

# Supporting Text: Economic Geographies

*Keywords: subsistence, livelihood, value chain, raw materials, resource management, association.*

## Economic geographies

... look at the economic characteristics of one or various places over time. This means they are concerned with how money and resources interact with populations, ranging from their source, production, and movement, to how they organise societies on a more profound level, for example by influencing politics and households.

## Local economic characteristics

Rural communities in northern Peru are considered subsistence economies. This means they produce food and other products to satisfy their own needs through consumption. If they do have excess products, they might then sell these for profit.

The most common economic activities in northern Peru are fishing, farming, and livestock farming - all part of the primary sector.

## What is the *immediate* economic impact of El Niño?

- Injuries, loss of life, and loss of housing mean that people can't work.
- Agricultural land is flooded and animals kept as livestock die.
- There is extensive infrastructure damage.
- The available money is focused on reconstruction, which limits the money used to maintain necessary daily needs or to further societal investments.
- Transport challenges limit the potential for import from and export to other regions, impacting access to resources.

## What is the *long-term* economic impact of El Niño?

Review
<i>For a quick review of the introductory session, ask the students what the long-term economic impacts of El Niño are and how these come about before revealing these. If they need prompting, encourage them to think of how El Niño benefits these communities through natural resources.</i>

Fishing, agriculture, livestock, and by-products are all economic activities which increase with the long-term impacts of an abundance of water.

### *How are these activities economic?*

With subsistence economies, it may seem like there is no monetary element involved. However, we can think of these in terms of value. As such, we come to recognise that products, including those ranging from natural resources, carry a certain economic value which is returned to the family. Another way to think of this is to recognise how the families would have to spend money elsewhere to obtain the same resources for their everyday needs, such as food at a market.

Next, we will find out more about how these come about and how we know that these activities are indeed increased with an El Niño event.

### **Next up...**

We are going to look at how the El Niño phenomenon impacts the production of natural resources (and their by-products) in the area by comparing “before” and “after” measures for the El Niño event in 2017.

### **But first: box plots**

The economic data we are going to be looking at is presented to you in the form of a box plot. Let's take a quick look at how to read box plots so we can then use these for our case study.

We are going to be using box plots to **compare** a set of values in two different conditions: whether or not an El Niño event has occurred. For example, we will compare the amount of meat produced in a year with an El Niño event and a year without. For this reason, we are going to look at box plots as a visual indicator of difference, rather than focusing more deeply on each set of values.

Here we can see two different set of box plots, each representing a different set of values. We are going to be focusing on **one** specific factor: the box. It is important to mention that there are many factors in a box plot that we are overlooking (such as the whiskers, the outliers, and the statistical features such as the quartiles, the interquartile range, the mean, and the median).

We are going to be making observations such as:

- The box on the right is **larger** than the box on the left. (The box on the right has a larger distribution than that on the left).
- The box on the right has **higher** values than the one on the left.

From this, we can draw a very general conclusion that the quantity of meat produced during an El Niño event (right) is larger than during a year without an El Niño event (left).

### **(Advanced) Understanding box plots**

A box plot is primarily used to show the distribution of values. As we can see in this image, the main features are the box in the middle (in green), and the whiskers. The box accounts for 50% of the values we have, and each whisker represents the 25% on both the minimum and maximum ends (known as whiskers). To keep it simple, we are going to focus on the middle box as a representation of 50% of the values that we have, and the whiskers as a representation of how high and low the existing values are.

### **(Advanced: continued) Reading a box plot**

Let's try this out with the following box plot, which represents the tilapia fish species caught during the El Niño event of 2017, in an area with irrigation. The numbers on the left are the values that are represented in the box plot.

From looking at the box, we know that 50% of the values lie between 139.5kg and 35kg. From looking at the whiskers, we know that the maximum value is 200kg and the minimum value is 25kg. We also know that 75% of catch is over 35kg, and that 50% of the values lie within 104.5kg.

The value of 300kg is not accounted for within the distribution because it is an outlier, meaning it is an abnormal value which would decrease the accuracy of the distribution.

### **Fishing**

This graph shows how El Niño impacts fishing productivity. We know that the abundance of rain fills the lakes, allowing fish populations to grow.

On the left, we are looking at the amount caught per trip that the fishermen made out on the lakes. The box on the left shows the amount caught during a non-Niño season, and on the right during an El Niño season. We can see that this increases dramatically during an El Niño year.

The graph therefore tells us that overall, fishermen catch a lot of more fish per trip after an El Niño event, rather than before. We can also think of how the overall amount of fish caught will be bigger if fishermen are going on more fishing trips.

### **Agriculture**

These graphs show how El Niño impacts agricultural production. We know that increased rain irrigates the desert lands, resulting in an increase in vegetation growth. We also know that sediment from overflowing rivers carry sediment to fertilise the land.

The graph on the left shows us the area of land that is harvested. We can tell from the two boxes that the area used for agriculture is a lot larger during an El Niño event, as the box on the right has much higher values. The graph on the right shows the quantity of crops that are produced, comparing them between a non-Niño year and a year with an El Niño event. It shows

that for different types of crops, in this case cotton, maize, beans, and pumpkin, there is always more produced during an El Niño event.

## **Livestock**

This graph shows the impact of El Niño on livestock farming. We know that livestock farming is impacted by El Niño because, when there is more vegetation in the area, there is more food for the animals to feed on and they become healthier. When the animals are healthier, they are more likely to have more offspring.

The graph on the right shows meat production per year – the amount of meat that is produced from farms, indicating that more meat is produced during an El Niño year than a year without an El Niño event.

## **So, what happens to these products?**

We have seen that there is an increase in products, also known as raw materials, during an El Niño event. These include fish, crops such as corn or pumpkin, and meat, as well as by-products such as honey.

To find out where these products go, we're going to look at the value chain. A value chain shows the steps through which a raw material becomes a finished product for consumption.

## **Production**

We have seen that the raw materials available in northern Peru start as either fish, vegetation, or animals. Then, in the process of production, these are turned into materials to be consumed. Fish are stored in either salt or ice to be transported. Crops are harvested to be consumed as such or to create further products from them, such as honey from carob trees. Animals are farmed and used for meat or other products, such as milk. All of these are then ready to be consumed.

## **Destinations**

These products can end up in various destinations, particularly when there is an increase in production such as the one brought along by an El Niño event.

First, as we saw with subsistence economies, the products may go back to the farmers' and fishermen's homes for their own consumption. Second, the products may be sold locally to community members. Third, the products might be transported to larger cities to be sold in markets. Lastly, the products might be sold to stockpilers, or intermediaries, who collect the raw materials from producers to then sell it themselves. This means that they take the job of transporting the products and finding the final consumers.

An example of this are vans that collect fish from the fishermen directly from the lakes, and then transport them into the city for sale in markets.

## **Consumption**

These destinations are shown here in the final stages of the value chain. After the process of production, the products are either consumed, sold directly to a consumer, or sold to intermediaries who then sell to the final consumer.

The sale of products occurs on different scales. It can be at a small, local level where the product remains in the community, at a larger scale when products are transported to larger cities, including the capital, Lima, or at the largest scale, the products can be exported to other countries, such as neighbouring Ecuador or even the UK.

## **How does El Niño impact the destination of these products?**

This graph shows us the proportion of the products that go to different destinations, comparing a non-Niño year with one that had an El Niño event. We can see that the main difference between the two years is that without an El Niño event, personal consumption is very high. However, with an El Niño event, sales to intermediaries are very high.

We can make sense of this by recognising how, with greater products, there is more excess product (or product that is leftover after meeting their own personal needs). Therefore, external sale and the use of intermediaries increases when production increases.

Own consumption might also decrease because individuals will have more money from sales to buy resources they want, rather than immediately needing to provide products for the family.

## **Challenges**

Fishermen and farmers face multiple challenges with fishing and farming that relies on El Niño rainfall. These include:

1. Transport to and from the lakes is difficult because of a lack of roads. There are no roads or other infrastructure because the lakes are temporary and there is therefore little incentive to invest in these.
2. Fishing and agricultural materials are costly. Farmers and fishermen need to purchase methods of transport, fertilisers, nets, materials for rafts, and other equipment to carry out these activities.
3. Political requirements make it difficult to fish and sell fish freely. Let's take a closer look at this by looking at resource management.

## **Resource management**

One of the biggest challenges faced by fishermen is that the local lakes are not politically “official” because they are temporary (they come and go with El Niño rains). This means that the lakes are not officially recognised as an element with natural resources.

As a result, there are no specific laws that cover these lakes. As they are water-based, the laws for fishing in the sea are simply applied to the lakes. This limits in-land fishing because fishermen can only catch fish within a certain size range. Sometimes, policemen control the roads between the lakes and cities, stopping fishermen to inspect the size of the fish. If their fish do not meet the requirements, the policemen take the fish and throw it out, causing waste and loss for the fishermen.

However, by prohibiting the catch of smaller or larger fish, there are large quantities of fish that are left in the lakes when they dry up, as the image shows. These fish could have been caught and eaten, thus producing a waste of resources that could have been taken advantage of.

### **Worker associations**

Residents working in the same areas and economic activities often form worker associations. These are groups of workers, much like unions, who come together to advocate for better working conditions.

For example, the fishermen who fish in temporary lakes gather in associations to ask political authorities to officially recognise the lakes, and to create regulations that are different to those for fishing in the sea. This will allow the workers more flexibility, better resource management, and will recognise the experiences of the El Niño phenomenon of the inhabitants of the area.

<b>Activity</b>
<i>Ask the students to summarise the main points learned throughout the lesson before taking them through to the conclusions.</i>

### **Conclusion**

1. Rural communities in Peru rely on farming and fishing for subsistence.
2. While immediate impacts of El Niño are negative for economic activities, they are positive in the long term.
3. Fishing, farming, livestock farming, and by-products increase with El Niño events.
4. The products are consumed both locally and on wider scales.
5. Resource management is a significant challenge for communities trying to take advantage of raw materials.