Plant and Environmental Sciences
Agricultural Experiment Station
College of Agricultural, Consumer and Environmental Sciences

Tiny houses for Northwest, NM: A collaboration between San Juan College and the New Mexico State University Agricultural Science Center at Farmington to demonstrate sustainable living

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Fig. 1 "Originally a self-governing tent camp of homeless adults in Olympia, Washington, Quixote Village now consists of 30 tiny houses, a community garden, and a common space with showers, laundry facilities and living and dining space." (Johnson, 2014) http://www.shareable.net/blog/11-tiny-house-villages-redefining-home

INTRODUCTION

Tiny houses and "Pocket neighborhoods" are gaining popularity in rural and urban settings with interested in sustainable or "green" living practices. Pocket neighborhoods also fill critical housing needs with vulnerable populations like the homeless (Figure 1). Tiny houses have many benefits including: 1) Reduced carbon footprint (reduced space means less energy consumption and less "stuff"); 2) A small floor plan enables affordably scaling up details like cabinetry and countertops that would otherwise be cost prohibitive in larger houses; 3) Less space equates to less mortgage.

Affordable housing on the Navajo Nation is problematic. Most of the Navajo Housing Authority units were built in the 1960's through 1980's. Many of these older units have fallen into disrepair. At least 20,000 Navajo households are estimated to still be without electricity.

OBJECTIVES

The New Mexico State University Agricultural Science Center (NMSU ASC) at Farmington, located on the Navajo Nation, needed to replace dilapidated visiting scientist/graduate student housing (Figure 2). Concurrently, the San Juan College (SJC) Building Trades Program was seeking hands-on classroom building projects that could be accomplished in 4 semesters and demonstrate energy efficiency, affordability and sustainable living principals. The SJC Horticulture program (affiliated with NMSU) was seeking hands-on landscape design projects.

Constructing a tiny house represented an opportunity for cross-institutional teaching and research collaboration.

Fig. 2. Dilapidated NMSU-ASC Farmington housing.

DESIGN, CONSTRUCTION AND EVALUATION

During the fall 2012 semester, a gravel foundation was leveled on the SJC campus on which the one bedroom/one bathroom house was framed (14 ft. x 32 ft. or 448 sq. ft.) (Figure 3). Approximately two semesters were needed for framing, roofing (metal) and insulation (foam board on exterior and fiberglass bats and sprayed foam interior to achieve approximately R-32 rating) (Figure 3). Beginning in the fall 2013 semester, windows were installed, the house was plumbed, and detailing the interior began. This entailed installing flooring (hardwood laminate and bamboo), cabinetry (oak with granite top), lighting, sinks and a tub. Two 4 ft long electric baseboard heaters and two window air conditioner units supply the heating and cooling. By June 2014, the foundation (concrete piers) were poured at the NMSU-ASC Farmington site (Figure 4). The house was then craned onto a flat-bed tractor trailer and moved from SJC to the NMSU-ASC Farmington where it was then craned onto the foundation (Figure 5). All state-wide building codes were followed during home construction.

Students from the SJC Buildings Program became part of the learning experience in the construction of the house while SJC HORT 130, Landscape Design and Maintenance students designed concepts for ornamental Xeriscape and edible garden outdoor spaces around the house (Figure 6). Student feedback showed high interest in the project Table 1) The house today (Figure 7).

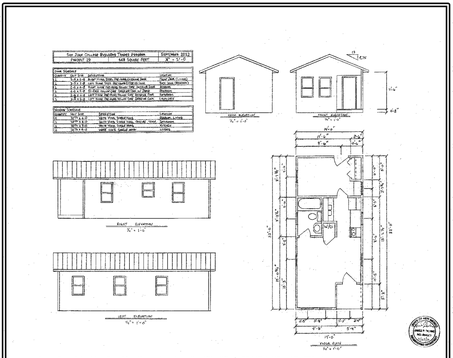
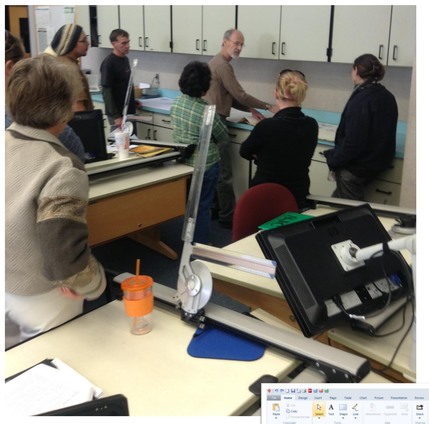


Fig. 3. Architectural plans and framing of house on SJC campus by Building Trades Program

Fig. 4. Concrete piers for foundation

Fig. 5. Transporting the house from SJC campus to NMSU-ASC Farmington permanent location



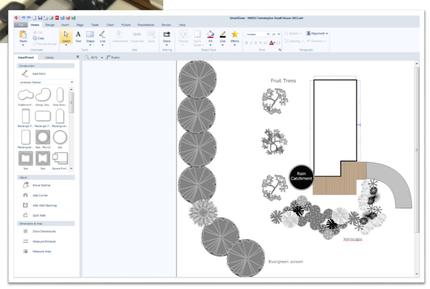


Fig. 6. Concept plans designed by SJC HORT 130 Landscape Design and Maintenance students, Spring 2013.

Table 1. San Juan College survey of student opinions of teaching for HORT 130 Landscape Design and Maintenance, Spring 2013. Opinion scale: 5=highest; 1=poorest

	STRONGLY AGREE (5)	AGREE (4)	NEAUTRL (3)	DISAGREE (2)	STRONGLY DISAGREE (1)	NO or INVALID RESPONSE	POINTS
AVE. % All Categories	56%	39%	5%	0%	0%	0%	4.51

What is the best part of this (HORT 130) course?

- "Learning how to design the landscape with plants and other features surrounding the outside of a house or commercial building"
- Learning to draw landscape blueprints and increasing my curiosity about landscape plants.
- "The out-of-class assignments."
- Practicing drawings; associating with fellow class mates."
- "The guest speakers who in the field, and being able to design own layout."

SUMMARY

House construction cost was approximately $40,000 (or about $100/ sq. ft), comparable to the average price per square foot of floor area in new single-family houses sold in the western U.S. ($ 102.75 / sq. ft. in 2010) (U.S. Census Bureau). The moving costs and utility hook-ups were about $4,000. Future building and moving costs should be lower in the future. Heating and cooling accounts for more than half of the energy use in a typical U.S. home, making it the largest energy expense for most homes (US Dept. of Energy http://energy.gov/public-services/homes/heating-cooling). The NMSU-ASC Farmington house, because of its small area relative to its insulation R-32 factor, should have low monthly energy costs compared to the U.S. average.

The tiny house project demonstrates community college and agricultural research station collaboration. Several sustainable living studies are planned including monitoring household/landscape water and energy usage. The house and landscape design provided students hands-on learning opportunities & will serve as a demonstration site to residents in NW New Mexico including the Navajo Nation.

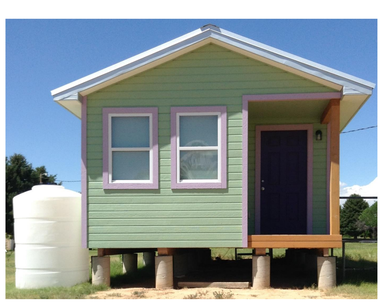


Fig. 7. The house today. Porch decking, ADA compliant ramp, rain catchment, xeriscaping and edible gardens are planned for 2015.

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