## What is Taro?

*Colacasia esculenta* is the species designation for a group of plants in the Araceae (aka Arum) family. Within this family, there are some edible root crops, one of which is commonly called taro. *Colocasia esculenta* also represents a wide range of landscaping plants often called Elephant Ears. In addition, the common name taro is sometimes ascribed to *Xanthosoma sagittifolium*. The two species are somewhat similar in growth, and their starchy corms are used similarly, so the confusion is easily understood. The broad botanical distinction is that *Colocasia esculenta* is native to Southeast Asia, while *Xanthosoma sagittifolium* is native to tropical America, leading to a Eurocentric description of Old World Taro vs New World Taro. An extremely important difference for Utopian Seed Project's work, and this report, is that *Colocasia esculenta* has proven easy to cultivate and produce, while *Xanthosoma sagittifolium* grows vegetatively, but produces little in the way of harvestable yield. For the rest of this report, we will refer to taro with the understanding that we are talking about *Colocasia esculenta*.

Taro is grown across many tropical and subtropical parts of the world. The FAO reported that 18 million tonnes of taro were produced worldwide in 2022. As a culinary crop, the primary yield is usually the underground corms and cormels, but the leaves and petioles are also eaten. All parts of taro must be cooked before eating because of the presence of calcium oxalate raphide crystals, which can cause intense irritation when consumed raw or undercooked. As a crop that was domesticated as much as 5,000 years ago, taro has a wide range of culinary applications. A 2023 paper titled, *Taro Roots: An Underexploited Root Crop*, with lead researchers from North Carolina A&T, noted, "Considering the sustainability and high nutritional value of taro roots, it is worth exploring their potential to thrive in warmer regions of the USA."<sup>2</sup> This report focuses on taro as a diversified crop for small-scale market farmers, but there is broader potential still to be explored.

Taro is described as a single polymorphic species, with most horticulturists further breaking the species into two botanical varieties - *C. esculenta var. esculenta* and *C. esculenta var. antiquorum.* A report by the Taro Network for Southeast Asia and Oceania (TANSAO) found the described taxonomic differences unhelpful in distinguishing varieties and preferred a system of named cultivars and cultivar groups. While Utopian Seed Project claims no taxonomic expertise

<sup>&</sup>lt;sup>2</sup> Ferdaus, M. J., Chukwu-Munsen, E., Foguel, A., & Da Silva, R. C. (2023). Taro roots: an underexploited root crop. Nutrients, 15(15), 3337. https://doi.org/10.3390/nu15153337

about taro, we have internally broken our taro into two groups that we have described as Tropical Taro (a large corm and a smaller number of cormels, aka Dasheen Taro) and Temperate Taro (a high number of small cormels, aka Eddoe Taro). The descriptions in Table 1 closely align with our experience of two distinct taro types, but we have not done further work to identify them with confidence.



Annotated parts of a taro plant

Source: Fang, Q., Matthews, P. J., Grimaldi, I. M., De Jong, H., Van De Belt, J., Schranz, M. E., & Van Andel, T. (2024). The invisible tropical tuber crop: edible aroids (Araceae) sold as "Tajer" in the Netherlands. *Economic Botany*. https://doi.org/10.1007/s12231-024-09624-y

# Table 1. Characteristics differences between Colocasia esculenta var. esculenta and var.antiquorum.

	Colocasia esculenta var. esculenta	Colocasia esculenta var. antiquorum
Geographic origin	SE Asia (including India)	Developed and selected in China and Japan after introduction from Southeast Asia
Geographic distribution	Polynesia, Southern China, Eastern Mediterranean, Egypt, Africa, West Indies, Trinidad	East Asia, Japan, Northern China, West Indies, Puerto Rico, Trinidad, Hawaii, Southern USA
	Mainly, large corm and petioles are used for food.	Mainly, small cormels are used for food. In some varieties, the main corm is acrid and inedible. Some cormels are practically free of acridity.
Corm size and number of cormels	Large main corm, cylindrical, edible, and 4–8 sucker cormels.	Small to medium-sized main corm and a large number of edible cormels (15–20 or more)
Uses	Main corm, leaves, and petioles used for food	Small cormels used for food

Source: Farm and Forestry Production and Marketing Profile for Taro by Harley I. Manner and Mary Taylor

## A Guide to Growing Taro in North Carolina

We have found that growing taro in Western North Carolina is fairly easy and productive. The following section is designed to give an overview of our growing procedures that we have refined over the last 5+ years of growing taro, and is specifically informed by our recent trials under the on-farm research grant.

## **Taro Propagation**

Taro is clonally propagated by taking the mother corm or smaller cormels of the underground growth and planting them. The propagation material will sprout and produce a new taro plant, which will produce more underground corms and cormels.

In Hawaii, it is the practice to harvest taro and then slice off the top section of the corm (with the growing point) to immediately replant. Our temperate season, with freezing winter temperatures, does not allow for this style of propagation, so we store corms over the winter and replant in the spring.

We often replant the whole corm or cormel to grow a new plant, below we have results from our On-Farm Trials suggesting that planting larger pieces will give higher yields. We assume this advantage will level off at some point, but further research is necessary.

We have also sliced the top off larger pieces, as they do in Hawaii, but for us, after winter storage. This allows us to plant the top section and still eat the lower section. This has worked for bigger corms and, anecdotally, led to faster and more vigorous rooting.

In summary, we have a propagation system that works. Taro is easily propagated from the mother material, much like many other clonally propagated plants, but there is still work to refine and improve the technique for our region.

### Growing Taro

Taro is a frost-sensitive plant, but the underground growth is cold-tolerant. We have observed taro overwintering in the ground. We have yet to establish the extremes that taro can tolerate,

but one 'perennial' patch has survived minus 1°F (Korean Taro). We assume that different varieties have different cold tolerances. This allows for a few different planting tactics:

**One:** Plant your taro as soon as you harvest it with the aim of overwintering. **This is not a tactic we have tried**, but it is possible to have a planting bed ready and replanted on the same day as harvest. We would suggest a deep planting to protect from ground freeze, perhaps 6-8". The corms/cormels should overwinter and sprout the following season as the weather warms. A future research project would be to fall-plant the taro (October) and overseed with an overwintering cover crop mix. The cover crop could be terminated in late April or early May, with the possibility that the taro will emerge through the mulch end of May or the beginning of June.

**Two:** Plant your taro early in spring once the ground is workable. If we have beds ready and prepared, then we prefer this tactic. It's useful to get an early planting on crops that we can, it's quicker and easier to plant a dormant piece of plant material than transplant a live plant. On the same note, you don't have to dedicate a heated growing space to transplants and all the time and energy it takes to nurture them. We planted taro on April 1 with great success, with a planting depth of about 6". The taro emerges as the soil warms. Occasionally, we'll cover with landscaping fabric ahead of emergence to warm the soil and control weeds.

**Three:** Taro can be treated like starting tomatoes. Corms or cormels can be bedded into pots (min 3" pots) or flats to pre-sprout in warm conditions (heat mats) about 4-6 weeks ahead of the average last frost date. Once they've broken dormancy and started sprouting, they can grow quite quickly and develop dense roots. Following standard transplant procedures, the plants can be hardened off ahead of transplanting into the field.

Typically, we see 3-4ft plants, but 6ft + is also possible. We have traditionally planted taro at 12" spacing, but results from the On-Farm Trial have persuaded us to increase to 18-24" (see below). The plants are erect and self-supporting. Taro can tolerate light to medium shade, and perhaps even heavier shade in some circumstances. Taro can also tolerate 'wet feet' and could be suitable for otherwise marginal growing areas with periodic flooding or standing water.

We have found taro to be tolerant of a range of conditions. We have grown taro in unirrigated rows (yield is likely to be lower if taro experiences long drought periods); in irrigated rows; in areas that could be described as soggy; and one of our growers grew taro in a submerged

system with periodic draining (he noted that while it worked, the yield wasn't much different to normal row culture). We imagine taro would do ok in medium-large containers, but haven't tried this ourselves. We have not investigated fertility requirements, but at our experimental farm, we don't fertilize beyond occasional compost applications and cover crops, and taro has grown well for us. Our farmers' interviews (see below) reveal a wide range of growing conditions, with varying yields. Our On-farm Trial also revealed that corm plant size and plant spacing have a strong impact on yield. More research will reveal ideal practices for maximizing yield.

We have not noticed much pest or disease pressure. The calcium oxalates seem to discourage deer, groundhogs, and voles, however we have had reports of foliar damage from some growers, and overwintered corms in the ground are susceptible to voles. We've seen a small amount of Japanese Beetle damage, but not significant. The classic viral diseases that plague some tropical taro growers don't yet seem present in our region. We'd still recommend good crop rotation.

#### Taro Harvesting

Taro can cause skin irritation for some people, usually presenting as itchiness but sometimes hives. Gloves are recommended when harvesting larger quantities.

#### Taro Leaf Harvest

The leaves and stems of taro are edible as long as they are cooked for a sufficient time (one chef has said 40 minutes for the Korean Taro variety). If growing for leaves, the plants can be spaced more closely (perhaps 6"). Harvesting the outer leaves allows new growth to come through.

The impact of leaf harvest on yield requires some further research. Our On-farm trial suggested that there was not a strong impact on yield, however, a report from Hawaii suggested that leaves can be harvested at any time during the growth of taro, but corm yields will be reduced if more than 3 leaves are picked per plant.<sup>3</sup> The same report noted that only young taro leaves are used for cooking, and you can harvest the tender unfurled leaves (within the stem) at the same time as the main corm harvest.

<sup>&</sup>lt;sup>3</sup> Taro Production guidelines for Kauai. (n.d.). http://www.extento.hawaii.edu/Kbase/reports/taro\_prod.htm

#### Taro Corm Harvest

The corms and cormels of taro are usually harvested after a long growing season (6-12 months in the tropics). In Western North Carolina, our season is shorter than taro's natural growth cycle, and so we like to leave taro in the ground for as long as possible (often allowing the first frost to knock back the leaves). The new cormels can sometimes push above the soil surface during growth. Unlike potatoes, there is no risk from sun exposure, but heavier freezes will damage the exposed eddoes. Taro plants can be dug much like potatoes, using a spade or fork to dig down about 1ft back from the center of the plant and lifting the plant. In loose soil, sometimes the entire plant can be lifted from the soil without digging. We have also used a potato plow to lift larger row plantings with success. Soil can be shaken loose from the root structure, corms and cormels tend to clump strongly together, but some cormels will break off during harvest. Spraying with a hose in the field can also release a lot of soil trapped between the cormels. We chop off the main stem a few inches above the corm and stack it into crates to be removed from the field.

#### Taro Storage

Taro can be eaten straight away (as long as it's cooked), but it also serves as a good winter storage crop. In addition, the propagation material needs to survive the winter to be replantable the following spring/summer. In our experience, taro can be cleaned by removing the stem and hosing or brushing off any clumps of dried soil. Taro benefits from being cured ahead of storage. This allows any harvest wounds to heal and the outer skin to dry. Under traditional post-harvest systems, curing is accomplished by placing corms in the sun until any harvest-damaged surfaces dry out. Corms can also be cured in naturally ventilated barns or other storage structures. Curing is less effective if damage to corms is extensive. We lay the corms and cormels on drying racks in a well-ventilated greenhouse for a week or two before moving to longer-term storage.

Taro stores well in potato-like storage conditions, which are cool and slightly humid. Some winter spoilage occurs, so periodic monitoring is advised. Too much airflow or dry conditions can lead to the taro corms drying out. Too much humidity can lead to rot. We stack them in crates and cover them with a cloth. This keeps them dark and allows for air exchange, but prevents them from drying out. The recommended temperature for prolonged storage is 45-50°F with a relative humidity of 85.