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SNAIL SPAWNING AND FATTENING SYSTEM (HELICICULTURE)

The Sevillian company Heligemas, located in Palomares del Rio, leads the "Snail Spawning and Fattening System" Innovation Operational Group, constituted on the foundation of the grants provided by the European Agricultural Fund for Rural Development (EAFRD), within the Andalusia Rural Development Programme 2014-2020. The project, which also involves the University of Seville, the Association of Agri-Food Cooperatives of Andalusia (FAECA), and the Ministry of Agriculture, Livestock, Fisheries, and Sustainable Development -through the Association for Rural Development of Andalusia (ARA)-, aims to implement a new snail production system with high innovation components.

The project, developed when this Operational Group was formed, has designed a spawning and fattening system for the animal that respects its biological and environmental composition, and also reverts to economic benefits for similar future results. The system involves the transfer of technology and knowledge from more than a decade of research carried out at the University of Seville and in Heligemas, a spin-off emerging from the Faculty of Biology of this same institution.

By applying novel solutions of stocking, automation, handling, control for large-scale breeding, and complete cycle of the *Iberus Alonensis* snail (*serranos*), food of animal origin will be produced with this highly appreciated mollusc, and greater efficiency will be achieved regarding water consumption in traditional exploitation. Generically, the project aims to contribute to the conservation and sustainable use of the natural "land snail" resource in Andalusia through its production against wild extraction, while promoting an adequate heliciculture sector that favours both the advancement of heliciculture and the development of the rural environment after its incorporation.

Operational Groups are key elements in the development of the European Innovation Partnership in productive and sustainable agriculture. They are groups of actors of different profiles, such as farmers, stockbreeders, foresters, agri-food or forestry industries, public or private R&D&I or training and advice centres, technological centres, or non-profit institutions, among others, that associate to achieve innovation in order to solve a problem or take advantage of an opportunity, following an approach of joint and multisectoral action.

The eligible cost of the project has been EUR 254,381.14, 90% co-funded by the European Union through the European Agricultural Fund for Rural Development.

It is considered a Project's Good Practice since it meets the following criteria:

1.The EAFRD's role has been suitably disseminated among the beneficiaries, potential beneficiaries, and the general public:

Firstly, at the entrance of the facilities of the Heligemas company, a permanent information plate has been installed disclosing the participation of EAFRD in this project in accordance with Community regulations:

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On the other hand, the Directorate General of European Funds of the Regional Government of Andalusia, among its specific tools to disseminate the role developed by the EAFRD, has included a wide catalogue of images and a brief description of the project on its new website of European Funds in Andalusia, specifically in the section "Projects":

https://www.juntadeandalucia.es/economiaconocimientoempresasyuniversidad/fondoseuropeosenandalucia/proyecto/214

Another tool of the Management Authority contemplated in the Communication Strategy of the Andalusia RDP 14-20 is a quarterly digital publication, the Huella magazine, which in its 7th issue (January-March 2019) dedicates a report to this project.

https://www.juntadeandalucia.es/economiaconocimientoempresasyuniversidad/fondoseuropeosenandalucia/huella1420/post-type-4.php?idC=5&idN=208&idR=61

In addition, the Association for Rural Development of Andalusia (ARA) publishes on its website a report on this project:

https://www.andaluciarural.org/la-helicicultura-andaluza-se-abre-a-la-innovacion-de-la-mano-del-feader/

Finally, the beneficiary has also disseminated the EAFRD's contribution to the development of this project through social networks: https://www.facebook.com/pg/InnovacionCaracoles/posts/

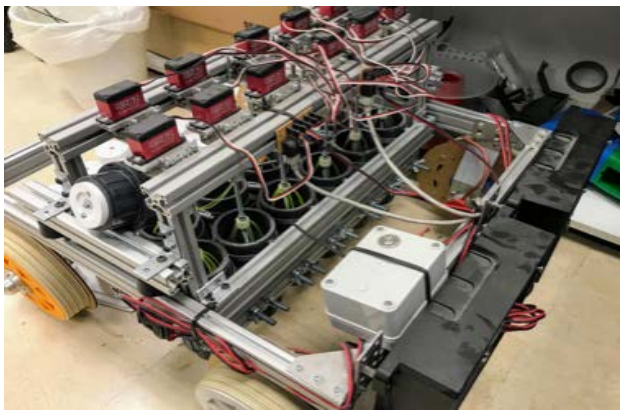
2. The action incorporates innovative elements:

The project is carried out in a rural environment, clearly in deficit of innovation and new technological trends. In this case, it is a matter of incorporating novel elements into the heliciculture or breeding of land snails, an agricultural line of high development potential, but also with important problems and deficiencies that are intended to be alleviated.

Basically, the action consists of designing and implementing a method for the spawning and fattening of snails on a commercial scale. These phases, together with reproduction and the 1st breeding phase, are the 4 typical stages of the breeding system developed by French heliciculture at the end of the twentieth century. Certainly, the breeding phases or stages of this system are met, but the rest is completely novel to a greater or lesser extent: from the species being bred (*Iberus alonensis sl*) to the technical solutions applied.

Surely, the most striking of this technique is the automation and isolation of spawning and fattening thanks to the use of expressly designed computer, programming, and robotic tools, as well as a unique stabling for these animals. This approximates other more developed zootechnics, meaning an important technological leap. In other words, there is a modern heliciculture compared to the conventional one that is currently being carried out in the world (or, at least, this is the one that has been disseminated).

The project involves having a commercial-scale snail breeding technique that is totally innovative, modern, with strong technological content, patentable, adaptable to any kind of snail, and scalable. Outright, this breeding technique is unlike anything known elsewhere in the world.



3. Adaptation of the obtained results to the established objectives:

As mentioned, the specific starting objective was to implement a new system for the commercial spawning and fattening of land snails, with modern zootechnical foundations based on better animal stabling, automation of the global process, and optimal comprehensive management of water usage. This has been successfully achieved.

The reproduction stages and the 1st breeding phase, within the Heligemas SL breeding system, are developed on medium and large scale with Heligemas company's own means. Therefore, the project for which the Operational Group is constituted adds the remaining two phases: spawning and fattening. In other words, the support of the European Agricultural Fund for Rural Development (EAFRD) has allowed to complete the commercial-scale production cycle of Heligemas, with all the innovative components derived from the previous research carried out at the company and/or the University of Seville.

The significance of the project carried out after the establishment and implementation of the Operational Group is strongly positive, promoting aspects such as business evolution of Heligemas SL., the technology transfer between university-company towards a productive sector in need, or the dissemination of agricultural activity among potential stakeholders in rural environments. The latter has been facilitated by the informative, communication, and connection work carried out by ARA (Association for the Rural Development of Andalusia) and Agri-Food Cooperatives of Andalusia.

For all of the above, the project acquires the necessary strength to contribute to the advancement of Andalusian heliciculture as an alternative, modern agro-industrial activity with the capacity to help the sustainable development of the rural environment in Andalusia and Spain. Currently, there are just under a hundred heliciculture initiatives in Andalusia (more than 200 in Spain) using conventional breeding methods. With the Heligemas SL system tested by the established Operational Group, many of these initiatives will be able to consider a change and update towards more effective zootechnics. Likewise, potential growers will be able to assess their incorporation into the breeding of snails. To this end, the possibility of integrating future breeders into the HELIGEMAS SL production line is envisaged, for example, to relieve and fatten large-scale breeds.

4. Resolution contribution of a regional problem or weakness:

The complicated global economic situation forces us to use all available natural and economic resources to meet growing needs. One of the most immediate needs is having safe, healthy, and quality food. This involves developing innovative, fruitful, sustainable, competitive, efficient, and even alternative primary production systems in our depressed rural environment. To this end, the connection and cooperation between the productive, research, and administration sectors that are related to the one of agriculture are essential.

The Andalusian and Spanish heliciculture sector is dominated by a few product-importing distributors who mainly come from Morocco. They are the ones that "move" the large quantities of the product, while those from heliciculture are tiny by comparison. The same order of magnitude identifies the trading capacity of growers in the market.

The heliciculture system proposed by HELIGEMAS is based on species with the added value of being indigenous (cannot be imported), which are scarce in the environment and have a greater gastronomic and economic recognition than the rest, which makes it possible to work with higher margins.

In Andalusia, traditional heliciculture initiatives lack of adequate scientific and technical bases, apply outdated and/or inefficient approaches, are not always environmentally friendly (including mismanagement of water usage, and are exclusively dedicated to the breeding of *H. aspersa*, a snail with little demand in our region but with great competition regarding catches and imports.

In short, the benefits that concern the flourishing Andalusian and Spanish heliciculture are worth noting and, from this point and in increasing order, these benefits imply farmers and stock breeders as potential "target public" and, in the face of serious problems in our country, as in the European Union and the rest

of the world, as an asset for natural sustainability, the development of the rural environment, and for the growing and latent need for quality food.

PROBLEMA	OPORTUNIDAD	SOLUCIONES DEL PROYECTO
Necesidades humanas crecientes y producción de alimentos	Alimentos nuevos o poco desarrollados	Caracoles terrestres: alimento a base de protéinas animales de alto valor biológico
Declive del medio rural	Actividades para el desarrollo rural	Helicicultura, alimentos tradicionales, gastronomía, conceptos y actividades derivadas, eventos, fiestas y costumbres...
Sobreexplotación de un recurso natural (caracol) por capturas + impactos de la actividad humana	Aprovechamiento y Uso Sostenible del Recurso Natural "Caracol Terrestre" y su cría como herramienta clave	Sistema innovador para la cría de especies amenazadas y la helicicultura de especies comerciales, posibilitanto la gestión racional del recurso (reintroducciones, refuerzos poblacionales, politicas de veda, etc)
Desarrollo de nuevos sistemas de producción primaria	Sistema de producción primaria innovador, fructífero, sostenible, competitivo, eficiente y alternativo	La Helicicultura moderna
Mercado helicícola Europeo en crecimiento en el que la oferta apenas compensa la demanda	Mercado ávido de producto	Estructuración, expansión y multiplicación del sistema productivo de Heligemas SL
La helicicultura se desarrolla de forma ineficiente, desordenada e insostenible al carecer de marco jurídico y medidas de gestión apropiadas	Auspiciar un marco de desarrollo moderno y adecuado a la situación real actual	Puesta en valor de los conocimientos generados durante una década para la regulación del aprovechamiento helicícola
La helicicultura mundial se basa en una única especie: "Helix aspersa"	Substancial nicho de mercado para otras especies y para la mejora de las tecnologías ya obsoletas empleadas con "aspersa"	Cría de especies alternativas, escasas, de alto valor gastronómico, con amplio mercado actual o potencial...
Las iniciativas helicicultoras se basan en técnicas y tecnológicas obsoletas, primitivas, ineficientes...	Sistema de cría a ciclo completo con técnicas y tecnología superiores a las conocidas... aplicable a *H.aspersa*	Implantación del innovador sistema de cría de Heligemas SL... con numerosas vías de negocio: técnicas, instrumentos, infraestructura, asesoramientos... para la
El alevinaje y el engorde de caracoles son fases sensibles en la helicicultura por la aparición de enfermedades, enanismos, baja rentabilidad, tiempo y mano obra, manejos complejos, etc	Sistema de ALEVINAJE y ENGORDE que solucione los problemas existentes	IMPLANTACIÓN DE UN SISTEMA NOVEDOSO PARA EL ALEVINAJE Y ENGORDE DE CARACOLES A ESCALA COMERCIAL, A PARTIR DE LA TRANSFERENCIA DEL CONOCIMIENTO GENERADO POR LA EBT DE LA USE

5. High target population coverage:

Taking into account the table in the previous section, the strong potential impact can be inferred both for direct beneficiaries (growers, stock breeders, farmers), as well as for the general public. There is an interprofessional organisation of snail breeding recognised by the Ministry of Agriculture, Fisheries and Food, to which this Operational Group (as a whole or via Heligemas SL) can be incorporated and/or promote an Andalusian option that groups as many heliciculture initiatives as possible.

In addition, one of the most important handicaps of heliciculture in Andalusia and Spain is that there is no regulated training, that is, quality training cannot be acquired within the Spanish education system. People who today want to start in the activity have to turn to private initiatives, which may be driven by own interests and lack sufficient training quality, or to some initiation programmes related to public bodies

such as those of the IFAPA Centre of Hinojosa del Duque (Cordoba) of the Regional Government of Andalusia. It is certainly an aspect to be solved and the Operational Group will be in a position to contribute to this matter, especially through the University of Seville, to reach more population coverage.

6. The horizontal criteria for equal opportunities and non-discrimination, environmental sustainability and/or social responsibility have been taken into account:

Women's participation in conventional heliciculture is high when compared to other similar agricultural activities. Among the numerous breeding grounds, women have been found to participate in some of the daily tasks of monitoring and maintaining these grounds. However, for other tasks that are considered to be tougher and more demanding, it is the man who is usually in charge. With the Heligemas breeding system, the daily tasks are mechanised and much of the temporary dedication of an operator is dedicated to the supervision and control. In other words, the possibility of introducing potential gender-related inequalities is reduced and women are ensured to be incorporated in equal conditions.

As for environmental, protection and conservation prospects, resource efficiency or biodiversity protection, the breeding system developed by HELIGEMAS SL optimally responds to these needs. It is characterised by not producing emissions of any kind, being climate-friendly, rationally managing the use of resources (especially water), and capable of adapting to the future demands of ecological heliciculture.

For the conservation of malacological biodiversity, it should be borne in mind that the vast majority of snails consumed in the world still come from nature. Repeated, irrational, and unchecked catches, especially in consuming countries such as Spain, have led to large declines in the quota and shortage of the native product. This has resulted in a tangible reduction in populations in certain geographical areas, and even their extinction, with the consequent environmental imbalance.

Snail breeding is, in itself, a fundamental tool for the rational management and conservation of the "land snail", a natural and economic resource currently in decline. In particular, it lowers the pressure on natural populations that is due to catches, allows repopulation and reintroduction in areas where they are scarce, provides a low environmental impact activity, and is compatible with the sustainable development of protected natural areas.

Precisely, the breeding system has been developed for endemic snails of the Iberus species, "*chapas*" and "*serranos*" of the *I. gualtieranus* and *I. alonensis s.l.* species, respectively. The first one is protected, and its breeding is useful for conservation purposes. The second one is a snail that is also scarce in nature because of its biological conditions and uncontrolled and repeated catches over time: its breeding will help reduce these pressures.

7. Synergies with other policies or instruments of public intervention:

The draft of this Operational Group is already contributing to strengthen the action of different administrations, at a regional level for the moment. This scale will progressively increase in the coming years both qualitatively and quantitatively. In this regard, it is important to highlight the many impacts related to snails and their zootechnical characteristics mentioned in table, paragraph 4.

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TECHNICAL DATA OF THE PROJECT

Andalusia Rural Development Programme 2014-2020

Measure 16. Cooperation.

Sub-measure 16.1. Support for the establishment of operational groups of the European Innovation Partnership for agricultural productivity and sustainability.

Focus area: 2A. Improving the economic performance of all farms and facilitating farm restructuring and modernisation to promote their presence in the market and agricultural diversification.

Beneficiary's website: https://www.caracolesinnovacion.com/

Project Manager: Ministry of Agriculture, Livestock, Fisheries, and Sustainable Development