

Report of the current state of agriculture in Todos Santos and El Pescadero region 2015



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August, 2015

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I. INTRODUCTION

With the renewed interest of the US government to establish collaborative educational opportunities with its neighbor Mexico, the Colorado State University Todos Santos Center is becoming a leading example.

Knowledge of the social and local environment realities play a meaningful role on acceptance, pathways and success of a foreign institution into a new community. Understanding this, the CSU Todos Santos Center, supported by the CSU Department of Agricultural Sciences, requested a study be conducted regarding the current state of agriculture in Todos Santos and El Pescadero region, in South Baja Peninsula state, Mexico.

The aim of creating this report was to provide baseline agricultural informational for the area, as well as connect with local stakeholders to determine future areas of collaboration with the Center. Information gathered for this purpose came primarily by informal interviews with community members in the agriculture sector and collecting data available from governmental institutions.

The report captures and synthesizes data available at the time of the study, along with other information of interest. It analyzes farming systems; agriculture challenges in the area and includes a SWOT (*strengths, weaknesses, opportunities, threats*) analysis. A list of community members, organizations, governmental, academic and research institutions related to agriculture in the region, along with the activities each of them addresses within the community is also included.

Final recommendations are based on results of outreach with members of the agriculture sector of Todos Santos and Pescadero region, and consider a global perspective of trends and challenges facing agriculture worldwide.

II. OVERALL OBJECTIVE

Collect baseline data on the state of agriculture in Todos Santos and Pescadero region, as well as to engage with local stakeholders to determine areas of collaboration and participation.

III. METHODOLOGY/APPROACH

(i) Interviews and groups

As a primary source of information for the assessment of the agriculture in Todos Santos and El Pescadero region, approximately 40 regional community members were reached including 18 individual growers, agro business companies, community groups, educational and governmental institutions in June and July, 2015.

Using a participatory community research approach, they were also asked about recommendations for educational workshops and research as well as what they considered useful and important for both the agricultural sector and the local community.

Target information from producers was focused on farming systems, cultivated crops and planting area, crop calendars and cycles, irrigation systems, water availability and costs, land possession, pest and disease management, farm supplies, technical and financial support, marketing and distribution channels, as well as significant challenges.

Additional information was obtained from educational and governmental institutions regarding agricultural research programs in the area, potential areas of collaboration and participation with the CSU Todos Santos Center and general information about the role of the governmental institutions.

(ii) Baseline data collection

Information from 2014-2015 farming cycle was requested from the Secretary of Agriculture, Livestock, Rural Development, Fishing and Food (SAGARPA), Mexican federal government unit (similar to USDA in US) with office in the state located in La Paz.

SAGARPA shared information about production areas of Todos Santos and El Pescadero region, number of producers, planting area by crop, harvested area by crop, crop yields, accumulated production values and target markets.

(iii) Web-based study

Additional information was obtained from digital queries such as emails, electronic documents, institutional web pages and articles from the following organizations.

Governmental:

- INEGI (National Institute of Statistics and Geography)
- SEMARNAT (Secretary of Environment and Natural Resources)
- JLSV, Junta Local de Sanidad Vegetal (Plant Health Board)
- SAGARPA (Secretary of Agriculture, Livestock, Rural Development, Fishing and Food)

Educational and Research institutions:

- CIBNOR (Center for Northwestern Biological Research)
- UABCS (Universidad Autónoma de Baja California Sur)
- INIFAP (Institute of Forestry, Agricultural and Livestock Research)

Gardening/Food security groups:

- SINADES A.C. (Natural Systems and Development, NGO)
- Raíz de Fondo A.C. (NGO)
- ASA Alianza para la Seguridad Alimentaria de B.C.S. (Food Security Alliance)

IV. REGIONAL CONTEXT OF AGRICULTURE IN TODOS SANTOS/EL PESCADERO AREA

(i) Agro ecological

Todos Santos is located on the Pacific coast side of the South Baja Peninsula, about 50 miles southwest of La Paz and 45 miles north of Cabo San Lucas.¹

The weather along this coastal region is dry (arid and semiarid) with an average annual temperature above 18 °C (range between 18°C and 28°C, approximately 10°C less than La Paz and Cabo San Lucas). These conditions are due to the proximity of cold ocean currents coming from the North Pacific Ocean and the frequent fog and low clouds presented in the area.

On the surrounding mountains, the climate is dry and warm. It changes again in upper altitudes to sub-humid with temperate climates and summer rains.²

According to the Todos Santos National Commission of Water meteorological station in 2014, the annual precipitation average registered from the last 5 years is 157.6 mm.³

The region is characterized by prolonged and severe droughts that are drastically interrupted by the presence of storms and hurricanes during the summer season.

There are diverse ecosystems in the area, including oasis and mangrove in the coastal zone, Xerophilous scrubland, deciduous forest and a pine-oak forest in the Sierra de la Laguna Mountains.

Vegetation is primarily Xerophilous scrubland composed mainly of cactus such as *cardons*, *old man cactus*, *barrel cactus*, *cholla cactus* and *pithaya cactus*, as well as *Yucca*, *palo adán*, *garambullo*, *gobernadora* and *jojoba*.⁴

The Sierra de la Laguna is a protected biosphere reserve and home to a large number of endemic flora and fauna species. It is also the main source of ground water supply. In the foothills of the sierra there are species from the deciduous forest such as *elephant tree*, *lomboy*, *ocotillo*, *palo verde* and *palo blanco*. The only pine-oak forest in Baja is located in a higher altitude of the Sierra de la Laguna.⁵

Agriculture in the region originally prospered in the oasis ecosystem; there are still several small farms and ranches in the surrounding areas, composed from tropical and subtropical fruit trees, palm trees and a variety of vegetables.⁶

Predominant characteristics of the soils in this region are sandy, clayed and calcic soils, low in organic matter.⁷ The most fertile soils are found in the surrounding oasis ecosystems.

The climate, soil and availability of water sources have been beneficial to agricultural activity in the region.

(ii) Historical

The origins of agriculture in Baja California Sur date from the arrival of the Jesuits order in the 18th century. They came to establish missions in Baja and convert the natives to the Catholic lifestyle.⁸ The Todos Santos mission was established in 1723 with the name, Nuestra Señora del Pilar de La Paz. In 1733 when the mission becomes independent, it was renamed Santa Rosa de las Palmas de Todos Santos.⁹

Over the next hundred years, rebellions and epidemics devastated the indigenous population, and mission efforts of the Jesuits, Dominicans and Franciscans ultimately failed; however, the town continued to prosper.

The agricultural boom began in 1842 when the then governor redistributed clergy land. Success was due mainly to abundant water and fertile soil in this special oasis ecosystem. The crops introduced by the missionaries continued to prosper. Such crops included sugar cane, corn, flowers, dates and tropical fruits such as mango, guava, papaya and avocado.

By 1850, Todos Santos had become the state sugar cane capital with a total of eight processing plants in the area. The sugar cane industry continued for 100 years during this period, known as the golden age of the town. Many buildings such a hotels, governmental offices, schools and a theater were built. In the early 1950s, a severe drought combined with the low price of the sugar after World War II caused the collapse of the sugar cane industry in the region. The last sugar cane processing plant closed in 1974.¹⁰

The town was renewed with the construction of the transpeninsular highway in the early 1970s, coupled with the end of the drought in 1981. A diverse variety of crops started to be grown including cucumber, avocado, papaya, mango, tomato and chilies. Chilies are the main crop planted in the area still today.

V. FINDINGS.

(i) Agricultural production systems

Agricultural production systems in Todos Santos and El Pescadero region include *conventional production*, *organic production* and *parallel production systems* (conventional and organic).

The majority of the planted area in the region is conventional, with about 61 percent of the total crops in El Pescadero and 66 percent from what was planted in Todos Santos during the autumn-winter and spring-summer cycles from 2014-2015.¹¹

Producers use commercial inputs like inorganic fertilizers, herbicides and pesticides that they mainly procure from farm supply stores in La Paz. Soil preparations take place using mechanical cultivation practices, plating in rows or beds usually covered with plastic mulch (black and silver). Monocrops of poblano chilies and green beans are commonly grown using this production system. Many conventional producers use the same field year after year due to land and water shortages. Crop rotation is not common. Land and water shortages are also one of the reasons producers said they are not very enthusiastic on becoming organic.

Organic production systems started in the region in 1985 with the arrival of Mr. Ross Vail, an American citizen from California who founded the first company to be certified organic in Baja Sur, *Sueño Tropical*. Their first export crop was basil, shipped to the U.S. *Sueño Tropical* is currently the largest company growing organics in the region. The company also has conventional plantings in a parallel system. The vast majority of their produce is exported; but a small portion is locally sold at *Agricole*. There are several independent small-scale organic producers in the area that sell locally, but are not certified organic.

a) Crop production scales and characteristics

Agricultural production in Todos Santos and El Pescadero area is mainly based on small-scale operation systems of native-local growers. Each of native-local grower holds between 1 to 4 hectares of land dedicated mainly to growing poblano chili peppers (*Capsicum annuum spp*), green beans (*Phaseolus vulgaris L.*), and culinary herbs during the autumn-winter cycle. Very few crops are grown during the spring-summer season. Along with cultivated crops, tropical fruit trees -- mangos, avocados, papayas, guavas, and citrus -- are also common.

Medium and large-scale producers grow mainly culinary herbs (basil is the most widely planted) as well as peppers, green beans, tomato, cucumbers and other vegetables in smaller quantities.

Large-scale producers primarily come from other parts of México (Baja Norte or Sinaloa) or from the U.S.

Listed in the table below are the main characteristics of the crop production operations found from Todos Santos and Pescadero region.

	Farming scale (hectares)	Cultivated crops	Water source	Irrigation system	Pest and disease control	Target market
Small-scale	1-10 has	Peppers, green beans, culinary herbs and few of them a variety of vegetables	Majority use the well from the ejido	Mostly drip irrigation, some use of traditional gravity fed methods	Majority chemical control	National
Medium-scale	11-50 has	Green beans, peas and culinary herbs	Private owned well, ejido well	Drip irrigation	Majority chemical control	Export and national
Large-scale	More than 50 has	Mainly culinary herbs, sweet peppers, tomatoes and green beans, and a variety of vegetables in a small proportion	Majority owned well	Drip irrigation	Chemical and organic	Mainly export

Table 1. Crop production scale and characteristics from Todos Santos and El Pescadero operations.

b) Crops and planting area.

Crop production in Todos Santos and El Pescadero region covers a wide range of crops: chilies (poblano), green beans, cucumbers, summer squash and different tomato and culinary herb varieties, destined for national and export markets.

According to SAGARPA data, during the main planting cycle (autumn-winter) from 2014-2015, a total of 670 hectares (1655 acres) were planted in Todos Santos and about 488 hectares (1205 acres) in El Pescadero. During the spring-summer cycle 45 hectares (111 acres) were planted in Todos Santos and 28 hectares (69 acres) in El Pescadero.⁴¹

Poblano chili pepper as a traditional crop

For more than 30 years (after the severe drought that ended in 1981), this region has been recognized as the best growing area for chili crop production, due mainly to the favorable agro ecological conditions and crop profitability. The most popular variety planted is the poblano. Salesmen from *Seminis*, *Hazera*, *Vitalis*, *US Agriseed* and *Capital Genetics*, which are international seed companies, come to the region to promote and sell improved varieties of peppers. There are grower parcels in the region where the companies conduct trials to validate their materials before starting to plant them on a larger scale.

This crop was also very popular in other agricultural regions of Baja, but has been seriously affected by the pepper weevil (*Anthonomus eugenii*), and plantings were prohibited for many years. Now, the Junta Local de Sanidad Vegetal (Local Board for Plant Health) carefully monitors the

population and damage from this pest, ordering the destruction of the crop when higher infestations are found. It is also required that by the end of June, all chili crops be destroyed to interrupt the life cycle of the insect. In Todos Santos and Pescadero farming areas, chemical pesticides have always controlled this pest, and some controversy has been detected regarding this issue (discussed in the pest and disease management section).

The poblano chili continues to be the most planted crop in the region, with about 41 percent of the total planting area in Todos Santos and close to 33 percent in El Pescadero dedicated to the crop during the autumn-winter cycle in 2014-2015.¹¹ All production is destined for the national market.

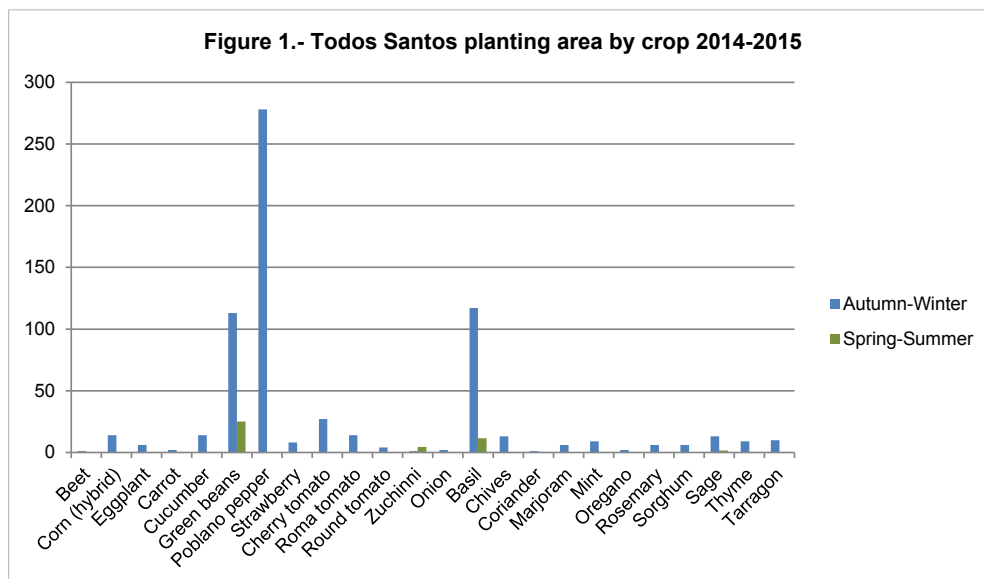
Other crops with economic importance¹¹

Basil is the second crop in order of importance planted in both locations, and is grown mainly using organic production systems. Larger and medium scale agro business companies have more land planted with this crop. Some of the small-scale growers have agreements with these companies to grow it and sell it to them.

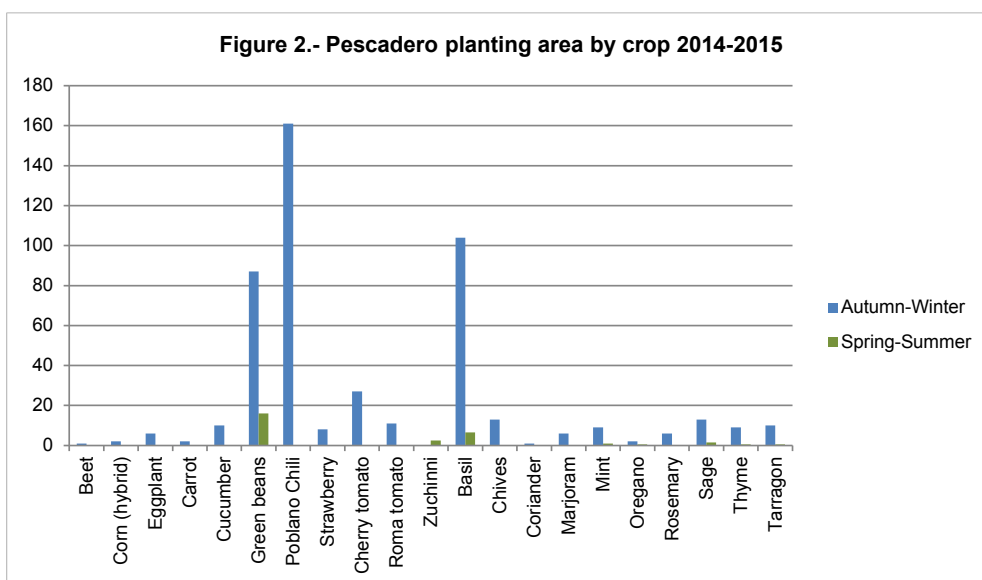
In the autumn-winter planting cycle, about 17 percent of the planting area in Todos Santos and about 21 percent in El Pescadero was basil.

Green bean crops represented 16 percent of the planted area in Todos Santos and almost 18 percent in El Pescadero.

Culinary herbs such as sage, tarragon, thyme, rosemary, marjoram, chives and mint, were planted last season in 10 percent of the farming areas in Todos Santos and 14 percent of the planting area in El Pescadero.



Source: 1 DDR 003 La Paz. SAGARPA 2015.



Source: 2 DDR 003 La Paz. SAGARPA 2015.

c) Crop cycles and calendars

Autumn-winter season.

Most agricultural activity in the region is observed during the autumn-winter season; planting season is from September through January. All varieties of vegetables and culinary herbs are planted in this period. For chili planting, there is a grower's agreement to plant only in the period from December 1 through January 30 to minimize the risk of pepper weevil (*Anthonomus eugenii*) proliferating in warmer temperatures.

Spring-winter season.

Very few crops are planted during the Spring-winter season. Planting dates are from first week of February through June 15th. Crops planted during this period are mainly culinary herbs and green beans.

	Autumn-Winter Cycle	Spring-Summer Cycle
Todos Santos	Chili, green bean, tomatoes, eggplant, corn, cucumber, beet, carrot and herbs: basil, chives, oregano, marjoram, mint, coriander, rosemary, tarragon, sage and thyme	Green beans, culinary herbs
Pescadero	Strawberry, pepper, green bean, tomatoes, eggplant, corn, cucumber, beet, carrot and herbs: basil, chives, oregano, marjoram, mint, coriander, rosemary, tarragon, sage and thyme	Green bean, zucchini, corn, sorghum and herbs

Table 2. Crop planting cycle Todos Santos/Pescadero region.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DEC
All vegetable varieties	Δ	Δ							Δ	Δ	Δ	Δ
Chili pepper	Δ											Δ
Herbs	Δ	Δ	Δ	Δ	Δ	Δ			Δ	Δ	Δ	Δ

Table 3. Planting calendar for the main crops in Todos Santos and Pescadero region.

d) Pest and disease control

The primary pests and diseases affecting crops in Todos Santos and El Pescadero region are directly related to chili pepper and basil, the main crops cultivated.

Pepper weevil (*Anthonomus eugenii*) has been the main pest causing economic losses in chili plantings for decades in Todos Santos and Pescadero region. Chemical pesticides have been the only method for controlling this pest. There is serious concern about this issue from community members worried not only by the effects of chemical pesticides in the environment but also on human health. There are chili fields in the proximity of the urban areas that create heightened concern. While, some chili growers believe that currently used pesticides have lower toxicity levels than in the past, risks of utilizing them are still present.

There is a serious disease, which has caused many losses in basil fields in the region in the last five years, called basil mildew (*Peronospora belbahrii*). According with producers there is still not an effective method for disease control. Most of the basil planted in the region is grown for organic export market, which further complicates the alternatives for control. Disease continues to be uncontrolled in conventional and organic production methods.

e) Land tenure

The majority of land dedicated to agriculture in the region is under the *ejido ownership system*. This land corresponds to communal land, granted by the Mexican government for agricultural purposes. Members of the ejido are entitled to use the land for their own benefit but they do not directly own communal lands. However, ejidos are able to grant title of specific parcels to individual members. Within the ejido there are three different categories of land property: individual parcels, common use property and community development property. Individual parcels owned by ejido members are the most common type of land possession for the agricultural producers in Todos Santos and El Pescadero area.

About 35-40 percent of the members from both ejidos, Todos Santos and El Pescadero, are principally engaged in agriculture, followed by fishing and ranching.

Medium and larger scale producers use their own private land or rent individual's ejido or private land.

According to the ejido presidents in both locations, renting the land is a common practice from the ejido members that are no longer working their parcels, considering that many of them are above 80 years old.

f) Financial and technical support

Producers reported that they do not often receive technical support. They have learned from years of experience and what has been passed down through generations. In some cases they are resistant to change. Farm supply companies provide loans, seeds, chemical fertilizers and pesticides to the producers to grow their crops during the autumn-winter season.

Organized groups such as ejidos, the Todos Santos ejido and sons of ejido member's producer cooperative, and agro business companies are commonly supported through governmental programs, which allow them access to technical and financial assistance. The modernization of the irrigation systems to most of the growers in Todos Santos and El Pescadero region is an example of this assistance.

g) Technology availability

The technology available to a producer depends on their production scale; typically the larger operations use the most technology.

Listed below are the types of technology used according to each production scale in Todos Santos and El Pescadero region.

TECHNOLOGY	SMALL-SCALE PRODUCERS	MEDIUM-SCALE PRODUCERS	LARGE-SCALE PRODUCERS
Improved varieties	Δ	Δ	Δ
Chemical pesticides and herbicides and/or organic pesticides	Δ	Δ	Δ
Chemical and/or organic fertilizers	Δ	Δ	Δ
Agricultural machinery	Δ	Δ	Δ
Drip irrigation systems	Δ	Δ	Δ
Crop protected infrastructure			Δ
Cold storage facilities		Δ	Δ
Packing facilities			Δ

Table 4. Technology available for producers in Todos Santos and El Pescadero region, 2015.

h) Water sources and management

Most of the water used in agriculture in the Todos Santos and El Pescadero farming areas comes from several wells owned by the ejidos in each location. Todos Santos ejido has the operating permit for eight wells from different watersheds: San Juan de Las Praderas, Las Tunas, Cañada

Honda and Santa Cruz. CONAGUA (National Commission of Water) is the federal organism that regulates the use of fresh water.

Ejidors are in charge of well management. Water use is based on a rotating system; a person is designated to control each user's turn. Ejido irrigation is based on an hourly rate of \$60 pesos in Todos Santos and \$35 pesos in El Pescadero. The ejidos also sells water to individuals that do not have easy access to municipal water, due mainly to the lack of water infrastructure outside of the urban areas.

Water is managed according with the water requirements from each crop, but normally, producers get certain amount of hours a week to cover their demand. In Todos Santos a grower usually requires 6 hours a week per hectare from a 4 inch pipe for a chili crop.

The majority of the producers have drip irrigation systems in their parcels. Gravity and sprinkling irrigation systems are used only for fruit trees.

Some producers (not ejido members) that have private properties and ranches have their own well and they also utilize drip irrigation systems on their production fields.

i) Marketing, selling and distribution channels

Target markets.

Export markets are very important to Todos Santos and El Pescadero region, representing more than half of the total production area. In Todos Santos during the main planting cycle in 2014, 330 hectares (815 acres) were harvested and destined to U.S. markets. Green beans, tomatoes, basil and other culinary herbs are the top commodities planted for this purpose.

Even when very few commodities are destined for national market, the accumulated production value registered from SAGARPA for Todos Santos, shows that in the last autumn-winter cycle from 2014-2015, local and national markets represented higher values in economic terms than exports, with a total accumulated production value of \$94,444,000.00 pesos (\$5,844,306.00 dollars) from crops like: poblano chilies, onion, zucchini, coriander, corn and sorghum; while accumulated exports were valued about \$49,232,900.00 pesos (\$3,046,534.00 dollars)¹¹ more than 2 million difference.

Selling and distribution channels.

Selling the produce and getting a fair payment for it, is a commonly complex issue for producers. Larger-scale producers dedicated to the export market in Todos Santos/Pescadero have contracts with brokers or retailers in U.S. These producers have facilities and infrastructure for packing and storing their produce. Cargo is sent by cold storage truck mainly to California, primarily by third party transportation companies.

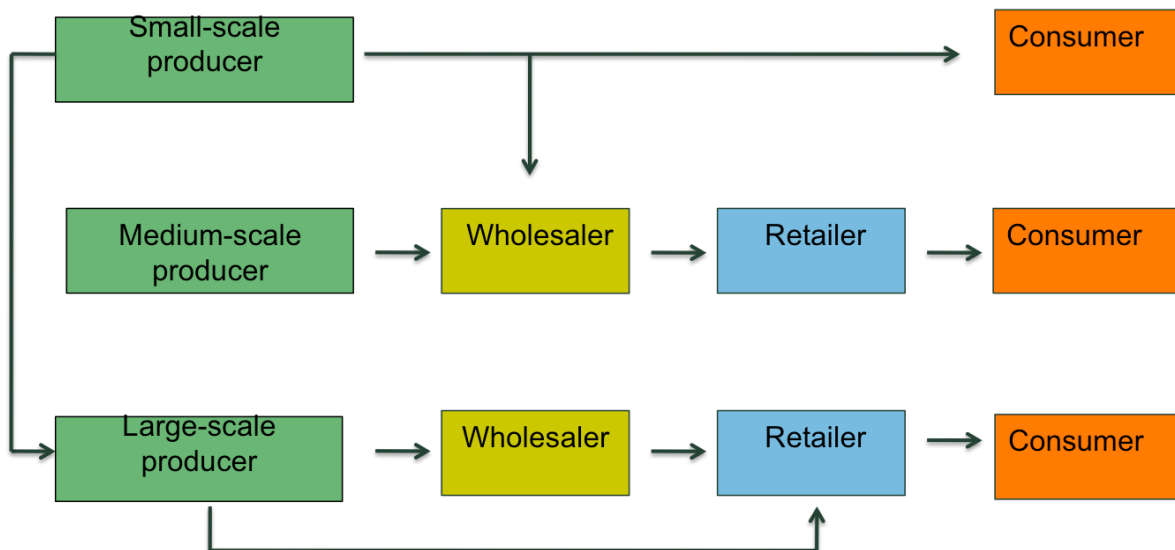
Medium-scale producers, sell their produce mostly in bulk. This produce is shipped mainly to the broker's packing facilities in Ensenada and Maneadero, Baja California Norte state.

A different scenario is seen with the small-scale chili producers. For many years, they have been selling their produce to intermediaries that come from other parts of Mexico (mainly Sinaloa, Mexico). They go to the parcels and offer the grower a certain price per kilogram quality. These are "coyotes" in rural areas from all parts of Mexico. Many "coyotes" take care of the harvest, selection and loading into the big trucks that they usually bring with them.

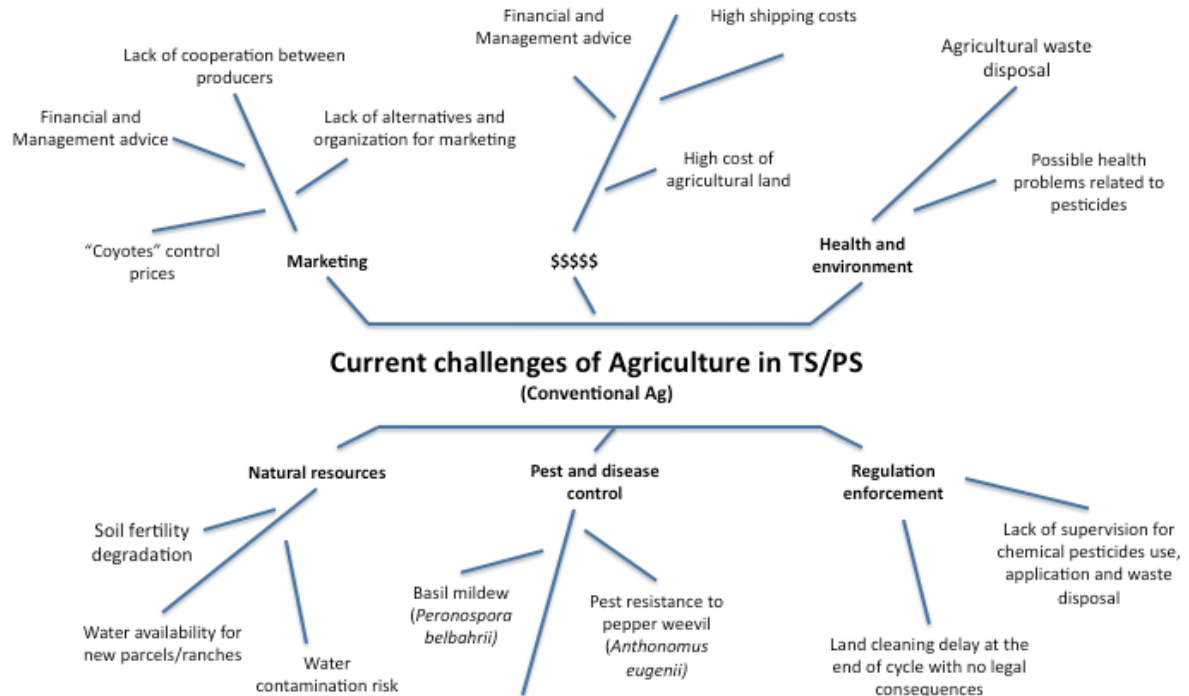
Some of them pay cash or just make promise to pay later. There have been many unfortunate cases in the past years where leave town and never pay the grower.

There is a small sector of producers that grow conventional and organic produce for a local market. They are usually found in several points of the transpeninsular highway between Todos Santos and El Pescadero or inside Todos Santos oasis area.

Marketing and distribution channels from Agriculture in TS/PS



(ii) Ag challenges diagram



(iii) SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of the agriculture sector in Todos Santos and El Pescadero area

Studying the results of the interviews conducted with producers and others related to the agricultural sector, has revealed that the *strengths* from this particular sector in Todos Santos and El Pescadero region, in order of perceived importance are:

- Favorable conditions for growing horticultural crops due to mild weather, soil and water sources availability and quality.
- Considerable historical experience in agriculture.
- Agriculture has traditionally been a very important economic activity in the region, the number one for many years.
- Good communication infrastructure (transpeninsular highway).
- Proximity to the main cities in the region (La Paz and Los Cabos), and a potential market for their produce.
- Access to governmental programs for farm modernization.
- Access to technology like machinery, irrigation systems and improved seeds.

The *weaknesses* identified are:

- High cost of shipping transportation.
- High cost of land for agricultural purposes.
- Lack of a cooperation culture between producers.
- No planning for crop planting or sales.
- Lack of organization for sales. "Coyotes set the prices."
- Most of the produce sold to "Coyotes."
- Pepper weevil becoming hard to control.
- Ineffective control for basil mildew, causing many crop losses.
- Difficulty securing fair prices for their produce.
- Lack of financial and management advise.
- Lack of available water to use to open new agricultural plots.
- Waste in the field (produce that does not comply with market standards but is still adequate for processing).

(The following opportunities were identified from the analysis of the *strengths* and *weaknesses* of the agricultural sector from Todos Santos and El Pescadero area, and reflect general viewpoint. These opportunities are not represented as the viewpoints of individuals interviewed for the research.

Opportunities for the sector:

- Diversification of crops to maintain a profitable farm business.
- Expanding to local-regional market in the area, by investigating demand for fruits and vegetables in La Paz and Cabo.
- Exploring possibilities for ways to preserve the produce, adding value to their produce.
- Form growers organizations around planting, production and sales.
- Seek support from governmental programs or education and research institutions for organized groups.
- Start the transition to a more sustainable agriculture.

Threats:

- Effects of climate change.
- Crop pests and diseases.
- Uncertain market.
- High level of bureaucracy for getting financial support from government and banks.
- Poor agricultural policies.
- Rising numbers of producers that sell rent or abandon their land.
- Degradation and contamination of the natural resources soil and water.

VI. COMMUNITY GROUPS RELATED TO AGRICULTURE IN TS, PS AND LA PAZ, B.C.S. AND COLLABORATION OPPORTUNITIES

Within the region, there are a number of community groups and non-profits that address important issues like the environment and food security. A brief description of their activities and mission is presented below.

SINADES A.C.

- SINADES is a non-profit organization and means Sistemas Naturales y Desarrollo (Natural Systems and Development). As an organizational platform for women and children, SINADES has made significant impact on the Pescadero community throughout the last 10 years.
- Dedicated to environmental education, development of natural and healthy lifestyle in the community of El Pescadero, Baja California Sur.
- *Current programs:* household scale greenhouses for organic vegetable gardens run by women, community clean-up campaigns and environmental education in schools.
- *Workshops:* vegetable garden for kids, healthy cooking, basic permaculture concepts, and creation of organic fertilizers, biological control and eco-technologies.
- Interested in creating a seed bank and learning more about how to grow organic vegetables in a limited space.
- SINADES plans to start its own local market with local producers.

RAIZ DE FONDO A.C.

- Non-profit organization that provides educational program opportunities to enhance the quality of life in the communities through community gardens, nutrition and youth leadership.
- Three community gardens are established in La Paz, each with a slightly different mission.
- Programs promote sustainable living, healthy nutrition, empowerment of the community and resilience.
- The organization activities include training for the public, kids and teachers, gardening classes, healthy cooking practices, water conservation techniques and school visits.

SBFSA (Southern Baja Food Security Alliance).

- Their mission is to help to create a local alliance of social, governmental and business organizations and growers to improve food security issues within the region. They have been working to outline strategies to provide healthy and fresh food to low income and at-risk families in at-risk urban and rural communities.
- CSU Todos Santos Center was invited to enter the group and has been attending monthly meetings.
- The Alliance's current process: outlining objectives and strategies to achieve their mission.

VII. GOVERNMENTAL INSTITUTIONS RELATED TO AG IN B.C.S.

*SAGARPA (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación).*¹²

- Secretary of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) is a branch of the Mexican federal government, similar to the USDA in U.S.
- MAIN FUNCTIONS:
 - Formulating, conducting and evaluating general rural development policy.
 - Integrate and promote investment projects to enhance productivity.
 - Application and management of economic resources from the federal government to support enterprises or farmers for planning, programming and consulting assistance in coordination with state and municipal governments, social and private sectors.
 - Develop, update and disseminate grants and investment opportunities in the rural sector.
 - Organize and maintain a database for the current economic studies on rural life, in order to establish ways and means to improve it.
- CURRENT PROGRAMS FOR FINANCIAL SUPPORT IN AGRICULTURE:
 - Financial support for projects integration (by-product systems).
 - Infrastructure and equipment investment (agricultural and genetic)
 - Coffee production encouragement
 - Innovation and technology transfer
 - Electricity for agricultural use
 - Agricultural diesel
 - Agricultural machinery modernization
 - Bio-energy and alternative sources
 - Protected agriculture technology
 - Productive reconversion
 - Support for the production chain of corn and beans
 - Irrigation technology
- A delegation office from SAGARPA in Baja California Sur is located in La Paz.

JLSV (Junta Local de Sanidad Vegetal)

- *Local board for Plant Health* (JLSV) is an auxiliary unit in coordination with SAGARPA
- MAIN FUNCTION: development of campaigns, programs and actions that protect plant health from pests and diseases from other states, as well as control and extermination of pests existing in the region, and evaluated safety of crops coming in and out of the state.¹³
- Three auxiliary offices in Baja: Mulegé, La Paz and Los Cabos.
- Todos Santos and El Pescadero farming areas are under JLSV La Paz jurisdiction.
- They are in charge of making sure that chili plantings dates are respected, to avoid severe pest outbreaks.
- Pest control and mitigation campaigns and actions are based almost exclusively under

chemical pesticide control.

- Technicians are trained to provide assistance to producers also based on chemical control.

*SENASICA (Servicio Nacional de Sanidad, Inocuidad y Calidad Alimentaria).*¹⁴

- *Agro food health, safety and quality national service* is an organism independent of SAGARPA.
- MAIN FUNCTION: regulate, manage, and promote agro food health, safety and quality, reducing the hazards inherent to agriculture, aquaculture, livestock production, and fishery activities in benefit of producers, consumers, and industry.
- Surveillance, monitoring and certification actions. Food safety emergency responses.
- Promotes and regulates the appliance and certification of food contamination risk reduction systems and agro food quality.
- Regulates organic certification in México, GAP (Good Agricultural Practices), GMP (Good Manufacturing Practices) for export agriculture.
- Works in conjunction with JLSV. There is not a delegation office in Baja California Sur, only verification and inspections control points (Guerrero Negro, Pichilingue Port in La Paz and Transpeninsular highway northern La Paz).

VIII. ACADEMIC INSTITUTIONS AND RESEARCH CENTERS RELATED TO AGRICULTURE IN B.C.S. AND COLLABORATION OPPORTUNITIES

UABCS (Universidad Autónoma del Estado de Baja California Sur)

- Located in La Paz, Baja California Sur.
- Degrees offered in Agronomy and Agribusiness Administration.¹⁵
- Little information available on academic research, according with professors from agronomy department, there are not many economic resources for research, but it was said that some researcher-professors are working on organic agriculture and evaluating bio-fertilizers.
- There is a strong opportunity to connect with this institution in terms of student exchanges, research collaborations, use of available, labs and experimental fields. CSU has established a memorandum of understanding with UABCS and communication with the agriculture department to create a comprehensive and beneficial partnership.

*CIBNOR (Centro de Investigaciones Biológicas del Noroeste)*¹⁶

- *Northwest Biological Research Center.*
- ACADEMIC RESEARCH: Aquaculture, agriculture in dry lands, environmental planning and conservation, and fisheries ecology.
- ACADEMIC PROGRAMS: The current master's and doctorate of science programs are focused on management and conservation of natural resources that offer academic development in the fields of aquaculture, b, ecology of dry lands, marine biology, or sustainable agriculture.

- Current collaborative agreements in agriculture: *Universidad Autónoma de Sonora*, MEXICO; *Universidad Michoacana de San Nicolas Hidalgo*, Morelia Mich., MEXICO; *Bruno University*, CZECH REPUBLIC; Guerrero Negro and Centenario farmers in Baja California Sur.
- Collaboration opportunities with CSU: being one the most recognized research centers in México, and with the amount of research being developed, a very beneficial relation could be established with the Center. A memorandum of understanding is in process.

CIBNOR			
RESEARCH FOCUS AREAS			
Aquaculture	Agriculture in dry lands	Environmental planning and conservation	Fisheries ecology
<i>Strategic Research lines</i>			
I. Biology and development of crustacean technologies II. Biology and development of mollusk culture technologies. III. Biology and development of fish culture technologies. IV. Biotechnology in plankton.	I. Organic agriculture. II. Plant health and food safety. III. Agro technology and energy resources. IV. Water, soil and climate in dry land areas. V. Biotechnology and use of genetic resources.	I. Ecosystem and ecosystem services. II. Environmental health and biomedicine. III. Condition of coastal systems and its environmental trend. IV. Biodiversity of México: problems, uses and conservation. V. Effects of human activities on natural resources: ecological restoration and environmental impacts. VI. Environmental microbiology. VII. Natural history museum: taxonomy and systematic.	I. Ecological effects of fishing in the Gulf of California marine ecosystems: identifying, evaluating and mitigating its potential impacts. II. Contribution to the sustainable development of new fisheries in Northwest México: biologic and bio-economic feasibility study. III. Variability and vulnerability of marine ecosystems in Northwest México. IV. Maximizing the economic value of marine products of Northwest México. V. Fisheries recovery and regulation in Northwest México.

Table 5. Research focus areas from CIBNOR, 2015.

INIFAP (Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias)

- National Institute of Forestry, Agricultural and Livestock Research (INIFAP) is a federal government institution with the mission of generating knowledge and technological innovations attending to needs from the forestry, agricultural and livestock sectors in México.¹⁷
- Thirty-eight experimental fields in México and two in Baja California Sur, located in Valle de Santo Domingo, in Comondú municipality (Northern La Paz) and Todos Santos.
- Todos Santos experimental is located in the transpeninsular highway, between Todos Santos and El Pescadero locations. These installations are no longer in use; however, experimental plots for research are still taking place for: *jojoba, litchi, neem and forage*.
- CURRENT RESEARCH PROJECTS:¹⁸

1. Jojoba (*Simmondsia chinensis*) germplasm management and evaluation. Todos Santos, B.C.S.
 2. Sunflower hybrids planting dates evaluation. Ciudad Constitución, Comondú municipality, B.C.S.
 3. Fertilizer evaluation and irrigation efficiency in forage species. La Matanza, La Paz municipality.
 4. Technologies for increasing productivity of garbanzo in Santo Domingo Valley. Ciudad Constitución, Comondú municipality.
 5. Oleaginous production technology for improving natural resources use. Ciudad Constitución, Comondú municipality.
 6. Technological package for avocado production in Baja California Sur. Ciudad Constitución, Comondú municipality.
 7. Techniques for breeding in livestock. Ciudad Constitución, Comondú municipality.
 8. Efficiency of reproductive management in livestock. Ciudad Constitución, Comondú municipality.
 9. Integrated management of goatherds. Ciudad Constitución, Comondú municipality and La Paz.
 10. Supplementation and management techniques of farming residues. Ciudad Constitución, Comondú municipality and La Paz.
- INIFAP has much research on native species of plants such as *jojoba*, *damiana*, *oregano*, *fan palm*, *palo zorrillo*, *palomauto*, *palo de arco*, *mezquite*, *palo blanco* y *palo escopeta*. They have also researched their ability to be planted, harvested, and used as well. Additional research includes medicinal plants and production of protected cactus.
 - *Collaboration opportunities*: There is lot of expertise in native species knowledge that can be very valuable for the CSU center application, as well as the current research that is taking place. Connection has been made with INIFAP and they are open to exploring specific collaborations.
 - *Administrative office is located in the same building from SAGARPA in La Paz, B.C.S.*

IX. FINAL RECOMMENDATIONS

Recommendations for CSU College of Agricultural Sciences and CSU Todos Santos Center are as follows:

- (i) *Local ag advisors proposal*
- (ii) *CSU Todos Santos Center focus programs proposal*

(i) Local Ag Advisors proposal

The following list represents selected members of the community from different agricultural areas such as governmental, academics and research institutions, as well as producers and technicians

from the area that could be potential contributors of ideas and recommendations for CSU Todos Santos Center.

Name	Position	Company/Institution
Ing. Maximiano Martínez Santillan	Rural District Chief 003 La Paz	SAGARPA
Dr. Ramón Jaime Holguín Peña	Agriculture in dry lands Coordinator	CIBNOR
Juan De Dios Duarte	Agronomy Department Head	UABCS
M.C. Denis Osuna	Extension and coordination director in B.C.S.	INIFAP
Mr. Ross Vail	Owner	Sueño Tropical
Ms. Elizabeth Aguirre	Owner	Agricole
Gerardo Olmos	Owner	Agrícola Olmos
Miguel Angel Leon	Producer and CSU Center Liaison	
Fabiola Rodríguez	Horticulture engineer, organic agriculture	

(ii) CSU Todos Santos Center program focus proposal

Current challenges of agriculture in Todos Santos and Pescadero region can be seen through as how the relate in a global context. Potential contributions from CSU Todos Santos Center could address regional challenges as well as promote and develop solutions for the future of agriculture in general. Considering this, the recommendations presented below are based not only on results of the outreach to members of the agriculture sector of Todos Santos and Pescadero region, but also consider a global perspective of trends and challenges that agriculture is facing worldwide.

The following ideas provide a potential framework to approach these new challenges.

Background

The *United Nations* has recently suggested a new direction for modern agriculture, proposing agroecology as an environmentally sustainable strategy that can meet more rapidly the growing demand for food in the world.

Agroecology is defined as, "the application of ecological concepts and principles to design and management of sustainable agro-ecosystems" (*Altieri, 1995*).¹⁹

United Nations Special Rapporteur on the Right to Food, Prof Hilal Elver, mentioned on her first public speech in 2014: "We are already facing a range of challenges. Resource scarcity, increased population, decreasing land availability and accessibility, emerging water scarcity, and soil degradation require us to re-think how best to use our resources for future generations."²⁰

There has been an international call for agriculture to become part of the solution of global climate change rather than a major contributor.

A recent study conducted by GRAIN, an international non-profit organization in 2014, found: "small-scale farmers are producing the majority of the world's food on just 25% of farmland", and that they are "feeding the world".²¹

Additionally, the *Food and Agriculture Organization (FAO)* is promoting developing an approach based on the need to ensure sustainable food security given climate change challenges. This new approach is called "climate smart agriculture") and was developed in 2010 after the Conference of Agriculture, Food Security and Climate Change. "Climate smart agriculture is an approach to

develop technical, policy and investments conditions to achieve sustainable agriculture development for food security given climate change. Climate smart agriculture *seeks food security* by increasing productivity and incomes, *adaptation* to the new climate and *mitigation* by reducing the impact of agriculture in future damage to climate change." (Lipper Leslie, Senior Environmental Economist, FAO 2014)²²

U.S.-based independent research institution, the Rodale Institute, claims "Organic agriculture is the key for climate change"²³ supporting this statement with more than 60 years of research.

While *agroecology* provides the scientific base for the shift to more sustainable agriculture, climate smart agriculture provides the idea for increasing resilience to major changes the world is currently facing.

Proposal approach for the Todos Santos Center

There is an opportunity for the CSU Todos Santos Center to serve as resource for research and education by being a model in the region based on the approaches presented above.

Three major strategies could be developed:

- A. *Community-based sustainable food systems models*
- B. *Sustainable living program*
- C. *Help with the transition into a more sustainable agriculture*

A. Community-based sustainable food systems models

Increasing the efficiency of agriculture and food systems is a critical challenge for a future in which the proximity to the source of food could be crucial. Developing small-scale food system models in areas such as Todos Santos or Pescadero could certainly be a reference for other smaller communities not only at regional level but also at global level.

Considering that "in a community-based system the community is not just providing food products but community members may actively participate in producing, processing, distributing, and consuming the food" (University of Michigan, Urban and Planning project, 2009),²⁴ the following strategies could be part of the model:

1. Estimate growers' capacity within the region including a food consumption requirement study. The feasibility of the idea could be explored in conjunction with SAGARPA, INIFAP, CIBNOR, UABCS, SEDESOL and the local government.
2. Cooperatives of small producers: Facilitate the conversation with local producers using CBPR (community-based participatory research) approach and provide tools and training for organization. An idea could be developed through both the Todos Santos and Pescadero ejidos.

3. Farmers markets: Facilitate conversations between local producers, SINADES and local government using CBPR approach. Learn from the experience of others farmers markets within the region.
4. Community gardens: Facilitate conversation between SINADES, women in the community and Ejido, as well as local government using CBPR approach.
5. Community supported agriculture: explore possibilities and provide talks about the model and feasibility in the region. Learn from the experience of local organic producers as Rancho Buen día.
6. Urban agriculture (container gardening): Food production in reduced spaces, develop workshops or courses in collaboration with Raíz de Fondo A.C., Gardening Guru etc.
7. Family agriculture (or farming): Study the organization of local family farming and facilitate training to strengthen the family farm. Look for collaboration with SAGARPA, UABCS, CIBNOR and local government.
8. Organic school gardens: Facilitate conversation with school directors, parent's school boards, SINADES, DIF and local government, using CBPR approach.

B. Sustainable living program

There is a genuine interest among members from the community in sustainable ways of living. They are not only interested in reducing the impact to the environment, they also are interested in finding more efficient and less-dependent ways to live given the sometimes harsh Baja conditions, such as water scarcity and hurricanes.

Suggested topics according to community respondents are:

1. Organic gardening
2. Water recycling and water conservation systems
3. Eco-construction
4. Eco technologies
5. Eco-friendly cleaning products
6. Natural mosquito repellants and insecticides
7. Dry toilets designs

C. Help with the transition to more sustainable agriculture

It is known that conventional and industrialized agriculture are often contributors to environmental problems and climate change. The agriculture systems in Todos Santos and El Pescadero region (as many others in U.S. or México) are still largely based on ideals of the green revolution.

The CSU Todos Santos Center could play a significant role helping educate and inform around a new way of thinking about agriculture.

The following strategies respond to this call, and are based what producers communicated that they are seeking to learn through possible workshops, lectures or research.

1. Water management and conservation: water efficient irrigation, water capture techniques.
2. Soil management, conservation and regeneration: do-it-yourself organic biofertilizers, plant nutrition, and good soil practices.
3. Sustainable pest and disease management: especially for chili pepper and basil.
4. Climate change research: Investigate and provide information around what is already happening in the region in terms of climate change to help inform recommendations for the future.

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