Cucumber as an intercrop

Nathanael Szobody submitted the following in response to an update in EDN 123 (https://www.echocommunity.org/resources/42b85f00-312c-414f-b905-7cf675acb675) on research ECHO is doing in South Africa. We thought these comments were particularly interesting and insightful, as they illustrate the contribution that farmers can make to further our understanding of agricultural practices such as intercropping. We appreciate the time that Nathanael took to observe what was going on in a farmer's field and to send ECHO a written assessment. Below, Nathanael's comments are interspersed with notes by Tim Motis; the latter are in italics and within square brackets.

Nathanael wrote, "I appreciated the data presented by Melissa Miller and Tim Motis in *EDN 123* concerning the benefits of planting cowpeas as living mulch under maize to help cool the ground. A short while after reading the article, I noticed my neighbor's sorghum and corn fields in our village of Sub-Saharan Chad. He had planted native varieties of domestic cucumbers in the very same holes as his sorghum and maize. While it was aesthetically pleasing to see the green cucumber foliage cascading from the base of the sorghum stalks and spreading out to cover the surrounding earth, I was skeptical of the association. I suggested that if he were to plant the cucumber between the rows of grain crop, or at least between the individual grain plants in the row, there might be less competition between the two crops and [they might] be mutually beneficial. Not so, he countered. His reasoning? The dense cucumber foliage cools the sorghum and maize roots from their first days of growth on. He assured me that the plants with cucumbers at their roots produce just as well if not better than those grown alone. Indeed, the cucumber is an ideal ground cover. Its creeping vines systematically branch at regular intervals so that the perimeter of its leaves all touch each other in a growing radius, sealing a low canopy to protect the fruit underneath (and the soil!) from the hot sun. Local cucumber foliage is so dense, thieving monkeys have to resort to rolling around on the plants to find the hidden cucumbers."

[Tim Motis (TM): These observations in Chad are consistent with what we found with cowpea grown with maize in our plots in S. Africa. As mentioned in EDN 123, soil temperature was 5 degrees cooler with maize/cowpea than maize alone. As it turned out, volumetric soil moisture was also slightly higher with maize+cowpea (4.9%) than maize alone (4.5%) at the 12th week after planting maize. Apparently, the amount of water conserved through shading/mulching the ground exceeded the amount of water lost to transpiration (movement of moisture through the leaves to the atmosphere).]

Figure 4. Cucumbers planted under okra (left) and growing into the space under roselle (right). *Photos by Nathanael Szobody, illustrating practices in his garden.*

Nathanael continued, "The method needs scientific testing under appropriate controls. But I found his testimony compelling as I discovered others employing similar practices (Fig. 4). While helping a friend hoe his millet field I was fascinated to watch his grandma meander through the field planting cucumber in between the millet sprouts. Neither extra profit nor enhanced millet production were in her calculation: 'When it comes time to hoe the millet we're going to get hungry, so we had better have some cucumbers to munch on.' Yet her approach was also precise and well informed in terms of symbiosis; cucumber and millet do well together, but squash is best planted among the peanuts, she explained. Gumbo (okra) also does well among the peanuts, where the gumbo seed is simply broadcast in a freshly plowed and planted peanut field. This makes sense in terms of ground temperature: from my experience

gumbo benefits greatly from cooler soil. Densely planted peanuts accomplish that effect. Additionally, gumbo is heavily tap-rooted and therefore competes minimally with the surrounding peanuts.

"While cucumber is not a legume and therefore does not have the benefit of adding nitrogen to the soil, crop rotation can have the same benefit.

"Additionally, cowpea foliage is very hardy and, left on the ground after harvest in any Sub-Saharan region, will be consumed by nomadic herds rather than having any lasting effect on soil humus (other than the manure dropped in the process, which is not a negligible factor). Whereas cucumber will be harvested long before the grain crop, its dead foliage is much more fragile than that of cowpea, disintegrating rapidly in the presence of precipitation and providing the soil with nutrients and humus before the nomadic herds have an opportunity to graze the fields."

[TM: It is helpful to be aware of the time it takes for leaves and stems of a cover crop to degrade. The rate of decomposition of crop residues influences when and how quickly minerals are released into the soil. Foliage that persists a long time can be helpful from the standpoint of keeping the soil covered; however, nutrient release is slow. Factors that affect degradation rates of cover crop residues include leaf thickness (e.g., thin velvet bean leaves degrade faster than jack bean leaves), growth cycle of the crop (e.g., lablab produces most of its biomass later in the season than cowpea), temperature, and rainfall. As Nathanael's comments illustrate, in addition to understanding principles of decomposition and nutrient release, it is important to take into account human and animal activities that affect the contribution of residues to the soil.]

Nathanael also shared: "Furthermore, the subsistence farmer and her family benefit more from nutritional diversity than market diversity. Cucumber is a very good source of vitamin C, vitamin K, and potassium, and is also a good source of vitamin A—the latter being particularly lacking in the Sub-Saharan diet, perhaps contributing to a high rate of eye disease in that region. While cowpeas, with the protein they provide, are a dry good and are available at a reasonable price year-around, Sub-Saharan Africans are most often deficient in less-affordable and only seasonally available vegetables and fruit. Therefore it is wise to benefit from the high-producing local cucumber varieties when the season permits."

[TM: We have noticed in a legume screening trial that the yield of successive cowpea plantings on the same plots has declined over time. Also, root knot nematodes have been more prevalent in cowpea plots than in velvet bean and lablab plots. When incorporating cover crops into farming systems, we need to think about ways to avoid the buildup of pests. A (non-leguminous) cucurbit ground cover could be rotated with leguminous ground covers.]

Nathanael concluded, "The beauty of using cucumber as a ground cover in this way is that it doesn't take an outsider to tell people how to do it; it is a well-known and labor-minimal method whose increased implementation needs only a little encouragement."

 http://edn.link/cndhfy