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EXTENDING SUSTAINABLE IRRIGATION OPPORTUNITIES TO SOCIALLY AND HISTORICALLY DISADVANTAGED FARMERS IN THE ALABAMA BLACK BELT TO SUPPORT COMMERCIAL-LEVEL PRODUCTION

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Abstract

This paper focuses on providing sustainable irrigation opportunities to socially and historically disadvantaged farmers (SHDFs). The ability to provide steady production capacity through the use of renewable energy sources and microirrigation is innovative, in that it demonstrated how to develop and utilize a sustainable irrigation system in both energy and water conservation. This venture is also innovative in that it sought to provide SHDFs with irrigation in a state in which irrigation in agriculture is minimal, while at the same time, offsetting the energy costs that normally accompany irrigation. Several farmers are profiled in their participation in the irrigation program. The lessons learned will provide a starting point for a more permanent research, educational, and outreach partnership between the United States Department of Agriculture (USDA) and SHDF clientele. This relationship will lead to further strengthening the relationships between Tuskegee University and both participating farmers and USDA agencies.

Key Words: Irrigation, Small Farmers, Agricultural Sustainability, Solar Energy, Black Belt

Introduction

The USDA definition of sustainable agriculture includes production with the intent of satisfying human food, fuel, and fiber needs; the enhancement of environmental quality as well as the natural resources base; efficient use of non-renewable and on-farm renewable resources; profitability of farm operations; and social aspects, including the quality of life. An alternative way in which to understand sustainable agriculture is from a holistic science perspective in which production is ecologically sound, economically profitable, socially just, and culturally appropriate. This approach to agriculture requires cooperation at various levels; farmers, universities, government agencies, communities, and businesses working together in new ways.

Sustainable contributions of SHDFs to the American farming landscape have been absent or marginalized for over a century due to social and economic injustices. A large and representative group of the affected producers currently reside in (or within) the Black Belt region, a “crescent” shaped region that runs from Virginia though the Carolinas, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas, and into Tennessee. The Black Belt is unique in three ways: (1) the soils are dark and of Prairie-types; (2) there is a history of plantation agriculture and extensive slave labor; and (3) the demographics comprise persistent poverty counties with relatively large percentages of African Americans (Wimberly and Morris, 1997).

In consideration of the history, demographics, and economics of this area social justice becomes a major issue. When we then consider the African American farmer in these counties and the admitted history of negligence as accounted for in the *Pigford* cases and CRAT Report (Pigford et al., 1997; USDA-CRAT, 1997), equal allocation of resources, and thus, distributive justice enters into the dialogue. Distributive justice is based on theories that seek to discuss the allocation of goods among citizens (Allingham, n.d.). In the realm of the environment, the allocation of such natural resources as clean water, soil, and forest resources are those that are often discussed, as the services that they provide to stakeholders are highly valued. In the case of SHDFs, clean groundwater for irrigation is one of the resources that are needed in order to secure stable production for a commercial market. In most cases, the capital needed to drill a well and supply energy to a pump is often beyond the means of the SHDF whose economics have historically been suited for subsistence. So, the issue of groundwater for irrigation for the Alabama SHDF is not only an issue of conservation, but also an issue of justice. The objectives of this article are to: 1) present the challenges faced by SHDFs transitioning to a commercial market, 2) provide the technological methods and equipment that may especially be of help to SHDFs making the transition to commercial markets, and 3) highlight the successful implementation of these technologies in three specific cases.

The Challenge

A main driving force for the growing interest of SHDFs in farming, and increasing acreage grown in fruits and vegetables, is the exploding new market opportunities derived from consumers requesting locally grown food. This desire by consumers of locally grown foods stems from realization by consumers of the health and nutrition benefits, enhanced taste and overall quality from freshness, and desire of consumers to support local farmers and sustain the environment. Tuskegee University, along with two other 1890 institutions, Walmart, C.H. Robinson, and a group of 20 Alabama Black Belt (ABB) farmers partnered during the 2011 growing season to secure commercial level markets for small scale Black Belt farmers. The 20 initial farmers produced 388 tons of watermelons, 21 tons of purple hull peas, and 17 tons of collard greens, while meeting retail industry standards for quality and timeliness.

Expectations for the 2012 growing season were high, with pre-season purchase commercial market requests reaching 5 times that of 2011, and expansion to farmers in surrounding states. Additionally, the state of Alabama Legislature provided funds ($2,000,000) to Tuskegee University to build and operate the Black Belt Family Farm Fruit and Vegetable Market Innovation Center (BBMIC). BBMIC will be located a few miles east of Selma, Alabama in the center of the Black Belt Counties. It will serve the same farmers participating in the commercial market opportunity and is scheduled for construction in 2014. The resulting fruits and vegetables grown by the participating farmers from the proposed project will be packaged and shipped from BBMIC. This increasing scale of production for the farmers poses opportunities and challenges. A key challenge is that the crop produced in 2011 was characterized by rain fed agriculture and synchronized planting. This approach to production resulted in poor yields and an intermittent product-to-market system.

Given Alabama's location in the humid southeastern region of the U.S., it has normally been perceived as receiving the benefit of plentiful rainfall. Although averages over long stretches of time give the impression of bountiful water for crop production, the reality is that Alabama still faces two issues that hinder the use of this water for crop production: (1) change in climate pattern that affect rainfall distribution leading to rainfall occurrence during winter/non-growing season, and (2) the propensity for seasonal drought. Rain-fed agriculture has long been the practice of vegetable crop production in Alabama, with only 1.2% of 9,033,537 acres of Alabama farmland under irrigation as compared to 10.0% and 11.9% in Georgia and Mississippi, respectively. The trend drops for the Black Belt counties where only 0.7% of cropland is under irrigation (USDA-NASS, 2009). Reliance on rain-fed agriculture has proven to be a hindrance for successful agricultural production for both small- and large-scale producers who are attempting to meet increasing demands for an increasing market. Rainfall distribution and reliability in Alabama have long been an issue. For example, Perry county, which has 15,306 acres of harvested cropland (USDA-NASS, 2009), receives an annual rainfall of roughly 54" of which only 24" falls during the growing season (May-October), during which evapotranspiration is also at its highest. Regarding Alabama drought, the state has been categorized with moderate to exceptional (highest level of drought) drought five out of the last eight years, with 2007 having the highest percentage of the state in exceptional drought ever recorded in the state (NDMC, 2014).

Some of the solutions to irrigation problems that have been successful include: (1) Making use of numerous but limited water bodies that abound within the catchment areas of Alabama's Black Belt Region for drip irrigation, (2) leaving more plant residue on soil to enhance organic matter accumulation which will further increase soil moisture accumulation and water holding capacity of soil, (3) crop rotation and winter cropping, and (4) making use of limited underground water resources in terms of well drillings.

Engineering Response

The problem with many solutions to the water issue in Alabama, including items 1 and 4 above, is that they require a net input of energy. This is not abnormal, as many of the successful agricultural innovations require energy input. Complexity arises in a world that has seen steady increases in the cost of fossil fuels and electricity. Since 2000, electricity prices have increased at a 2.5% annual rate, which is slightly higher than the 1.99% rate of inflation (Lowry et al., 2006) As privatization has dominated the energy sector of the U.S., many electric companies have focused on the reward of large contracts in large urban markets (World Bank, 1997), with the consequence of even higher rates and costs for running new electricity lines to rural locations; thus, leaving the rural citizen with the price of energy development. Providing SHDFs with irrigation systems require a net input of energy (primarily in electrical form), that will result in higher input costs for production over the entire lifespan of their enterprise.

Problems of rising costs and lack of electricity access do allow for the opportunity for energy innovation using alternative and renewable energy. One way in which producers can capitalize on this opportunity is through the adoption of renewable energy resources in crop production, which currently accounts for about 9% of total energy usage on farms (Xiarchos and Vick, 2011). According to Xiarchos and Vick, Alabama is one of the poorest implementers of on-farm solar energy use in the nation. With issues of discrimination and inadequate access to resources in the past, SHDFs in the ABB are in a good position to demonstrate the efficacy of on-farm alternative energy usage while also providing an alternative to the legacy of limited resources. For these producers, who are primarily involved in crop production, the most effective manner to take advantage of this alternative energy is in the provision and/or acquisition of irrigation pumps.

Photovoltaic-powered (PV-powered) farm equipment has tremendous benefits for rural farm incomes. There have been several international studies that have assessed the sustainability (economic, environmental, and social) of PV-powered irrigation in rural and poor communities such as in China (Yu et al., 2011), in Germany (Bucher, n.d.), in India (Surrendra, 2000), in Mexico (Foster et al., 1998), in Benin (Burney et al., 2010), and in Namibia (SELF, 2008). The aim of these studies was to assess the impact of the technology on rural and poor communities. These studies have recorded stimulation of individual and local economies, increased food security, increased food availability, and the energy advantages of PV power over traditional fuels. Though these methods have seen success in these isolated instances, PV-powered irrigation has yet to become a widely accepted agricultural practice in the U.S. in general, and in Alabama in particular. For the benefit of SHDFs, PV-powered irrigation provides a multifaceted answer for a complex problem.

The other piece of technology incorporated into the irrigation project was microirrigation and plastic mulch. Microirrigation has been a proven method of irrigation that allows more precise water placement, lower pressure requirements from wells, as well as lower delivery rates. This raises the potential for more profit through savings on water, fertilizer, and cultural costs because of the increased efficiency. Also, microirrigation has demonstrated to positively impact yield and production of several fruits and vegetables (Bucks and Davis, 1986; Dalvi et al. 1999), the major focus of SHDFs. Additionally, plastic mulch has been suggested as a complimentary technology with surface drip irrigation systems to help extend the growing season through soil temperature control, soil moisture control, and reducing soil erosion to name a few benefits. This technology also has had the benefit of increasing vegetable yields according to economic and marketing analysis (Berle et al. 1984; Brown, 1984; Meline and Hochmuth, 1988; Sander et al. 1986).

When the search began for solutions to the challenge presented to the group of farmers that were attempting to take up the marketing opportunity, immediately a USDA assistance program, the Environmental Quality Incentives Program (EQIP) was considered. EQIP is a voluntary program that provides financial and technical assistance to agricultural producers through contracts up to a maximum term of ten years in length (USDA-NRCS, 2012). These contracts are designed to help EQIP eligible farmers (normally covers Limited Resource Farmers [LRFs], New and Beginning Farmers [NBFs], and SHDFs) engaged in forestry, livestock, and crop production address conservation concerns with regard to their natural resources. In addition, a purpose of EQIP is to help producers meet Federal, State, Tribal and local environmental regulations (USDA-NRCS, 2012). Assistance normally is given in the form of financial assistance based upon a portion of the average cost of the conservation technology that the farmer is looking to implement. Special concessions are made to SHDFs including increased rates and up to a 30% advance. Farmers have utilized this program in the past to receive irrigation wells and materials for the capability of microirrigating up to 1.0 acre of cropland.

Although the EQIP program has a record for providing excellent service to LRF, NBF, and SHDFs, the program would prove insufficient to address the challenge presented by the increased commercial marketing opportunities for the SHDFs. Due to high installation prices, and a necessity for increased acreage for increased volume, even with pooled resources, the amount of expendable currency needed was well beyond what the farmers had available. For the two reasons of irrigating larger tracts of land coupled with concerns of energy conservation, the project was initiated under a Natural Resource Conservation Service (NRCS) Conservation Innovation Grant (CIG), called the Tuskegee University-Black Belt Photoirrigation Project (TU-2BP).

Three Cases of Enhancing Irrigation Capacity in the Alabama Black Belt

One of the objectives of the recent marketing opportunity (through the Walmart Initiative) for the Small Farmers Alabama Cooperative (SFAC) was to increase the capacity of SHDFs in order for them to become full participants in modern food systems at the commercial level. Environmental impacts were of primary concern to the project participants, and care was taken to avert or minimize any negative impact during implementation of the project. There were three farmers whose participation highlights the benefits of the technology directly, and they are briefly profiled.

Farmer One

The first farmer has been farming full time in Alabama for the past 12 years. He is currently farming on 40 acres of a 100-acre track of family land. On about 10 of those 40 acres he uses modern irrigation methods, including microirrigation with plastic mulch. The rest of the acreage utilizes subsistence methods of rain-fed agriculture. A few years ago, the farmer was able to utilize the NRCS Agricultural Water Enhancement Program (AWEP) to have a 2-acre irrigation reservoir installed. The irrigation reservoir is constantly refilled by a natural spring. Though the irrigation reservoir has been installed for close to 5 years, the funds to include the irrigation delivery system were not included; thus, restricting the farmer’s expansion. With the help of TU-2BP, the farmer was able to run almost half of a mile of pipe to bring a reliable water source to the other half of his farm operation. This will allow for more consistent and sustainable production in the future.

Farmer Two

The second farmer is from South Central Alabama, and farms a 32-acre tract of land part-time. In addition, the also co-operates other pieces of family land with other family members. Although there was an established well on-site, the farmer has been using rain-fed techniques for the past 5 years. The well and pump had not been operational for the past five years due to unknown reasons. Despite the fact that the farmer could not afford to have another system installed, he still produced watermelon, purple-hull peas, and collard greens, but the yields were low because of the absence of a reliable water source. Through TU-2BP, this farmer was able to have a well driller come to assess the problem with the existing well and pump. It was found that the well had been struck by lightning, which “shorted” the pump and cracked the casing surrounding the well rendering it useless. As a result of this finding, a brand new well and pump were installed, and microirrigation supplies, including plastic mulch, were provided to support the irrigation of the entire farm.

Farmer Three

The third farmer has his operation in Marengo County. This farmer has been producing collard greens, purple hull peas, and watermelons for the past three years. The farmer has been cultivating close to 50 acres for production, and has not been using any controlled source of irrigation water. Because of the “wide open” space (little shading) that the farmer was utilizing, it made him an excellent candidate for implementing solar power. The farmer had his well completed in November of 2013, and is currently waiting for his solar installation to be completed. Though he will have the installation on the 50-acre tract, the solar powered unit will be 4.5 kW and will only have enough capacity for 15 acres. If growing procedures suggested by University specialists is followed carefully, that 15 acres can be optimized for production of watermelons and/or purple hull peas during the next growing season.

Conclusion

As sustainable agriculture was defined above as containing the aspects of renewable energy use, enhancing environmental quality, and increasing farmer profitability, the irrigation project described has led an effort to ensure these things through proven sustainable technologies. Providing the equipment for solar powered well pumps and microirrigation supplies, has removed a major economic hurdle that normally acts as a deterrent for many SHDFs to participate in commercial markets. The increasing demand for locally sourced food, sustainable supply chains, and the use of renewable energy support the environmental agendas of commercial partners and the federal government. The ability to provide steady production capacity through the use of renewable energy sources is innovative in that it demonstrated how to lower the ecological imprint of sustainable agriculture systems. The project sought not only to improve SHDF status, but also sought to support and demonstrate sustainable irrigation in a state in which irrigation is minimal, while offsetting energy costs that normally accompany irrigation technology. To date, there are no known active or past projects that have simultaneously attempted to address the issues of water debit and renewable energy in the southeastern region of the U.S.

With an increasing number of farmers taking part in the expanded marketing opportunities provided, there will be an ever-increasing need for water. Freshwater, and in particular groundwater is a limited resource, of which its quantity and quality needs to be constantly monitored to ensure its sustainability. Those participating in its use should be educated on management of these resources, which is why the coupling of Extension education with such an initiative is important for the work moving forward. Educating SHDFs on well management, water quality issues and testing, and water aspects of food safety will be central to this effort of commercializing SHDF production. As mentioned above, the unequal distribution of resources is an injustice to those lacking the opportunity to utilize the resources. As has been shown throughout history, this injustice is correctable through the increased participation of those marginalized persons. Further research into the efficacy of the sustainable methods introduced on the social, economic, and environmental wellness of the participating SHDFs and cooperatives will be the subject of further research and education in the coming year.

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