

## Strategic product design, based on aromatic plants, for the sustainable development of rural communities in a health crisis COVID-19

### Diseño estratégico de producto, a partir de plantas aromáticas, para el desarrollo sostenible de comunidades rurales en crisis sanitaria COVID-19

NIVÓN-PELLÓN, Alejandra†\*, UTRILLA-SARMIENTO, Beatriz'', RIVERA-AGUILAR, Ma. Asucena'' and MÁRQUEZ-CASTILLO, Eréndira'''

^ *Universidad Autónoma de Querétaro, Faculty of Engineering, Querétaro, Mexico.*

'' *Universidad Autónoma de Querétaro, Faculty of Philosophy, Queretaro, Mexico.*

''' *Universidad Autónoma de Querétaro, Humanities and Image Production, FFi, Queretaro, Mexico.*

ID 1<sup>st</sup> Author: *Alejandra, Nivón-Pellón* / ORC ID: 0000-0002-1715-4335, Researcher ID Thomson: V-8717-2018, CVU CONACYT ID: 668097

ID 1<sup>st</sup> Co-author: *Beatriz, Utrilla-Sarmiento* / ORC ID: 0000-0002-3155-8141, CVU CONACYT ID: 342263

ID 2<sup>nd</sup> Co-author: *Ma. Asucena, Rivera-Aguilar* / CVU CONACYT ID: 363905

ID 3<sup>rd</sup> Co-author: *Eréndira, Márquez-Castillo* / ORC ID: 0000-0001-6427-9862

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#### Abstract

One of the main objectives of the production systems and high-impact products strategic design, supporting economic and social growth in rural communities, is to maintain a continuous exchange of experience and knowledge without compromising integrity and resources of the communities and their inhabitants. Due to the COVID-19 health emergency, the Technological Transfer and Agricultural Innovation Center belonging to the Universidad Autónoma de Querétaro, has seen the need to innovate the traditional way of knowing and evaluating the needs of the communities that open the doors for collaborative work. Using a Phenomenological and Social Construction approach, the result has been a modular workin to design a sustainable product, based on aromatic plants, that impacts both the development of the community and the health of the target user. This interdisciplinary work has been divided into the social and technological system evaluation module, the feasibility of the technological proposal module, and the strategic product design module.

**Strategic design, Sustainable product, productive system**

#### Resumen

Uno de los objetivos principales del diseño estratégico para la mejora en los sistemas productivos y diseño de productos, de alto impacto, que apoyen el crecimiento económico y social en comunidades rurales, es el de mantener un continuo intercambio de experiencia y saberes sin comprometer la integridad y recursos de las comunidades y sus habitantes. El Centro de Tránsito Tecnológica e Innovación Agropecuaria perteneciente a la Universidad Autónoma de Querétaro, se ve debido a la emergencia sanitaria COVID-19, en la necesidad de innovar desde un acercamiento Fenomenológico y de Construcción Social la manera tradicional de conocer y evaluar las necesidades de las comunidades que abren sus puertas al trabajo colaborativo. Dando como resultado un trabajo modular para el diseño estratégico de producto sostenible, a partir de plantas aromáticas, que impacta tanto en el desarrollo de la comunidad como en el beneficio de la salud del usuario final. La colaboración interdisciplinaria, se ha dividido en el módulo de evaluación del sistema social y tecnológico, módulo de factibilidad, propuesta y apropiación tecnológica y finalmente módulo de diseño estratégico de producto.

**Diseño estratégico, Producto sostenible, Sistema productivo**

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\* Correspondence to Author (Email: [alejandra.nivon@uaq.mx](mailto:alejandra.nivon@uaq.mx))

† Researcher contributing as first author.

## Introduction

Volatile or essential oils are the complex mixture of aromatic substances that give flowers fragrance, they also have bioavailable molecules of pharmacological action, widely used in food, liquor, confectionery, perfumery, cosmetics and aromatic therapies. Essential oils are recognized for being the purest blends extracted from nature and for being one of the easiest to isolate and purify. They are commonly obtained by steam distillation, pressing or the use of organic solvents. The volatile oils can be deposited on the petals and organs of the flowers, the pericarp of the fruits such as critics, wood bark, stem and leaves such as cinnamon or roots such as valerian. It constitutes from 0.1 to 1% of the dry weight of the plant. (López, 2004).

Some molecules present in essential oil mixtures are of special therapeutic and pharmacological interest, such as: antiseptic, bactericidal and fungicidal capacity; its irritant properties that stimulate microcirculation or a slight anesthetic or sedative action, decrease of intestinal spasms; anti-inflammatory action, among others. On the other hand, a growing use of essential oils is, according to the United States National Library of Medicine, the “use of fragrances and plant essences to affect or alter the state or behavior of a person and facilitate physical and mental well-being, and emotional” (taken from Sanz and Ortiz, 2007). The oils for therapeutic use must have a guaranteed quality, those extracted with the help of solvents are not considered suitable for this purpose, to be used cutaneously they must be diluted in vegetable oils such as sesame or olive oil to avoid damage to the skin and promote its absorption. The molecules of essential oils are fragile to light and oxidation by air, so they must be kept in tightly closed amber bottles (Lopez, 2004).

Faced with the COVID-19 health emergency, the world observed a phenomenon characterized by the search for preventive treatments or treatments that would reduce the damage caused by this disease and strengthen the immune system.

That is why onion and garlic vegetable extracts are studied in depth for their organosulfur compounds (Guillamon, 2018), essential oils of laurel, clove and thyme, mainly for their protective active principles against external agents such as eugenol, thymol, and linalool and mixture of substances that also raise the immune system (Del Villar Ruiz and Melo, 2010). For its part, cinnamon, together with its essential oil, promotes angiogenesis characterized by the formation of new blood vessels, in addition, its active principle cinnamaldehyde and some phenolic compounds could have an effect to counteract thrombi (Choi DY, et al, 2009), problem associated with COVID-19 disease due to propensity for blood clots (Hincapie *et al.*, 2021).

Mexico is rich for its biocultural knowledge and its wide variety of aromatic plants that are generally sold dry in local markets for home consumption, large productions are destined for the national and international industrial process of essential oils for therapeutic purposes. Of these productions, the ecological ones stand out due to their medicinal potential; named according to the Regulation of the European Economic Community 2092/91, which determines for Spanish speakers that: products known as organic will be called organic and are identified as being obtained from sustainable production systems that do not represent damage to the land and maintains a natural balance with the environment by not generating chemical residues or adding pesticides or herbicides.

The support of government programs to productive processes in so-called suburban and rural areas in the state of Querétaro (eg POPMI, Program for the Productive Organization of Indigenous Women; PFRI, Program for Regional Indigenous Funds; PROCAMPI, Program of Coordination for Support to Production Indigenous) has been reflected in the rabbit, fruit, horticultural and livestock production in the 18 municipalities that make up the state for several years, however, when establishing dialogue with some of the beneficiaries of these programs, it is observed that on rare occasions the productive improvement scales to products of high added value and differentiation positioned in the local urban and peri-urban markets. It is frequently observed that only production for family consumption is achieved.

There is a record of innovation systems and sustainable product development for community support aligned to the 2030 Agenda, in these cases the participation of the Community, State and University has been a technological generation system that benefits local development, as an example the machine earth mixer for the elaboration of artisan bricks, designed and manufactured in the Faculty of Engineering of the Universidad Autónoma de Querétaro (Lara, 2021). Therefore, it is considered important and pertinent not only the passive study of community development and social innovation, but also the active participation by the agents that make up the Higher Education system in the state of Querétaro, students and teachers who in a way together with the community, develop technological packages for the improvement of production systems and the generation of high-impact products in the market that support economic and social growth, while maintaining a continuous exchange of experience and knowledge without compromising integrity and resources of the communities and their inhabitants.

## Methodology

Since before the COVID-19 health crisis began, the Center for Technological Transfer and Agricultural Innovation belonging to the Universidad Autónoma de Querétaro (CETTIA-UAQ), has made an exploratory approach to producer communities, from a Phenomenological and Social Construction approach, to know their interests, needs, technological capabilities and exchange experiences and biocultural knowledge. In order to determine whether university participation and intervention is appropriate, when evaluating the possibility of generating competent quality products that support the economic, cultural, social and ecological growth of the communities. Once the initial report is available, due to the change in face-to-face dynamics to meetings on virtual platforms and cellular telephony, the Thematic Analysis is used for the Phenomenological study of the specific needs of the productive groups or consortiums, there is the participation of students of the Bachelor of Agro-Industrial Engineering belonging to the Faculty of Engineering and of the Bachelor of Humanities and Image Production attached to the Faculty of Philosophy both of the Universidad Autónoma de Querétaro (UAQ).

Thematic Analysis aims to make explicit significant constructs represented in language referring to the social experience following the postulates proposed by Schutz in 1973: models postulated from the experience of the participants classified into categories, these must be recognized by the actors on a daily basis (Mieles et al, 2012). To achieve this, we worked for a year with two groups of each semester of students assigned to the aforementioned careers and faculties who were involved in product design projects, they were informed in depth of the characteristics of the communities for work in productive social projects. It is important to highlight that the participating students have been trained for empathic analysis, sustainable and strategic design. For product and image design, tools such as the Value Proposition Map (Sytrategizer, 2021) and the value elements prioritized in the Almquist pyramid in 2016 are used.

## Results

We worked with producer groups in the state of Querétaro that are located in a micro region made up of the communities of Gudiños, Panales, La Estancia, La Puerta and Nogales in the semi-desert area, the mentioned communities are classified as indigenous communities of high degree of marginalization.

As a representative example, the demographic characteristics of the Gudiños community located in the municipality of Tolimán in the state of Querétaro, Mexico, where there has been an approach to livestock, horticultural and fruit producers, are shown below. An example is also shown as a representative example of the strategic product design for one of the producer consortiums.

Demographic data Gudiños locality, Tolimán Querétaro municipality, Mexico as of 2010	
Total population in the locality	514
Men:	246
Women:	268
Inhabited private homes	112
Degree of marginalization of the town:	High

Marginalization estimators		
Indicators of homelessness 2010	Value	%
Inhabited private homes	112	
Lack of quality and living spaces		
Homes with dirt floors	1	0.89
Lack of access to basic services in inhabited private homes		
Homes without drainage	42	37.50
Homes without electricity	1	0.89
Homes without piped water	18	16.07
Homes without toilet	26	23.21
Scholarship		
% Illiterate population aged 15 years or over		11.14
% Population aged 15 years or over without completed primary school		23.10

**Table 1** Gudiños locality demographic data, Tolimán Querétaro municipality, Mexico as of 2010

Source: INEGI. *Population and Housing Census 2010: Main Results by Locality, Microregions Unit. CONAPO estimates (2011)*

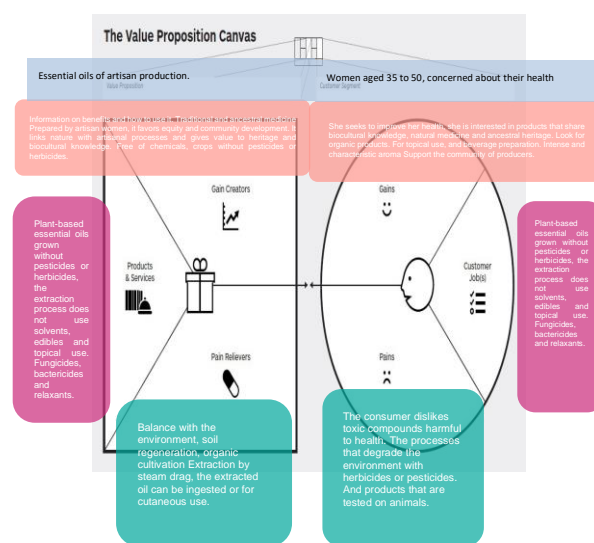
In this community, the Plantas Medicinales Gudiños S.C. by R.L. Producers of aromatic plants with high extraction potential, they have intermediate infrastructure for protected cultivation such as: arch tunnels and small non-automated greenhouses for the production of seedlings mainly.

In order to establish collaboration ties between the Universidad Autónoma de Querétaro and said consortium dedicated to the organic and environmentally friendly production of aromatic plants, an exchange of knowledge and evaluation is carried out through the Center for Technological Transfer and Agricultural Innovation. The community is visited, the actors that make up the productive activities of this consortium are known and described, as well as the problems they face. A collaborative strategy is defined according to the needs of the community and the consortium of producers itself in order to generate a productive technological project using the cultivated raw material in order to give it added value and generate sustainable economic resources for the participants.

Different ideas are proposed in some virtual workshops. With the help of the students of the Degree in Agroindustrial Engineering, a value map is established with the tool: "The value proposition Canvas by Strategyzer" based on the analysis of the text The Value Proposition Design (Osterwalder et al, 2014) and the pyramid of value proposed by the article The Elements of Value (Almquist et al 2016).

The first, based on the analysis of effectively recognizing the qualities of a product, related to the characteristics of the potential consumer. While the pyramid of the 30 elements of value is focused on the attributes that the product-consumer relationship gives, strata focused not only on a functional aspect, but also on the psychological aspect of the relationships that are formed at the time of bonding. between the consumer and the producer.

The value map for the proposal is presented below: essential oils obtained from aromatic plants produced in a respectful way with the environment, regenerating cultivated soils, without the use of pesticides, herbicides and extraction without solvents. The oils can be used topically or ingested for their purity, for bactericidal, fungicidal and relaxing purposes. As can be seen in figure 1, the possible users of the essential oils of lavender, rosemary and thyme are described: women between 30 and 50 years old, who are looking for natural alternatives to maintain or improve their health, become involved with the production methods. They prefer chemical-free products, appreciate biocultural knowledge, artisan production and knowledge of ancestral medicine. On the other hand, they are willing to acquire the product in specific places, to get involved with the production methods, they are also willing to learn and put new knowledge into practice.



**Figure 1** Value map (Strategyzer, 2021), of the proposal: essential oils made from organic raw material, for topical consumption or ingested

Source: Own elaboration.

CETTIA UAQ, evaluates the technological feasibility for the extraction of essential oils with the current production reported by the consortium Plantas Medicinales Gudiños S.C. by R.L. The economic viability is also evaluated and management, prospecting and economic projection strategies are carried out in the short and medium term to analyze the requirements of the production and commercialization of the proposed product. In order to extract the active principles of aromatic plants (lavender, thyme and rosemary), the extraction method by steam dragging is proposed, with a stainless steel still easily adaptable to the spaces and conditions of the community; An initial investment is made of dropper containers of 3 and 5 ml amber color and sesame oil as a vehicle for rapid topical absorption. The purity of the extraction is compared with recognized brands in the market with the HPLC chemical analysis method.

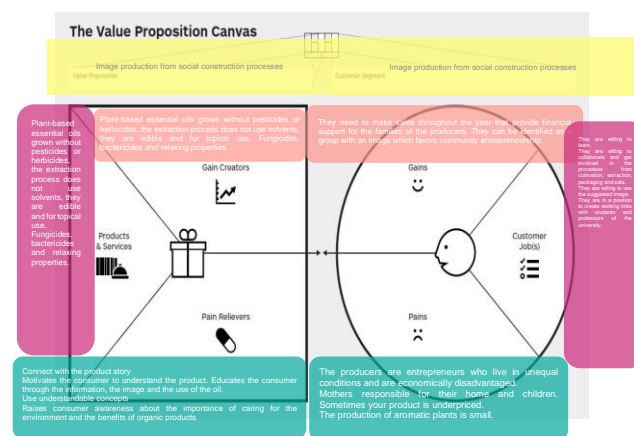
Regarding the strategy proposed for the activities of diffusion, marketing and sale of the product, it is intended that the value chain of essential oils in the community of Gudiños highlights its work of organic production, the balance with the environment from the cultivation of plants putting into practice the regeneration of soils. In addition, it is intended to generate and highlight extraction methods without the use of solvents in order that the oils can be used both cutaneously and ingested. It is perceived as important that the product links the end user with nature, traditional ancestral medicine and artisanal production methods. To transmit the biocultural heritage characteristic of the community. This is intended for the user to obtain assertive information that allows the continuous use of essential oils in the amounts and recommended methods and to feel the expected benefits.

To achieve this, we worked with the students of the Humanities and Image Production (HyPI) degree in order to correctly visualize the needs of the consortium of producers. The students empathically and with the limitations of distance work, learned the degree of marginalization in the community and that there is also a high level of male migration that leads to single-parent families where the economic responsibility falls on the mothers.

Therefore, it is considered important to guide the producers of the region in an appropriate way so that they can place a quality product on the market throughout the year, this would strengthen the community work that the consortium already has and would help sustainably to the economy of some members of the community.

The producers are willing to learn, and get involved in the production process from seedling generation to oil extraction, packaging, labeling and sale of the product. And they are in all the disposition to create bonds with the professors and students of the University.

Therefore, the proposal summarized in figure 2 is the result of a process of analysis and dialogue.



**Figure 2** Value map (Strategizer, 2021) of the proposal: Image production from social construction processes for use in essential oils made by women entrepreneurs from the Gudiños community

Source: Own elaboration

This is how the essential values that define the product were reached: an element that improves health, prepared by entrepreneurial women in a rural community, who try to meet their economic needs in an environment surrounded by nature and biocultural knowledge.

An image is presented, taking female producers as the main user, with elements for the creation of content and that can be used in turn on the product label, figure 3.

The interlaced lines describe the silhouette of three women with their hands on their hearts giving an embrace effect between them, this element aims to represent the community of the producer and brings with it the feeling of integration and sororidad, the latter concept due to the perceived history that portrays the difficulties they have experienced in such a way that they individual women producers and the union before their entrepreneurship. The heart of the center has lavender, rosemary and thyme leaves and flowers. Finally, the image in the background represents the relationship between nature and the product itself and its production methods.



**Figure 3** Image designed to represent the production of essential oils by the consortium of producers of aromatic plants in the community of Gudiños Querétaro. Author Eréndira Márquez Castillo

### Discussion and Conclusions

This case study is intended to publicize the work generated by the Center for Agricultural Technology Transfer of the Universidad Autónoma de Querétaro. The case of the community of Gudiños in the municipality of Tolimán in the state of Querétaro, Mexico, has been gratifying because the consortium of producers Plantas Medicinales Gudiños S.C. de R.L., has an interest in learning and exchanging knowledge, wants a means of economic generation and its members are committed to the production process. In such a way that it has been possible to generate a model of sustainable social innovation that does not compromise the identity of the community and favors its social, cultural and economic development.

Due to the COVID-19 health emergency, different forms of work had to be found, since community workshops in work areas with the active participation of students, teachers and producers were suspended. The work was implemented by development modules: the social identification and evaluation module, the technical development module and the product design strategy module.

Once the evaluation of the actors that intervene in the productive system has been made, it highlights that the members of the consortium are mothers responsible for the household economy who are economically disadvantaged and that on occasions they have found it necessary to waste their product already that their small productions are sometimes not taken into account. Recognition is made of the technology available and the productive capacity of the consortium. The technological capabilities of the community give us the guideline for the type of process that can be proposed for product development so that technology adoption is simple and natural. Finally, an image is proposed whose value is perceived both by the user of the essential oil and by the consortium of producers since it is proposed as a means to express the needs of their community by giving them their own voice, and that motivates the consumer to understand and know the product as organic and artisan at the same time that sensitizes it to the care of the environment and links with biocultural knowledge. The image and the content should be a point of union that identifies the consortium of producers and gives them a feeling of unity.

The challenge for interdisciplinary and collaborative work between the community, students and teachers of CETTIA was great, and it consisted of transmitting the information in a truthful, objective and analytical way so that each of the modules could face the challenge and complement their contribution with collective knowledge. A new model of technological development and social innovation has emerged with this experience, which allows the generation of strategic products from collaborative work at a distance, which will surely be reflected in product diversification strategies for social development in the communities. rural areas of the region.

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