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Rural Energy Needs of Smallholder Women Farmers for Improved Farm Productivity and Rural Business Enterprises in Abia State, Nigeria

Godson-Ibeji CC, Chikaire JU*, Ajaero JO and Markalbert US

Department of Agricultural Extension, School of Agriculture and Agricultural Technology, Federal University of Technology , Owerri, Imo State, Nigeria

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***Corresponding author:** Chikaire JU, Department of Agricultural Extension, Federal University of Technology, Owerri, Imo State, Nigeria. Tel: 08065928862; Email: futo.edu.ng@gmail.com

Abstract

The study investigated the energy needed by rural women farmers to improve their livelihood and agricultural production in Abia state. The specific objectives were to identify the energy needs, identify energy needs rural business enterprises; and to identify the energy sources available to the respondents in the study area; identify the effects of access to energy on women farmers,. A purposive sampling technique was adopted in selecting 150 respondents. Data were collected by use of structured questionnaire and interview schedule. Simple descriptive statistics such as mean, percentage and frequency distribution and a 4-scale likert type scale were used to analyse the data. The result revealed that women in the study area need energy for many activities, both on farm and off farm and some of the areas include cooking, processing, storing, telecommunication, infrastructure and transportation and others. Increased productivity, high income generation, reduced stress, increased living conditions are some of the effects of access to energy have on rural women farmers. The women in the area have few energy sources on which they depend on to carry out their various activities and these sources include machines, electricity and human power. Based on the findings, recommendations were made on women being seen as great movers of agricultural production and should be allowed and assisted to have better access to energy sources just like their male counterparts.

Keywords: Agricultural Production; Energy Needs; Livelihood; Rural Women

Introduction

The global food sector is dependent on energy inputs. The natural energy flows from the sun and the various forms of chemical energy stored biologically in the soils and oceans are essential for plant growth to produce food, fish and fibre (FAO, 2011a). In agricultural production, humans use external energy inputs to support natural processes so that a given area of land or water produces more than it would do otherwise. This auxiliary energy can come in many forms: human labour, animal power, fossil fuels, renewable energy or mechanical energy obtained from the consumption of liquid fuels in engines (FAO, 2011a).

Agriculture contributes significantly to economic and social development in the vast majority of developing countries. 45 per cent of the developing world‘s population lives in households involved in agriculture and most depend on agriculture and the agri-based economy for their livelihoods. In agriculture-based countries, the agricultural sector generates on average 29 per cent of gross domestic product (GDP), employs 65 per cent of the labour force, and is crucial in driving overall growth. The increase in agricultural productivity is the primary driver of global poverty reduction (World Bank, 2007).

In providing for human needs, agriculture has many functions: its primary role is to produce food and other primary goods for human consumption and thereby contribute

to food security. Agriculture provides foodstuffs and drinks, produces animal feed and also delivers a wide range of non-food goods and services(Utz, 2011; Best, 2014). For example, plant and crop-based resources are used as raw materials for a wide variety of industrial product, including pharmaceuticals, synthetics, biofuel production, rubber for tyre production, wood and other fibres for paper and furniture production, starches for adhesives and as ingredients in the confectionery industry, vegetable oils are used as food additives and in paints and resins, and of course fibres such as cotton, silk, linen, jute and hemp are used in the clothing industry. All these production and transformation steps require energy, which is thus considered a key factor in agriculture in achieving sustainable development and poverty reduction.

Modern energy services are distinct from human and animal power. Energy inputs to modern and sustainable agricultural production and processing systems is a key factor in moving beyond subsistent farming towards food security, added value in rural areas and expansion into new agricultural markets. (Utz, 2011).

Women make up around 43 per cent of the agricultural workforce in developing countries (FAO, 2011). Certain tasks are considered women's and girls' work in particular settings, such as weeding, milling or grinding, or collecting water for irrigation and drinking. Women tend to have less access than men to mechanical equipment, yet done manually these are backbreaking tasks.14 Shifting to mechanical or electrical power (such as for water pumping or operating mills) is often argued to be a way to reduce women's drudgery and free up time for leisure or other activities (Köhlin et al., 2011). The FAO estimates that if women generally had the same access to productive resources as men – including energy and equipment – they could increase yields on their farms by 20–30 per cent, raising total agricultural output in developing countries by 2.5–4 per cent (FAO, 2011b).

It seems virtually impossible to quantify energy gaps in smallholder agriculture and related rural enterprises, since energy sources and uses are so diverse and diffuse, scattered across millions of small farms and communities. However, some of the headline statistics give a hint of the scale of the problem. In sub-Saharan Africa:

- Most farm power relies on human effort (65 per cent) or animal power (25 per cent), with a minority from engines (10 per cent). This is much lower than for other developing regions, where engines constitute 50 per cent of farm power (FAO/UNIDO, 2008).
- Just 4 per cent of cropland is irrigated, compared with 39 per cent in South Asia and 29 per cent in East Asia (Practical Action, 2012).

An estimated 10–20 per cent of grains are lost after they are harvested at an annual cost of uS$4bn – equal to the value of cereals imported each year (World Bank, 2011). Smallholder farmers' are understood here as rural producers using mainly family labour to cultivate crops or raise livestock for their own consumption, or for sale to local markets and processing plants.

Across many developing countries, particularly in sub-Saharan Africa, smallholder agriculture is still largely based on human work using simple hand tools for activities like tilling or weeding, and draught animal power, for instance in ploughing or transporting goods. This is quite a different starting point for most energy planners, utilities and investors, who are mainly concerned with large-scale grid expansion to homes and industry (Best, 2014). Energy is one of many inputs to productive processes, and it is hard to disentangle its impact from other factors and since agriculture is practiced by many poor and vulnerable women, it is therefore important to know the energy needed for optimal production. The knowledge of these energy need creates a better access to better development outcomes.

Whether this applies to the study area is unknown, therefore this study. Specifically the study aims to: a. identify the energy needs of women farmers in the study area; b. identify energy sources available to the respondents in the study area; c. identify rural business enterprises energy needs; and d. examine perceived effects of access to rural energy on women farmers.

Methodology

The study was carried out in Abia State of Nigeria. Abia State lies between latitude 5^{o} 25^{1} and 5^{o} 42^{1} North of the equator and between longitude 7^{o} 30^{1} and 7^{o} 50^{1} East of the Greenwich meridian. It is located within the Southeast zone of Nigeria. Abia state occupies about 5834 square kilometers and is bound in the North and Northeast by the states of Anambra, Enugu and Ebonyi. To the West of Abia State is Imo state, to the East and Southeast are Cross River State and Akwa Ibom State, and to the South is River state. The most important rivers in Abia state are the Imo and Aba rivers, which flow into the Atlanta ocean through the Niger Delta. The state is made up of 17 local Government Areas. The two main sources of data collection used in this research were, the primary and the secondary data. The primary data were collected using structured interview schedule and questionnaire while the secondary was collected from books, reports, journals, existing literature reviews, bulletin and information from the library. The population under study consisted of all women farmers in the State. Purposive sampling technique was used for this study. Three food producing Local Government Areas were selected namely; Isiala-Ngwa South from Abia Central, Obingwa from Abia South and Ugwunagbo from Abia North purposively. A list containing 1500 women farmers was obtained from the Agricultural Officers of the 3 LGAs. From this list, 150 women farmers were randomly selected for the study. Data were collected by use of structured questionnaire and interview schedule and analyzed using descriptive statistics such as mean, percentage presented in frequency tables. Objectives analyze 1 and 3 .A four (4) point Likert type scale of Strongly Agreed, Agreed, Disagreed and Strongly

Disagreed, assigned values of 4 to 1 was used to analyze objective 2 which is mathematically represented as

$$\frac{4+3+2+1}{4} = \frac{10}{4} = 2.50$$

Therefore, a mean of 2.50 was adjudged okay and acceptable as effects on them, while any value below 2.50 was not accepted.

Results and Discussion

Energy needs of respondents

(Table 1) showed that 67.3% of the women need energy for cooking, 64% need it for various processing activities, 58.7% need it for house lighting 54.7% need energy for storing, 46.7% need energy for telecommunication, 42.7% need energy for infrastructure and transportation, 40.7% need energy in their land preparation, 37.3% need it for drying, 36.7 need energy for pumping water, 32% need energy for grinding, 30% need it for cultivation, another 30% need it for ploughing their field while 24.7% and 15.3% need energy for harvesting / threshing and packing respectively. This is in line with the classification of energy need by Utz, (2011), who reported that key energy requirements of smallholders which include:

- Energy for transport to take goods to market and supply other key services that farmers need, and;
- Energy for production, processing and commercialisation of products. This covers activities, such as pumping water to irrigate crops, drying fruits and vegetables, or charging mobile phones to obtain market price. Also supported by the classification of Best(2014) who highlighted four basic areas of energy needs namely: land preparation, irrigation, processing and storage.

Areas of energy need	*Frequency	Percentage (%)
Land preparation	61	40.7
Pumping water	55	36.7
House lighting	88	58.7
Infrastructure and transportation	64	42.7
Cooking	101	67.3
Storing	82	54.7
Grinding	48	32
Cultivation	45	30
Harvesting / threshing	37	24.7
Processing	96	64
Telecommunication	70	46.7
Drying	56	37.3
Ploughing	45	30
*Multiple response		

Table 1: Energy Need of Women Farmers in the Study Area.

Energy sources available to respondents

(Table 2) showed that 94% of the respondents have access to human power, 75.3% can access thermal (heat) energy, 58.7% are linked to electricity, and 50.7% have access to gas / diesel engines while only 4% each can access hydro and animal power. This implies that quite a good number of the respondents do not practice mechanized agriculture despite the large expanse of land that they have access to cultivate. Most farm power relies on human effort (65 per cent), with a minority from engines (10 per cent). This is much lower than for other developing regions, where engines constitute 50 per cent of farm power (FAO/UNIDO, 2008).

On a preferential scale, most of the farmers prefer machines, followed by electricity, then animal power, thermal energy (solar), hydro power and human power which is the least preferred.

Sources	*Frequency	Percentage (%)
Electricity	53	35.3
Animal power	6	4
Thermal energy (solar)	113	75.3
Human power	141	94
Hydro power	6	4
Machines	16	10.7
*Multiple response		

Table 2: Energy Sources Available To Respondents.

Rural Business Enterprises in Using Energy

Business opportunities requiring energy abound in rural Nigeria as shown in **(table 2)**. The business opportunities includes oven cooking (bakeries)(96.6%), cooking/water heating (100%),local beer brewing(73.3%), use of grinders/compressors(89.3%), refrigeration/freezing (98.6%) barbing/hair dressing (91.3%), lighting bars/beer parlours (94.0%), charging of batteries/cell phones (87.30%), craft making (54.6%), sewing cloths/fabrics (98.6%), ice block making (96.6%)among others. The above rural business opportunities reveal that these enterprise are at the core of rural development. This will reduce if not address the problem of mass exodus of healthy young and energetic youths to urban cities known as rural-urban migration (EUEI-PDF and GIZ (2013a; EUEI-PDF and GIZ (2013b),), the provision of clean energy will encourage the youths to stay behind and replace our ageing farm population.

Rural business enterprise	*Frequency	Percentage
Oven cooking/bakeries	145	96.6
Cooking /water heating/restaurant	150	100
Local beer brewing	110	73.3
Use of grinders/compressors	134	89.3
Drilling and cutting materials(metals)	96	64
Refrigeration/freezing	148	98.6
Barbing/hair dressing	137	91.3
Lighting bars/parlors	141	94
Charging batteries /cell phones	131	87.3
Crafts making	127	84.6
Sewing cloths/fabrics	148	98.6
Use of computers/internet café	94	62.6
Ice block making	145	96.6
Ice cream making	150	100
*Multiple Response		

Table 3: Rural Business Enterprise Energy Needs.

Perceived Effects of Access to Energy on Women Farmers

(Table 4) showed the effects of energy access on women farmers include, increased productivity ($\bar{X}$=3.74); improved access to information and information technology($\bar{X}$=3.74); higher income generation ($\bar{X}$=3.65); reduction of time consuming tasks ($\bar{X}$=3.65); Reduced stress ($\bar{X}$=3.65); reduced drudgery ($\bar{X}$=3.64); sense of inclusion in the modern electrified world ($\bar{X}$=3.63); better access to healthcare services ($\bar{X}$=3.61); improved status in household energy ($\bar{X}$=3.59); better light for reading and other night time task ($\bar{X}$=3.57); reduction of indoor air pollution ($\bar{X}$=3.48); more secured water supply from pumped irrigation ($\bar{X}$=3.42); increased education as a result of better lighting in school ($\bar{X}$=3.40); empowerment ($\bar{X}$=3.38); improved income from better access to fuel based transport ($\bar{X}$=3.38); assuring more opportunities for women to be more productive ($\bar{X}$=3.23); increased women in decision making ($\bar{X}$=3.20); poverty reduction ($\bar{X}$=3.16); and better health due to better and more food ($\bar{X}$=3.06). These are in line with a study by Chikaire *et al.*, (2011; Chikaire *etal.*,2011b) who reported the consequences of improved energy services for women to include improved status in household energy, empowerment, improved income for better access to fuel based transport, reduction of indoor air pollution, reduced burden from fuel collection and processing, reduced drudgery by replacing human animate energy to inanimate energy, increased education as a result of better lighting in school, better health from health services that have access to improved lighting, cold chain storage, and communication, improved access to information through radio, tv and other information technology, sense of inclusion in the modern electrified world, reduction of time consuming tasks, better light for reading and other night time tasks, more secured water supply from pumped irrigation, reduced stress and better health due to better and more food.

Perceived effects	Mean ($\bar{X}$)	SD
Higher income generation from farming	3.65	0.48
Increased women involvement in decision making	3.2	0.72
Poverty reduction among women farmers	3.16	0.77
Assuring more economic opportunities for women	3.23	0.78
Reduced drudgery of farm equipment	3.64	0.62
Increased crop productivity	3.74	0.45

Improved status in household energy	3.59	0.57
Reduction of time consuming tasks	3.65	0.63
Reduction of indoor air pollution	3.48	0.75
Better light for reading and other night time task	3.57	0.68
Increased education as a result of better lighting in school	3.4	0.72
Better access to healthcare services	3.61	0.66
Improved access to information and information technology	3.74	0.44
Sense of inclusion in the modern electrified world	3.63	0.65
More secured water supply from pumped irrigation	3.42	0.57
Better health due to better and more food	3.06	0.79
Empowerment	3.38	0.65
Reduced stress arising from hard labour	3.65	0.56
Improved income from better access to fuel based transport	3.38	0.63
Decision rule: Mean 2.50 and above accepted		

Table 4: Perceived Effects of Energy Access on Women Farmers.

Conclusion

The study revealed that women in the study area need energy for many economic activities, both on farm and off farm and some of the areas include cooking, processing, storing, telecommunication, transportation and others. Increased productivity, high income generation, reduced stress, increased living conditions are some of the effects, access to energy have on rural women farmers. The women in the area have animal power, and human power energy sources on which they depend on to carry out their various activities.

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