



FACT SHEET

Agriculture/Natural Resource Extension

Robert A. Kluson, Ph.D.

Alley Cropping With Fruit/Nut Trees For Diversified Small Farms in South Florida

This fact sheet offers information on the topic of alley cropping with fruit/nut trees with a special emphasis for the small farmer who is interested in a diversified production system of crops grown to meet the yearlong demand of locally-produced foods. This paper is one of a series of fact sheets that is intended to introduce you to the application of the principles of agroforestry. This subject is timely as small farming, nationally, statewide and locally, is expanding its role as a provider of food and fiber within the context of our society's initiatives towards enhanced sustainability. This information is based on the available research and experience generally appropriate to South Florida, as well as to Sarasota County...

What Is Agroforestry? In its simplest terms, agroforestry is the combination of traditional agriculture and forestry, hence the word agroforestry. Agroforestry designs vary from combinations of vegetable crops with citrus trees, hay with pecan trees, to goats with pine trees. These agroforestry combinations are distinguished from traditional agriculture or forestry by a couple of key traits. First, an agroforestry design is intentionally managed as a whole system with intensive cultural practices for more than one crop and/or animal. Second, the landowner uses interactions between trees, crops, and/or animal components to achieve particular objectives while protecting resources. This intentional

The Journey to Sustainability Begins With Education

combination of agriculture and forestry creates an integrated and sustainable land use system (1).

Why Should I Consider Agroforestry? Under today's agricultural setting, farmers and landowners face many challenges as they seek to make their farms and forestlands profitable, productive and environmentally sustainable. A host of problems—farmland conversion, urbanization pressures, reductions in water quality and availability, climate change, soil erosion, irregular cash flows, and increased government regulation—make managing the family farm or forest a difficult task (2). At the same time new agricultural marketing opportunities are being developed with the rise of consumer demand for a diversity of locally-produced foods and value-added products. Agroforestry offers new and innovative approaches to farm production in response to today's challenges and opportunities. These approaches seek to be practical, profitable, and low in cost in addressing the needs of farmers, landowners and their communities.

What Is Alley Cropping? Alley cropping is defined as the planting of rows of trees at wide spacings, creating alleyways within which agriculture or horticultural crops (annual or perennial) are produced. It is one of the emerging agroforestry practices in the Southeast (3). The trees can be planted in single or blocks of rows between the alleys. Also the tree rows can be planted with single or multiple tree species. Depending on the level of shade provided by the tree row over time, the alley crop could be changed to match the changing conditions. The trees themselves can also be managed by thinning, pruning and/or harvesting in order to maintain optimal growing conditions in the alleyways for the alley crops.

Are Fruit/Nut Trees Used In Alley Cropping? Yes, and actually alley cropping with fruit/nut-bearing trees and shrubs is one of the more common combinations in the Southeast. Examples include persimmon with cut flowers, vegetables during citrus establishment, and blueberries with ornamentals (2). It can be an appropriate cropping system design for the establishment of new fruit orchards

The Journey to Sustainability Begins With Education

on diversified small farms that are producing multiple crops to meet the demand of locally-produced foods. Or it can be implemented in already planted orchards that lend themselves to designs of alley cropping. It can also be an alternative cropping system for citrus producers that are facing reduced yields due to the replacement of trees lost to citrus greening and canker.

What Are The Benefits of Alley Cropping With Fruit/Nut Trees?

The reported benefits include many of the same ones attributed to agroforestry in general, as well as additional ones specific to fruit trees and shrubs. The general benefits include (2) :

- 1) soil conservation - reduction of loss of nutrients, organic matter and sediment erosion.
- 2) water conservation and quality - reduction of water use by plants, filtering of chemicals from runoff, promotion of infiltration to groundwater, and treatment of waste effluent and salinization.
- 3) economic - promotion of income from multiple products with a steady cash flow.
- 4) pest management - provision of barriers to reproduction and spread of pests, and habitat for beneficial insects and birds.
- 5) wildlife habitat - provision of cover, food, nest sites, and corridors for movement.

The specific benefits include:

- 1) economic – alley cropping horticultural crops before fruits/nuts come into production can provide earlier and extra income during the early orchard phase.
- 2) production – nutrient cycling from alley cropping management would increase yields of fruit/nut trees
- 3) stability – increased diversity will reduce pests of fruit/nut tree crops
- 4) labor management – farm labor is spread throughout the year

What's The Basis For These Benefits? The recent emergence of the agroecosystems concept provides a very useful tool to explain the benefits of

The Journey to Sustainability Begins With Education

alley cropping with fruit/nut trees. An agroecosystems is defined as a site of agricultural production, for example, a farm, understood and analyzed as an ecosystem but with the addition of the farmer (4). In tern, an ecosystem is a concept derived from the science of ecology that analyzes natural systems of living and non-living parts that appear to display long term sustainability. To this end, the model of a sustainable agroecosystem allows us to identify elements of structure and function that will promote benefits.

Therefore, benefits are produced with the alley cropping of fruit/nut trees when the design and management of the agroecosystems achieve natural ecosystem-like characteristics while maintaining a harvest output. For example, the successful management of the interactions between the tree and alley crops achieves the following properties:

- 1) Energy flow – increase capture of onsite solar energy to achieve a better balance between energy used to maintain the internal processes of the system compared to that embodied in harvested and exported crops.
- 2) Nutrient cycling – lower the nutrient losses from the system by closing the nutrient cycles between tree and alley crops.
- 3) Population regulating mechanisms – increase the presence of the natural biological controls of crop pests with greater design of a hierarchical scale of diverse habitats from the field to the landscape levels.
- 4) Stability – increase the ecosystem processes of resiliency by managing a succession of annual alley crops and perennial tree crops that optimizes their respective growing conditions.

Are There Drawbacks to Alley Cropping with Fruit/Nut Trees? It's important to fully evaluate the costs to decide the comparable value of benefits realized from alley cropping of fruit/nut trees. Some of these costs include the following (3, 5):

- 1) establishment investment for planning and installation
- 2) risk of competition between tree and alley crops for light, water and nutrient due to improper installation and management

The Journey to Sustainability Begins With Education

- 3) increased labor requirements and skills for maintenance of an alley cropping system and demands of different harvest seasons
- 4) chemical labeling restrictions may limit the compatibility of agri-chemicals used on fruit/nut tree and/or alley crops
- 5) timing of harvest – care must be taken to avoid interference of harvest activities of the different crops

How Do I Get Started In Alley Cropping With Fruit/Nut Trees? Because this practice is an integrated system of production, whole farm planning and skillful management are necessary to do it successfully. The design must incorporate the growth requirements of the tree and alley crops, as well as other farm management goals. For example, the width of the alleys should be sufficient to meet the sunlight requirements of the alley crop, as well as the ease for the movement of necessary equipment for the production and harvest of both the tree and alley crops. If the farm is susceptible to erosion and/or surface water movement then the rows need to be planted on the contour and not as straight rows.

The choice of your fruit/nut tree and alley crops will depend on your answers and action steps to the following questions (3, 6):

- 1) what can you market profitably? Also does your business plan identify niche markets of local consumer demand for your crops (7)?
- 2) what grows well in your area? Also have you completed a site and landscape assessment of your land to identify other conditions that could be improved by, or limit the effectiveness of alley cropping (8)?
- 3) how compatible are the tree and alley crops?
- 4) what level of management do you want? For example, alley cropping of tree and nontree crops simultaneously requires a greater level of knowledge of their different growing requirements.

The most common trees used in alley cropping systems in the Southeast are those already grown in orchards or plantations. The fruit and nut tree species include chestnut, hazelnut, peach, pecan, persimmon, and walnut (3).

The Journey to Sustainability Begins With Education

Fruit/nut tree species for South Florida will need to be adapted to the soil and climate conditions of the region. Candidate fruit tree species can be found at the website of the UF/IFAS Fruitscapes Program (9) and from the research of the nonprofit organization E.C.H.O. (10).

Innovative farmers in the Southeast have designed multi-species alley cropping systems that include fruit/nut trees with alley crops of vegetables, herbs and ornamental plants (3). However, combining alley crops with tree crops requires careful planning. Issues that need to be considered are species selection, spacing, scheduling and management. A critical factor is the impact of understory environment of the tree crop, such as shade, on the alley crop. Row crops such as corn, soybeans, wheat, sorghum, or potatoes that need abundant light, will usually be shade limited by tree canopies except during the early years of tree establishment. Other crops that do well in shade can be planted under or closer to the trees (3). Research supported by the USDA's Western Sustainable Agriculture and Research Education (WSARE) has identified a list of 75 shade-tolerant tropical species that can be used as alley crops (11). Candidate shade-tolerant alley crops could also include crop species identified for the forest farming type of agroforestry (12).

Where Can I Find More Information? The sources of information about alley cropping with fruit trees are increasing across the world. Typically, they can be found at the research and development centers for agroforestry but now they are also being expanded by centers and groups usually focused only on crop production. The following is a growing list of such resources:

Agroforestry Net, Inc. Holualoa, Hawaii
<http://www.agroforestry.net/index.html>

Agroforestry Research Trust. Totnes, UK
<http://www.agroforestry.co.uk/>

Association for Temperate Agroforestry. Univ. of Missouri, Columbia, MO.
<http://www.aftaweb.org/index.php>

Educational Concerns for Hunger Organization (ECHO). Web Portal

The Journey to Sustainability Begins With Education

http://www.echotech.org/mambo/index.php?option=com_frontpage&Itemid=1

Permaculture Research Institute. The Channon, NSW, Australia

<http://permaculture.org.au/>

UF/IFAS Center for Subtropical Agroforestry. Univ. of Florida. Gainesville, FL.

<http://cstaf.ifas.ufl.edu/index.htm>

University of Missouri Center for Agroforestry. Columbia, MO.

<http://www.centerforagroforestry.org/index.htm>

USDA National Agroforestry Center. Univ. of Nebraska. Lincoln, NE.

<http://www.unl.edu/nac/>

World Agroforestry Center. Nairobi, Kenya.

<http://www.worldagroforestrycentre.org/af1/index.php>

World Vegetable Center. Tainan, Taiwan.

<http://www.avrdc.org/>

References

1. Garrett, H.E.. and R.L. McGraw. 2000. Alley Cropping Practices, pp. 149-188. In Garrett, HE., et.al., North American Agroforestry: An Integrated Science and Practice. ASA, Madison, WI.
2. Workman, Sarah W. and Samuel C. Allen. The Practice and Potential of Agroforestry in the Southeastern United States. UF/IFAS Publication #CIR 1446 <http://edis.ifas.ufl.edu/FR146>
3. Workman, Sarah W., Samuel C. Allen, and Shibu Jose. Alley-Cropping Combinations for the Southeastern USA. UF/IFAS Publication #FOR 106 http://edis.ifas.ufl.edu/document_fr142
4. Gliessman, S. 1998. Agroecology: Ecological Processes in Sustainable Agriculture. Sleeping Bear Press, Chelsea, MI.
5. Elevitch C. and K. Wilkinson. 1999. A Guide to Orchard Alley Cropping For Fertility, Mulch and Soil Conservation <http://www.agroforestry.net/pubs/oachbk.pdf>
6. Beetz, A. 2002. Agroforestry Overview. ATTRA Publication. <http://attra.ncat.org/attra-pub/agroforestry.html>
7. Strong, N. Market Research: Finding Your Niche. CSTAF Fact Sheet #2. <http://cstaf.ifas.ufl.edu/cstaffactsheetniche.pdf>
8. USDA National Agroforestry Center. Planning Agroforestry Practices. <http://www.unl.edu/nac/afnotes/gen-3/gen-3.pdf>
9. UF/IFAS Fruitscapes. <http://trec.ifas.ufl.edu/fruitscapes/>
10. Motis, T. 2007. Agroforestry Principles. E.C.H.O. Technical Note. www.echotech.org/mambo/images/DocMan/AgroforestryPrinciples07.pdf
11. Wilkinson, K. and C. Elevitch. 2000. Integrating Understory Crops With Tree Crops. <http://www.agroforestry.net/pubs/Understory.pdf>

The Journey to Sustainability Begins With Education

12. Becker, B. and S. Workman. 2003. Farming in the Forests of Florida. UF/IFAS EDIS Publication #Cir 1434/FR144.
<http://edis.ifas.ufl.edu/FR144>

Sarasota County Extension
6700 Clark Road, Sarasota, Florida 34241
(941) 861-5000; Fax: (941) 861-9886
Website: <http://sarasota.extension.ufl.edu>

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. U.S. Department of Agriculture, Cooperative Extension Service, University of Florida, IFAS, Florida A. & M. University Cooperative Extension Program, and Boards of County Commissioners Cooperating.