva et al. , 2017) and the recognition of -small farmers as social subjects, in contrast to large industrial conglomerates (Sarandón and -Flores, 2014; Sarandón and Marasas, 2015). 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 (Shen- nan et al. , 2017; Vásquez and Vignolles, 2015), which limits its possibility to respond to the growing demand for food (Silva et al. , 2017).

Thus, it is observed that conventional agriculture and agro-ecology 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 (Kovács-Hostyánszki et al., 2017; Pimbert, 2015; Silva et al., 2017; Zhao et al., 2016), which propose to maintain the productivity of the conventional model, but 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 (Altieri and Nicholls, 2000), such as -biodynamic agriculture, permaculture and organic agriculture (Palmisano, 2018). 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 (Landini, 2011; Landini etal., 2014). There are multiple researches 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 (Blesh and Barrett, 2006; Kamiyama et al., 2011), the willingness to adopt conservation practices -(Chalak et al., 2017) and the valuation of conventional production practices, including the use of agrochemicals (Stotz, 2012).

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 (Christoplos, 2010) and acting as facilitators of processes of reflection and critical analysis of practices (Ingram, 2008), 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 a 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.

MATERIALS AND METHODS

A self-administered questionnaire was applied to rural extensionists within the framework of a 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:

1. 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

2. 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 (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, 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%;
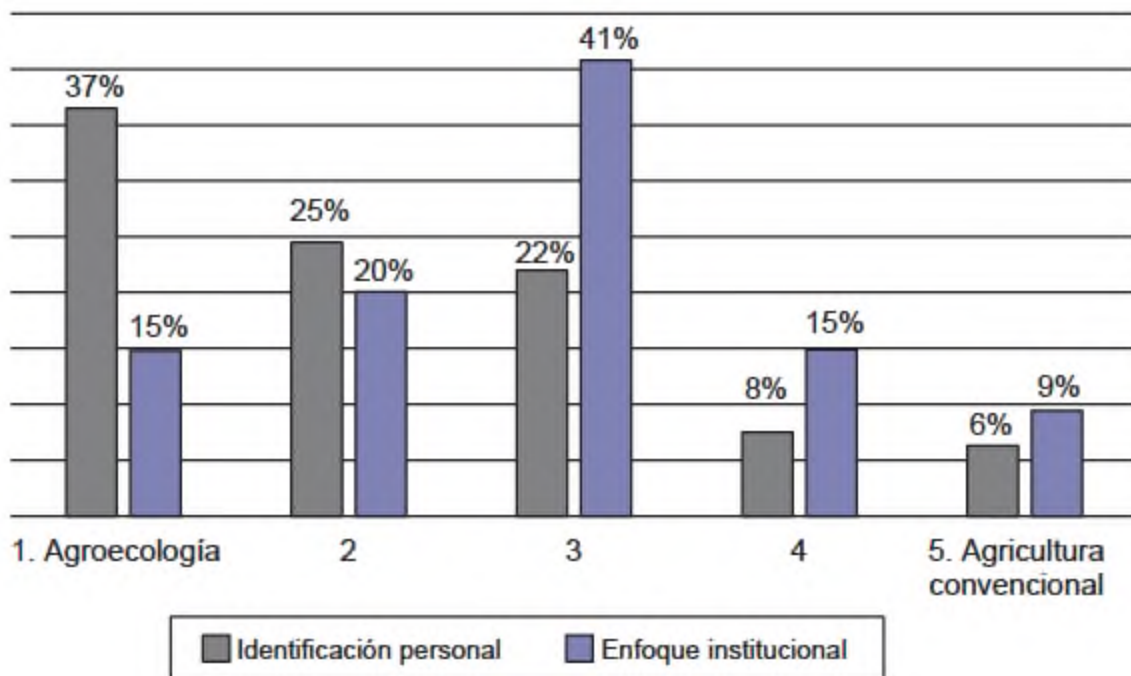
Pampeana (Buenos Aires, Córdoba, Entre Ríos Santa Fe) 29.7%; and Patagonia (Chubut, La Pampa, Neu- quén, Río Negro, Santa Cruz and Tierra del Fuego) 12.9%.

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 $p<.05$ 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).

RESULTS

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.

Agroecology	5. Conventional agriculture
Personal identification	Institutional approach

Figure 1. Assessment of productive approaches.

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.

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 ($R\$(583)=.46$; $p<.001$). 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.

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.

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 agro-ecological 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 and tertiary -were unified-, creating a new category called Non-University Educational Level. A -comparison was made using Kruskall-Wallis analysis and it was found that there were differences in the productive model of the extensionists according to their educational level (KW: x^2 (3)=13.4; p=.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.

Variables	Personal identification	Characterization of the Institution
Sex	MW: Z= -3.71; p<.001	MW: Z= -0.52; p = .605
Age	R_s = -0.07; p = .072	R_s = -0.08; p = .056
Experience	R_s = -0.05; p = .209	R_s = -0.08; p = .061
Institution	KW: χ^2 = 1.39(2); p = .499	KW: χ^2 = 16.56(2); p<.001
Regions	KW: χ^2 = 12.16(4); p = .016	KW: χ^2 = 11.50(4); p = .021
University education	KW: χ^2 = 9.05(2); p = .011	KW: χ^2 = 0.50(2); p = .501
Educational level	R_s = 0.11; p = .008	R_s = 0.11; p = .006

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

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

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 (x^2 (2)=34; p<.001) and between the regions -where extensionists work and their educational level (KW: χ^2 (4)=111 p=.026). In contrast, it was concluded that there -was no -association in the crossing of the rest of the variables analyzed -(sex and region: χ^2 (4)=3.95[p=.413; sex and -educational level-: U=40280; p=.241; region and university training: x^2 (8)=6.71;

p=.568; and university training and -educational level-: KW: x^2 (2)=1.13; p=.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-Haen-szel (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 the 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 personal productive model is sustained (MH: x^2 (1)=2.71; p=.100). This means that the productive model with which the exten- sionists 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: X^2 (1)=2.36; p=.124) and maintaining this -variable value - (MH: x^2 (1)=1.17; p=.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 level 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: x^2 (1)=0.00; p=.969).

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 ex- tensionists 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: x^2 (4)=11.1; p=.026). After the analysis it is -also observed that the institution of belonging is unequally distributed according to regions (χ^2 (8)=68.9[p<.001) and that the educational level is different according to the institutions (KW: χ^2 (2)=29.3; p<.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: x^2 (1)=0.69; p=.410).

Based on the existence of different -educational levels -of 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: X^2 (1)=1.85; p=.173), the educational level does act as a confounder in the association between institution and institutional productive model (MH: x^2 (1)=17.4; p<.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.

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: x^2 =(1)=19.6; p<.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.

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 from

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 (Salo- monsson et al., 2009). 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.

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%

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

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 (Guevara -and Wesz, 2013; Siliprandi, 2010). 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 (Da Ros, 2012). 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 (Sarandón and Flores, 2014).

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 in moving extensionists towards a conventional productive approach from their previous position.

Contributions and implications

This article proposed 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 recognize 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.

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 correlate in 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 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, a rural environmental psychology has important contributions to make (Olivera Méndez, 2015).

ACKNOWLEDGMENTS

REFERENCES

ALTIERI, M.; NICHOLLS, C. 2000. Agroecology: Theory and practice for a sustainable agriculture (No. 630.2745 A468ag). United Nations Environment Programme, Mexico. (Available: http://www.agro.unc.edu.ar/~biblio/ AGROECOLOGIA2%5B1%5D. pdf verified: 31 October 2018).

BETANCUR, L.M.; GIRÓN, S.M.; BETANCUR, L.F. 2018. The milpa as an alternative for agroecological conversion of -conventional agricultural systems of beans (Phaseolus vulgaris), in the municipality El Carmen de Viboral, Colombia. Idesia, 36 (1), 123131-. (Available: https://scielo.conicyt.cl/pdf/idesia/v36n1/0718- 3429-idesia-36-01-00123.pdf verified: October 31, 2018).

BLESH, J.M.; BARRETT, G.W. 2006. Farmers' attitudes -regarding agrolandscape ecology: A regional comparison. Journal of Sustainable Agriculture, 28 (3), 121-143. (Available: https://www. tandfonline.com/doi/abs/10.1300/J064v28n03_10 verified:31 October 2018).

CAPELLESSO, A.J.; CAZELLA, A.A. 2013. Indicador de susten- tabilidade dos agroecossistemas: estudo de caso em áreas de -cultivo de milho. Ciência Rural, 43 (12), 2297-2303. (Available: http:// www.scielo.br/pdf/cr/v43n12/a33113cr2012-0634.pdf verified: October 31, 2018).

CAPELLESSO, A.J.; CAZELLA, A.A.; SCHMITT FILHO, A.L.; FARLEY, J.; MARTINS, D.A. 2016. Economic and environmental -impacts of production intensification in agriculture: comparing transgenic-, conventional, and agroecological maize crops. Agroecology and Sustainable Food Systems, 40 (3), 215-236. (Available: https:// www.tandfonline.com/doi/abs/10.1080/21683565.2015 .1128508- verified: October 31, 2018).

CHALAK, A.; IRANI, A.; CHAABAN, J.; BASHOUR, I.; SE- YFERT, K.; SMOOT, K.; ABEBE, G.K. 2017. Farmers' willingness to adopt conservation agriculture: New evidence from Lebanon. Environmental Management, 60 (4), 693-704. (Available: https:// www.ncbi.nlm.nih.gov/pubmed/28634636 verified: 31 -October 2018).

CHRISTOPLOS, I. 2010. Mobilizing the potential of rural and agricultural extension. FAO, Rome. (Available: http://www.fao. org/ docrep/012/i1444e/i1444e.pdf verified: 31 October 2018).

DA ROS, C.A. 2012. A contribuição das visitas de campo no ensino -das ciências agrárias na UFRRJ. Revista Ciência em Extensão, 8 (1), 107-122. (Available: http://ojs.unesp.br/index.php/ revista_ proex/article/view/524/636 verified: October 31, 2018).

GUEVARA, M.A.; WESZ, J. 2013. Gender and agroecology: -Case studies in Brazil. Agroecología, 7 (2), 101-110. (Available: http://revistas.um.es/agroecologia/article/view/182881 verified: October 31, 2018).

INGRAM, J. 2008. Agronomist-farmer knowledge encounters: an analysis of knowledge exchange in the context of best -management practices in England. Agriculture and Human Values, 25, 3, 405-418. https://doi.org/10.1007/s10460-008-9134-0

KAMIYAMA, A.; MARIA, I.C.; SOUZA, D.C.; SILVEIRA, A.P. 2011. Percepção ambiental dos produtores e qualidade do solo em propriedades orgânicas e convencionais. Bragantia, 70 (1), 176-184. (Available: http://www.scielo.br/pdf/brag/v70n1/ v70n1a24.pdf verified: October 31, 2018).

KAVITHA, V.; CHANDRAN, K. 2017. Organic farming in -conserving bio diversity in India-A review. Agricultural Reviews, 38 (4), 316-320. (Available: https://arccjournals.com/journal/agricultural-reviews/R-1709 verified: 31 October 2018).

KOVÁCSDHOSTYÁNSZKI, A.; ESPÍNDOLA, A.; VANBERGEN, A.J.; SETTELE, J.; KREMEN, C.; DICKS, L.V. 2017. Ecological -intensification to mitigate impacts of conventional intensive land use on pollinators and pollination. Ecology Letters, 20 (5), 673-689. (-Available: https://onlinelibrary.wiley.com/doi/epdf/10.1111/ele.12 762 verified: 31 October 2018).

LANDINI, F. 2011. Peasant economic rationality. Agrarian World, 12 (23). (Available: http://www.scielo.org.ar/pdf/magr/ v12n23/v12n23a14.pdf verified: October 31, 2018).

LANDINI, F.; BERAMENDI, M.; VARGAS, G. 2019. Use and -management of agrochemicals in family farmers and -rural- workers -in five Argentine provinces. Revista Argentina de Salud Pública, 10 (38), 22-28. (Available: http://rasp.msal.gov.ar/rasp/ articulos/volumen38/22-28.pdf verified: 09 June 2019).

STOTZ, E.N. 2012. Os limites da agricultura convencional e as razões de sua persistência: estudo do caso de Sumidouro, RJ. Revista Brasileira de Saúde Ocupacional, 37 (125), 114-126. (-Available: http://www.scielo.br/pdf/rbso/v37n125/a14v37n125.pd f verified: October 31, 2018).

OLIVERA MÉNDEZ, A. 2015. Environmental psychology and rurality. In: LANDINI, F. (Ed.). Towards a Latin American rural psychology. CLACSO, Buenos Aires. 304-314 pp. (Available: http://biblioteca. clacso.edu.ar/clacso/se/20150213020711/Hacia_psicol ogia_ rural.pdf verified: October 31, 2018).

PALEOLOGOS, M.F.; IERMANÓ, M.J.; BLANDI, M.L.; SARAN- DÓN, S.J. 2017. Ecological relationships: a central aspect in the redesign of sustainable agroecosystems, from Agro- ecology. REDES: Revista do Desenvolvimento Regional, 22 (2), 92-115. (Available: https://online.unisc.br/seer/index.php/redes/ article/view/9346/pdf verified: October 31, 2018).

PALMISANO, T. 2018. Alternative agricultures in the context of agribusiness. Experiences in the province

of Buenos Aires, -Argentina. Estudios Sociales, 28 (51). (Available: http://www.scielo. org.mx/pdf/estsoc/v28n51/0188-4557-estsoc-28-51-00002.pdf verified-: October 31, 2018).

PIMBERT, M. 2015. Agroecology as an alternative vision to -conventional development and Climate-Smart Agriculture. -Development, 58 (2-3), 286-298. (Available: https://link.springer.com/ article/10.1057/s41301-016-0013-5 verified: 31 October 2018).

SALOMONSSON, L.; NILSSON, A.; PALMER, S.; ROIGART, A.; FRANCIS, C. 2009. Farming systems education: Case study of Swedish test pilots. Renewable Agriculture and Food Systems, 24 (1), 48-59. (Available: http://digitalcommons.unl.edu/agronomyfacpub/362/ verified: 31 October 2018).

SARANDÓN, S.; MARASAS, M.E. 2015. Brief history of agroecology in Argentina: Origins, evolution and future perspectives. Agroecología, 10 (2), 93-102. (Available: http://revistas. um.es/agroecologia/article/view/300861 verified: 31 October 2018).

SARANDÓN, S.; MARASAS, M.E. 2015. Brief history of agro-ecology in Argentina: Origins, evolution and future perspectives. Agroecología, 10 (2), 93-102. (Available: http://revistas. um.es/agro-ecologia/article/view/300861 verified: 31 October 2018).

SHENNAN, C.; KRUPNIK, T.J.; BAIRD, G.; COHEN, H.; FOR- BUSH, K.; LOVELL, R.J.; OLIMPI, E.M. 2017. Organic and -conventional agriculture: A useful framing?. Annual Review of Environment and Resources, 42, 317-346. (Available: https://www.annualreviews.org/doi/pdf/10.1146/annurev-environ-110615-

085750 veeri- fied: 31 October 2018).

SILIPRANDI, E. 2010. Women and agroecology. New political subjects in family farming. Investigaciones Feministas, 1, 125-137. (Available: http://revistas.ucm.es/index.php/INFE/article/view/INFE1010110110125A/7697 verified: October 31, 2018).

SILVA, E.M.; VIEIRA, E.T.; TASHIMA, L.D.; GUILHERME, D.D. 2017. A sustainability rereading of agrarian production systems. Interações, 18 (4), 43-54. (Available: http://www.scielo.br/pdf/inter/ v18n4/1518-7012-inter-18-04-0043.pdf verified: 31 October 2018).

STOTZ, E.N. 2012. Os limites da agricultura convencional e as razões de sua persistência: estudo do caso de Sumidouro, RJ. Revista Brasileira de Saúde Ocupacional, 37 (125), 114-126. (-Available: http://www.scielo.br/pdf/rbso/v37n125/a14v37n125.pd f verified: October 31, 2018).

VASQUEZ, P.; VIGNOLLES, M. 2015. Ecological agropro- ductive establishment vs. conventional agriculture: Tandil County, Buenos Aires Province. Sociedade & Natureza, 27 (2), 267280-. (Available: http://www.seer.ufu.br/index.php/sociedadenatureza/article/view/27326/.pdf verified: October 31, 2018).

ZHAO, R.; HE, P.; XIE, J.; JOHNSTON, A.M.; XU, X.; QIU, S.; ZHAO, S. 2016. Ecological intensification management of maize in northeast China: agronomic and environmental response. Agriculture, Ecosystems -& Environment, 224, 123-130. (Available: https://www.sciencedirect.com/science/article/pii/S0167880916301840?via%3Dihub verified: 31 Oct 2018).