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ASSESSING THE IMPACT OF THE SMALL FARMER-TUSKEGEE UNIVERSITY-WALMART PROJECT ON THE HOUSEHOLD ECONOMY OF SMALL AND LIMITED RESOURCE FARMERS IN ALABAMA

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Abstract
This study focused on the impact of the Small Farmer-Tuskegee University-Walmart Project, an agribusiness opportunity for small and limited resource farmers in rural Alabama. The Project provided a package of programs that strengthened the farmers' entrepreneurial capacity and secured a market with Walmart for contracted produce. The study applied the triangulation approach to collect field data, and conducted a case study using quantitative and qualitative tools to measure socioeconomic and environmental impacts. The results revealed that the target group benefitted enormously, as desired variables, namely, family income; technical knowledge; agribusiness entrepreneurial skill; leadership quality; factor productivity; direct, indirect, and induced impacts; and employment in the community, changed positively.
Keywords: Entrepreneurship, Household Economy, Small and Limited Resource Farmers, Walmart Initiative

Introduction
The Small Farmer-Tuskegee University-Walmart (SFTW) Project was started in January 2011 by Tuskegee University and its partners, and has accomplished many things thus far for socially and historically disadvantaged farmers (SHDFs) and small and limited resource farmers (SLRFs). SFTW has opened an opportunity for the target audiences in Alabama to increase the supply of contractual produce by building their individual and institutional capacity. Tuskegee University initially focused on 21 producers for the SFTW Project. The primary produce that Walmart agreed to purchase from local producers were watermelon, yellow squash, purple hull peas, and collard greens. As per the supply standard set by Walmart, farmers supplied the majority of their quality produce to Walmart to reap the contract price and sold the remainder to other markets, such as schools, canneries, processors, farmers' markets, and other direct local markets. Simultaneously, they also produced other crops (e.g., tomatoes, potatoes, cantaloupe, sweet potatoes, and sweet corn) to diversify their farm production and income streams. However, they had to find markets for other crops through their personal efforts, again, such as the aforementioned direct markets.

Due to rigid criteria, five farmers (Table 1) were certified and regularly supplied the four types of produce to Walmart. Initially, the scale of production was very small, but over time the farmers expanded production and strengthened their capacity. Tuskegee University assisted the farmers in taking advantage of this agribusiness and marketing opportunity by helping them increase their production of contracted produce. The goal for establishing a working relationship with Walmart was to enhance the economic well-being of SHDFs/SLRFs. One of the major achievements of this project is that the farmers secured a market for the produce supplied (Table 1) that meet the SFTW Project standards. The objectives of this study were to (1) build and strengthen farmers' human capacity to increase the production and productivity of identified crops, (2) assess the various impacts of the Project, and (3) educate SHDFs and SLRFs about agribusiness planning and entrepreneurship development.

Table 1. List of Five Regular Suppliers to Walmart

Farmer	County	Farm size (Acreage)	Year joined	Crops grown
A	Autauga	50	2011	Watermelon
B	Autauga	150	2011	Watermelon, Yellow Squash, Zucchini
C	Chilton	200	2013	Watermelon, Purple Hull Peas, Collard Greens
D	Dallas	40	2011	Purple Hull Peas, Watermelon
E	Butler	80	2013	Purple Hull Peas, Collard Greens, Watermelon

Literature Review

This section provides literature related to economic impacts of various projects. For instance, Hodge et al. (2005) measured the impact of Florida citrus industries in the 2003-2004 season using IMPLAN software. They showed how the expenditures invested in the citrus industry affects several other sectors of the Florida economy to increase economic activity in the state. Humphreys and Korb (2006) analyzed the short-term and long-term economic impact of the nation's Historically Black Colleges and Universities (HBCUs) using IMPLAN technique. The study revealed the economic impacts that HBCUs have on their communities. These impacts include value-added aspects, labor income, and total employment. The authors reported that the total economic impact of the nation's HBCUs was, for example, $10.2 billion in 2001. The institutions collectively generated a value-added impact of $6 billion, a labor income impact of $4 billion, and a total employment impact of 180,142 total full- and part-time jobs in 2001. Fields et al. (2013) examined the economic impacts of Alabama's agricultural, forestry, and related industries and reported the impacts as $70.4 billion in total output, $30.8 billion value added, and 580,295 jobs created. Hayami and Ruttan (1985) showed that agricultural output can grow in two main ways; first, as an increase in the use of resources of land, labor, capital and intermediate inputs, and second, through advances in techniques of production with greater output obtained through a constant or declining resource base. Ball et al. (1997) explained that environmental impact of agriculture is quantifiable; it can be incorporated into a Malmquist productivity index which requires only quantity information in its construction.

Most analyses of agricultural productivity have utilized the Total Factor Productivity (TFP) concept. According to Coelli et al. (1998), a TFP is preferred over partial productivity measures since partial measures can provide a misleading picture of performance. Barbu (1997) applied a case study approach using contingent valuation module in Kenya to evaluate the impact of agricultural extension on the household economy. The study analyzed 15 years of data on 285 households regarding their willingness to pay for extension services. The findings revealed that there was little, if any, link from research to extension. Thus, there were no new research findings and/or applications for extension workers to take to farmers. Hence, extension services had minimal impact, and also, were not proactive. In short, they were inefficient. This fact implied that the project was not sustainable. According to Barnard and Nix (1979), the use of gross margins became widespread in the UK when it was first popularized among farm management advisers for analysis and planning purposes. The gross margin per hectare for crops or per head livestock can be compared with 'standards' obtained from other farms. Lampkin and Measures (2001) explained that in organic farming systems gross margins are also useful for farm planning and for making comparisons of enterprises on the same farm, between organic holdings, or between conventional and organic enterprises.

Methodology

Conceptual Framework of the SFTW Project

Considering Tuskegee University's goal to empower target farmers (SHDFs/SLRFs) through Extension/Outreach services, the College of Agriculture, Environment and Nutrition Sciences (CAENS) explored an opportunity that opened up a secured market for local produce with a business giant, Walmart. The Extension component used the five-stage adoption diffusion model (awareness, interest, evaluation, trial, and adoption) developed by Rogers (1962). Figure 1 illustrates the process of how Tuskegee University initiated the SFTW Project for the well-being of the target farmers. Tuskegee University negotiated a deal with the Walmart to empower SHDFs/SLRFs, by providing training, extension services, and outreach programs, so that they can supply contractual produce based on Walmart standards. Certified producers benefitted through the secured market coordinated by the Small Farmer Agricultural Cooperative (SFAC), and in association with Tuskegee University, which provided the technical and managerial support.

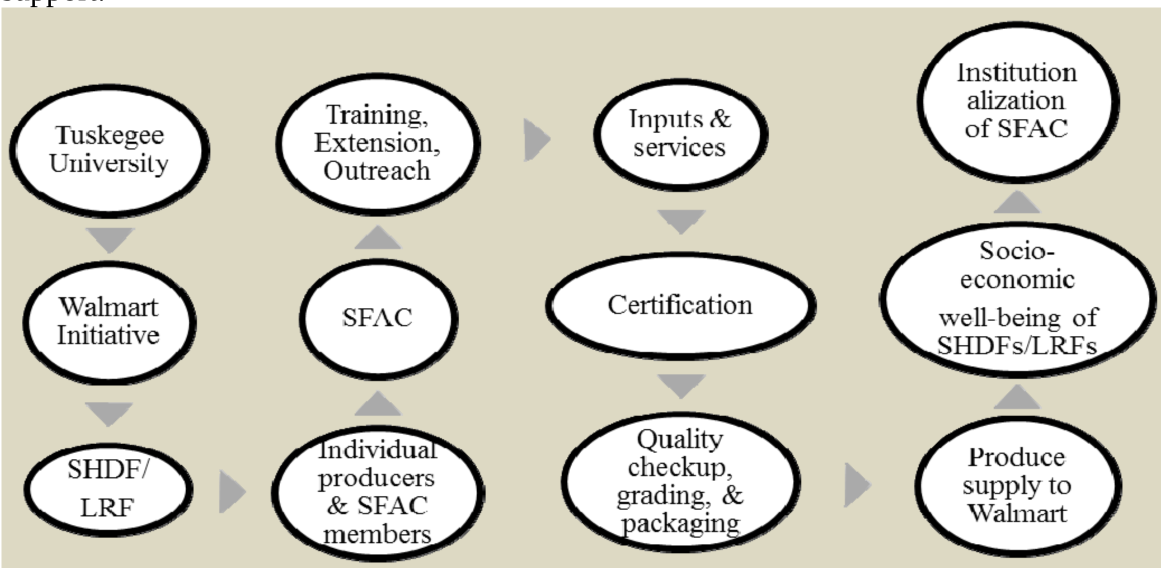

Figure 1. Conceptual Framework of the SFTW Project

Major Activities Implemented

The Tuskegee University team has implemented numerous activities to strengthen the capacity of the SHDFs/SLRFs and SFAC to sustain the agribusiness opportunity with Walmart. A majority of the accomplished activities during the SFTW Project are listed in Table 2. Identified producers were provided with a series of workshops and consultations to enable them to be certified producers and suppliers of the contracted produce to Walmart. Also, participating farmers were supervised and regularly monitored by SFAC, specialists, and Extension agents – especially during the times of planting, harvesting, packaging, and grading.

Table 2. Major Activities Implemented by the SFTW Project Participants.

Activities	Before SFTW	During SFTW	Activities	Before SFTW	During SFTW
Farmers facilitated	0	21	Farmers provided with irrigation supplies	0	30
Certified farmers supplying produce	0	12	Cooperatives established	0	1
Number of crops supplied	0	5	Refrigerated truck procured	0	1
SHDFs/LRFs trained on commercial production	0	21	Post-harvest processing plant established	0	1
SHDFs/LRFs trained about food safety standards	0	21	Packaging/holding facility center managed	0	4
Cold storage established	0	5	Farmers received food certification training	0	21
Wells constructed for irrigation	0	9	Farmers received integrated pest management (IPM) training	0	21
Well pumps fixed	0	3	Number of bee hives distributed	0	384
Custom built/mobile pumps for surface/pond irrigation distributed	0	3			

Ways of Measuring Impact and Approaches of Impact Assessment

The study followed Figure 2 to assess the impact of the SFTW Project. Positive change in knowledge and skills of the target farmers was assessed under capacity building, during training sessions. Correspondingly, gross margin; factor productivity; direct, indirect, and induced impact, as well as employment were assessed under the economic impact assessment. Similarly, peer and professional networking, farm and family environment, and social recognition were analyzed under the social impact assessment. Additionally, the ecological impact was captured by added value of the land, vegetation coverage, and economic valuation of the potential nitrogen fixation by the legume crop, purple hull peas, within the period of 4 years.

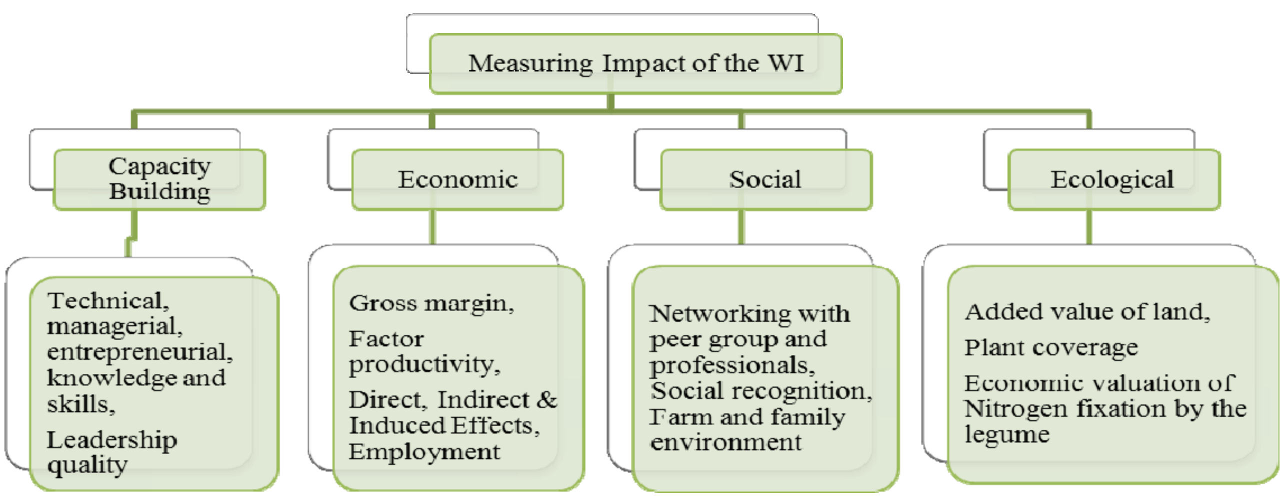

Figure 2. Ways of Measuring Impact of the SFTW Intervention

The study primarily carried out process evaluation of an ongoing intervention. Theoretically, impact assessment should be done after a program is over; generally, after one year and within three years with a major focus on outcomes. However, the SFTW Project is an ongoing project; therefore, the study also used mixed types of methods that were comprised of quantitative and qualitative tools, namely, before versus after approach, and production function approach. Also, descriptive statistics, namely, frequency distributions and percentile rankings were assessed using SPSS.

Data Collection

The data were obtained from Tuskegee University accounting records, direct observations, farm recordings, personal contacts, and data provided by the producers in a pre-structured recording format. Multiple visits, consultations, and telephone calls were made to obtain the maximum possible amount of data from the five certified producers and suppliers to Walmart (Table 1). The data comprised mainly inputs (own, procured, subsidies), major outputs (quantity produced and supplied to Walmart and local markets), and price information. Data were collected for the year 2015, and some of these were used to project values for a period of four years.

Data Analysis

This study applied various approaches, mainly, factor productivity, before versus after approach, cost and return analysis, production function approach, capacity building, and IMPLAN analysis to assess the impact of the SFTW project intervention. These approaches are discussed in turn below.

Factor Productivity

The concept of productivity is widely accepted as a key performance benchmark for farm entities. Rising productivity is related to increased profitability, lower costs, and sustained competitiveness. It is defined as the ratio of outputs to inputs and can be analyzed at various levels. Larger values of the ratio are considered as better performance indicators. There are two measures of productivity analysis: (i) Partial/Commodity factor productivity (CFP): The ratios are the most common forms of productivity measurement. CFP can be calculated as the ratio of each of the outputs to each type of input. The study calculated CFP using the equation below.

$$CFP = \frac{\sum (Qy_i * Py_i)}{\sum (Qx_i * Px_i)} \qquad \text{(i)}$$

Where, Qy_i stands for the output type and quantity for a particular commodity; Py_i is the price of each output type and quantity; Qx_i is the input types and quantities, and Px_i is the average price for inputs.

(ii) Total factor productivity (TFP): It is the aggregate output over the aggregate input, which measures the efficiency of farmers in combining the available inputs to produce a unit of output. It is calculated using the equation below.

$$TFP = \frac{\sum \sum_{j=1}^{m} (Qy_j * Py_j)}{\sum \sum_{i=1}^{n} (Qx_i * Px_i)} \qquad \text{(ii)}$$

Where, Qy_j stands for the output quantities from j^{th} commodities, Py_j is the average price for the j^{th} commodity, Qx_i stands for the quantity of i^{th} inputs, and Px_i is the average price of the i^{th} inputs.

Before versus After Approach

Before versus After Approach uses baseline information of the farmers who were involved in the SFTW Project before it was introduced, and compared their socioeconomic and farm characteristics with the current conditions of the same producers. Figure 3 demonstrates the income of the target farmers before the SFTW Project was implemented (denoted by A) and the level of income of the same target farmers at present condition due to SFTW Project (denoted by B). Thus, the difference between two points (B-A) was a desired situation through the SFTW intervention.

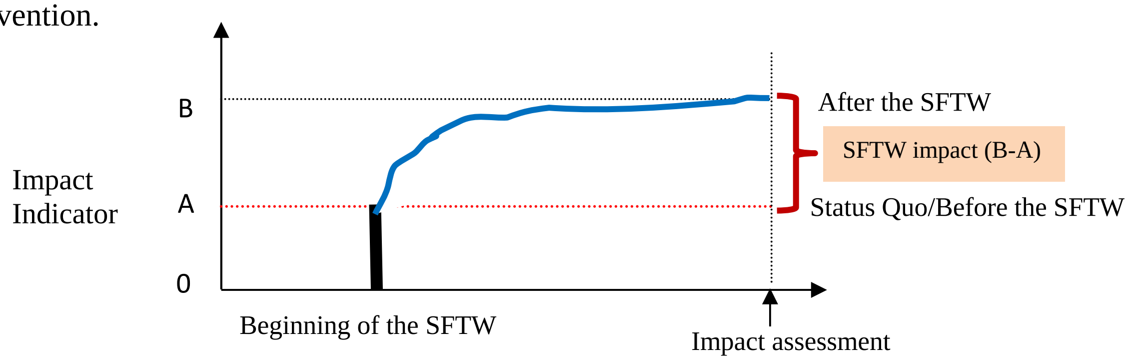

Figure 3. An Illustration of the Before vs After Impact Assessment Approach
Source: Modified from Bauer (2001)

Cost and Return Analysis

Cost and return analysis is the most common method of determining and comparing the profitability of farm enterprises. The gross return/margin of the farm produce was calculated using the following equation.

$$\pi = TR - TC \qquad \text{(iii)}$$

$$\pi = Py * Y - \sum_{i=0}^{n} Pxi * Xi \qquad \text{(iv)}$$

Where, π= Gross return, TR = Total revenue, TC = Total cost, Y = Quantity of output, X_i = Quantity of i^{th} input, P_y = Price of output, P_{Xi}= Price of i^{th} input

Production Function Approach

The impact of the SFTW Project was estimated using the production function approach as proposed by Colman and Young (1989) depicted in Figure 4, where the level of production was only (0A) quantity with (f_0) input before the SFTW Project was implemented. After SFTW project had intervened with a new technological package, the production curve shifted from PF_0 to PF_1, with a corresponding rise in output from 0A to 0B at the same level of given input, f_0. This means the SFTW opened at least two possibilities on each individual farm to enhance and strengthen the capacity of the SHDFs/SLRFs.

1) More output (0B) could be produced with the same quantity of inputs (f_0)
2) The given level of output (0A) could be obtained with a reduced level of input usage (f_1), all inputs other than SFTW intervention held constant.

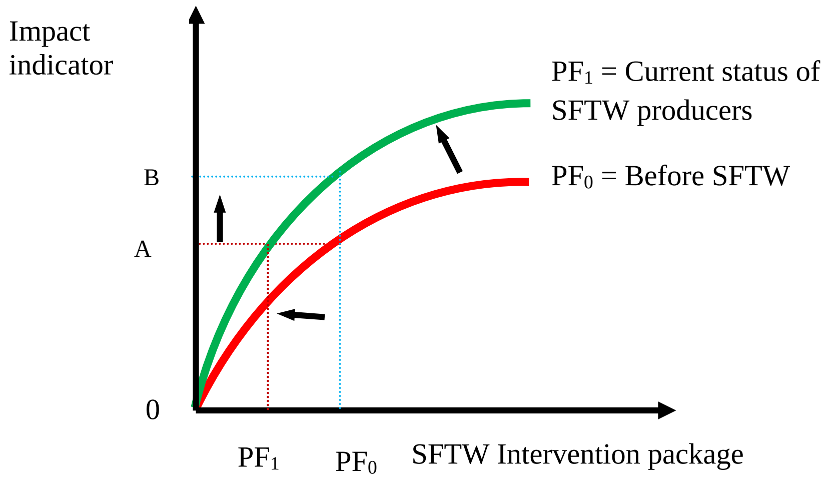

Figure 4. Measuring Impact using the Production Function Approach (Factor-Product Relationship)
Source: Modified from Colman and Young (1989).

Capacity Building and Other Assessments

Capacity building refers to the enhancement of the ability of individuals, groups, institutions, and organizations to identify and solve development problems over time (Morgan, 1993). According to German Technical Cooperation [GTZ] (1999), the goal of capacity building is to enhance the capability of people and institutions sustainably to improve their competence and problem-solving capabilities. As per this definition, the impact of the SFTW Project on the farmers' capacity regarding technical knowledge and skills was assessed using frequencies. Similarly, the study assessed the impact of the SFTW Project on farmers' agribusiness knowledge and skills, farm income and family standards, land quality and environment, managerial skills, social recognition, leadership quality, and networking, using "yes" and "no" questions.

IMPLAN Analysis

IMpact analysis for PLANning (IMPLAN) is an economic impact and social accounting software package that measures economic impacts from data representing actual local economies rather than extrapolating regional data from national averages. It is an input-output model that uses economic multipliers to estimate the effects of changes in final demand for one or more industries in the region of interest. These multipliers measure the direct, indirect, and induced effects of new expenditures on changes in output, income, and employment. The direct effect is the initial change in the sector of interest and involves the initial purchase made by the producers. The indirect effect refers to changes in inter-industry transactions, such as when supporting industries, such as seeds, fertilizers, and equipment. The induced effect refers to changes in local economy due to spending that may result from income changes of the industry employee households, and create a continued cycle of indirect and induced effects.

IMPLAN, therefore, enhances impact analysis. Impact is the reportable, quantifiable difference or potential difference a program makes in the lives of people. It shows a sustainable societal, environmental, and/or economic change. The major focus of impact analysis is on economic impact analysis that predicts the economic effects on households, a region or a new business, a new project venture or economy of interest. Economic impacts are changes in total economic activity (e.g., output and employment) associated with an industry, event, or policy in an existing regional economy. The total economic impacts are the sum of direct effects, indirect effects, and induced effects, often expressed in terms of output, value-added, income or employment. The study used IMPLAN V3.1 for the analysis, and impact was ascertained at the county/local level, after the SFTW intervention.

Results and Discussion

Factor Productivity

Table 3a and 3b reveal that the Commodity Factor Productivity (CFP) and Total Factor Productivity (TFP) ratios were found to be much higher than the breakeven point (1:1) for all contract produce in all counties. The highest input to output ratios of watermelon and purple hull peas in Dallas County, respectively, 3.96 and 3.84 implied that the rate of return (ROR) was 1:3.96 and 1:3.84. Correspondingly, the 3.26 CFP for watermelon in Chilton County, followed by the 3.33 CFP for purple hull peas in Barbour County also demonstrated high RORs (1:3.26 and 1:3.33, respectively). In general, all producers in all counties had significantly high RORs from all produce.

Table 3a: Partial and Total Factor Productivity of the SFTW Producers in Dallas and Autauga Counties

Crops	Dallas			Autauga		
	Input	Output	CFP	Input	Output	CFP
Watermelon	5,051.00	19,990.00	3.96	82,443.00	213,449.00	2.59
Collard Greens	13,143.00	33,622.00	2.56	2,464.00	3,048.00	1.24
Purple Hall Peas	4,970.00	19,104.00	3.84	-	-	-
Yellow Squash	-	-	-	3,080.00	3,809.00	1.24
Total	23,164.00	72,716.00		87,987.00	220,306.00	
TFP	3.14			2.50		

Table 3b: Partial and Total Factor Productivity of the SFTW Producers in Chilton and Barbour Counties

Crops	Chilton			Barbour		
	Input	Output	CFP	Input	Output	CFP
Watermelon	15,443.00	50,400.00	3.26	-	-	-
Collard Greens	-	-	-	800.00	1,820.00	2.28
Purple Hall Peas	-	-	-	675.00	2,250.00	3.33
Yellow Squash	-	-	-	275.00	700.00	2.55
Total	15,443.00	50,400.00		1,750.00	4,770.00	
TFP	3.26			2.73		

CFP = Commodity Factor productivity; Total Productivity Factor

Also, the higher TFP ratios, 2.50 and above, for all farms in all counties implied that the farms were technically efficient. Thus, the technical and managerial capacity of the SHDFs/SLRFs was strengthened through the SFTW Project. The higher RORs of the farms in Chilton and Dallas Counties implied that they were performing better than the farms in Barbour and Autauga Counties.

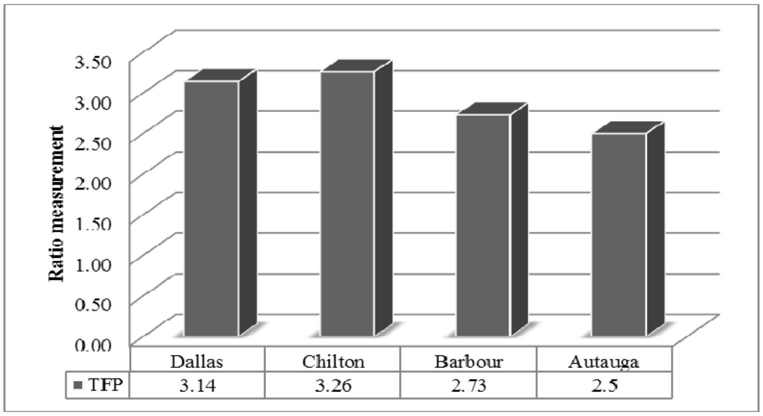

Figure 5. Total Factor Productivity of the SFTW Producers in Four Counties

Costs and Returns Analysis

Table 4 shows the gross margin analysis of watermelon for three counties. The total margin was highest in Autauga County, followed by Chilton and Dallas. In total, farmers in all three counties received a large amount of gross margin from the watermelon i.e., $180,912.00 in 2015. Thus, projected gross revenues for watermelons were $723,648.00 (180,912 x 4) over four years, other things held constant.

Table 4. Gross Margin Analysis of Watermelon

Crop	County					
Watermelon	Dallas	Autauga	Chilton	Barbour	Total (2015)	4 years total (Projected)
Expenses[1] (A)	5,040.50	82,443.00	15,443.00	-		
Incomes (B)	19,990.00	213,449.00	50,400.00	-		
Gross margin (B-A)	14,949.50	131,006.00	34,957.00	-	180,912.50	723,648.00

Table 5 shows the gross margin of collard greens for three counties. Dallas County had the highest gross margin, followed by Barbour and Autauga. Farmers in all three counties had a positive and large margin from the collard greens i.e., $6,683.00 in 2015. Thus, collard greens projected revenues were $26,732.00 (6,683 x 4) over a four year period, other things held constant.

Table 5. Gross Margin Analysis of Collard Greens

Crop	County					
Collard Greens	Dallas	Autauga	Chilton	Barbour	Total (2015)	4 years total (Projected)
Expenses (A)	525.00	2,464.00	-	800.00		
Incomes (B)	5,604.00	3,048.00	-	1,820.00		
Gross margin (B-A)	5,079.00	584.00	-	1,020.00	6,683.00	26,732.00

Table 6 presents the gross margin of purple hull peas for the two counties. Dallas County had a higher gross margin than Barbour County. Farmers in both counties had a positive and large margin from the purple hull peas i.e., $6,664.00 in 2015. Thus, purple hull pea projected gross revenues were $26,656.00 (6,664 x 4) over four years, other things held constant.

[1] Expenses included seeds, fertilizer, chemicals, hired labor, gas, irrigation, soil testing, liming, and transportation.

Table 6. Gross Margin Analysis of Purple Hull Peas

Crop	County					4 years total
Purple Hull Peas	Dallas	Autauga	Chilton	Barbour	Total (2015)	(Projected)
Expenses (A)	1,600.00	-	-	675.00		
Incomes (B)	6,689.00	-	-	2,250.00		
Gross margin (B-A)	5,089.00	-	-	1,575.00	6,664.00	26,656.00

Table 7 presents the gross margin of yellow squash for two counties. Autauga County had a higher gross margin than Barbour County (Table 7). Farmers in both counties had a positive margin from yellow squash i.e., $1,154.00 in the year 2015. Thus, yellow squash projected gross revenues were $4,616.00 (1,154 x 4) over four years, other things held constant.

Table 7. Gross Margin Analysis of Yellow Squash

Crop	County					4 years total
Yellow Squash	Dallas	Autauga	Chilton	Barbour	Total (2015)	(Projected)
Expenses (A)	-	3,080.00	-	275.00		
Incomes (B)	-	3,809.00	-	700.00		
Gross margin (B-A)	-	729.00	-	425.00	1,154.00	4,616.00

Of the total gross margin obtained for the four SFTW Project crops, watermelon contributed 93% of the total gross margin; followed by collard greens, 3%; purple hull peas, 3%, and yellow squash, 1% (Figure 6).

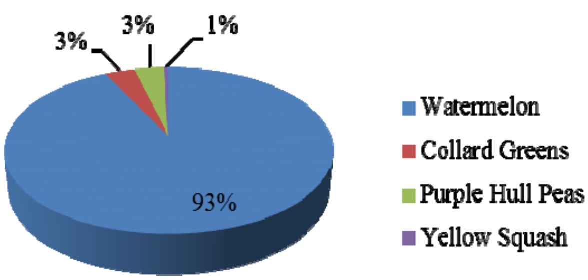

Figure 6. Contribution of Each Crop to Total Gross Margin

Impact of the SFTW Project on Employment Creation

Table 8 shows seasonal (part-time) employment creation by county. The average number of people employed remained almost the same. The ability of the SHDFs/SLRFs was reinforced due to the SFTW Project intervention as they created 252 part-time/seasonal employment opportunities over three years (with available data) in four counties. The employment number included both family members and hired laborers. The hired laborers were partly from the community and partly from South America. The highest number of seasonal employment was supported in Autauga (114), followed, respectively, by Dallas (60), Chilton (57), and Barbour (21). The total wages earned over the period was about $400,000.00.

Table 8. Seasonal Employment Creation by County

County	2013	2014	2015	Number of seasonal employment created	Average wages earned (Y)
Dallas	20	20	20	60	54,000.00
Barbour	7	7	7	21	37,800.00
Autauga[2]	38	38	38	114	205,200.00
Chilton	19	19	19	57	102,600.00
Total	84	84	84	252	399,600.00

Assessing Impact using IMPLAN Economic Modeling System

Tables 9-13 provide information regarding four impact types, namely, the direct, indirect, induced, and total effects. The aggregated total output (employment, labor income, value added, and output) was found to be the highest ($209,035.00) in Dallas County, followed by Autauga ($203,932.00), Chilton ($40,235.00), and Barbour ($19,960.00). The highest direct output was $145,432.00 in Dallas County; followed by $144,135.00, in Autauga County; $30,413.00 in Barbour County, and $14,507.00 in Chilton County. These outputs supported 60, 114, 57, and 21 seasonal jobs, respectively. In addition, the increased amount of direct output sustained, respectively, $105,835.00, $110,672.00, $22,333.00, and $9,676.00 in wages/labor income in Dallas, Autauga, Chilton, and Barbour Counties.

Besides employment, labor income, and output, the results indicated that a huge amount of value added dollars was generated in all counties, respectively, $108,520.00 for Dallas; $119,736.00 for Autauga; $22,634.00 for Chilton, and $12,855.00 for Barbour, as part of indirect business tax collections (sales tax, excise tax, property tax, fees, fines, licenses), labor income payments, and other property-related income (corporate profits, interest income, rental payments). In other words, value-added accounts for all Non-commodity payments associated with farms' production at the county level. However, the impact of indirect and induced effects on employment was minimal. Employment is based on seasonal jobs created in each county during the planting and harvesting seasons. The employment figures reflected a grand total of seasonal employment created over four years, including hired family members.

Table 9. Impact Summary of the SFTW Project Intervention in Dallas County

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	60.0	105,835.30	108,525.70	145,432.00
Indirect Effect	0.2	5,434.00	6,969.20	13,176.60
Induced Effect	0.5	14,880.00	27,981.60	50,426.70
Total Effect	60.7	126,149.30	143,476.50	209,035.30

Table 10. Impact Summary of the SFTW Project Intervention in Autauga County

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	114.0	110,671.80	119,736.40	144,135.00
Indirect Effect	0.3	6,880.50	8,048.80	13,362.90
Induced Effect	0.4	11,137.60	25,311.70	46,433.70
Total Effect	114.7	128,689.80	153,096.90	203,931.60

[2] Autauga County has two SFTW producers

Table 11. Impact Summary of the SFTW Project Intervention in Chilton County

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	57.0	22,333.40	22,633.80	30,413.50
Indirect Effect	0.0	479.10	739.50	1,814.50
Induced Effect	0.1	1,942.30	4,424.50	8,007.30
Total Effect	57.1	24,754.80	27,797.80	40,235.40

Table 12. Impact Summary of the SFTW Project Intervention in Barbour County

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	21.0	9,676.10	12,854.60	14,507.20
Indirect Effect	0.0	607.70	729.50	1,160.40
Induced Effect	0.0	1,019.50	2,269.80	4,292.30
Total Effect	21.0	11,303.30	15,853.90	19,959.90

Total Impact Summary Results using IMPLAN

Table 13 illustrates the summary results of the SFTW Project intervention at the county level. The direct output effect was $334,488.00; the indirect output effect was $29,514.00, and the induced output effect was $109,160.00. These three (direct, indirect, and induced) effects contributed to the total output impact of $473,162.00. Therefore, the SFTW intervention, through direct effect, increased production by $334,488.00 and generated a combined indirect and induced (additional) production of $138,674.00 in the four counties.

In the case of employment, approximately 252 direct seasonal jobs (family members and hired laborers) were supported by the SFTW intervention over a period of four years. An additional seasonal job was created due to an indirect effect on local industries. Another job was supported in local industries where the direct and indirect workers bought goods and services, induced effect. Thus, the SFTW Project intervention supported 254 seasonal jobs in the local economy.

Table 13. Impact Summary of the SFTW Project in the Selected Four Counties

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	252	248,517.00	263,751.00	334,488.00
Indirect Effect	1	13,401.00	16,487.00	29,514.00
Induced Effect	1	28,979.00	59,988.00	109,160.00
Total Effect	254	290,897.00	340,226.00	473,162.00

Impact on Capacity Building

Table 14 shows the changes in technical knowledge and skills of farmers. Ninety-six percent or more responded that they strengthened their technical knowledge and skills; hence, they enhanced human capacity in the various aspects at the desired level. The technical knowledge and skills included; land preparation, soil testing, applying lime and fertilizer application, identifying plant diseases, knowing pests, grading, packaging, and food safety standards. The enhanced capacity is reflected in the results of increased output in all farms in the four counties (Tables 9-13); positive gross margins for all four crops (Tables 4-7), and highly positive input-output ratios for all produce supplied to Walmart (Table 3a and 3b).

Table 14. Change in Technical Knowledge and Skills of the Target Farmers

Areas of technical know-how	Response (%)
Land preparation	96
Soil testing	96
Lime and fertilizer application	100
Inter-cultural operations	100
Spraying chemicals	100
Identifying plant diseases	100
Knowing the types of pests	96
Grading the products	96
Packaging/storing the products	100
Food safety standards	100

Table 15 reflects change in farmers' agribusiness entrepreneurial knowledge and skills. One hundred percent responded "yes" for all, but one, of the 15 variables, confirming that all five producers gained an enormous amount of knowledge and skills. Human capacity of the target farmers on desired variables, namely, agribusiness management, marketing produce, entrepreneurial skills, business communication, managerial skills, leadership quality, and professional and peer networking, was found to have increased to a higher than the expected level. Correspondingly, family income, health conditions, standard of living, quality of land, and family environment were also found to have greatly improved, including their social status.

Table 15. Change in Farmers' Agribusiness Entrepreneurial Knowledge and Skills

Expected areas of increased knowledge and skill	Yes (%)	No (%)
Has knowledge about farm business management increased?	100	-
Has knowledge about marketing produce increased?	100	-
Would you consider yourself a true agribusiness entrepreneur?	100	-
Would you like to keep supplying your products to Walmart?	80	20
Has family income increased due to the WI?	100	-
Have health conditions of the family members improved?	100	-
Has the value/quality of land increased?	100	-
Has the WI helped improve farm and family environment?	100	-
Have your business communication skills improved?	100	-
Have your managerial skills improved?	100	-
Has your social recognition/standard increased?	100	-
Has your leadership quality improved?	100	-
Has your working network increased/expanded with professionals/peers/entrepreneurs?	100	-
Have you created employment for the family?	100	-
Have you also provided technical service to the community?	100	-

Social Impact

The SFTW Project farmers were recognized as better entrepreneurs and were consulted more in the community because of their business with Walmart through Tuskegee University, accrued knowledge and skills in agribusiness, increased farm income and family standards, and a built in working networks with professionals, peers, and entrepreneurs. More importantly, they created employment not only for family members, but also for people in the community. Virtually, there were no farm jobs available in the identified farms through agribusiness before the SFTW Project was introduced in 2011. As of 2016, the SFTW Project has supported and created 254 seasonal jobs over four years period (Table 13).

Ecological Impact

It was found from field observation that the five SFTW Project suppliers demonstrated great care in protecting the top soil year-round. Thus, they made sure that they reduced wind and water erosion of the top fertile soil. Also, they kept their fields clean to comply with sanitation and quality standards, and this increased the value of the land. Moreover, producing leguminous purple hull peas in Dallas and Barbour Counties saved the major portion of expense on nitrogen fertilizer as it absorbed atmospheric nitrogen (Table 16). According to Walley et al. (1996), grain legumes, such as peanuts, cowpeas, soybeans, and fava beans, are good nitrogen fixers and will fix all of their nitrogen needs other than that absorbed from the soil. These legumes may fix up to 250 lbs. of nitrogen per acre and are not usually fertilized. Purple hull pea has similar attributes (Victory Seed Company, 2017).

Table 16. Ecological Impact of the Purple Hull Peas

Area planted (Acres)	Per Acre Nitrogen absorption (lbs)*	Total Nitrogen fixed (lbs)	Nitrogen value @ $0.73/lb	4 Year projection
12	250	3000	2,190.00	8,760.00

*Source: Walley et al. (1996).

The amount of fixed nitrogen was converted into the equivalent dollar amount based on the market price. This means the leguminous crop has dual advantages: (i) reduces the negative externality of chemical fertilizer that farmers were supposed to apply, and (ii) saves the equivalent dollar amount by substituting for the fertilizer cost. Thus, $2,190.00 ($0.73 x 3,000) was saved in nitrogen fertilizer in 2015 and the projected amount saved over four years was $8,760.00 (2,190 x 4) by just planting Purple Hull Peas over 12 acres.

Conclusion

Generally, the results obtained through quantitative and qualitative analyses of the SFTW Project interventions were found to be highly correlated with the objectives of the study. The target farmers (SHDFs/SLRFs) were served through various activities. The Tuskegee University, CAENS Team, implemented the activities and provided outreach across the state of Alabama, regularly monitored and certified five suppliers to Walmart, and established SFAC to empower SHDFs/SLRFs for the long-term. The impact of the Project for all indicators was highly positive. Commodity factor productivity and total factor productivity had high RORs. The results of gross margin demonstrated a positive return. The direct, indirect, and induced impact of employment, labor income, value added, and output was positive. Farmers' technical, managerial, and entrepreneurial skills were greatly strengthened and enhanced. Social impact showed that targeted farmers were highly recognized in their local communities. The Project also had a positive ecological impact as the leguminous crop saved fertilizer cost and reduced environmental pollution. The overall achievement of the SFTW Project could be replicated in other counties in Alabama. However, SFTW farmers need to be trained in the basics of farm management, farm economics, and record keeping. Systematic and regular record keeping would help carry out in-depth economic analysis of their farm businesses. Simultaneously, regular monitoring of the farms, review of their farm activities, and recording relevant activities would make producers more efficient.

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