



Figure 1: The geography of Turkey is extremely mountainous with most of the agriculture occurring in river valleys and plains along the coasts.
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Turkish Agriculture

Grapes, figs, pomegranates, mulberries, walnuts, pistachios, apricots, cherries, almonds, chestnuts, apple, pears, wheat, olives, and barley. These are all crops that arose in the area now known as Turkey according to Nikolai Vavilov. It is a “center of origin” of cultivated plants, and from Turkey these crops have spread all over the world. Turkey is a cross roads, linking Asia to Europe. It is a mountainous country with a central high plateau and numerous valleys cutting through its center. It has two great rivers that drain the land, the Tigris and Euphrates (Fig. 1). Up until just recently, those rivers ran free and undammed. Along Turkey’s Mediterranean coast, the land rapidly rises to high mountains, leaving only a fringe of land that is flat and farmed. Where the wilderness starts, it’s common to see wild figs, olives and other plants growing. The great diversity of habitats is partially what has encouraged the great diversity of plants in this area of the world.

Turkey has a Mediterranean climate, which essentially means it has winter rain and summer drought. Rainfall patterns along the Mediterranean coast are very similar to those of Southern California. It doesn’t mean it has a climate like Southern California, though. The Mediterranean coast is extremely hot and humid in the summer. and into the fall it can be quite warm. Crops come to maturity sooner there than here.

It seems like crops are at least six to eight weeks more advanced than in California's Mediterranean climate. The soils in much of this area are clay textured and limey with high pHs. Fortunately many of the tree crops, such as fig, pomegranate, olive and pistachio are well adapted to these problematic soils. In many respects, because of the low rainfall and the high water holding capacity of these soils, many of these crops could be grown without supplemental irrigation in the past.

I was lucky enough to be able to spend nearly a year in Adana, Turkey at the largest agricultural university in the country, Cukurova University – www.cu.edu.tr. It has an Agriculture College that is comprised of Soils, Horticulture, Irrigation, Animal Science, Plant Protection, Agricultural Engineering, Food Technology, and Extension Education Departments. The Horticulture Department has collections of many of the major tree crops, such as fig, citrus, pecan, pomegranate, mulberry etc. It has an avocado collection that dates back to the 1980's. The University was founded in 1973, but the site was an agriculture vocational school that dates to a much earlier era. There was actually a collection of avocado seedlings established at the school in the 1930s, but most of those trees are long dead. The grafted trees that were established in three separate plantings during the 80s were comprised of mainly Mexican varieties. Of the 57 or so varieties that were introduced, only the cold tolerant ones have survived. There are also plantings of grafted varieties at other research centers in Mersin, Antalya and Dordyol (near Iskenderun) where the winters are milder. There they have specimens of varieties, such as 'Hass' and some West Indian varieties that are more cold sensitive. A concise history of Turkish avocado introductions is in the World Avocado Congress III Proceedings (Demirkol, 1995) (Fig. 2)



Figure 2: The hills and mountains surrounding the Cukurova campus. The reservoir is used for flood control, drinking water and irrigation. The snow covered Tarsus Mountains are in the background. In the foreground are areas where wild olives grow.

While I was in Turkey I got to collaborate on several research projects with faculty in the Soils, Plant Protection, and Horticulture Departments. Because the soils are high in carbonates, peaches and apples have problems with iron chlorosis. We evaluated different soil treatments, the most unusual being iron EDDHMA which is not available in the US. It is produced in the Netherlands and was tested here many years ago and found to be no better than EDDHA (Sequestrene® 138) and more expensive. The manufacturing process is cheaper now and we will see how it now performs with apples and peaches in the Turkish situation. We also are comparing a number of other materials, such as a mixture of composted manure and ground basalt that the soil scientist I was working with claimed to be very effective. We'll see. Another trial is evaluating timing and single or double girdling of avocado branches on fruit size and yield on eight different varieties. That data is being collected at this time (December 2011). The most important citrus rootstock is sour orange. The rootstock is used on every citrus variety and does extremely well in the heavy, calcareous soils (Fig. 3). There have



Figure 3: A pest control advisor and grower/nurseryman showing the berms where virtually all trees are planted to improve water drainage.

been numerous selections of this rootstock and we did a field evaluation of a rootstock trial to see if there were differences in tolerance of these selections to citrus nematode. Further greenhouse trials are being carried out to determine if the field results on 30 year old trees are confirmed on newly planted trees. Several trials were started comparing girdling and plant growth regulators on yield and fruit size of 'Fortuna' mandarin. A curious result of girdling citrus according to growers and faculty is that it results in much fewer seeds. I am replicating this trial on lemon in Ven-

tura. Another trial I am replicating is how citrus ‘sour orange’ rootstock compares to the new USDA releases ‘Furr’, ‘Bitters’ and ‘Carpenter’, all of which have good tolerance to high pH and Phytophthora root rot. Most of the work in Turkey is still ongoing and results will not be known for a few more years.

The area around Adana is called the Cukurova Plain (Cilician Plain in history), surrounded by the Tarsus Mountains. This is the largest irrigated agricultural area of the country and is where most of the citrus is planted. There has been a long history of growing cotton which has been made into the wonderful cotton cloth for robes, towels and linens (Fig. 4). A number of rivers drain the mountains, making irrigation pos-



Figure 4: The Cukurova Plain with new plantings of mandarins. The Tarsus Mountains are in the background.

sible with most fields flood or furrow irrigated. Citrus is a newcomer to the area, dating from the 1970s and 80s and is notable that many new orchards are being planted now (Faber et. al. 2010). The orchards are well maintained, with modern irrigations systems. Some growers have their own weather stations and evaporation pans to determine irrigation scheduling. Many also have soil moisture measuring systems for scheduling irrigations. In many respects, growers are as or more technologically savvy than many California growers. There are pest control advisors and there is even an insectary modeled after Associates Insectary in Santa Paula (www.biyotar.com). They make releases of beneficial insects for controlling mainly citrus pests, but other crop pests, as well (Fig. 5).



Figure 5: The only commercial insectary in Turkey which ships beneficial insects all over the Middle East and Europe.

One of the wonderful experiences was being invited to growers' orchards. They are hungry for information and travel all over the Mediterranean, Florida and California to get information. Many of the citrus varieties they have are from Europe, the U.S., Australia and even South Africa. Citrus has been grown here for 2,000 years, but as a major crop, it is fairly recent (1970s). Much of the area planted to citrus, was once planted to cotton. When cotton prices collapsed, they looked around for other crops, and citrus was one of them. Many maladies are new to them, like 'Fukumoto' Decline, greasy spot of citrus, and Alternaria. It was extremely hot and humid in the summer of 2010 and greasy spot had popped up on all kinds of citrus varieties. It was so hot that even the fig variety collection dropped its fruit in August; it is normally picked in September. I visited over 25 orchards and sometimes inspected them multiple times to see how they performed over the seasons. I was invited to speak at the Farmer's Union which is an educational group, somewhat along the lines of California Avocado Society, as well as in the different departments at Cukurova University, and at Mustafa Kemal University with its newly formed agriculture school.

Most of the orchards are small, 1-6 acres in size, although there are some very large growers with more than one thousand acres. All types

of tree crops are grown in the area, and are often grown as a hodge podge of interplanted citrus, stone fruits, pomegranates, figs, olives and grapes. The bulk of the crops are for domestic consumption, but much of the citrus is for export to Russia and the Ukraine. Many of the same mandarin varieties that are being planted in California are also being planted here. A very common “lemon” variety here is ‘Meyer’ which is tolerant of mal seco disease which affects ‘Lisbon’ and ‘Eureka’ varieties. There are even fewer pesticides registered for use on citrus in Turkey than in California. This is largely due to the very strict export rules that Russia has imposed on pesticide residues. The packers of the citrus must keep strict watch over what is used in the orchards, in order to avoid having a whole shipment of fruit detained or destroyed at the Russian border.

Most of the Cukurova Plain is too cold for avocado production. Most of the avocados are grown along the coast between Antalya and Mersin, and a few are grown in Turkish Cyprus. A total of 360 acres is planted (2009, FAOSTAT and Turkish Statistical Institute), with a harvest of 524 tons in 2007. Most of the fruit is for sale into the capital Istanbul or to the very busy tourist trade in the country. Most Turks do not know what to do with an avocado. One entreprenuring grower who had seen avocados grown in San Diego has bought a hillside in Turkey at relatively low cost and planted trees there to avoid the frost. He has planted about 20 acres with the intent to plant more if they are successful. The oldest trees will be in their third year this spring (2012). Land in general is about as expensive as it is in California and the title to the land is often in a very complex ownership with family members. Land is



Figure 6: Avocados interplanted with citrus and bananas along the coast near Antalya. Most orchards are small – 1-10 acres, although there are some very large groves, as well. People and subtropical crops go hand in hand here, the way it is in Southern California.

often owned by a village, and then only village members are allowed to farm it (Fig. 6).

This very narrow coastal band where subtropicals are grown is under heavy development pressure. It is similar to Southern California where people and avocados seem to like the same places. The value of the land is high and more and more intensive agriculture is being practiced in this area (Fig. 7).



Figure 7: As in Southern California, more and more plasticulture is being done to grow crops year round. Even peaches, bananas and other tree crops are grown in tunnels. Here green peppers and tomatoes in tunnels.

The Euphrates River has been dammed in the interior of the country, and land which had only been used as goat and sheep grazing is now being leveled for plantings of pistachio, walnuts, olives and stone fruits. The 26 dams on the Euphrates are going to significantly increase the land planted to deciduous orchards and Turkey will become a major exporter of fruit and nut crops. Even though this is the land where walnuts and almonds originate, the domestic demand for these nuts is only satisfied by importing California grown nuts. With all the ground being planted to nut crops, Turkey will soon become a major competitor with California for the world nut market (Fig. 8).

The whole Turkish economy is booming with new roads, apartments, subways, and industrial factories. They continue to manufacture much of what they consume, including clothing, cars, trucks and white goods. They export many agricultural products, from dried apricots to citrus to cotton to olive oil. However, Turkey is still a major importer of beef, corn, rice, cooking oils and other basic food products, but this will change as the irrigated lands expand. It was fun being in such a dynamic



Figure 8: Land cleared and leveled for planting to new orchards of pistachio, walnuts and stone fruits. This is all new agricultural land that is going to be irrigated with water from the Euphrates River.

country and where the people are so courteous and where the food is so good.

References

- Anonymous. Turkish Statistical Institute. 2011. www.tuik.gov.tr.
- Anonymous. Food and Agriculture Institute – FAOSTAT. 2011. www.faostat.org.
- Demirkol, A. 1995. Avocado growing in Turkey. Proceedings of World Avocado Congress III. pp 451-456.
- Faber, B., T. Yesiloglu and A. Eskalen. 2010. Citrus production in Turkey. *Citrograph* 1(5): 34-36.
- Nabhan, Gary Paul. 2008. *Where Our Food Comes From: Retracing Nikolay Vavilov's Quest to End Famine*