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Responding to the Popular Demand: Itinerary for the Socio-Political Learning of Situated Agroecologies in Chile

Santiago Peredo Parada ^{1,2,3,*}, Claudia Barrera Salas ^{1,4} and Sara Burbi ³ 

¹ Group of Agroecology and Environment (GAMA), University of Santiago de Chile, Santiago 7501015, Chile

² Environment and Society Program, Pablo Olavide University of Sevilla, 41013 Sevilla, Spain

³ Centre for Agroecology, Water and Resilience, Ryton Gardens Campus, Coventry University, Coventry CV8 3LG, UK; sara.burbi@coventry.ac.uk

⁴ STAND Group, University of Granada, Campus Universitario de Cartuja, Calle Prof. Vicente Callao 3, 18011 Granada, Spain; cbarrerasalas@correo.ugr.es

* Correspondence: santiago.peredo@usach.cl

Abstract: Agroecology has proven to be successful in responding to the demands and needs of a collective due to the relevance of its approach and proposals, which are built collaboratively between all the actors under a specific context that focuses on the actions developed. This is facilitated when spaces of horizontal interaction are generated through dialogues between different perspectives and experiences. In this perspective, agroecological training in higher education, i.e., university level, requires structural changes that go beyond the incorporation of technical content. Based on a critical documentary analysis of the records generated in the implementation of teaching innovation projects, the learning itinerary in agroecology is presented, consisting of four certifications based on transformational learning and supported by active methodologies. The potentialities, including marketing potential, of the proposed learning itinerary relate to curricular design, the articulation of the itinerary, the suitability of the learning methodologies used, the performance of the teachers, and the participation of the students. It is concluded that the implementation of flexible itineraries allows for addressing the transformation processes necessary for an agroecological transition in which we see a convergence of students' skills, the learning objectives, and the requirements of the various actors with which they interact.

Keywords: agroecological education; transformative learning; active learning; situated agroecology



Citation: Peredo Parada, S.; Barrera Salas, C.; Burbi, S.

Responding to the Popular Demand: Itinerary for the Socio-Political Learning of Situated Agroecologies in Chile. *Sustainability* **2022**, *14*, 7969. <https://doi.org/10.3390/su14137969>

Academic Editors: Manuel González deMolina, David Gallar Hernández and Emma Siliprandi

Received: 26 May 2022

Accepted: 17 June 2022

Published: 30 June 2022

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1. Introduction

In 1988, the World Food and Agriculture Organization [1] issued a report on the subregional seminars on “Training and Training of Agricultural Science Professionals for Extension and Rural Development in Latin America”, in which it pointed out the need to change the training received by young university students so that they become true agents of development. Although these seminars did not address the root of the problems that are causing the crisis experienced in rural areas, but rather the symptoms with which such a crisis manifests itself, the events pointed out the need to incorporate curricular elements that lead to the knowledge and understanding of the natural and socioeconomic environment in which future professionals will work. The FAO report acknowledged the importance of the curricular problem and the urgent need for action on training programs, as well as the expansion of the debate to sectors of society that are knowledgeable and sensitive to the subject.

A clear example of this was the meeting between CLADES (Latin American Consortium of Agroecology and Development) and FAO on “Agroecology and Agronomic Education in Latin American Universities”, held in Santiago de Chile in September 1991. This was a very important milestone for the agroecological movement because it represented a transcendental action for the consolidation of the agroecological proposal as a

curricular alternative through a holistic approach. The work carried out at this meeting delivered the principles, the bases, and a proposal of contents, becoming the first reference to incorporate the agroecological approach in the scientific-technological training of agricultural sciences [2].

Thirty years later, within the framework of the II International Symposium on Agroecology, held in Rome on 3–5 April 2018, FAO recognized Agroecology for its contribution to the transformation of healthier and more sustainable production and agri-food systems. However, much has been debated regarding the contents to be addressed, and different strategies have been developed for their incorporation into the curricula: modules, subjects, curricular lines within agronomic training, the creation of new degrees at the undergraduate level, and agricultural engineering at the postgraduate level, both master's and doctorate.

The development of learning programs on agroecology in Latin America has had diverse trajectories depending on the context in which they have been generated or characterized—in general, by situations of marginality, especially in their beginnings. In Chile, the development of agroecology training programs has been slow. At present, there are no postgraduate degrees, and of the 18 universities that provide agricultural courses only 5 report a subject or module on agroecology. University programs on agroecology refer mainly to those developed within the framework of continuing education, i.e., diplomas and postgraduate degrees.

The teaching of agroecology at the undergraduate level in Chile has been focused on the incorporation of a single subject that tries to cover the wide diversity of contents and perspectives that this approach brings together. Very few are the experiences of curricula that consider the various areas of knowledge of the agroecological approach, and there are no records of teaching innovations either in the pedagogical or curricular field or training programs at the postgraduate level [3].

However, agroecological teaching and learning require curricular designs that allow the understanding of the complexity of the territories. This implies the formulation of new profiles of graduates, the incorporation of active learning methodologies, interdisciplinary approaches, articulated itineraries for the progression of skills, and a close link with the community. In this scenario, continuing education programs present administrative flexibility in terms of entry requirements, program content, and target audience, constituting an alternative for agroecological training and learning at the university level. These gaps in the Chilean university system have served to accommodate the tangible demands of a community increasingly interested in agroecology.

The growing interest from society initially overwhelmed higher education institutions in a context of social mobilizations for free and quality education. In the case of the University of Santiago de Chile (USACH), this led to the multi-state participatory construction of a policy of Linkage with the Environment: a *“transversal function that materializes in a system of collaborative relationships and actions, which [may] vary in their degrees of formalization, time and level of bidirectionality”* [4] (p. 6) towards different actors of the medium to *“seek to ensure a training with social responsibility that is in tune with the needs of the environment”* [4] (p. 9). Along with this, the Institutional Educational Model (MEI) seeks the comprehensive formation of students with a view to the needs highlighted by current times. The purpose of the MEI is the generation of training trajectories for undergraduate education, with the aim of promoting the possibility of having specialized, flexible, interdisciplinary training, within the perspective of lifelong learning.

The Continuing Education Program in Agroecology (PECA) is the result of the confluence of needs and interests of various actors to create training programs, as a part of lifelong learning, that integrates with the training plans of degrees in agri-food sciences. This allows access to agroecological education to all of the interested public through itineraries with intermediate certifications.

The collective process of curriculum design, with a view to generating changes that would foster the development of more sustainable societies, gave way to the design and implementation of the training and learning proposal in this study.

The objective of this work is two-fold: (a) to document the implementation of an itinerary for university-level agroecological training describing the main characteristics at each level and (b) to establish the main potentialities and advantages that entail the teaching of agroecology using an active methodology in the context of continuing education.

1.1. The Demands for Quality Education

In Latin America, the possibility of equal access to educational resources is strongly conditioned on the level of the economic income of people [5]. In Chile, this educational inequality is presented with greater emphasis, with a gap in proportions between the poorest and richest quintile at the time of access to higher education institutions, with the richest having a great advantage [5]. In Chilean society, marked by strong economic–social inequality [6], the possibilities of accessing university education are highly determined by one’s economic resources available [7]. The segmentation of secondary education in Chile [8] has the result that access to university is restricted to those who come from the highest socioeconomic sectors to the detriment of the poorest groups [9], fostering social and economic inequalities. Thus, those who can choose to continue training at this level of education are from the same privileged groups.

Faced with this unjust and unfair scenario, early in the twenty-first century, student mobilizations began to demand quality education, reaching a critical point in 2011, when widespread social demonstrations took to the streets of Chile [10]. In this context, the first Diploma in Education for Sustainable Development (ESD) is framed as one of the strategies developed by the University of Santiago de Chile to build an inclusive and socially responsible university. Over time, the diploma managed to articulate the link between the environment, education with social relevance, and open spaces for the development of projects that responded to the needs of local communities. In turn, the experience of teaching this diploma gave the university input to carry out research on this type of experience and the impact it has both on the people who study it and on the communities involved.

A natural evolution from this was a journey marked by constant interactions between the various actors who sought to establish a training program within the university that responded to when demands emanating from society began. One of the elements that ensured the interest and permanence in the execution of this program, in addition to its educational quality and inclusivity factors, was the permanent reflection based on the curricular adjustments necessary to respond to an education for sustainability using as tools a transdisciplinary approach and a teaching model of the co-construction of knowledge. A second determining aspect was the absence of admission requirements, and the possession of previous formal courses, since these do not determine subsequent performance [11]. This approach sought, on the one hand, to avoid the perpetuation of the vicious circle of exclusion in higher education and, on the other hand, to recognize and validate the knowledge that people have obtained throughout their lives, without distinguishing whether these belong to the field of formal, informal, or non-formal education [12].

Supported by a pedagogical methodology based on transformational learning, the training focused on the students becoming critical, participatory citizens concerned about their environment. The latter materialized with the realization of a practical project, which was elaborated within a group by students themselves. Students’ working groups had the following characteristics:

- (a) A *transdisciplinary nature*, that is, in which it seeks to transcend the disciplinary logic of the training usually received on the basis that social reality is complex and must be approached from a holistic perspective [13].
- (b) The *diversity of knowledge* is combined, both that delivered by academic training and that acquired through professional practice and/or trades and also that obtained by life experience in general, in consideration of the relevance of recognizing and respecting the various forms of learning and knowledge available, which allows generating learning communities.

- (c) The *diversity of people* in terms of age and gender interact, making available a multiplicity of approaches that, through collaborative dialogue, must respond to a need of the community with which a member of the group has a relationship that is participatively relieved by the community itself, resulting in a proposed solution that is of a holistic and sustainable nature for the benefit of the community [14].

The teaching model implemented in the programs that constitute the training itinerary offered a critical and dialogical proposal in which academic and traditional knowledge were integrated, with respect to various disciplines, creating a space in which students learn. Students played a leading role in the construction of a joint body of knowledge based on the conjunction of academic knowledge and experience. In this way, the results have been the product of the actions defined and developed by the student body itself.

The model was intended to relieve and reinforce the role of public universities in fostering critical, reflective, independent, and democratically minded thinkers [15] to become agents of change towards sustainable societies [16]. With this, it seeks to promote equality over academic distinction as an element of social justice [17]. The integrated effort of academics, professionals, administrators, and students, often relegated to the background despite its importance being recognized [18], has been oriented towards higher objectives of the development, conservation, preservation, and quality of life of the local, national, regional, and global community. Through an innovative approach to socially contextualized, dynamic, and self-reflective teaching [19], permanent dialogue is promoted between the training processes of new professionals, technicians, researchers, and social leaders in coherence with the territory in which they operate, understanding the spatial and temporal dimensions that this implies.

1.2. Limitations for the Implementation of an Agroecological Curriculum

The momentum generated by CLADES in the Latin American region in the 1990s by promoting meetings and preparing working documents for the debate of an agroecological curriculum highlighted a series of structural limitations in those same universities that initiated such a challenge. Institutional records from those years indicated that higher education institutions should promote a process of academic restructuring not only of curricula but of the entire curricular conception and design by the universities [20]. The addition of a subject or certain contents on sustainability is not enough to train a professional prepared to give an adequate response to new challenges [21]. Substantial changes are required for the creation of new profiles of graduates and for the training of professionals who could meet agroecological objectives [22].

In the curricular development in agricultural sciences at Latin American universities, technology was not approached as the expression at a specific moment of the productive system that obeys the development of social forces and negated the dialectical selection between them because of the interaction and coevolution of both that are in permanent feedback [23]. Additionally, the main structural problem of universities remained their privatization, thus making it difficult to meet the priorities set by society based on the needs of farmers [24]. The little flexibility of the curricula, the resistance to change of some teachers trained in old paradigms, and the lack of a faculty qualified for these challenges made it difficult to incorporate the agroecological approach in universities.

Two decades later, the same limitations are found in introducing agroecology in higher agricultural education, emphasizing that the compartmentalization of disciplines and the reductionist approach of these hinders inter- and transdisciplinary work with holistic approaches and appropriate methodologies to address socio-environmental complexity [25]. *“The university as a learning community is in crisis in the quantitative and qualitative, both in the so-called countries of the North and in those of the South; and this crisis is due both to economic reasons and to a lack of values, attitudes, concepts”* [26]. While recognizing that agroecology is an opportunity for universities to renew the ways of generating, managing, transferring, and disseminating knowledge, he warns that the scenario is not the most favorable.

Within the European Higher Education Area, it can be argued that the reduction of public spending in universities, coupled with the implementation of the Bologna Plan, carries the risk of a decrease in the quality of the training and education provided, the absence of education as an integral experience, an increase in pressure from external actors favoring fragmentation and overspecialization of the future workforce, and the increase in the cost of studies and specialization. On the one hand, the implementation of the European Higher Education Area (EHEA) as part of the Bologna Plan has meant a strong privatization, elitization, and increase in the price of university education with a decrease in the degrees offered [27]. On the other hand, it highlights how it allowed the incorporation of new teaching methodologies and the introduction of new areas of knowledge. The latter could have facilitated the creation of new subjects and postgraduate courses in agroecology. However, the creation of more specific degrees that incorporate agroecological principles can be considered a better strategy than the mere incorporation of subjects in plans with reductionist approaches [27].

Therefore, the experience of the Autonomous University of Chapingo (Mexico) [28] pointed out that the agroecology program is the only one where there is an approach to the curricular mainstreaming of the environmental issue from the roots, reinforcing the validity and relevance of training plans in agroecology as an independent curriculum and, in doing so, overcoming the debate that was addressed by the agroecologists of Latin American Scientific Society for Agroecology (SOCLA) in its beginnings.

2. Materials and Methods

For the elaboration of this work, a critical documentary analysis of the records generated by the authors and collaborators, members of the Agroecology and Environment Group (GAMA), constituting results of the development and execution of the following teaching innovation projects supervised by Educational Innovation Unit (UNIE) and co-financed by the Academic Vice-Rector (VRA) of the University of Santiago de Chile (USACH) are shown in Table 1.

Table 1. Teaching innovation projects executed in the Continuing Education Program in Agroecology (PECA) of the University of Santiago de Chile.

Teaching Innovation Project	Code	Objective
Mainstreaming sustainability in university curricula	REC-4095	Establish a comprehensive proposal to incorporate sustainability across training programs
Design of a training itinerary in agroecology at the undergraduate and postgraduate level	038-2012	Develop a proposal for agroecological training articulated between undergraduate and postgraduate training cycles
Service-Learning (SL) as a competency-based training methodology in university education	048-2012	Incorporate the SL methodology in university agroecological training in collaboration with a community partner
Use of Simulated Markets as a Project-Based Learning (PBL) method in undergraduate training	029-2013	Implement the PBL methodology as support in university agroecological training based on collaborative work with communities
Assessing the impact of implementation of transformational learning	USA-1307	Determine the perceptions of students and teachers in relation to the transformational learning implemented

The following activities were carried out:

- (a) *Mainstreaming of sustainability in university curricula*: an initiative developed within the framework of the University Collaboration Protocol “Sustainable Campus”—with the sponsorship of the University Social Responsibility Program (RSU)—which aimed to establish an itinerary for the study of sustainability through a flexible curriculum and

- transformative and active learning methodologies. It was established as an instance of propaedeutic training in studies for sustainability [29].
- (b) *Design of a training itinerary of agroecological specialty for the articulation of undergraduate and postgraduate degrees*: designed to articulate the formation of university degrees oriented to agricultural commercialization—with postgraduate training through the intermediate studies of postgraduate studies. This sought to reinforce the agro-productive training of the university degree with agro-ecological sustainability subjects focused on the design and management of agroecosystems to maintain the agroecological attributes of food along the marketing and distribution chain [30].
 - (c) *Service-Learning as a competency-based training methodology in university education*, whose purpose was to implement this methodology in the subjects of agroecology as a result from educational program design (b), based on the generation of an institutional commitment with community partners, e.g., group of farmers, the content structure, and its learning strategy, aimed at the organization of student learning through collaborative work requested by farmers [31].
 - (d) *Use of Simulated Markets as a method of Project-Based Learning (PBL) in undergraduate courses*, with the purpose—for agroecological teaching purposes—of moving towards training processes that link the student with real situations. The experiences focused on the formulation and execution of projects aimed at the (re)connection of the local organic production of farmers based on agroecological principles with responsible consumption through circuits of social proximity and geographical proximity [32].
 - (e) *Evaluation of the impact of the implementation of transformational learning in training programs for sustainability in the framework of innovation in teaching* [33]. The relationship between the innovative elements, i.e., transformational learning and active learning, and the didactic activities was established based on the dimensions addressed by the transformational learning proposal. Active learning was intrinsically linked to the moments and the ways in which the methodologies were applied during the learning process (Table 2).

Table 2. Relationship between the innovative elements incorporated and the didactic activities used.

Innovative Element	Dimensions	Didactic Activity
Transformative learning	Spaces for reflection	Analysis of critical areas and the theoretical-epistemological foundations of the socio-ecological crisis, i.e., reading and debates in groups
	Meta-observation	The “place” from where one is living the learning process, and how one’s experience is being, i.e., individual reports and feedback
	Collective space	The process emphasizes the recurrences or emotional, bodily, and linguistic learning that each participant expresses as a habit, i.e., dynamics of encounter and dialogue between peers
	Moments	Didactic activity
Active learning	Contextualization of the problem to be addressed	Situate in time and space to identify causes and potentialities, i.e., search for literature and videos
	Approach to the group/community with which you interact	Approach and exchange with the different actors to know, plan, and execute projects/activities, i.e., visits, workshops, meetings, and work on the farm
	Reflection on what has been done	Individual and group evaluations related to achievements, limitations, and experiences, i.e., discussions and workshops

3. Results

The implementation of the teaching innovation projects mentioned in the previous section resulted in the itinerary illustrated in Figure 1.

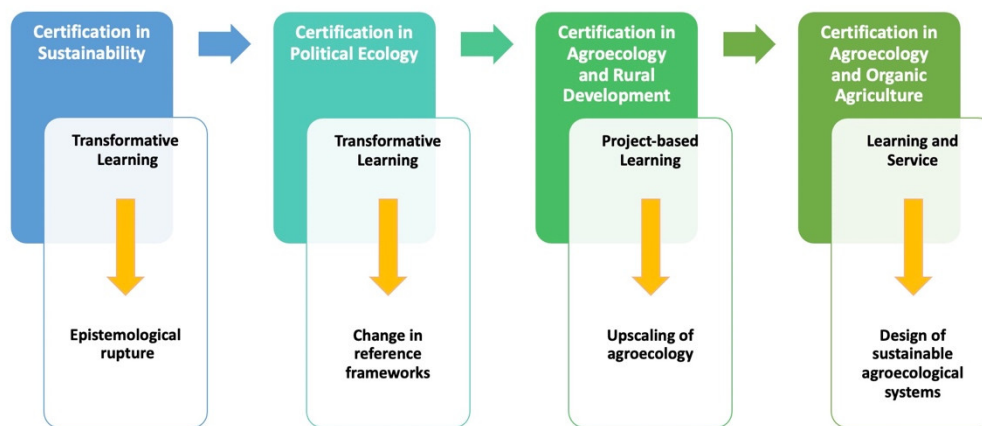


Figure 1. Training itinerary, learning methodologies, and main characteristics. Source: based on [30–32,34].

3.1. Certification in Sustainability: The Epistemological Rupture

Modern epistemology defines nature as a reified, essential other, susceptible to being possessed by human society [35]. Under this perspective, it is possible to observe two main currents in the approach to the ecological crisis [36]: neoliberal and structuralist, where both assume the ontological singularity of nature. The neoliberal current aspires to the development of instruments that contribute to increasing efficiency in the production and management of resources, without questioning “the dominant productive organization model” [37] (p. 3), oriented to sustained growth. The structuralist current, while recognizing “the role of economic rationality in unsustainability” [37] (p. 4), concentrates its attention on the unequal distribution of impacts and benefits associated with the production and management of resources.

However, “nature is not a matrix, nor a resource, nor a tool for the reproduction of man” [35] (p. 122). The concept of “nature” is an operational distinction that refers not to a pre-existing univocal reality, but to relationship, dynamic and co-created habitat [38,39]. The alternative of strong sustainability [40], the radical vision of ecological economics, the perspective of complexity, and “ontological multiplicity” [39] (p. 170), converge in the recognition of nature as a multiple and emerging phenomenon. In other words, it is about conceiving “nature” not as a manifestation of a transcendent, alien, external reality but rather a reality that is not separated from the human, as immanent entities.

Therefore, it is possible to affirm that the solutions for efficient management, conservation, and distribution have in their definition of nature, as a singular and univocal phenomenon, the epistemological basis of the problem. Incorporating these approaches into professional training has meant revising the conventional bases of knowledge construction to transcend specialization and move towards a transdisciplinary and complex perspective [36].

Considering the multiplicity of nature as an emerging phenomenon with its associated conflictive elements—expressed in the correlation and synergy of phenomena associated with the ecological crisis—and as immanent to the political and social conflicts of actors with competing perspectives, one of the greatest risks for its approach has been the reduction of this complexity and disciplinary fragmentation [41]. Thus, in this context “it is essential to start from a complex thought (...) and to question the epistemological bases that enable the exploitation and destruction of ecosystems, as a dominant form of appropriation of the environment. In this last category, interdisciplinarity is indispensable, understood as the joint construction of a new object of knowledge” [42] (p. 37). This implies addressing the challenge of a “methodological pluralism (that) allows the articulation of different paradigms, through their methodologies, concepts and tools, to address and discuss the theoretical and political problems involved in the complex relationship between society and the environment” [37] (p. 6). There is a need for teaching approaches that allow students to deal with complexity and uncer-

tainties [43] and for transdisciplinarity to be considered as a fundamental characteristic of agroecology education [44], which constitutes a great challenge for educators [45].

3.2. Certification in Political Ecology: Changes in Reference Frameworks

As has been pointed out, from the post-humanist perspective, nature is not a matrix, nor a resource, nor a tool for the reproduction of the human being and the alternative of strong sustainability and the “ontological multiplicity” that converge in the recognition of nature as a multiple and emerging phenomenon. Moreover, the recognition of the extended reality to the actor remains an immanent phenomenon in nature [46], where this does not exist a priori but rather is existing, creating new and recurring events.

From the point of view of political ecology, which advocates “the recognition that environmental transformations are based on political actors and therefore on power relations” [47] (p. 42), conceiving actors as inherent phenomena represents an opportunity to expand the creative possibilities of these actors on themselves and the inhabited territory. The concept of “immanent actor” in fact relieves the subject as a performative—co-creator of realities rather than as a pre-existing phenomenon.

In this perspective, we can affirm that power is acted by each actor that inhabits the world, in reciprocal influence or co-presence with all actors [46,48]. Correspondingly, the world as an inhabited place is dynamic, sustained by this reciprocal influence. This view is central to review the concept of an actor that has been put at the basis of political ecology: it is not then an essential, rational, and conscious subject that negotiates or affects the reality of another equivalent actor, and that influences a transcendent third party, nature. The transformative power of the actor, expressed in socio-ecological activism, seems to be based on deep intuitive and emotional processes [49]. In the perspective of inheritance, the actor moves and inhabits the world in reciprocal influence, generating networks in the encounter and convergence with the movement of other actors. This journey involves, inseparably, our rationality, corporeality, cosmology, and emotionality [49]. These elements take central stage in the formative itinerary, where it is the values and attitudes that motivate the students, recreating and influencing all the interactions of the network [50].

3.3. Certification in Agroecology and Rural Development

The conceptualization and spaces of agroecological action have overflowed the property (i.e., farm), expanding at the level of the food system including the value chain with marketing, distribution, and consumption [51]. The relocation or territorialization of socio-productive relations demand institutional accommodation strategies and social alliances that allow the formation of local agri-food systems [52].

Upscaling and outscaling agroecology to democratize agroecological consumption requires the participation of various actors to bring local production closer to committed consumption [53]. Thus, in the formative stage outlined in this study, the development of the skills that allow the transformation of agri-food systems at different levels and scales is pursued through processes of the exchange of experiences, dialogues of knowledge, and co-creation of knowledge between the different actors of a territory, overcoming the conventional models of the transfer and application of knowledge and technologies [54].

The use of active learning methodologies, such as project-based learning, has allowed the participation of students as actors committed to the community, e.g., group or community partner, in search for alternatives to address the needs highlighted by the community, thus highlighting that agroecological knowledge must be extended to the entire food chain [44].

3.4. Certification in Agroecology and Organic Agriculture

Whilst there are initiatives for the marketing and distribution of agroecological products that are integrated in pre-established channels, the strategy of the substitution of inputs for organic production on the farm evidently has not resulted in the establishment of sustainable agricultural systems. The financial dependence generated in farmers by the acquisition of inputs, their activity—especially biocides, and the productive hyper-

specialization that organic monoculture has generated highlight the need to advance in the agroecological transition strategy based on the design of biodiverse farms.

Sustainable agriculture depends on healthy agroecosystems, and for this purpose, soil biota must be promoted through the management of organic matter and diversified habitat through practices such as polycultures, cover crops, and crop associations, among others, which constitute the two pillars of an agroecological transition [55]. Based on this, courses at this level pursue the development of skills, aimed at minimizing chemical inputs and production costs; the conservation and management of soil fertility; the planning of agroecosystems based on local resources and land capacity; and making efficient use of water, nutrients, and genetic resources [56]. The application of the learning and service methodology has consisted of the elaboration of joint strategies between farmers and students to establish farm designs through the application of agroecology-based cultural practices, with a special emphasis on local resources.

During the evaluation carried out in this study, the aspects referred to the perceptions of the actors involved in the learning process, i.e., teachers, students, and farmers stand out, as well as the aspects related to the adaptations and changes made in the execution of the projects. The results' highlights are presented as follows:

- a. The high value that teachers attribute to their participation stands out with regards to the performance of teachers involved in transformative and active learning processes (Table 3).
- b. With regards to the students' perceptions of the processes, the results indicate changes in the reified conception of oneself, of others, and of the environment (Table 4).
- c. Farmers' perceptions indicate the valuation of people, their work, and collaborative work as the most important aspects in the experiences developed (Table 5).
- d. With regards to the use of projects as a central element of active learning, the results of the evaluations indicate the aspects to be considered to overcome the specifications for each interaction group (Table 6).

Table 3. Self-evaluation of teachers' performance. Source: [33].

Categories	Evaluation (Out of 7)
1. The contents are taught by teachers with an interdisciplinary approach.	6.8
2. The contents are taught in consideration of the heterogeneity of the group of students.	7.0
3. The teachers present the contents in a way that invites questioning and questioning by the students.	6.8
4. In the teaching-learning process, teachers recognize their emotional component and that of the student body.	6.3
5. Teachers incorporate new frames of reference/new points of view on the contents they teach.	6.8
6. Teachers use individualized and group techniques that promote dialogue within the classroom.	6.0
7. The climate of the class encourages the spontaneous and generalized participation of the student body.	6.5
8. Teachers positively reinforce the participation of students (they know how to listen).	6.5
9. Teachers have an attitude of respect for the opinions of others.	7.0
10. Teachers ensure that a climate of trust and respect prevails in the classroom among the participants.	7.0
11. Teachers explain in detail the existing frames of reference, which comprise cognitive and emotional components.	6.5

Table 3. *Cont.*

Categories	Evaluation (Out of 7)
12. Teachers generate a space for feedback from the class performed.	5.0
13. Teachers show concern and empathy for students.	7.0
14. It promotes the transformation of mental habits, which constitute the usual way of thinking, feeling, and acting of people.	6.8
15. Students are encouraged to take responsibility for their own learning.	6.8
16. The possibility of seeing things from different points of view is encouraged.	7.0
17. The teachers encouraged them to continue training in the subjects studied.	7.0

Table 4. Students' perception of the learning process. Source: [49].

Dimension		At the Beginning	At the End
Of themselves	Affirmation	I can't have influence. I have nothing relevant to contribute.	I'm with others. I'm entangled.
	Discourse	<p>"I had the feeling that I wasn't capable of being a relevant actor in social processes" (Questionnaire 23).</p> <p>"I had the feeling of not being of much contribution, because I felt that I didn't want to talk, thus I better didn't talk . . . So, I always doubted whether giving my opinion or point of view" (Report No. 20, 2015). [At the beginning] it was very difficult for me to open to dialogue . . . I told myself 'maybe it's not that necessary', 'maybe what I want to say will be annoying', that kind of excuses nullifying all that is behind, invalidating myself" (Report No. 10, 2015).</p>	<p>"And this is what is happening in this long path, some leave, others arrive in our lives, and so it is how we all receive small pieces of other people that we never met, but that are somewhere in the person that is in front of us today, and so we will continue meeting others, and giving them small pieces that were given to us, to me the interconnection is there, among all of us and everything . . . we are here because in some place, many years ago, many dreamed and prayed for this moment. There is nothing left than to honor them in the same way that we honor the ones to come" (Report 16, 2015). "I can clearly see that we are part of a huge network of knowledges, which provides a foundation to each local initiative" (Questionnaire 3).</p>

Table 4. Cont.

Dimension		At the Beginning	At the End
Of the environment	Affirmation	Crisis is imminent and unavoidable. Changes are too difficult.	I acknowledge complexity. I acknowledge diversity.
	Discourse	<p>“I saw a path where everything was stuck and common. I only saw the typical system’s path and to go on with that, boring and sad . . . I only saw a territory wearied away, thus I only expected to continue eroding it” (Questionnaire 25).</p> <p>“I saw as very difficult to change my reality and to see it from another place” (Questionnaire 22).</p> <p>“[I thought] that society was too complex to achieve concrete changes” (Questionnaire 11).</p> <p>“I saw that socially there was almost none or a lacking development of socioecological issues troubling us” (Questionnaire 2).</p>	<p>“I understand the territories in a complex, multi-scalar way” (Questionnaire 13).</p> <p>“Today I can diagnose a territory with the tools acquired without a biased view. I relate to my territory, I understand its processes, I understand its problems better” (Questionnaire 18).</p> <p>“Understanding the communities from all the edges reviewed in the units, and understanding that these are linked according to the area where they are located and develop” (Questionnaire 1).</p>
Of the actors	Affirmation	There are no allies. I don’t need allies.	I mobilize with others. We are co-creators.
	Discourse	<p>“I saw that socially there was almost none or a lacking development of socioecological issues troubling us” (Questionnaire 2).</p> <p>“I thought that it was possible to conduct changes alone, that I didn’t need support to achieve what I decided” (Questionnaire 14).</p>	<p>I move with them, with my peers, to generate networks of linked worlds with others to create collectively, share learnings, knowledges, and experiences” (Report No 19, 2015).</p> <p>“The different actors . . . participate in the construction of this vision of the territory” (Questionnaire 4).</p>

Table 5. Farmers’ perception of co-executed activities. Source: [31].

Category	Narrative
Valorization of the person and their work	“We are glad that they have chosen us” (E3)
	“We see very well that they work with us” (E6)
	“For us it is important that a university considers us” (E1)
Collaborative work	“You are giving us the opportunity to improve and learn” (E5)
	“The work you do with these students is very good, so you know how we work” (E8)
	“The work you do with us is very good, it should be repeated more often” (E10)

Table 6. Adjustments and modifications in the implemented projects. Source: [32].

Characteristics	Moment 1	Moment 2
Approach to the theoretical contents	Intensive school training	Adjustment and adaptation throughout the development of the project
Formation of the group	One or two students and farmers	Students and farmers make up a single group
Counter-operator leadership	Technical Support Professional	Farmers themselves
Product definition	Consensus between farmers and teachers	Consensus between students and farmers
Projects	Depending on interested students	One only per course

4. Discussion

After a seven-year period of development of the formative itinerary, it was possible to observe potentialities and advantages of the proposed training itinerary in agroecology. These are shown in Table 7.

Table 7. Potentialities and advantages of the training itinerary in agroecology.

Variable	Potentialities and Advantages
Curriculum designs	<ul style="list-style-type: none"> • It allows the incorporation of inter- and transdisciplinary approaches to analysis. • It promotes dialogue between different areas of knowledge and popular knowledge. • It allows the configuration of diverse scenarios for learning. • It is based on the use of various techniques that facilitate the exchange of experiences between students and teachers.
Articulation of itineraries	<ul style="list-style-type: none"> • The itineraries are articulated according to the interrelations that occur between individual and collective dimensions. • It is based on a circular model of learning that moves towards levels of greater complexity (person-community-society-planet). • It allows the incorporation of new reference frameworks in relation to the community with which the participants interact and belong. • It enables the generation of new scenarios of joint action with the community. • It facilitates the realization of actions that respond to the needs of a community. • It provides flexibility to overcome the rigid and compartmentalized curricular structures present in university education.
Adequacy of learning methodologies	<ul style="list-style-type: none"> • It promotes a dialogue that is not managerial, but co-creative, which enhances and facilitates the creative experience between the participants. • It allows to articulate the formation of the individual, research, and social insertion within the community. • It always promotes inclusion and discussion between those involved in the collective learning process. • It allows learning tailor-made for the student in which the student's skills converge with the requirements of a group of farmers. • It facilitates the contact of students with real situations outside the classroom based on a permanent dialogue between theory and agroecological praxis. • It allows the development of degrees of autonomy in students in their learning process. • It facilitates the combination of scientific approaches with knowledge resulting from field experience. • It facilitates feedback that encourages a constant search and updating of adequate and relevant information to act in scenarios not established beforehand. • It highlights the relevance of the student's performance by giving them a sense of responsibility.

Table 7. Cont.

Variable	Potentialities and Advantages
Teachers' performance	<ul style="list-style-type: none"> • It activates a favorable attitude towards the educational process over the mastery of the thematic contents. • It reinforces the commitment towards the achievement of the didactic objectives and the teaching activities. • It facilitates a disposition towards debates in conditions of horizontality. • They propose appropriate strategies to address the heterogeneity of the student group. • Better deployment of instances for interpellation and questioning by students. • Greater provision of spaces for feedback and transformation in thinking and acting habits. • It promotes the creation of collaborative spaces for co-creation.
Students' participation	<ul style="list-style-type: none"> • It promotes the identification of a change of consciousness and an opening and internalization of new knowledge. • Internalizes diversity and heterogeneity as core values and, with it, an openness to pluralistic approaches. • It allows the establishment of a different relationship with the environment. • It facilitates the incorporation of sustainable practices in the workplace related to the space of daily habitability. • Promotes participation in activities and/or incorporation into organizations related to sustainability. • It facilitates networking, favoring collaborative and interdisciplinary work.

4.1. The Curricula Design

The design of curricula for agroecological education require a (re)definition of the programs, in which it is possible to expand the orientations originally elaborated for a technical–agronomic curriculum. The experience of the authors is that curricular redesigns of agronomic curricula do not tend to promote the incorporation of inter- and transdisciplinary approaches for a dialogue between different areas of knowledge and people's knowledge that conceive nature and our relationship with it from an epistemological rupture and the creation of new reference frameworks [36].

The flexibility granted by continuing education to expand the target audience, coexistence with people with different experiences, training and trajectories, the configuration of diverse scenarios for learning, and the use of diverse techniques facilitate the exchange of experiences that expand and enrich the training processes. The epistemic tension of agroecology highlights the existence of the tendency of green agronomy training plans that are far from transcending the modern paradigm [57]. Additionally, the transmutation through which a curriculum should pass to truly incorporate the agroecological approach entails a high degree of entropy, where a new conceptual approach of origin is more advantageous. An example of this is the creation of training plans in agroecology based on intercultural educational models [58].

4.2. The Articulation of Itineraries

Training and learning itineraries in higher education tend to be organized in basic training initially, followed by specialized training, both in relation to the areas of knowledge that contribute to a certain professional sector. What has been designed in the PECA is the articulation of itineraries, i.e., courses, diplomas, and postgraduate degrees, based on the interrelations that occur between individual and collective dimensions.

The itinerary presented in this work has been organized initially based on a circular learning model that moves towards levels of greater complexity: person > community > society > planet. This model has been structured as a process of "integration-transcendence" in which the passage from one level to the next is considered a "holarchy" [49]. Subsequently, the itinerary focuses on a phase understood as the incorporation of the reference frameworks with the community that allow the student to generate new action scenarios in conjunction with said community, tapping into endogenous potentials. Finally, with the appropriate contextualization, concrete actions are carried out that are of a more technical nature and on a smaller scale, responding to the needs of a community or group of farmers.

This flexibility allows for overcoming the rigid and compartmentalized curricular structures present in a university education that hinder agroecological teaching [59].

4.3. *The Suitability of the Learning Methodologies*

The suitability of the learning methodologies used in the different certifications have been decisive to the development of the skills proposed in each certification. The transformational learning methodology is adopted in the first phase of the paradigm shift, which implies, in the way of observing and inhabiting the world of actors, i.e., teachers and students, a dialogue not directive but co-creative, which enhances and facilitates the creative experience between the participants, recognized in their capacity as actors and apprentices. These characteristics coincide with the collaborative ways that agroecology promotes and synergizes when it is developed with unconventional educational approaches [45].

For the phase oriented to participation with the community, the project-based learning (PBL) methodology has allowed to articulate the formation of the individual, research, and social insertion within the community, which generates inclusion and discussion among those involved. It has been observed that the application of this methodology allows for tailor-made learning for the student in which the skills of the student converge with the requirements of a group of farmers [32]. Organizing learning based on the development of a project that meets the specific demands of farmers along with bringing students closer to real situations are characteristics to highlight in reference to the fact that the learning process has consisted of a permanent and continuous dialogue between agroecological theory and praxis and that degrees of autonomy are developed in students in their learning process [60].

Although not exclusive, the suitability of the learning and service methodology (A+S) for the development of skills related to actions at the farm level due to the characteristics of agro-productive activities is observed [31]. Like the PBL methodology, the use of A+S allows, through practical cases [45], the combination of scientific approaches with the knowledge resulting from experience [44]. The approach to real on-farm cases through a permanent dialogue between students, farmers, teachers, and technicians facilitates feedback that fosters a constant search and updating of adequate and relevant information to act in scenarios not established in advance [61].

Finally, the combination of the learning methodologies used throughout the training itinerary transform students into agents of change, while the relevance of their performance gives them a sense of responsibility.

4.4. *Teachers' Performance*

In relation to the performance of the teachers involved in this work, the attitude and commitment in the educational process prevail over the mastery that they possess of the thematic contents and their skills in the implementation of the methodologies used. As important as the content developed during the training itinerary, through debates in conditions of horizontality, the attitude and commitment of teachers has been fundamental in the achievement of the objectives.

Teachers show a high commitment in the development of their teaching activities, considering appropriate strategies to address the heterogeneity of the group of students, the use of interpellation and questioning by students, the creation of spaces for feedback, and transformation in the habits of thinking and acting.

This has meant, on the part of teachers, assuming new roles. It is no longer simply a linear delivery of content, but the creation of collaborative spaces for co-creation. In the process of active learning in agroecological education, the teacher becomes a counsellor and catalyst [60], generating a complicity between the actors.

4.5. *The Participation of the Students*

The participation of the students, from their perspective, has implied profound transformations at the level of the individual, which has allowed changes in their practices

in at least six areas of action: (1) personally, referring to the identification of a change of consciousness and an opening and internalization of new knowledge; (2) attitudes of socio-cultural sustainability, accepting diversity and heterogeneity as fundamental values and, with it, an openness to pluralistic approaches; (3) attitudes of environmental sustainability that emphasize establishing a different relationship with the environment; (4) sustainable practices in the workplace related to the space of daily habitability; (5) participation in activities and/or incorporation into organizations related to sustainability; and (6) networking, favoring collaborative and interdisciplinary work.

Assessments made by the students included comments such as: *“It helped me a lot to have a different perspective of the world”*; *“it forces you to open your mind to new practices that integrate everyone”* *“(the training) guided my future work interests”*; *“it was an opportunity that opened a door to new research topics and practices that foster the construction of a more sustainable society”*; and *“I made networks that allowed me to carry out a community organization project”* [33]. Similar results were found in other studies [62] and therefore denote the transformations of university students enrolled at agroecological education programs in which unconventional methodologies have been used.

5. Conclusions

The growing interest in agroecology and the urgent need for change in university curricula for its incorporation find a space in higher and continuing education that has proven to be effective for the purposes of implementing a holistic, systemic, and inclusive agroecological education. Programs should allow the implementation of flexible itineraries by developing a curriculum pertinent to the paradigmatic change proposed by agroecology, addressing at different levels the processes of socio-ecological transformation necessary for an agroecological transition towards sustainable societies.

In this context, the pathways implemented allow the deployment of potentialities where the skills of the students converge, with the learning objectives developed by the team of teachers and the requirements of the various actors with which they relate for the development of agroecological initiatives. The contextualized and adapted application of active learning methodologies is suitable for the development of skills among students, such as collaborative work and co-creation. The approach to specific problems, the development of practical cases, and the possibility of experiencing real situations, even establishing links with the communities, motivates the student to achieve specific objectives.

On the other hand, the uniqueness of agroecological experiences, as well as the difficulty of establishing comparative studies due to the lack of similar works, limits the scope of this study in the extent that it can be directly extrapolated to other contexts. This constitutes a great challenge for the implementation of new experiences in different contexts and highlights the need to develop new studies that accompany these learning processes focused on other actors, student profiles, the impact generated in the communities with these interactions, and the social dynamics in the agents of change.

Author Contributions: Conceptualization, S.P.P. and C.B.S.; methodology, S.P.P. and C.B.S.; validation, S.P.P. and C.B.S.; formal analysis, S.P.P. and C.B.S.; investigation, S.P.P. and C.B.S.; resources, S.P.P. and C.B.S.; data curation, S.P.P. and C.B.S.; writing—original draft preparation, S.P.P. and C.B.S.; writing—review and editing, S.B. and S.P.P.; visualization, S.P.P., C.B.S. and S.B.; project administration, S.P.P. and C.B.S.; funding acquisition, S.P.P. and C.B.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding. This work was supported by Universidad de Santiago de Chile (Project USA 1555).

Institutional Review Board Statement: Not applicable, the study did not require ethical approval.

Informed Consent Statement: Not applicable.

Data Availability Statement: The study did not report any data.

Acknowledgments: We acknowledge Dirección de Investigación Científica y Tecnológica, Universidad de Santiago de Chile and all those who have participated, in one way or another, over the years: colleagues, students, researchers, administrative staff, farmers, peasants, and all the people and professionals belonging to the different social organizations and public and private institutions that collaborated in this initiative.

Conflicts of Interest: The authors declare no conflict of interest.

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