

At the last meeting, for Lesson Five, you were asked:

look through your seed catalog and choose the type of potato you would like to grow. At our next meeting we will vote on which seed potatoes to buy. Be able to explain why you choose your potato variety.

Please write me with the name of the catalog and the name of the potato. I will compile a list and then we can vote.

Lesson Six - PLANTMASTERS' YEAR 2020 P³ YEAR POTATO Section

This year we will try to learn a little about each of the three Ps at each meeting. Parts of the lesson are marked ADVANCED. Younger members can ignore these parts. **Make sure you do everything that is in bold print.** If there is a laboratory and/or an assignment, complete them, and do one of the projects at the end of the chapter. Bring the project to the next meeting. WORDS PRINTED IN ALL CAPITAL LETTERS may be new vocabulary words. For help, see the glossary at the end of the lesson.

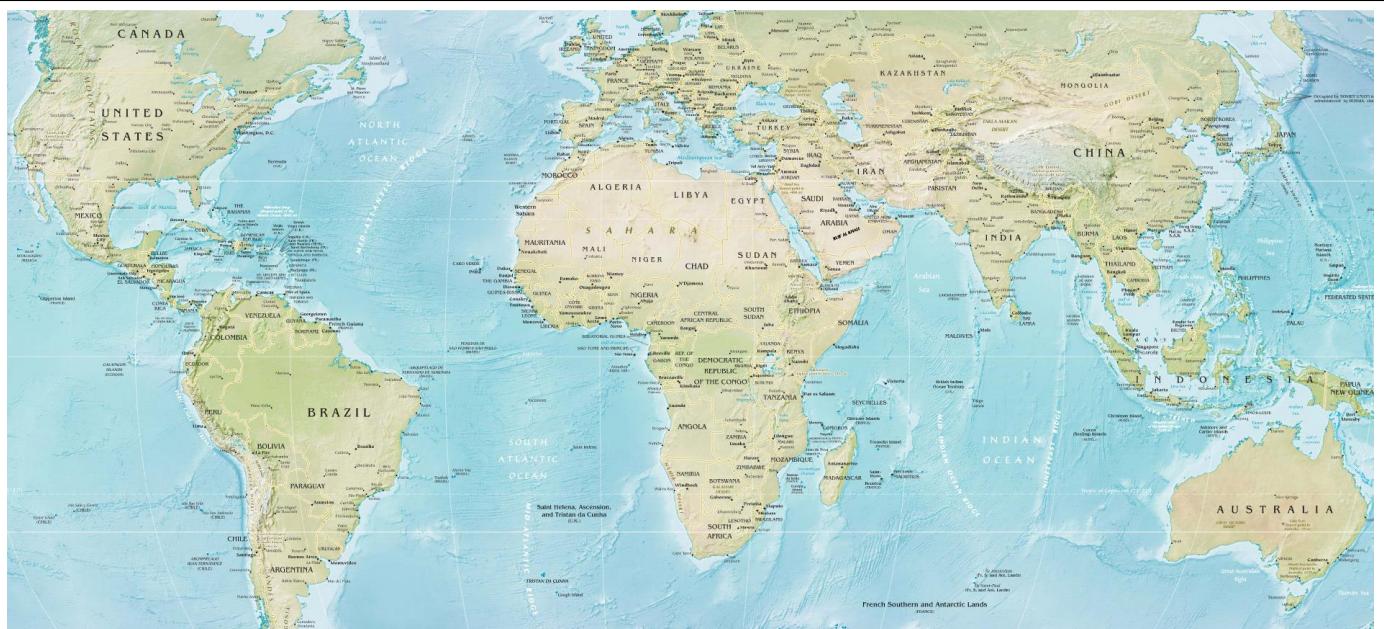
INTRODUCTION to Lesson Six

In this lesson we will learn more about potatoes and where they originated. We will move on to how bees collect nectar and pollen. We will end with some phenological observations.

First P of P³ – Potato

ORIGINS AND SPREAD OF POTATO, *Solanum tuberosum*

There are 1500 to 2000 SPECIES in the GENUS *Solanum*. The GENUS *Solanum* includes potato, tomato and eggplant. Most of the SPECIES of *Solanum* originated in the New World. A big exception is the type of eggplant we grow in our gardens, which is an Old World plant. Potato (*Solanum tuberosum*) finds its origins in Andes Mountains in Peru and Bolivia, tomatoes (*Solanum lycopersicum*) originated in western South America, and the eggplant we know (*Solanum melongena*) comes from India. **Find Peru, Bolivia, western South America and India on the map in the box below. Circle Peru in red, Bolivia in purple, western South America, in blue and India in yellow.**



CIA Fact Book – Public domain.

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The mountain people of Peru and Bolivia were using wild potatoes 8,000 years ago. These people DOMESTICATED potatoes about 6,000 years ago. Potatoes might be one of the first plants grown as a crop in the New World. The Inca people continued developing new breeds. The word for potato comes from the Inca word for potato, 'papa'. The potato was central to the Inca way of life. They built an entire empire on the tubers of this plant.

Potatoes were probably introduced by the Spanish and other slave traders to Africa as a cheap food for slaves. In about 1570 the potato was introduced to Spain. It was taken to the other countries of Europe. At first it was considered poisonous. Within 100 years, potatoes were grown all over Europe. It was introduced to India in 1610, to China in 1700, and Japan in 1766. In the early 1700's Scotch-Irish migrants took the potato to North America. Potatoes became more and more important as people realized that this crop could provide more calories at a lower cost than grain.

Go back and reread the last paragraph. While reading find all the countries listed on the map on the previous page. **Do what you are directed in the table below.**

Make a green arrow to Spain.	Circle Africa in Orange.	Make an orange arrow to China.	Circle Japan in red.
Circle Europe in black.	Circle North America in blue.	Circle Ireland in green.	

WHO WERE THE INCA? The Inca of Peru were one of the great civilizations of the Americas. They were the largest empire in the New World before the arrival of Columbus. The Inca continued developing new breeds of potatoes that their predecessors had first DOMESTICATED. A single government controlled many different tribes. The empire lasted only 100 years, from 1438 to 1532. In 1532 the Spanish conquered the Inca, taking all their gold and silver. They left the highly developed civilization of the Inca in ruins.

HOW THE INCA GREW POTATOES

There were two big differences between agriculture in the Old World and in the Americas. In Europe animals were DOMESTICATED widely. Some animals

ADVANCED - The Spanish, in their quest for gold, did not realize the importance of the tubers they saw in the Inca store houses. The Spanish used it as food for the indigenous people and had little other interest in this plant. In the quote below, however it is called a treasure.

"The Spanish conquistadors first encountered the potato when they arrived in Peru in 1532 in search of gold ... At the time the Spaniards failed to realize that the potato represented a far more important treasure than either silver or gold ..." from *The Impact of the Potato* by Jeff Chapman

ADVANCED When the Europeans arrived in the Americas, they found people practicing a sophisticated agriculture. The agriculture in many parts of the New World was superior to the agriculture practices in Europe. Remember, Europe had not been out of the Dark Ages for very long. It is now thought that agriculture is as old in the New World as it was in the Old World, starting over 10,000 years ago. It is important to remember that 9 of the 30 most important agriculture crops came from the Americas. These crops were already being used by the indigenous peoples of the Americas when the Europeans came. 60% of the daily diet eaten by people all over the world today comes from crops which the Native Americans domesticated. It is estimated that over 1200 species of plants were used for food and drinks by the native peoples of the Americas. Native Americans had domesticated over 300 food crops. New seeds were traded actively between peoples.



The Inca Empire
Attribution at the bottom of lesson as #1.

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ADVANCED The Inca called their empire “Tawantiinsuyu”. In Quechua, a language of the Inca, Tawantiinsuyu means ‘Realm of the Four Parts’ as it was made up of four parts. Can you see the four parts on the map above? The capital, Cusco, was located where all four parts come together. **Find this place and draw an arrow to it.** Although we use the word Inca for the people, the word itself means lord or ruler. The word referred to the emperor.

Many scholars would say that the entire empire was based on the potato. The potato provided the “food” an entire civilization became based upon. Potatoes were so important the Inca people measured time in how long it took to cook a pot of potatoes. A papacancha or topo was the amount of land a family needed to grow enough potatoes to feed themselves.

were used in farming, for example to plow. Most of the Native Americans did not have domesticated animals, none used them for help with plowing. Also, most Native Americans did not have iron. Farming tools were made from wood, shells, and animal bones.

The fields would be plowed using a foot plow called a taclla. A taclla was a 5 to 6 foot wooden stick with two handles. The tip

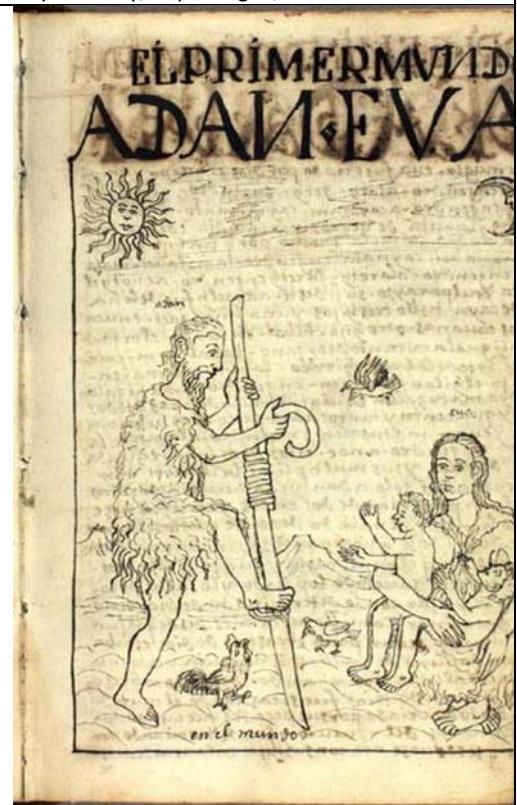
was either copper or hardened by fire. The farmer would use his weight to turn the heavy soil. Similar tools with steel tips are used today. A stone-tipped club was used to break up soil clods. There were also bronze-bladed hoes and digging sticks.

Modern Day taclla.



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Drawing from Felipe Guaman Poma de Ayala's *Primer nueva coronica y buen gobierno*, Photo courtesy of the Digital Research Center of the Royal Library, Copenhagen, Denmark.



Agriculture was difficult for the Inca people. Much of their empire was mountainous with limited amounts of land that could be easily farmed. Water was also scarce. The Inca solved these problems by farming on terraces and building canals. Terrace agriculture had already been used by the pre-Inca people. The Inca improved on their ideas. Stone walls were built to make raised level

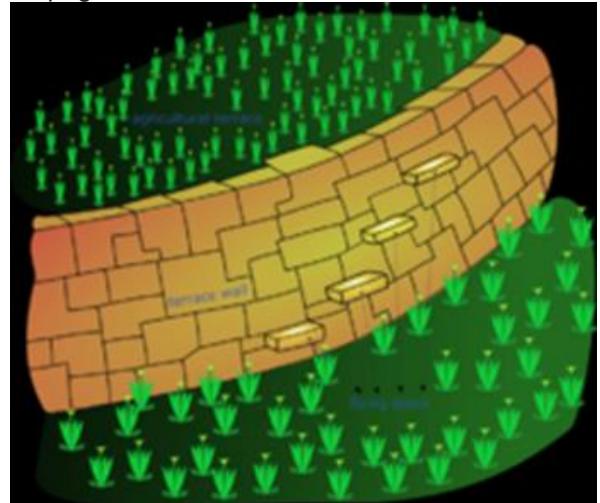
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fields. These fields formed “steps” on the sides of the hills which were too steep to plough or irrigate. Soil would be carried to the terraces. These terraces created more land to farm. The top soil would also not be washed away in heavy rains.

By Martin St-Amant (S23678) - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=8450312>



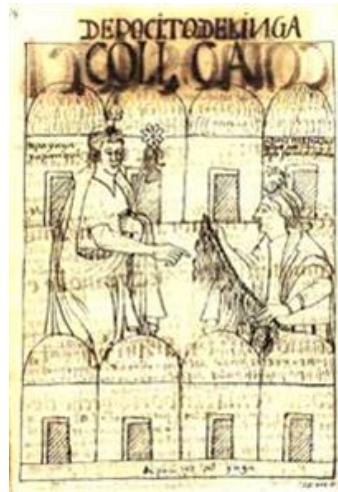
Diagram showing Inca terrace engineering for agriculture. Notice the stone walls and the steps. https://commons.wikimedia.org/wiki/File:Inca_terraces_en.png



ADVANCED The Inca had an extraordinarily sophisticated agriculture. Around the capital city, experts developed new breeds of potatoes and other plants. They used different terrace levels to mimic the different climates of the empire. From this one “experiment station” the Inca developed plants for the entire empire, 3,400 miles long with 10 million people. These experts would teach and advise the people on breeds, how to use new techniques for irrigating or draining land, and how best to terrace and plant. The Spanish conquerors were amazed at the amount of food the Inca had stored in the government granaries. Some of the harvest went to support the ruler and government, but most of the harvest was kept in a central storage place to be given to the people as needed. Food was available even if crops failed.

Water was also a problem. It rains from December to May in the Andes. Some years there is hardly any rain at all. The Inca constructed canals that would bring water to the terraces and to other fields. The Inca system of aqueduct rivaled any found elsewhere in the world.

Government Granary - Felipe Guaman Poma de Ayala



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https://en.wikipedia.org/wiki/Incan_aqueduct#/media/File:Incan_aqueduct_at_Tipon,_Cusco,_Peru.jpg



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ASSIGNMENTS FOR LESSON SIX - Potatoes

1. Explain how the Inca used these.

a. Terrace - _____

b. Quipu - _____

c. Taclla - _____

2. Find Attachment 1 on the next page. Complete the table. I will email you a document with colored pictures. I know some of the detail is hard to see in some of the copies.
3. Make a quipu. Follow Mr. La Favre's directions found in Appendix A. It is at the website lafavre.us/plantmasters

PROJECTS FOR LESSON SIX - Do at least one of the projects described below.

- Attachment 2 includes three myths. Read these and draw a picture for one of the myths in Attachment 2.
- Older members, read https://hort.purdue.edu/newcrop/Hort_306/reading/Reading%2014-3.pdf on the lives of the Inca OR *Farming Like the Incas* at <https://www.smithsonianmag.com/history/farming-like-the-incas-70263217/>

Younger members go through the lesson at <http://www.historyhistories.com/about.html>

You can either write a summary, or make a set of drawings depicting aspects of Inca life.

GLOSSARY FOR LESSON SIX - Potato

domestication – animals - to tame and breed for human use
plants – to adapt and cultivate for human use

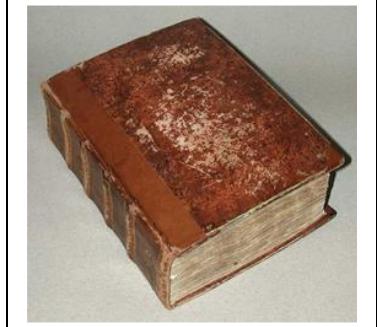
genus/genera – A group of plants (or other living things) . A genus has one or more species which have certain characteristics in common. The italicized names are the scientific names of plants. Plants can have many common names, but they each have only one scientific name. The genus is always capitalized and the species is never capitalized.

species – A group of similar organisms which breed only among themselves.

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Attachment 1

Felipe Guaman Poma de Ayala wrote *Primer nueva coronica y buen gobierno* (*The First New Chronicle and Good Government*) around 1615 (less than 100 years after the Spanish got to Peru). It is 800 pages long with about 400 drawings written mostly in Spanish. In the early 1660s, the Danish Royal Library received a copy. It was lost on a shelf until 1908 when Richard Pietschmann found it. It is an extraordinary chronical of the life of the Inca. Use the table below and the drawings on the next page to recreate the Inca calendar. **You can go to Appendix A at the web site for enlargements of the originals or line/water color re-creations. Details are easier to see.**



Name of month	What is the farming activity?	Answer or do.
January		What tool are the people using?
February		Circle at least 3 animals which are attacking the crops and the lady banging on the drum.
March		Circle at least 4 birds.
April		Circle the thief.
May		What are sheaves?
June		We dig up potatoes in the fall. Do you know the seasons are opposite to ours in Peru? Learn why.
July		What is a granary?
August		What other months did the Inca guard their fields?
September		What is “maize”?
October		What do you like about this drawing?
November		Where is the water coming from?
December		What is uqa?

* Quechua, pronounced qheshwa, is the language spoken by the native peoples of the Andes of South America. 13 million people in Bolivia, Peru, Ecuador, North Chile Argentina and Southern Columbia speak this language today. It was the official language of the Inca Empire.

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All the drawings from Felipe Guaman Poma de Ayala's *Primer nueva coronica y buen gobierno*, Photo courtesy of the Digital Research Center of the Royal Library, Copenhagen, Denmark.

Attachment 1

January: Maize, time of rain and digging up the earth; *Qhapaq Raymi Killa*, month of the greatest feast.

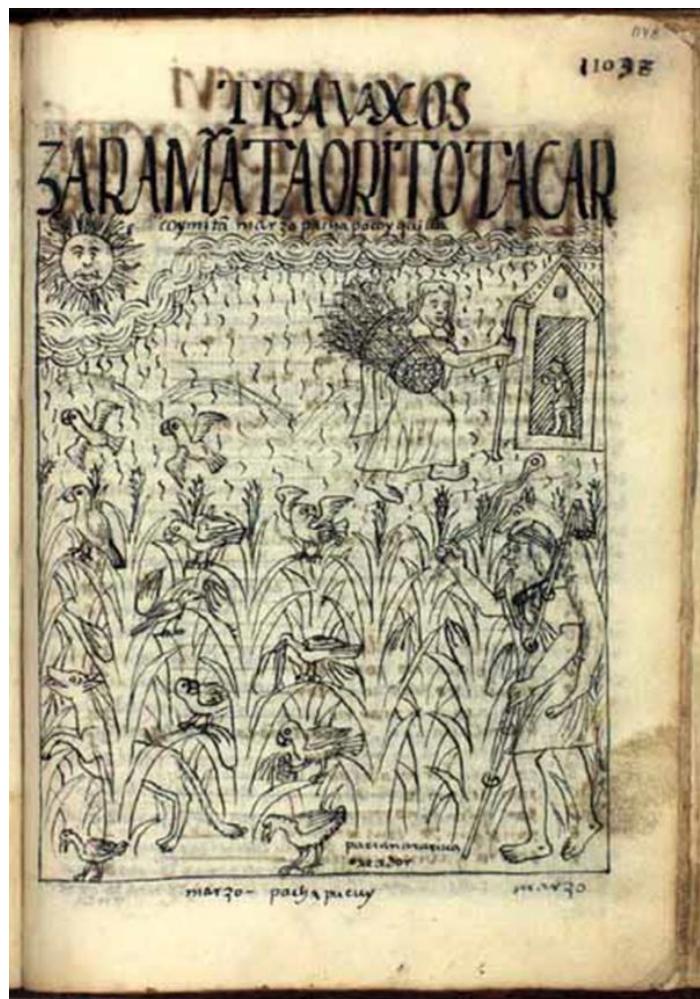


February: Time of watching the maize at night; *Pawqar Waray Killa*, the month of donning loincloths.



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March: Time of chasing parrots from the maize fields; Pacha Puquy Killa, month of the maturation of the soil.



April: Maturation of the maize, time of protecting it from thieves; *Inka Raymi Killa*, month of the Inka's feast!

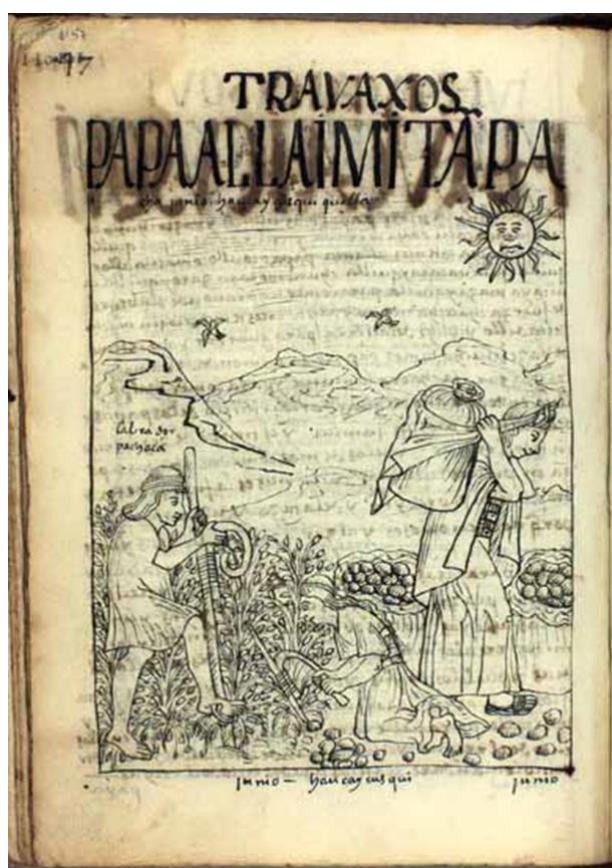


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May: Time of reaping, of gathering the maize; Aymuray Killa, month of harvest.



June: Time of digging up the potatoes; Hawkey Kuski Killa, month of rest after the harvest.

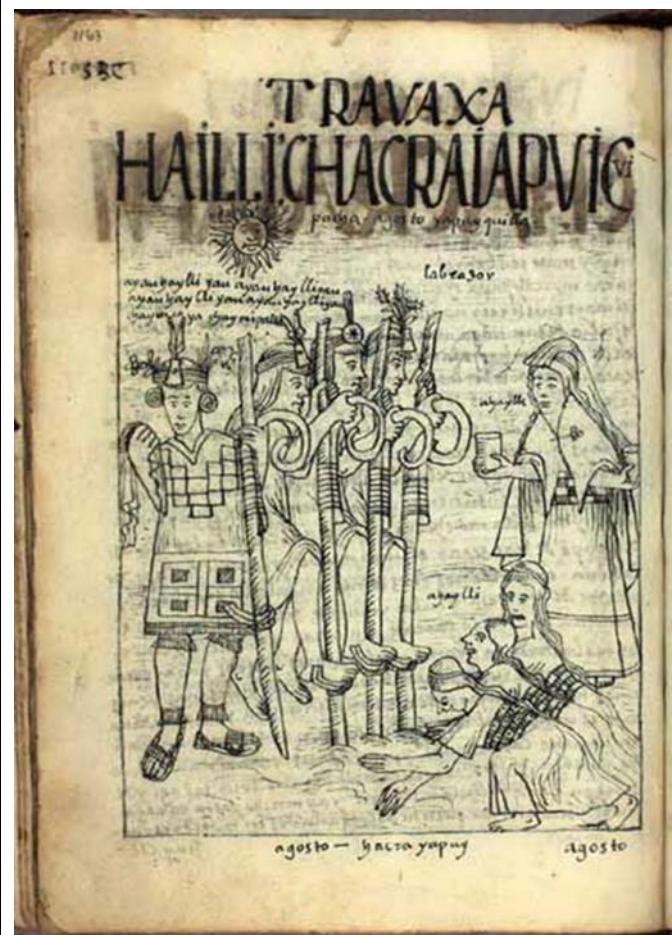


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July: Month of taking away the maize and potatoes of the harvest; *Chakra Qunakuy Killa*, month of the distribution of lands.



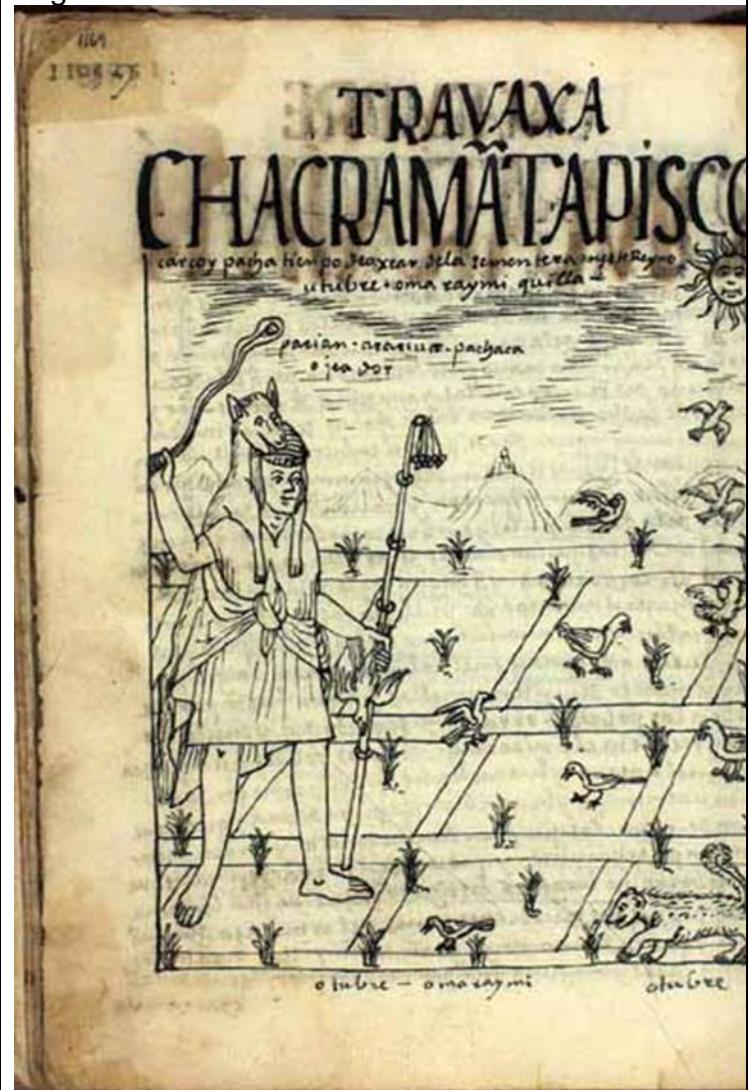
August: Triumphal songs, time of turning the soil; *Yapuy Killa*, month of turning the soil.



September: Cycle of sowing maize; Quya Raymi Killa, month of the feast of the queen, or quay.



October: Time of watching over the fields in this kingdom; Uma Raymi Killa, month of the feast of origins.



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November: Time of watering the maize, of scarcity of water, time of heat; Aya Marqay Kill, month of carrying the dead.



December: Time of planting potatoes and uqa, tubers; *Qhapaq Inti Raymi Killa*, month of the festivity of the lord sun.



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Attachment 2

Andean Legends of the Origin of the Potato GIFT OF THE GODS

These are taken from the *Potato, Treasure of the Andes From Agriculture to Culture*, edited by Christine Graves.

A. One myth tells us of the birth of agriculture. Viracocha-Pachacamac, the creator and renewer of the world, the maker of matter and time, sent his two children, Imai Maman and Tocapu, to visit the realm where people lived. He ordered them to observe the plants that grew there, and to study and classify them. They would show people which plants were good and which were bad, which were nutritious, which had medicinal properties, and which were poisonous. They were to teach these people, who Viracocha-Pachacamac had created, the knowledge of sowing crops and how to use them properly so that they would never lack food.

For 8,000 years, farmers have dug deep into the furrows of the earth to extract the food and energy placed by the Creator at the service of humanity. During this time the potato has lived side by side with humans, playing a vital role in rituals such as the summer solstice festival and the sacred ceremony to honor the full moon. The ancient inhabitants of the Andes named the moon Mama Quilla, the lady and mistress who conferred fertility upon women and also made Mother Earth, Pachamama, germinate so that she could offer up her potatoes at harvest time.

B. According to an Andean legend, the people who planted the quinoa grain conquered the highland communities, planning to let them die out slowly by cutting back gradually on their food supplies. On the verge of starvation, the poor prayed to the Heavens. God sent them a handful of large, fleshy seeds which, when sown, grew into beautiful plants that embellished the highland plains with their purple flowers. The invaders showed no opposition, planning instead to confiscate the harvest. When the plants had withered and their fruits appeared to have ripened, the overlords invaded the fields and took what they assumed to be a bountiful harvest.

Desperate and starving, the oppressed prayed to the Heavens once more, and they heard a voice saying: "Dig into the earth and pull out what I have hidden there to fool the evil and raise up the good." They did as they were bid, and found, beneath the soil, the magnificent potatoes. The highlanders harvested all the tubers and hid them in secret stores. Every morning, they added a few potatoes to their hunger rations, and soon they grew strong enough to overthrow their oppressors. The overlords, seeing that they had been defeated, fled. Never again did they disturb the peace of the mountains.

(Based on a myth from Andahuaylas, Apurimac, Peru)

C. But the potato's saga must also be traced in the labyrinth of myth, the fathomless depths of the centuries from which it reaches us in the form of magical tales. One such story is about a woman who was the sole survivor of the extreme poverty that ravaged the first inhabitants of the Andes. She eked out a living in the arid desert sands until one day she fell asleep under the scorching sun. As she slept, she was impregnated. She bore a son and did her best to feed and care for him. But the child died, and his remains were scattered across the land. Maize sprouted from his teeth, manioc from his long white bones; sweet potatoes grew from his brains and potatoes sprang from his testicles. His eyes, his hands and his head, likewise, sprouted food, and the land soon teemed with crops so that people would never again die from hunger.

Appendix A – Directions for making a quipu, only on line.
Look on line, Make your own quipu.

