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8 ORIGINAL ARTICLE / ARTÍCULO ORIGINAL

9 PARTICIPATION OF THE AGRONOMY CAREER IN THE LOCAL DEVELOPMENT OF
10 THE MUNICIPALITY OF TRINIDAD, CUBA

11
12 PARTICIPACIÓN DE LA CARRERA DE AGRONOMÍA EN EL DESARROLLO LOCAL
13 DEL MUNICIPIO TRINIDAD, CUBA

14
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23 Running Head: Influence of the Agronomy Carrer in local development

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ABSTRACT

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Among the main latent difficulties that constitute a current brake on the achievement of the proposed objectives to achieve food sovereignty in the Municipality of Trinidad, Cuba, based on respect and conservation of the environment, the following can be mentioned: poor agrotechnical management, indiscriminate use of agricultural inputs, lack of knowledge of producers and professionals of sustainable production technologies, soil degradation, lack of knowledge of botany and plant improvement of frequently planted crops, poor quality or insufficient availability of the gamic and agamic seeds used, lack of knowledge and violation of current agrarian legislation, agricultural territorial planning outside the real context presented by the municipality, among others. Elements that in one way or another have to do with the insufficient training of professionals and workers in the agricultural sector in the territory. This work proposes a design and implementation of training actions in the agricultural sector of the territory that allow achieving sustainability standards therein, based on a joint action between the Municipal University Center of Trinidad and the Municipal Delegation of Agriculture, already exposing the first results of this training, managing to contribute to the territory the first 53 professionals trained in the version of the Diploma in Sustainable Agriculture, another result obtained is that several Agricultural Engineers have graduated, whose Diploma Work Topics have been in charge of solving problems that prevent the development of agriculture at the municipal level, achieving the publication of some of these works in high-impact magazines at an international level, among others, which contribute to increasing work efficiency in the agricultural sector of the territory. thus contributing to the local development of the territory and obtaining recognition of the research and contributions made in the territory at an international level.

Keywords: effectiveness – elevation – strategy – territory – Training

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RESUMEN

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Entre las principales dificultades latentes y que constituyen un freno actual para el logro de los objetivos propuestos para alcanzar la soberanía alimentaria del Municipio Trinidad, Cuba, sobre la base del respeto y conservación del medio ambiente, se pueden mencionar las siguientes: deficiente manejo agrotécnico, uso indiscriminado de insumos agrícolas , desconocimiento de los productores y profesionales de las tecnologías de producción sostenible, degradación de los suelos, desconocimiento de la botánica y fitomejoramiento de los cultivos frecuentemente sembrados,

62 mala calidad o insuficiente disponibilidad de las semillas gámicas y agámicas utilizadas,
63 desconocimiento y violación de la legislación agraria vigente, planificación territorial agropecuaria
64 fuera del contexto real que presenta el municipio, entre otros. Elementos que de una u otra forma
65 tienen que ver con la insuficiente capacitación de los profesionales y trabajadores del sector
66 agropecuario en el territorio. El presente trabajo propone un diseño e implementación de acciones
67 de capacitación en el sector agropecuario del territorio que permitan alcanzar estándares de
68 sostenibilidad en el mismo, a partir de una acción conjunta entre el Centro Universitario Municipal
69 de Trinidad y la Delegación Municipal de Agricultura, exponiéndose ya los primeros resultados
70 de esta capacitación, logrando aportar al territorio los primeros 53 profesionales formados en la
71 versión del Diplomado en Agricultura Sostenible, otro resultado, obtenido es que se han graduado
72 varios Ingenieros Agrónomos, cuyos Temas de Trabajo de Diploma han estado en función de
73 resolver problemas que impiden el desarrollo de la agricultura a nivel de municipio, logrando la
74 publicación de algunos de esos trabajos en revista de alto impacto a nivel internacional, entre
75 otros, los cuales contribuyen a la elevación de la eficiencia del trabajo en el sector agropecuario
76 del territorio contribuyendo de esta forma al desarrollo local del territorio y obteniendo un
77 reconocimiento de las investigaciones y los aportes realizados en el territorio a nivel internacional.

78 **Palabras clave:** Capacitación – efectividad – elevación – estrategia – territorio

79

80

INTRODUCTION

81

82 Strategies are general programs of action that carry with them commitments of emphasis and
83 resources to implement a basic mission. They are patterns of objectives, which have been
84 conceived and initiated in such a way as to give the entity a unified direction (Koontz, 1991).

85 Humanity is at a turning point in its history. It is faced with great disparities between nations and
86 within nations, with worsening poverty, hunger, disease, illiteracy, and with the continuing
87 deterioration of the ecosystems on which our well-being depends. However, by integrating
88 environmental and development concerns and paying more attention, basic needs can be met,
89 living standards for all can be raised, ecosystems can be better protected and managed, and a more
90 secure and prosperous future can be achieved. No single nation can achieve these goals alone, but
91 together we can achieve them in a global partnership for sustainable development" (Cabrera,
92 2013).

93 In the Roadmap derived from the World Higher Education Conference held in Barcelona in 2022,
94 it was stated that:

95 “Higher Education Institutions have three great social missions: to produce knowledge through
96 scientific research, to educate people, in the broad sense of the word, paying special attention to
97 the knowledge and skills necessary for professional life, and to be socially responsible...”
98 (UNESCO, 2022).

99 Each territory has specific particularities that allow it to move in one direction or another more or
100 less rapidly Maqueiras (2021). Thus, considering planning as the primary basis for development, it
101 is necessary to speak of a new type of planning, called ecological, environmental or strategic,
102 which can be conceived as: "The instrument for planning and programming the use of the territory,
103 productive activities, the management of human settlements and the development of society, in
104 congruence with the natural potential of the land", sustainable use of natural and human resources,
105 and the protection and quality of the environment. This idea is cemented in the possibility of
106 thinking and creating the future from the knowledge and valuation of the present and its
107 articulation to the past, and should be understood, then, as a public management tool to control,
108 promote and direct contemporary social systems, articulated in their geoeological sustenance base
109 (Valdés & Suárez, 2018).

110 Trinidad, as a territory populated since pre-Columbian times and with more than half a millennium
111 of existence since its foundation as a village that early reached the category of city, has treasured
112 physical-geographical particularities and its historical and economic evolution, which make it an
113 ideal scenario for the development of tourism as the main support for its development (CAM
114 Trinidad, 2023).

115 But the transition from an economy that was sustained for centuries by the sugar cane activity to
116 another that requires a vision and therefore a more holistic study and use of all the potential of the
117 territory such as tourism, represents a challenge that its human resources are in the obligation to
118 face because it has identified by the government authorities a bank of problems, where one of the
119 priorities is the satisfaction of the growing food needs of a demographic nucleus in constant
120 expansion, facing for it a series of difficulties within the agricultural infrastructure that it has, to
121 be able to give a solution to the existing problems, many of them are in the obligation to face, One
122 of the priorities is the satisfaction of the growing food needs of a demographic nucleus in constant
123 expansion, facing a series of difficulties within its own agricultural infrastructure, to be able to

124 solve the existing problems, many of these difficulties have been generated by the actions of man
125 himself in his historical desire to provide food to his fellow countrymen (Valdés *et al.*, 2023).

126 Among the main latent difficulties that constitute a current obstacle to achieving the proposed
127 objectives for territorial food sovereignty based on respect for and conservation of the environment
128 are the following: poor agrotechnical management, indiscriminate use of agricultural inputs, lack
129 of knowledge of producers and professionals of sustainable production technologies, soil
130 degradation, lack of knowledge of botany and phytotechnics of frequently planted crops, poor
131 quality or insufficient availability of gamic and agamic seeds used, ignorance and violation of
132 current agrarian legislation, territorial agricultural planning outside the real context presented by
133 the municipality, among others (Valdés, 2019).

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137 of knowledge of producers and professionals of sustainable production technologies, soil
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139 quality or insufficient availability of gamic and agamic seeds used, ignorance and violation of
140 current agrarian legislation, territorial agricultural planning outside the real context presented by
141 the municipality, among others (Valdés, 2019).

142 It is also correct to highlight the critical situation of the coastal strip of Casilda which presents a
143 strong contamination of its waters by human action that has turned this area into a highly dangerous
144 focus emitting diseases that significantly affect the health of the population (PGOU, 2018).

145 An important part of the aforementioned limitations are the cumulative result of a predominant
146 ideology within the professionals who have directed the productive process and logically of the
147 producers themselves, in the use of a conventional agricultural model, which as has been handled
148 previously, has fallen into complete crisis, not adjusting to the current precepts that move the
149 agricultural development at a global and national level, nor to the elementary desire for the
150 preservation of our own species (Hernández *et al.*, 2023).

151 The University, the main center in charge of managing the formation, training and permanent
152 improvement of these resources, has to undertake important actions to encourage them to
153 undertake in a productive, rational and scientifically based manner the great tasks that will allow
154 them to creatively integrate the management and protection of their agricultural resources, urban

155 and territorial planning, the efficiency of productive activities in correspondence with the updating
156 of the country's economic model and in general, the environmental sustainability of tourism
157 development, even considering the new forms of management, for which the environmental issue
158 is identified as one of the most important concerns of mankind; The boom that this issue has taken
159 in recent years is related to the intensification of numerous problems at all scales, which affect
160 society in an increasingly harmful way (Law on Food Sovereignty and Nutritional Security, 2022).
161 It is necessary to promote a change in the productive mentality, through the search for and adoption
162 of sustainable and harmoniously integrated agricultural production techniques that constitute
163 alternatives to traditional models, and achieve an increase in the production of healthy food in the
164 quantities necessary to satisfy the demanding demands of tourism. It is also necessary to
165 disseminate more widely the variety and richness of the tangible and intangible heritage and
166 promote its proper management and interpretation for its conversion into tourism products that
167 show the richness and diversity of the culture of the municipality and the country (González, 2007).
168 From training, science and innovation, we continue to contribute to the implementation of
169 Municipal and Provincial Development Strategies, local innovation systems, self-management and
170 sustainability of municipalities, with the participation of Municipal University Centers (CUM) as
171 main actors in knowledge management, with special emphasis on capacity building, which is
172 evident in the increase in actions at the territorial level. There are dozens of local development
173 projects, technologies certified and absorbed by the municipalities. The increase in R&D&i
174 projects that contribute to the development of the territories is notable, including several of
175 international scope (Díaz-Canel, 2022).

176 This study is aimed at the so-called long-term solutions, and proposes to carry out an investigation
177 on alternatives that can contribute to train, qualify and overcome professionals capable of
178 assuming the challenges of sustainable development in the construction of the economic model to
179 be built in Cuban society, including those incorporated to the non-state management forms. It is
180 also articulated with the Municipal Development Plan, as a strategy to strengthen the municipality
181 and at the same time improve the use and rational exploitation of its agricultural and fishing
182 resources in a results-oriented local management framework.

183 To design and implement alternatives of formation, training and improvement, in the agricultural
184 sector of the Trinidad municipality, Cuba, from the university and in consonance with the real

185 needs of the territory, in contribution to the theoretical and practical strengthening of local
186 development in the Trinidad Municipality.

187

188

MATERIALS AND METHOD

189 In order to achieve the objectives of this research, several stages were outlined. The first stage
190 consisted of characterizing the agricultural sector of the municipality of Trinidad, Cuba. For the
191 university to be a protagonist in the process of social development, it must integrate from a
192 systemic conception its substantive processes: academic, labor and research and break its walls
193 with genuine extension processes that instruct while educating from latent and felt needs in their
194 different contexts of action and project their activities of : Therefore, the university of the territory
195 will bring together the existing human capital and will do so by taking advantage of its own and
196 external resources, so as to produce the necessary synergy between all stakeholders and interested
197 parties, it is necessary to align strategies, knowledge and priorities of development with human
198 welfare.

199

200 **Stage 1. Characterization of the agricultural sector in the Municipality of Trinidad, Cuba**
201 **(CAM Trinidad, 2023; Sánchez, 2023).**

202 The Municipality has a territorial area of 116,747.37 ha and of them 60,703.72 ha are agricultural,
203 including 13,288.2 ha of temporary crops, 14,327.5 ha of permanent crops and 44,976.99 ha of
204 livestock. It also has a non-agricultural area of 44,154.68ha, of which 43,151.22 ha are dedicated
205 to forest plantations. The Idle Land Fund available at the end of 2021 was 1,787.48 ha, a figure
206 that was higher in previous years and has decreased due to the fact that today there are a total of
207 1,745 tenants in the territory, of which 286 are property owners and usufructuaries by different
208 Resolutions 1459.

209 The economic base of this Sector in the territory is supported by: Trinidad Agroforestry Company
210 with 4 UEB: UEB Coffee Benefit: Felicidad, Seibabo and La 23, UEB Valle de los Ingenios, UEB
211 Urban Farm, UEB Assurance.

212 As a result of the low availability of areas with irrigation systems (0.0003 ha), which means that
213 almost all crops are grown in dry land, together with the intense drought that has affected the
214 municipality in recent years, the levels of production and collection of agricultural products, which
215 is why it is necessary to increase the areas under irrigation, since there is potential in terms of

216 supply sources, which can be exploited with appropriate technologies, which could reverse the
217 current results.

218

219 **Stage 2. Study and adaptation of the research and training objectives of the Agronomy**
220 **Career of the Municipal University Center of Trinidad in terms of local development.**

221 For the fulfillment of this stage, a transdisciplinary group of the Municipal University Center of
222 Trinidad was created, belonging to the Agronomy career of this center, among which were
223 Agronomists, Foresters, Veterinarians, among others, who together with specialists of the
224 agricultural system in this municipality, undertook the task of analyzing the Local Development
225 Strategy, They were given the task of analyzing the existing Local Development Strategy in the
226 municipality, and under the care and monitoring of the Municipal Administration Council (CAM),
227 after knowing the 6 strategic lines shown in the strategy, consensus was reached that the strategic
228 line number one, under the title: "Production and food with science", fit perfectly with the
229 intention of the Agronomy Career of the Municipal University Center to contribute to the support
230 of the local development of the municipality, being able as a university to respond to the demands
231 and needs that this line demanded for its execution.

232

233 **Stage 3. Diagnosis of the agricultural sector of the Municipality of Trinidad.**

234 At this stage the transdisciplinary group created and mentioned above was called with the task of
235 conducting a diagnosis of the agricultural sector of the municipality of Trinidad, in the period
236 between January 2015 and December of that year, covering 100% of the existing productive forms
237 in the sector, and 100% of the agricultural, livestock and forestry territory of the municipality, for
238 this purpose three work teams were created, which would cover the entire territory, To this end,
239 three work teams were created, which would cover the entire territory, gathering the threats,
240 opportunities, weaknesses and strengths that existed in each productive form, and in each
241 component of the agricultural system of the municipality, that is, agriculture, forestry and
242 livestock, then a work table was set up where by analysis and weighting the weaknesses, threats,
243 opportunities and strengths that were common and those that were not were established,
244 establishing a general diagnosis of the sector for this period of time in this municipality.

245

246 **Stage 4. Establishment of the action plan by the Municipal University Center in order to**
247 **contribute to local development.**

248 Finally, and bearing in mind the weaknesses and threats found in the diagnosis, most of which
249 were directly or indirectly related to training problems and low application of science and
250 technology, an action plan was created and implemented between 2016 and 2019 to solve these
251 threats and weaknesses, which made it possible to put the potential of the specialists of the
252 Agronomy Career of the Municipal University Center of Trinidad in terms of training and d solve
253 many of the problems detected, in addition, all the research potential of the career was involved in
254 order to solve some of the problems that appeared in the diagnosis that prevented progress in the
255 aspirations of the territory of a sustainable local development. In 2019, several results of the
256 implementation of the action plan began to be obtained, appearing results that allowed to begin to
257 evaluate the impact that the participation of the Agronomy career had had on local development,
258 that work continues, and the impact is monitored until today.

259
260 **Ethical Aspects:** This work responds to one of the lines of research of the Agronomy Career of
261 the Faculty of Agricultural Sciences of the University of Sancti Spiritus, which in turn is in full
262 consonance with the Local Development Strategy in force in the Municipality of Trinidad,
263 contributes new aspects to knowledge in the still little explored topic of the participation of the
264 different university courses existing in municipal university centers, and specifically the
265 Agronomy course in local development. This work is guaranteed by its tutors and institutions that
266 represent that it does not constitute plagiarism of another presented, both in Cuba and
267 internationally.

268

269 **RESULTS AND DISCUSSION**

270

271 **Diagnosis of the current situation of the agricultural sector in the Municipality of Trinidad**
272 **carried out by specialists of the Trinidad Municipal University Center.**

273 The diagnosis was the tool used by the specialists of the Municipal University Center of Trinidad
274 to obtain data that would allow us to know the real situation of the agricultural system of the
275 Trinidad Municipality in the evaluated period, allowing us to know the risks and opportunities that

276 exist in the agricultural sector of the municipality and that directly affect the functioning of this
277 sector.

278 The strengths, weaknesses, opportunities and threats that the agricultural sector has at the time of
279 introducing a scientific result are framed below.

280

281 **Strengths**

282 ★ Existence of the science and innovation system in the province (Trinidad Municipal
283 University Center, Trinidad Plant Health Research Station, Entomophagous and
284 Entomopathogen Production Center, County, Trinidad).

285 ★ High number of qualified researchers in the agricultural sector.

286 ★ Integrated provincial strategy for science, technology and technological innovation.

287 ★ Existence of areas available for agricultural production.

288 ★ Beginning of a process of assimilation of scientific-technical results for low-input systems
289 obtained by research centers.

290 ★ Existence of various forms of production in the agricultural sector with great productive
291 potential in the Trinidadian territory.

292 ★ Existence of permanent sources of food, vegetable and fruit production during all seasons
293 of the year.

294 ★ Existence in some of the productive forms of advanced technologies that can promote an
295 increase in the production of vegetables, viands and fruit trees.

296 ★ Existence in some of the productive forms of osseous facilities that can be reconditioned
297 for the installation of the necessary technological equipment in the mini-industries.

298 ★ Established producers, with a high level of relevance and knowledge in the art of producing
299 vegetables and fruits.

300 ★ Proximity of the productive forms to the main population centers and companies of the
301 territory.

302

303 **Weaknesses**

304 ★ Insufficient introduction into productive practice of the scientific results of the agricultural
305 research centers.

- 306 ★ Low availability of material and financial resources in the agricultural sector of the
- 307 territory.
- 308 ★ Lack of continuity of scientific results (scientific results that have been shelved).
- 309 ★ Lack of visibility, will and creativity of many of the cadres that manage the agricultural
- 310 sector in the territory in the need to implement new technologies that allow new productive
- 311 options.
- 312 ★ Deficient contracting process of agricultural productions between the productive forms and
- 313 the Municipal Collection.
- 314 ★ Delinquent payments for contracted productions between the productive forms and the
- 315 Municipal Collection.
- 316 ★ Existence of osseous lands in the municipality's land fund.
- 317 ★ Poor conception of the territorial planning of vegetable production.
- 318 ★ Outdated soil fertility studies of the territory.
- 319 ★ The existence in the Municipal Direction of Agriculture of an incomplete and inefficient
- 320 human resources training strategy.

321

322 **Opportunities**

- 323 ★ The country's need for import substitution.
- 324 ★ Priority in the country towards innovation issues.
- 325 ★ Definition of priority research lines in the country (food production, energy saving, import
- 326 substitution).
- 327 ★ Interest on the part of the Provincial Assembly of People's Power and the PCC, for
- 328 innovation issues and introduction of scientific results.
- 329 ★ Sufficient natural resources for the introduction of agricultural results.
- 330 ★ Increased demand for a variety of packaged vegetable products by the sectors: self-
- 331 employed, tourism, business and population of this municipality.
- 332 ★ Political will of the authorities of the territory to create new productive opportunities in the
- 333 agricultural sector of the territory, which at the same time, allow an increase in the
- 334 productions and variety of agricultural products.
- 335 ★ Existence of available labor in the territory to meet the demands of the agricultural sector
- 336 and to face any new investment in the sector itself.

337 ★ Existence of a Municipal University Center that can meet the training demands of the
 338 agricultural sector in the territory.

339

340 **Threats**

341 ★ The economic and commercial blockade is maintained.

342 ★ Unstable international scenario (world crisis).

343 ★ Increase in the prices of raw materials and materials on the market.

344 ★ Effects of climate change.

345 ★ Fluctuation of the labor force in the territory.

346 ★ When an analysis and evaluation of the results shown in the diagnosis is made, it is obtained
 347 that many of the weaknesses and threats shown by the agricultural sector in the
 348 municipality are directly or indirectly related to problems in the training of its human
 349 resources, which limits the achievement of more efficient processes, preventing the desired
 350 sustainability of the sector.

351 ★ The following is a breakdown of the Action Plan designed to provide a solution to the
 352 training problem that has arisen, showing actions for each stage, i.e. initial, diagnosis,
 353 intervention and evaluation, but due to the format required for this presentation and in order
 354 to save space, only the diagnosis stages will be addressed (Table 1).

355

356 **Table 1.** Action Plan designed to provide a solution to the training problem.

357

Diagnosis.	Selection of diagnostic tools and techniques to determine the current status of the company.	2015	Research group.	Determination of the starting situation
Ejecution.	Training and research actions to resolve threats and weaknesses detected in the diagnosis.	2016-2019	Research group.	Monitoring of the implementation process.
Evaluation.	Evaluation of the results obtained in the different diagnoses to plan a work strategy.	2019	Research group.	Measurement and comparison of results obtained.

Evaluation.	Evaluation of the impacts on the preparation of the leaders and workers of the companies, the self-employed sector and population centers.	2019	Research group.	Measurement and comparison of results obtained.
Evaluation.	Evaluation of the impacts on the preparation of the teachers - tutors who are part of the study	2019	Research group.	Measurement and comparison of results obtained.
Evaluation.	Assessment of the impacts on the preparation of tutors for master's degrees and diploma work	2019	Research group.	Measurement and comparison of results obtained.
Evaluation	Evaluation of improvements in environmental quality levels in the CUM.	2019	Research group.	Measurement and comparison of results obtained.

358

359 **Results obtained to date with the implementation of the action plan.**

360 The first results obtained from the implementation of the strategy are as follows:

361 Completion of a Diploma Course in Sustainable Agriculture: In this Diploma Course, directives
 362 and workers of the different productive forms in the agricultural sector of the territory participated,
 363 achieving a graduation of 53 graduates, who with the presentation of their theses proposed
 364 solutions to different problems of the agricultural sector of the municipality.

365 Postgraduate Phytotechnology Course: This course was considered a postgraduate and training
 366 course, with the participation of professionals from the agricultural sector, but also workers who
 367 did not have a higher level of education, achieving 20 graduates.

368 Training in basic agronomy topics for the Head of the Training Department of the Enrique Villegas
 369 del Algarrobo Agronomy Polytechnic.

370 A postgraduate course in Techniques and Principles of Management to the managers and workers
371 of the UBP Cigar Factory Juan de Mata Reyes, in 2018 with the graduation of 15 students in the
372 Postgraduate modality and 5 in the Training Course modality.

373 Advice on agricultural issues to the Local Development Group, as well as participation as
374 methodological advisors in the First Strategic Line of the Local Development Strategy.

375 Delivery of postgraduate courses on Food Sovereignty to Mayors and main cadres of the Municipal
376 Assembly of People's Power.

377 The culmination of studies of 10 students in the Agronomy Career, course 2023, in the modality
378 of Regular Course by Meetings, who will defend their Diploma Work in option to the title of
379 Agronomist Engineers in topics that respond to the current needs of the agricultural sector of the
380 territory, propitiating the search for a sovereign and sustainable territory in the feeding of its
381 population.

382 The generalization of one of the scientific investigations, carried out by students and professors in
383 a company producing bioinputs in Costa Rica, see Annex 1.

384 The delivery of training courses to Social Fighters in the Socialist Agroecological Training Center
385 Indio Rangel of the sister Bolivarian Republic of Venezuela, on issues related to Agroecology,
386 between 2020 and 2021, achieving the training of more than 600 fighters, which through the
387 Francisco de Miranda Front, became multipliers of these issues nationwide.

388 The training of the main cadres of the Francisco de Miranda Front, in the sister Bolivarian Republic
389 of Venezuela on management issues, here was jointly developed a Management Strategy for the
390 Socialist Agroecological Training Center Indio Rangel, which was published in an international
391 indexed magazine, located in the first level of the Ranking, see the list of publications that appeared
392 in these results.

393 The visibility and recognition of the scientific research undertaken by the Agronomy Career of the
394 Municipal University Center of Trinidad at national and international level has been achieved, an
395 example of this is the achievement of the publication of this strategy in an international journal
396 indexed in the first place of the Ranking. See list of publications appearing in these results.

397 The visibility and recognition of the scientific research undertaken by the Agronomy Career of the
 398 Centro Universitario Municipal de Trinidad has been achieved at national and international level,
 399 an example of this is the achievement of the publication of this strategy in an international journal
 400 indexed in the first place of the Ranking. See list of publications appearing in these results.

401 Two professors belonging to the career are currently completing their Master's degree in
 402 Agricultural Sciences, attached to the José Martí Pérez University of Sancti Spiritus.

403 List of publications on agriculture and livestock in the Municipality of Trinidad in first and second
 404 level indexed journals (Table 2):

405 **Table 2.** List of publications on agriculture and livestock in the Municipality of Trinidad.
 406

Title of publication and journal	Year of the publication
<i>Heterorhabditis bacteriophora</i> effect on coffee berry borer in the Algarrobo locality, Trinidad, Cuba. <i>Centro Agrícola</i>	2016
Strategic model for the Agricultural Production Cooperative 13 de Marzo, Trinidad, Cuba. <i>Revista Científica Agroecosistemas</i>	2018
Preparation of a Manual for the Organization of the Work of the Nucleus of Socialist Agroecological Training "Indio Rangel" (NUFASIR) Bolivarian Republic of Venezuela. <i>International Journal of Science, Technology and Society</i>	2021
Accion of planification in The CPA "13 Of March", Trinidad City, Cuba. <i>International Journal of Advanced Technology & Science Research</i>	2021
Legal Status Until 2016 of the Land Fund, Labor, Salary and Performance in the Agricultural Sector of the Trinidad Municipality. <i>International Journal of Science, Technology and Society</i>	2023

407
 408 As can be seen in the previous table, it has been possible to output some of the results obtained in
 409 the scientific research carried out in the Agronomy program of the Municipal University Center of
 410 Trinidad, either through undergraduate or postgraduate training actions, an example, of this is the
 411 publication made in 2016, in Centro Agrícola Magazine, a magazine that is indexed in top-level
 412 databases, and shows the results obtained in a Diploma Work in the control of the main pest that
 413 Today it causes damage to the coffee plantations in the Trinidad municipality. All of the above

414 contributes to a vision of continuous training of our professionals, from the connection of our
415 undergraduate students with 112 careers and 64 Higher Technician programs, with study plans
416 increasingly aligned with the 2030 National Development Plan and from a more comprehensive,
417 flexible and diverse postgraduate training (UNESCO, 2024).

418 The results of the aforementioned research have had a great impact not only at the national level,
419 but also internationally, the above can be corroborated in the request made by the Company Bio
420 Control S.A of Costa Rica (2019), which requested the main author of this work the formal
421 authorization of the results obtained in this research to be used as scientific support in its research
422 work and production of biocontrollers.

423

424 **Author contributions: CRediT (Contributor Roles Taxonomy)**

425

426 DVZ = Delvis Valdés-Zayas

427 GPC = Gretty Polo-Conesa

428

429 **Conceptualization:** DVZ, GPC

430 **Data curation:** DVZ, GPC

431 **Formal Analysis:** DVZ, GPC

432 **Funding acquisition:** DVZ, GPC

433 **Investigation:** DVZ, GPC

434 **Methodology:** DVZ, GPC

435 **Project administration:** DVZ, GPC

436 **Resources:** DVZ, GPC

437 **Software:** DVZ, GPC

438 **Supervision:** DVZ, GPC

439 **Validation:** DVZ, GPC

440 **Visualization:** DVZ, GPC

441 **Writing – original draft:** DVZ, GPC

442 **Writing – review & editing:** DVZ, GPC

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