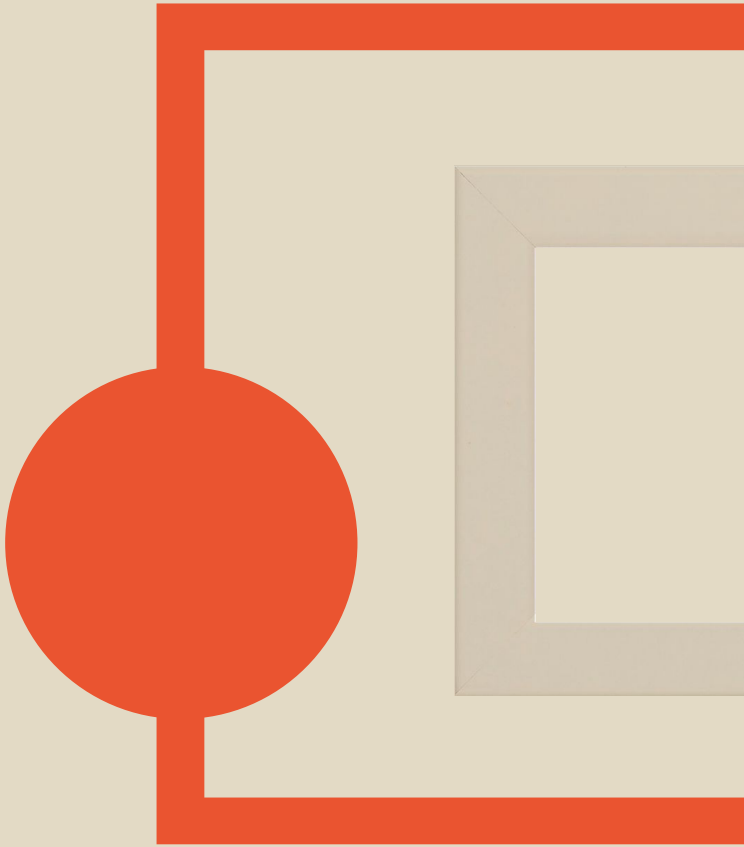
Addressing concerns in the Chijnaya communities

Technology Clinic 2021-222



EXECUTIVE SUMMARY

In addressing the various concerns of the Chijnaya communities in Peru, the Technology Clinic aimed to explore and develop opportunities in the areas of leftover salty whey and participatory tourism. Our goal was to do so while being cognizant of the values and traditions of the Andean communities.

For whey, we looked into various possibilities to either dispose of or reuse the leftover waste. Using modified cheese recipes, making salt licks for cattle, using a simple biodigester, making pickles, and using it as trout food were all determined to be viable and effective methods to deal with the salty whey. We created a table comparing the different advantages and disadvantages of each option in order for the client to best determine which will be most suitable for their specific needs.

For tourism, we focused on the different ways that participatory tourism could be implemented without the use or need of middle men. This way, the communities could directly profit from the service while also spreading their unique culture. We developed a demo website to show how this could work and proposed various possible workshops that could be hosted, including one that incorporates the alpaqueros.

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THE TECHNOLOGY CLINIC

The Technology Clinic is an **interdisciplinary course** at Lafayette College in Easton, PA, which provides students with **practical experience** for novel uses. Since its inception in 1986, the Tech Clinic has provided opportunities for small groups of highly motivated students – usually five or six members – to work closely with mentors to **solve real-world problems**. These students and facilitators bring a variety of experiences, skills and perspectives that contribute to the authentically interdisciplinary nature of the course.

MISSION STATEMENT

The goal of this Tech Clinic is to provide useful information for the communities served by the Chijnaya Foundation. We will consider some possible opportunities for the various areas of possible and potential improvement that have been brought to our attention.

After looking broadly at possible opportunities, we are looking into the technical application of these concepts to determine which would be most practical and in line with traditional Andean values.

MEET THE TEAM

SHOVA MALLA ‘22
Economics and Environmental Studies

Shova is a Senior from Surkhet, Nepal. She is an EXCEL Scholar involved in research, LaFarm, International Student Association and Asian Cultural Association clubs.

SAKIB SHAHRIAR ARNOB ‘23

Sakib is a Junior from Bangladesh. He is a McKelvy Scholar and a part of the Student Government as well.

KATELIN SEBER ‘23
Government & Law and English

Katelin is a Junior from Antwerp, Belgium. She has been heavily involved with the International Student Association and the Office of Sustainability.

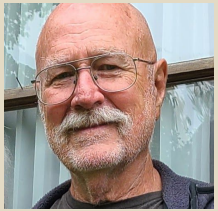
JORGE YOSHIYAMA LEE ‘24
Psychology

Jorge is a Sophomore from Lima, Peru and is planning on majoring in psychology. He is involved with the Language Center.

MEET THE TEAM

LILY HALVORSON ‘24
International Affairs and Chinese

Lily is a Sophomore from Minneapolis, MN. She plays violin and is heavily involved in three music ensembles on campus.



DAN BAUER
Founder of Technology Clinic

Long-time resident of the Easton area, Dan has lived in highland Peru, Ethiopia, and southern Mexico. He began his studies in engineering and, after completing a degree in Journalism and a stint in the Peace Corps, completed his PhD in Social Anthropology.

LUIS SCHETTINO
Associate Professor
Psychology & Neuroscience

Born and raised in Mexico, Luis is a neuroscientist with broad interests in the social sciences. He has participated in Tech Clinic in a number of projects.

THE ANDEAN ALTIPLANO

At more than 12,500 feet above sea level, the Altiplano is a vast high plateau in the Central Andes. This region is shared by Peru and Bolivia. In the 1960s, the Peruvian Altiplano was home to an agrarian population of approximately 700,000 people with 82% living in rural areas. In 2017, the population had increased to 1,172,697 with 46% rural. The population is divided almost equally between two major linguistic groups, the Quechua and the Aymara, referred to collectively as Qolla. Rural residents are primarily farmers whose livelihood is derived from subsistence agriculture on small plots of land.

THE CHIJNAYA COMMUNITIES

Late in 1962 and the beginning of 1963, heavy rains caused rivers on the Andean Altiplano to overflow and the waters of Lake Titicaca to flood low lying areas in Puno. The District of Taraco was one of the worst hit areas. Hugo Contreras saw the flood crisis as an opportunity to initiate a covert pilot agrarian reform program. He proposed to relocate the flood victims to lands on a hacienda at a higher elevation outside the flood zone. Contreras recruited an American Peace Corps volunteer and anthropologist, Ralph Bolton, who was living in a community adjacent to those severely impacted by the disaster, to help recruit flood victims for what became known as the Proyecto Taraco-Chijnaya. Eventually, the project managed to purchase a hacienda from the holdings of the Catholic church in Puno. A cohort of 72 families was assembled to participate in this experimental relocation project. On September 23, 1963, the heads of these families moved from Taraco to Chijnaya to build this new community. From the beginning, it was made clear that the community would be run as a cooperative with land, animals and machinery held and operated in common, not individually.

CHIJNAYA FOUNDATION

The Foundation began in 1965 following a visit to the community of Chijnaya, Peru, by Dr. Ralph Bolton, an anthropologist who worked there as a Peace Corps Volunteer. This visit provided the opportunity to partner with the people and work with them on projects to address challenges within their community. Since 2005, the Foundation has worked with a total of 32 communities in the surrounding Lake Titicaca Basin.

Their mission:
The Chijnaya Foundation works in partnership with rural communities in Southern Peru to design and implement self-sustaining projects in health, education, and economic development.

How they work:
By providing humanitarian, technical, and development assistance to communities in the Andean highlands of Southern Peru, the Foundation is able to administer grants and loans, technical expertise, and research in agriculture, health, small industry, traditional crafts, housing, and community services, all focused on improving the cultural and economic well-being of indigenous Andean people.

WASTE NOT, WANT NOT

The notion that **byproducts** of agricultural and industrial processes should not be perceived as waste to be eliminated or accumulated but, instead, as a source of **useful substrates** for new or existing products is one of our **guiding principles**.

Many of the processes designed to produce food and energy result in byproducts that can be **reinserted in the productive cycle** with little or no modification. A good example of this is milk whey, which has been successfully reclaimed from the production of cheese for a wide variety of uses, including nutritional supplements and novel food types.

SEMESTER ONE AT A GLANCE

1. **Whey**

Key issues:
- Environmental damage
- Lack of demand for salty whey

Opportunities:
- Use whey to replace fish meal
- Make other cheeses like ricotta
- Digesters

- **Alpaqueros**

Key issues:
- Decreasing wool quality
- Poor standing in the market

Opportunities:
- Improve breeding practices and infrastructure
- Increase market reach
- Decrease the rate of abandonment

4. **Solar Energy**

Key issues:
- Steep price

Opportunities:
- Local suppliers
- Infertile/unused land

5. **Trout Farming**

Key issues:
- Importing fish food that is costly

Opportunities:
- Fish food from whey
- Fertilizer from detritus

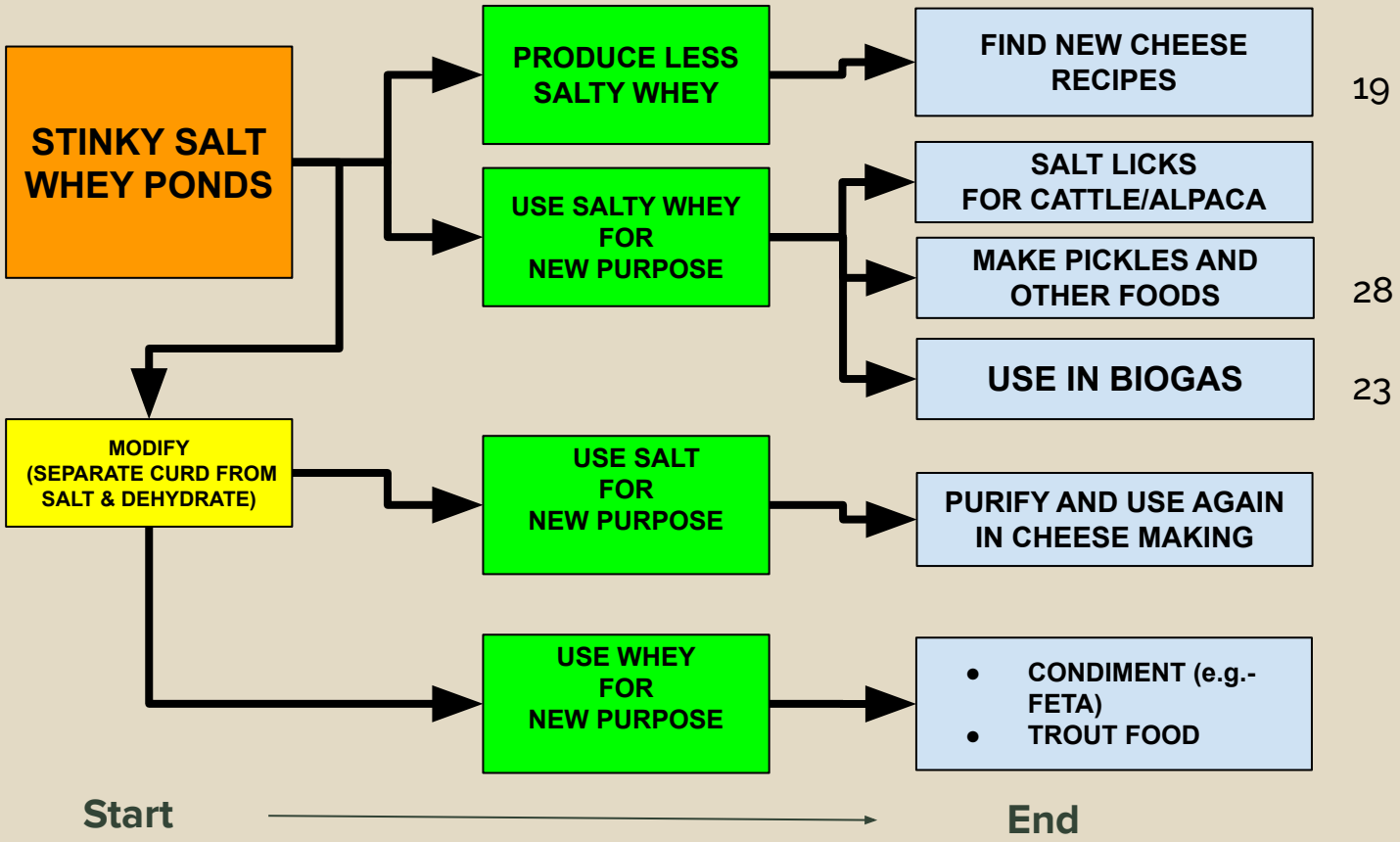
SALTY WHEY

One of the byproducts of cheese production is **salty whey (25% salt)**.

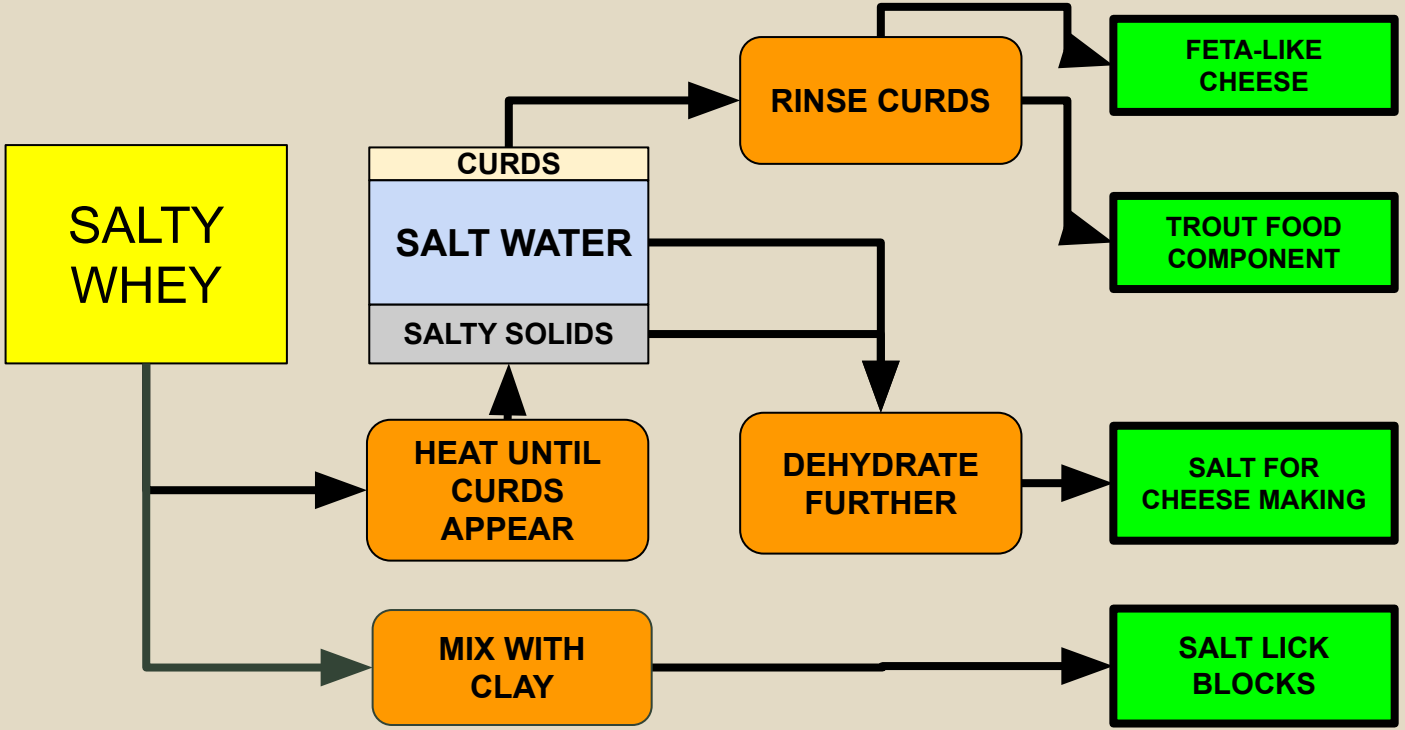
While sweet whey can be employed as **animal feed** or to make **ricotta**, its salty counterpart currently has no further use and is **disposed of in open spaces, causing environmental damage and other undesirable consequences**.

The Tech Clinic team was asked to explore ***possible uses of salty whey***.

SALTY WHEY REDUCTION CHART



CURD SEPARATION FROM SALTY WHEY

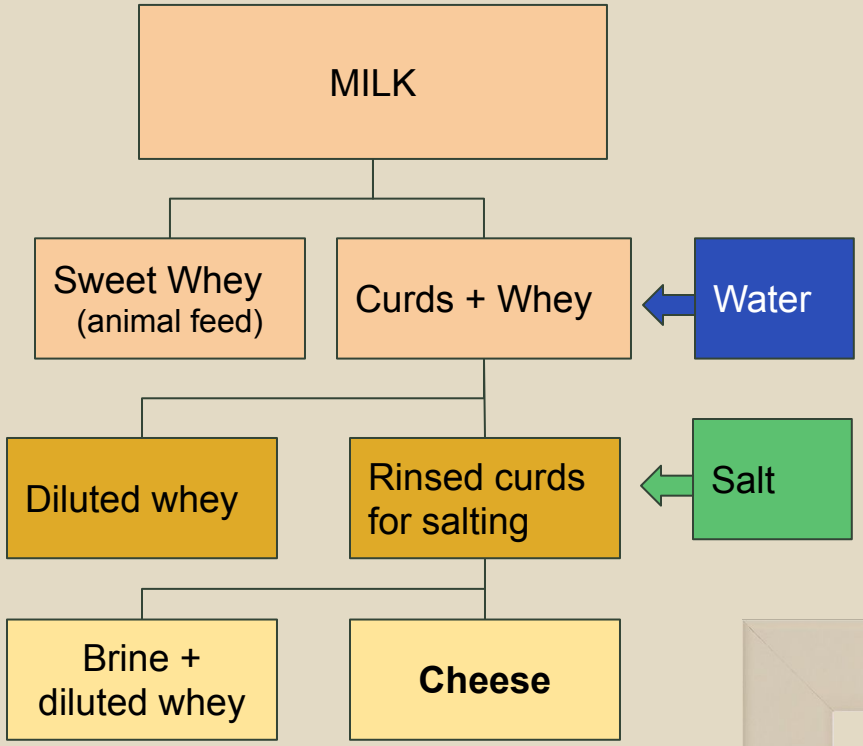


TRYING NEW CHEESE RECIPES

A possible solution for the reduction of the amount of salty whey currently produced could be the **substitution of water for whey in the process of cheese salting and pressing.**

Rinsing the curds prior to salting would remove a significant amount of sweet whey in a diluted form, which could be either concentrated through boiling or disposed of in a more environmentally-friendly way.

The byproduct of making the cheese would be a salty brine with some diluted whey which could be **dehydrated through boiling** or used in any of the solutions described in the report with the advantage of having a considerably lower capability for spoilage.



Running a blind taste test:

The proposal described in the previous slide begs the question of whether the cheese produced while substituting whey in the salting process would have the appropriate **quality** and **taste**.

In order to ensure that the quality of the cheese is not compromised, a blind taste test is recommended. A blind test would ensure that the judges' decisions are not biased by their expectations.

Here are some instructions on running a blind taste test for two cheeses:

1-Divide into three groups: preparers, servers and judges.

2-The preparers must make sure that the information of which sample belongs to which cheese is not available to the other two groups.

3-Preparers make three samples per judge of each item to be tasted and label each plate with a letter (A, B, C, etc.), making sure that the samples of each item are not organized into a pattern. Preparers keep a table describing which code corresponds to each sample.

4-Preparers leave the room and servers and judges are allowed to come in. Servers serve the samples, one at a time, to the judges.

5-Judges take notes for each sample in a taste sheet and write down which one they liked best and why.

6-Servers collect the taste sheets when the judges have finished their task and tally the results.

7-Preparers provide their table in order to determine which of the two cheeses is preferred. If the judges were unable to determine which sample came from which cheese, then there is not difference between them.

Salt Lick (Bloque de sal) Recipe:

This is the recipe that **inspired our process**.

- Mix together two parts rock salt, four parts bonemeal and one part of clay. Pound and sift the clay from a termite mound.
- Add enough water to the mixture to create a thick paste.
  Line a cardboard box with a trash bag.
- Pour the mixture from the bucket into the lined box. Allow several hours for salt block to harden.
- Remove the salt block from the box when dry. Peel away the trash bag and dispose.

Recipe Source: https://goneoutdoors.com/how-to-make-your-own-salt-block-7564548.html

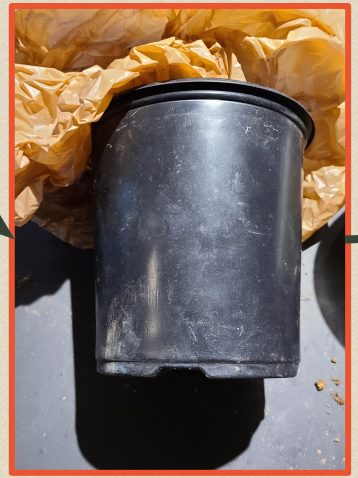
Making our own salt lick:

Salty Whey

Clay

Mix to obtain a paste

Place in mold lined with plastic



Wait for it to dry and unmold

(The addition of clay is desirable as a mineral supplement.)

WHEY: PICKLE TEST

Small yellow potatoes cooked for 8 min in boiling water. The result was a slightly crisp potato.

Potatoes added to 3-300 ml jars with **salt, garlic, white vinegar**, **whey** and **water**. Vinegar added to give a bit of acidity. The salt was incremented by 1 tsp for jars 2 and 3 in order to test how much salt is reasonable to add. Each teaspoon of salt weighed about 6 grams.

The addition of whey was to see whether it would alter the flavor either positively or negatively. Sometimes sour whey (from yogurt) is used in 'lacto-fermented' pickles. In this case there did not seem to be much extra flavor, one way or the other. Perhaps the salt prevented the whey from producing any fermentation.

	Jar 1	Jar 2	Jar 3
Whey (unsalted)	50 ml	50 ml	50 ml
Salt	1.5 tsp (9g)	2.5 tsp (15g)	3.5 tsp (21g)
Water	200 ml	200 ml	200 ml
Vinegar	1 tsp	1 tsp	1 tsp
Salt Concentration (%)	3.5	5.6	7.7

Pickled potatoes have a potential for being **commercialized**, as this example from Colombia shows.

The pickles were kept at room temperature (18℃) for **ten days**, after which they were sampled.

Tasters did not think the pickles were too salty, even at the highest concentration (3).

Other vegetables such as ***oca*** may prove to be a good choice for pickling.

RENEWABLE ENERGY

SIMPLE BIODIGESTER

Anaerobic digestion is a technique that has been widely used in various fields in order to perform the treatment of wastes with high organic load.

The deployment of this technology for wastewater treatment can bring various environmental and economic benefits, including the production of energy in the form of electricity and heat (Antonelli et al., 2015).

With a **simple biodigester** that uses manure and water, the excess salty whey can be used to make **methane gas** as well as **fertilizer**. The resulting fertilizer will have some salt but this should not impact its effectiveness much.

We have consulted with Joaquin Viquez from **Green Empowerment** to further understand the possibilities, challenges and solutions to the existing issues related to biodigester in the regions of Peru and South America in general.

Three main challenges:

1. Temperature → Bacteria needs warm temperatures:
    - Solution:
        - Insulate from the ground so it does not lose temperature.
        - Try to capture sunlight heat as much as possible.

2. Salinity of the cheese whey → bit more complicated to remove:
    - Issue of concentration - if the cheese whey were diluted with water, the end mixture might fall under the threshold for biogas.
    - Bacteria might also affect salinity - can grow if the conditions were cold?

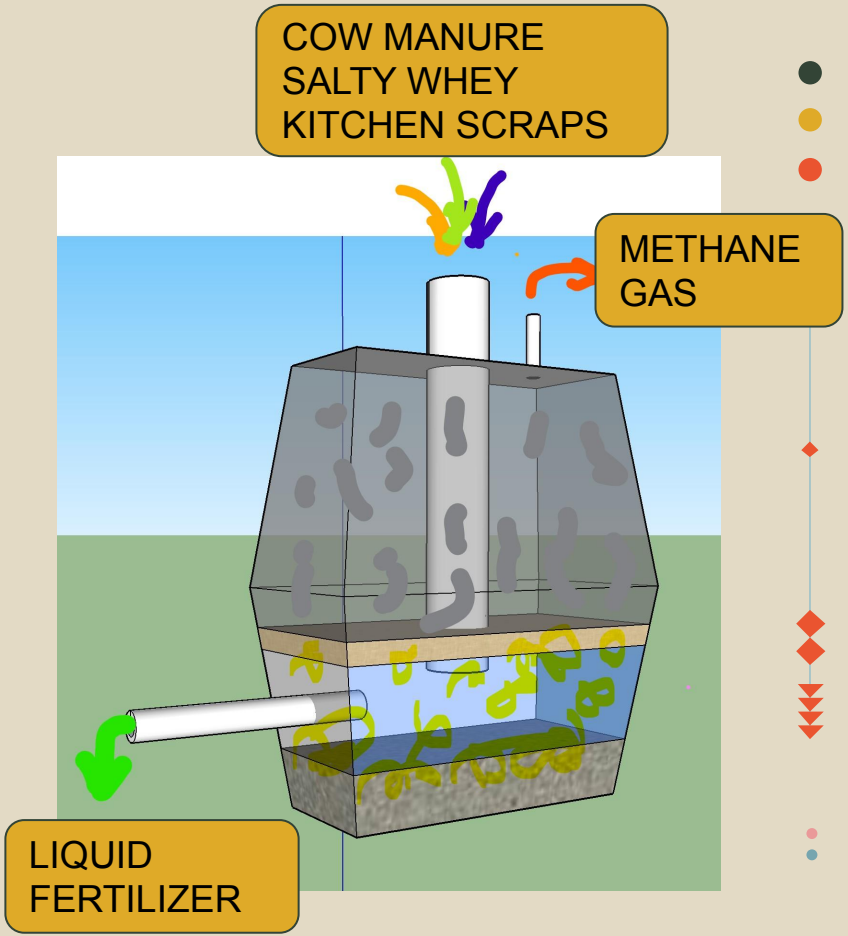
3. Potential acidity → byproduct of biogas fermentation:
    - If there is too much organic acid, biogas can go too sour (methane is really sensitive to pH condition and stops working in too sour condition - methanogenic bacteria).
    - Acidity becomes less of an issue when there is more water and manure.
    - More cheese whey than manure would be a problem so need enough manure and water.

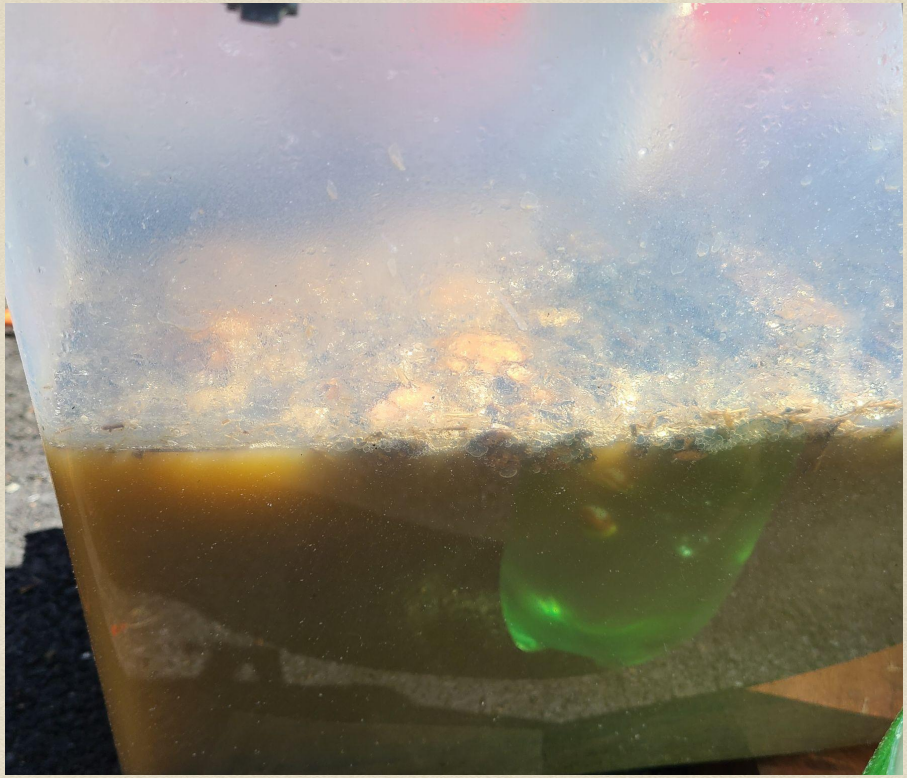
Prototype Design:

The waste is inserted through the top funnel which moves it down below the level of the liquid. After a while, the waste will start floating on top and making gas. Thus, **fermentation** is happening in both the top and bottom of the biodigester.

Anaerobic process is producing methane gas that comes out of the small tube at the top which is connected to a hose to a **storage chamber**. Liquid fertilizer comes out of the side tube.

Our digester has an **electric heater** to initialise it, such as one typically used to heat an aquarium → eliminates 2 months needed to start working (we used this because we did not have time but it is not necessary).





Shows the process of methane gas being made from the waste.

In this picture, **kitchen scraps** were added to the biodigester with manure.

It began bubbling and producing methane gas. This gas is being captured in a plastic bottle.

SOLAR ENERGY

When looking for various opportunities related to solar, we took the following **questions** in to consideration:

1. What are the needs for electric power?
    a. Water pumping
    b. Irrigation
    c. Lighting
    d. Shearing
    e. Cheese Making
    f. Phone and computer charging
    g. Cooking
2. What groups have appropriate standing (access to rotating funds) for purchase and maintenance?
3. Grid reliability?
4. Daytime/nighttime electric needs?

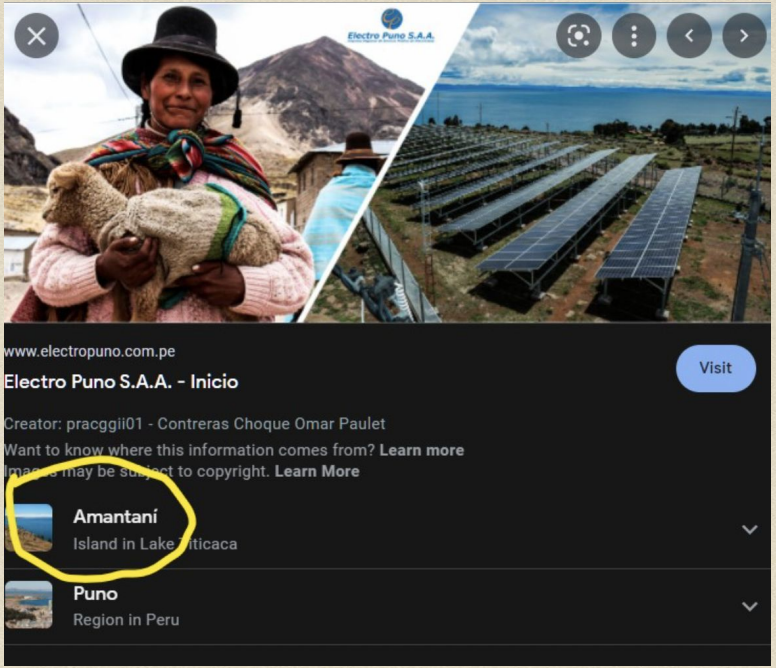
Solar energy has become more **widespread** and **less expensive** than in the past. Local suppliers such as Electro Puno already has operations around the region and there are also water pumping systems available in Juliaca.

Donors can underwrite computer charging systems to help with rural education. Solar arrays can also be transported among group members for **alfalfa irrigation** as they require no permanent wiring.

Solar lighting for short periods of time is also relatively **inexpensive**. However, full-time systems would require substantial batteries (i.e. in RVs - systems cost about $500).

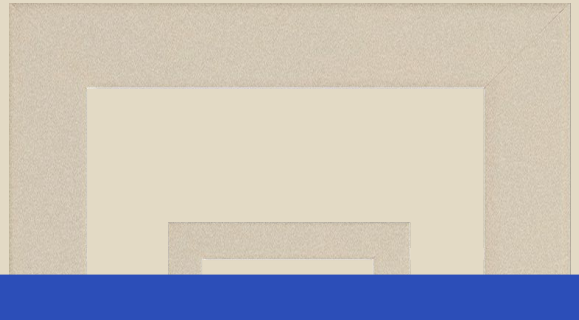
Solar Mini Grids

We also explored the use of solar mini grids for the Altiplano region. The **Government of Peru** has also recently focused on solar PV-based off-grid solutions to increase **increase rural electrification**. Such systems are already in use in the **Pucará region** and being set up by various non-governmental organisations (IRENA, 2018). Local suppliers such as **Electro Puno** has already operations set up in the Amantani which is in the Lake Titicaca region.



Source: Policies and Regulations for Renewable Energy Mini-Grids (2018), International Renewable Energy Agency

TROUT



Opportunities We Explored This Semester:

- Utilizing **modified whey** from cheese factories as fish food
  - Making effective use of the salty whey
- Developing a **capture device** for fish waste
  - Produces fertilizer that can be sold or used
- Utilizing **trout farming for tourism purposes**
  - Establishing a separate cage for tourists to catch their own trout
  - Economically viable

SALTY WHEY: TROUT

Modified whey from cheese factories can be utilized as food for the trout. This comes with a three step process:

1) Boil whey until the **proteins and fats congeal**

2) Rinse with water to **remove some of the salt**

3) Extrude to form **small bits**

The salty cheese is very desirable for the trout. We fed both the traditional trout food and the salty cheese-whey to the trout we raised, and the fish seemed to prefer the whey-feed over the traditional feed.

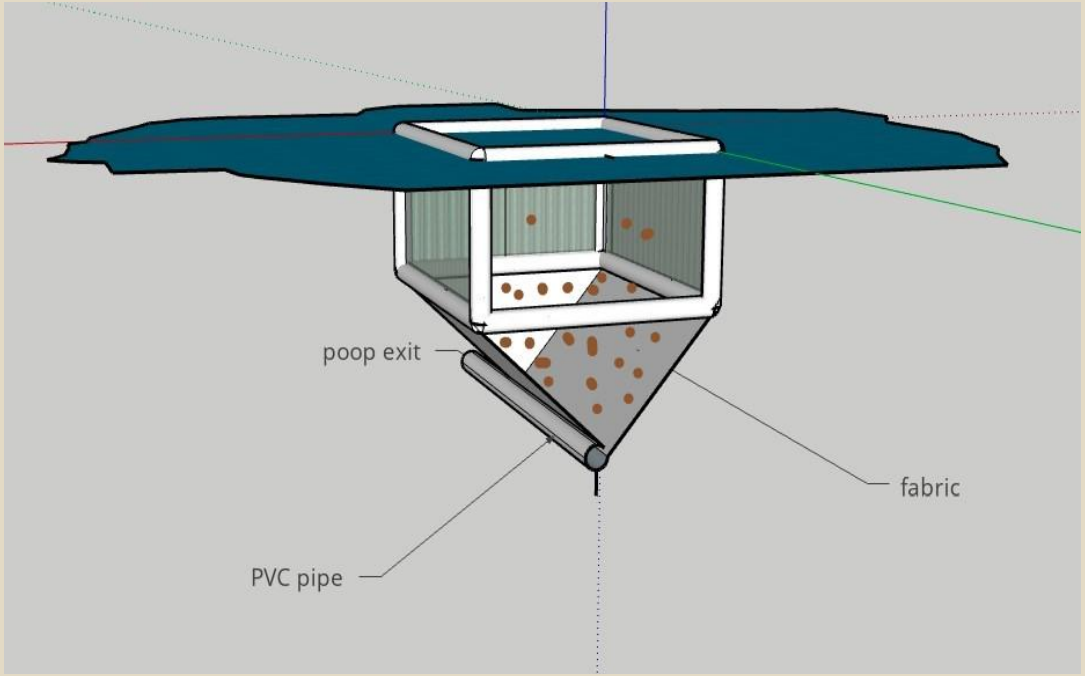
This is not a new practice. Several **fish hatcheries** utilize this method including well known Pennsylvania farmers.

Capture Device for Cage Fishing Waste:

This contraption is capturing the fish waste. The waste produced by the fish can either be dispersed into the water or collected by the PVC pipe.

Fish detritus can be **converted into fertilizer** which can be brought to the surrounding lands and used by local **farmers**.

It is also **lucrative** for farmers to sell.



Exploring Tourism:

Utilizing Trout Farming For Tourism: Economically Viable

- Take tourists out to catch dinner in cage of mature trout
- Fly fishing tours around Cusco
- Separate cage just for tourists to catch their own fish
  - People enjoy fishing, attractive activity, additional form of income for trout hatchery/farms

Source: https://eurofish.dk/

Source: https://www.peruanglers.com

Source: https://www.peruanglers.com

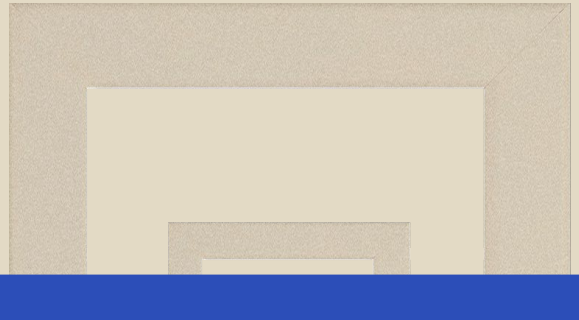
TROUT CONSIDERATIONS

	CAGE FISHERS	TOURISM	ENVIRONMENT	Questions to Consider
CAPTURE TROUT MANURE	SALE PRICE/ LABOR NEEDED	N/A	BETTER WATER QUALITY	How does weather affect device?
USE MODIFIED WHEY FROM CHEESE FACTORY	COST? FISH QUALITY?	N/A	N/A	MONOPOLY?
ADD TOURIST FISH CAGE	INCOME	ADDED ATTRACTION	LITTLE EFFECT	MONOPOLY?

OPPORTUNITIES SUMMARIZED:

	A PLUS FOR QUESEROS?	A PLUS FOR TROUT FARMER?	A PLUS FOR DAIRY FARMERS?	ENVIRONMENTAL IMPACT?
TROUT FOOD FROM SALT WHEY	**LESS MESS, SOME INCOME**	MIGHT REDUCE COSTS	N/A	REDUCE IMPACT OF SALT ON LAND
FEED TO **BIODIGESTERS**	**LESS MESS, LITTLE IMPACT ON INCOME**	N/A	COOKING GAS, CLEANER FERTILIZER	REDUCE IMPACT OF SALT ON LAND REDUCE METHANE
MAKE INTO **SALT LICKS** COWS ALPACAS	**LESS MESS, SOME INCOME**	N/A	LOCAL SOURCE OF COW LICKS	REDUCE IMPACT OF SALT ON LAND
MAKE **PICKLES**	**LESS MESS, SOME INCOME**	N/A	N/A	REDUCE IMPACT OF SALT ON LAND

TOURISM



Overview

1. Cultural and participatory tourism
2. Findings from online research
3. Learning from the local people
4. Current state of tourism and Alpaqueros
5. Possible opportunities and recommendations

Image Source: https://www.peru.travel/en/experiences/amantani

Cultural and Participatory Tourism

Participatory tourism goes hand in hand with cultural tourism to provide unprecedented, authentic and unforgettable experiences for travellers.

This type of tourism is important for developing country like Peru as it creates new socioeconomic opportunities.

Questions to consider:

- How is tourism currently carried out in the Chijnaya communities?
- How can we expand on already existing participatory tourism?
- What kind of infrastructure exists to support participatory tourism?

Source: UNWTO, The floating islands of the Ruos, in Lake Titicaca, are a significant tourist destination for the country. Alex Bryce, PromPerú.

We learnt more about cultural participatory tourism

- Culture and tourism have **a symbiotic relationship.** Arts and crafts, dance rituals, and legends which are at risk of being forgotten by the younger generations may be revitalized when tourists show a keen interest in them. (UNWTO, 2016)

So what is the main objective?

According to the World Tourism Organization (2016), cultural tourism **should ensure that tourism contributes to enrich and safeguard the cultural identity of destinations by promoting cross-cultural exchanges** between tourism and host communities.

This idea is the foundation behind the opportunities and recommendations that we highlight in this report.

Opportunities identified for participatory tourism are:

- Festivals and celebrations
- Gastronomy
- Creative Industry: Handicrafts, music and dances, mystical experiences, theatre and cinemas, plastic arts, literature, museums.

Some of the strengths and opportunities that are of our interests are highlighted below:

Tourism, Culture and Community Partnership in Peru

Strengths	Opportunities
• **Sustained economic growth** • Diversity and natural and cultural supply: tangible and in tangible; • **Strong community identity;** • **Increased professional capacity;** • Public-private alliances	• **Technological development;** • Country brand; • Regional diversity • **Diversification and new niches;** • **Strengthening of network cooperation;** • Replication of successful promotion models (e.g. gastronomy); and • Identification and conservation of heritage

Retrieved from UNWTO, 2016

From our online research

Tourist activities are already **participatory** in nature. For example:

- Catch and eat fresh fish from the lake Titicaca,
- Cultural dance performances
- Participate in daily activities with locals
- Go out in reed canoe, learn to harvest reeds, set out fishing nets, make crafts

We found that there is a gap in **online representation of tourism** in the Chijnaya regions. Most of the online advertisement is surrounded around Lake Titicaca. For example:

1. Puno and Uros Island 2-day trip
2. Amantani Island Homestay
3. Puno: Fiesta de la Virgen de la Candelaria, Virgin of Candelaria Feast

Source: https://www.getyourguide.com/puno-region-l2179/from-cusco-puno-and-uros-islands-2-day-trip-t406902/

Learn from the local people

Meetings with Jhuver Aguirre, Ralph Bolton, David Cajo and Alfonso:

We conducted informational interviews of some of the local people and learned that the biggest problem is the exploitation of the tour guides and the local people through very low pay and large profit margins. **Most of the profit goes to the travel agencies** that do the reservations and bookings.

For an example for a full day booking, travel agencies charge ~$50 and the hosts receive ~$15.

We also learned that the community is very interested and capable but need the necessary trainings and resources to do their own bookings and reservations. The Prodia Foundation is interested in providing **scholarship for digital marketing.** The scholar could be responsible for creating digital content and advertising the webpage.

Another problem is that often **the local people try to cater to what the tourists may like** in terms of gastronomy and ignore the staples available in the community.

Source: https://www.getyourguide.com/puno-region-l2179/from-cusco-puno-and-uros-islands-2-day-trip-t406902/

TOURISM and *ALPAQUEROS*

Throughout this project, **alpaqueros** have been a constant consideration as we feel this is an **important** and **traditional** practice that should be **preserved**.

Originally, the focus was on how the wool has been sold and how the quality was slowly decreasing due to the negative middleman component.

- The alpaqueros would sell their wool to middle men that would scam them.
- Regulation is a huge issue here as there is no real legal authority monitoring these transactions
- Wool prices were also decreasing due to the decreasing quality of the wool due to many things, bad breeding practices among them

Both pictures by Alex Pashley retrieved from https://www.aljazeera.com/features/2015/6/25/pulling-the-wool-over-peruvian-shepherds-eyes

Because of this, helping out alpaqueros directly was beyond our scope. Getting in between the inner workings is very tough. So, we decided to aggregate the alpaqueros under our **tourism** part of the project as it tackled many issues we had originally identified such as **income** and **awareness**.

This is an **indirect solution** to the actual problem since it **alleviates** rather than treats it. However, it can still yield valuable outcomes.

The hope is that the **increased awareness** would bring **more regulation** and **protection** for the rights of alpaqueros. Perhaps not through legal changes, as these would be impossible to actually implement and regulate but through a **standard buyer** coming in to help. This could also lead to **capitalistic exploitation**, which is already happening with tourism.

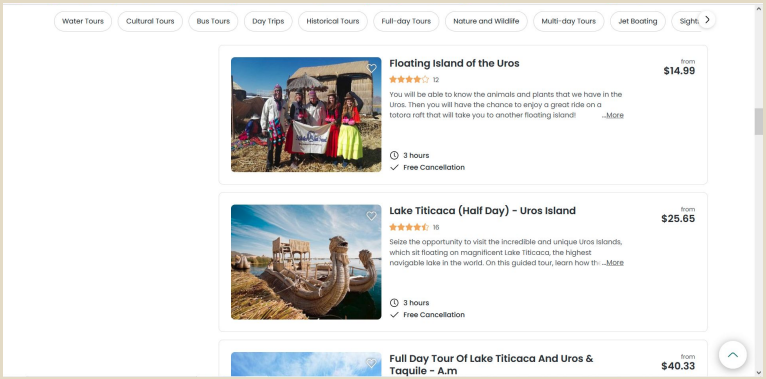
Source:
https://www.genevaenvironmentnetwork.org/events/wednesdays-for-the-planet-alpaqueros/

This would involve what has already been mentioned in **participatory tourism**. The biggest issue with involvement of alpaqueros would be **logistics**.

One issue would be getting groups up to the grazing pasture of the alpaqueros. This is extremely **weather dependent**, among other factors. Proper **communication** is also essential, there needs to be an **open line** between the **alpaqueros** and the **tourist organizations**.

This is a tall ask since they are one of the biggest issues that we are dealing with. The tourist organizations are unfair and exploit the tour guides and actual workers.

Altiplano



Examples of tourism services

Screenshot from: https://www.viator.com/Puno-attractions/Lake-Titicaca/d4726-a6406

We want the tourists to **participate** and **understand** the nature of the practice and how it was passed on.

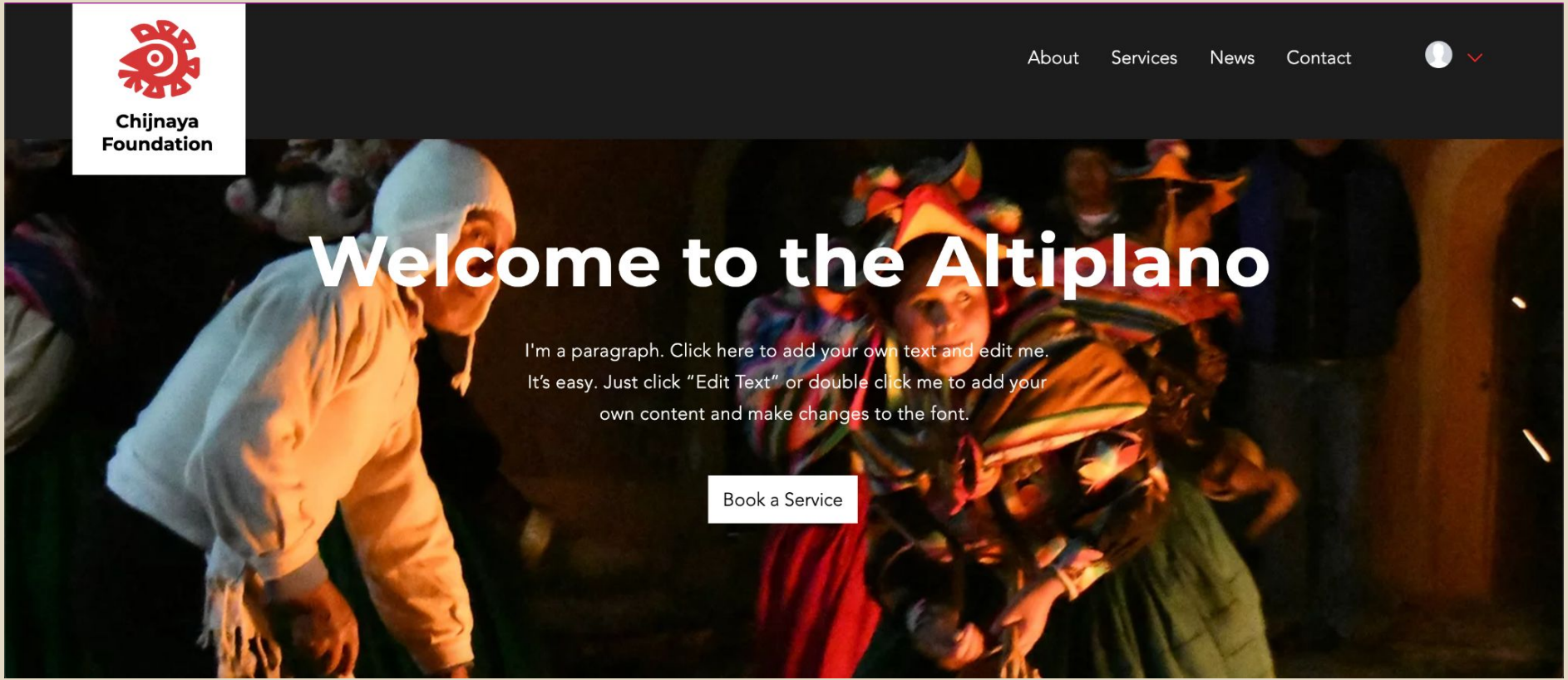
Also, if we can involve them in the tourism, they could get **paid** and, therefore, be more willing to **stay in the practice**.

If we were to fix the **monetary issue** with the travel agencies, more money could be given to the alpaueros.

We could look at the systems that other cities have in place, like **Cusco**, a much more popular alpaca tourist region.

Picture of tourism in Cusco

Webpage Sample



Chijnaya Foundation

About Services News Contact Log In

The Alpaca Experience - 2 Day Workshop

Offered Daily

$60

Book Now

Amantani Island Homestay

Offered Daily

$80

Book Now

Food Tasting Experience - 1 Day Workshop

Sat

$40

Book Now

Taquile Island

Book Now

Sample of blog post on the webpage

10 Local Cuisines To Try In Ccotos

0 0

Fishing in Lake Titicaca

0 0

Top Tours in the Altiplano

0 0

Read More

Expanding the Participatory Tourism: Workshop Ideas

Tourists can participate in a variety of the following activities:

1. **Alpaca wool spinning**
   - Teaching tourists how to make small woven items.
2. **Hiking up to see alpacas**
   - Showing tourists spring and fall shearing days
3. **Farming**
   - Harvesting potatoes
4. **Food tasting**
   - Learn to delicious local cuisine
5. **Ceramics making**
   - Decoration of the bulls for the kids
   - Decoration relevant to the travellers
     - Christmas decorations

Learning from other developing countries: Nepal Yak Tourism

Nepal, a country in South Asia, has a long history of raising **Yak** which is a type of **himalayan cattle**. Similar to Alpaca, Yak is used for milk, cheese, meat and wool products.

To revive the Yak herding as cultural practice, the rural municipality and the association for Nepal Tourism board organized a **Yak festival** in 2017. It took place at an altitude of 3,560 meters and was organized on the Nepali New Year.

Governmental-level promotions event is **necessary not only incentives to revive yak culture but also to increase yak significance** in the hilly and high-altitude region (Nepali Sansar, 2019; My Republica, 2022).

Giri Raj Baskota / Republica A glimpse of the one-day yak festival organized at Charrate of Falelung Rural Municipality, on Saturday.

Source:
https://www.nepalisansar.com/culture/nepal-yak-festival-2019-promotes-eco-tourism/

The festival was not only beneficial to **promote Yak keeping business** but also brought in **business for the local tourism communities**.

Increased visitors and local hotels were all full. Had at least 1000 visitors from Kathmandu and nearby eastern districts (Nepali Sansar, 2019; My Republica, 2022).

Dairy products were kept in the exhibition. There were horse races, yak rides, local cuisines, folk music, and traditional Indian and Nepali dance performances.

Following this model, **an annual alpaca festival can be organized** where alpaca made products are kept in exhibition and tourists have the opportunity to taste local cuisine and participate in other activities.

It could be a great idea to increase national tourism as well.

Source: https://www.nepalisansar.com/culture/nepal-yak-festival-2019-promotes-eco-tourism/

Tourism Opportunities Summarized

1. Technical assistance in running the website and booking recommendations.
    - A scholar to oversee and implement digital marketing strategies

2. Workshops to increase participatory tourism
    - Harvesting potatoes with the host family
    - Hike up to see the alpaqueros
    - Participate in the alpaca wool shearing day
    - Knit garments from the alpaca wool

3. Explore inclusion of alpaca and trout farming in tourism (long-term plan)
    - Increased awareness of alpaqueros possibly leading to economic and cultural security
    - Logistical issues are important
    - Part of the larger tourism plan

ALL OPPORTUNITIES

All Opportunities Summarized

1. Whey

- Modify cheese recipe to reduce salt concentration at source
  - Use rinsed curds to make commercial products (ricotta)
- Use salty whey to make salt licks for cattle
- Use salty whey to pickle vegetables such as potatoes

2. Renewable Energy

- Further develop the biodigester design and test on-site prototypes to assess its viability
- Work with Local Suppliers to expand the existing use of mini grids

3. Trout

- Add leftover whey to trout feed
- Create cages to catch detritus and use or sell as fertilizer
- Add a separate trout cage for tourism purposes

4. Tourism

- Technical assistance on webpage management
- Opportunities for digital marketing
- Workshops model for participatory tourism

a. Alpaqueros

- Annual Alpaca Fair
- Learn about access to pasture and help their standing in the market

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- Joaquin Viquez (Green Empowerment)
- GreenWalk Trout Hatchery

APPENDIX A

Trout Cage Farming:

DO_2 : near saturation
CO_2 : < 2.0 ppm.
Temperature: 12-21°C
pH: 6.5-8.5
Manganese: < 0.01 mg/litre.
Iron: < 1.0 mg/litre.
Zinc: < 0.05 mg/litre.
Copper: < 0.006 mg/litre in soft water or < 0.3 mg/litre in hard water

APPENDIX B

Sample Website link: https://shova8malla.wixsite.com/tech-clinic-2022