Socio-Economic Consequences of Technological Change on the Rural Non-Farm Igbo Women Entrepreneurs of South-Eastern Nigeria: Implications for Farm and Non-Farm Linkages

Jonathan Okechukwu Alimba
Justina Uzoma Mgbada

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newtec@bidii.com

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Executive Summary

Technological change has affected many aspects of rural women's non-farm enterprises with many positive and negative socio-economic consequences on the women enterpreneurs and their households. This study investigated the extent of this change, and the socio-economic effects of the change on the rural Igbo women entrepreneurs engaged in cloth weaving, pot making, palm-oil processing, *garri* processing and local brewing in south-eastern Nigeria. Specifically, it attempted to assess the technical change in these enterprises in relation to the perceived negative consequences, to find out if the change was neutral or biased to those consequences. An attempt was made to find out the implications of the identified consequences of technical change on rural inter-sectoral linkages. A total of 250 non-farm women entrepreneurs randomly selected from 10 purposively chosen communities in five out of nine Igbo-speaking states of south-eastern Nigeria provided the quantitative data. One hundred and sixty other rural women entrepreneurs of various age groups from the chosen communities provided the qualitative data. Data were collected using interview schedules and a Focus Group Discussion (FGD) guide. Analysis of the data was by use of descriptive statistics, cross-tabulations, multiple regression model, inter-correlation matrix model and factor analysis. Analysis of qualitative data from FGD was by folk interpretation and verbatim quoting of discussants' views.

The major findings of the study were that: rural women's non-farm enterprises were dominated by ageing entrepreneurs with low educational background, low operating capital, low income and consumption expenditure; the rural areas from where they operated lacked basic social infrastructure and amenities; out-migration of the rural to urban type was high among the female youths, and adoption and adaptation of some innovations was low or faulty; most of the socio-economic problems of the entrepreneurs adversely affected the proper adoption of innovations rather than be the product of technical change.

Chi-square results from cross-tabulation analysis showed that some personal socio-economic characteristics of entrepreneurs influenced their adoption behaviour which was associated with the negative consequences of innovations on the women entrepreneurs; the coefficients of multiple determination (R^2) showed a high influence of the identified independent variables associated with technical change on the dependent, that is the level of technical change while inter-correlation analysis established many useful inter-relationships among variables that were used to explain reasons for the nature of consequences of technical change.

Varimax rotated factor matrix of relevant variables was used to identify and name factors that will need urgent technology policy intervention and, based on it, technological change was assessed as neutral or biased to the socio-economic conditions of the women entrepreneurs, while the three types of rural linkages identified in the area were consumption, backward and forward production linkages. The implications of technical change on them were highlighted. Specifically, forward production

linkage which involves use of farm outputs in the rural processing industries was identified as more beneficial to the women because it involves minimal leakage of capital from the rural economy.

The study recommended, among other things: urgent solution to some social and economic attributes of the women entrepreneurs which tend to impede on proper adoption of innovation such as low education, finance, and gender bias; provision of social infrastructure and amenities in the rural villages; encouragement of research and development of appropriate technologies that are resource conserving, less women labour-displacing, and environment-friendly; establishment by state governments of non-farm extension programmes; establishment of community polytechnics to improve local technical know-how; restructuring of the micro-credit system to give it a rural face; encouragement of the formation of genuine rural women entrepreneur co-operatives and other associations; and proper exploitation of such rural linkages as the forward production linkage which has minimal resource leakage out of the local economy.

The Poverty Alleviation Programme in Nigeria ought to be hinged on these recommendations if the rural non-farm women entrepreneurs of this area are to benefit from it.

Chapter One

Introduction

Background and Problem Statement

Rural women in Nigeria and indeed in most other developing countries are struggling with a problem that is aggravated by the conventional rural development strategies. As observed by Carr (1984), since the supplanting of the traditional barter system by cash economies, rural women have found it increasingly difficult to satisfy their cash needs, more so, as their hold on cash income is eroded by their displacement from their traditional income-earning activities. Such indigenous enterprises include clay pot-making, cloth weaving, cloth dyeing, palm-oil processing, *garri* processing and local beer distilling. These activities used to provide not only employment to the women but also formed good linkages with the farm that enhanced rural income and growth.

The struggle to find appropriate and acceptable ways of enabling women to spend their time as productively as possible in support of their families should continue. This should not only be directed to peasant farming activities but to other non-farm activities that are viable but capable of exploiting the benefits of the linkages between the sectors.

Linkages are here used to describe the manifold interactions between agricultural (farm) and rural non-agricultural (non-farm) activities in a developing economy. Rural linkages therefore concern the interactions between agricultural and non-agricultural enterprises in the rural economy (Rains and Stewart et al, 1987). Two forms of rural linkages can be identified. These are the consumption linkages where incomes generated by activities in one sector lead to demand for output of another sector and, secondly, production linkages which may be forward or backward. Backward production linkages occur where productive activity in one sector requires inputs from another, such as cotton or wool for cloth weaving. Forward production linkages occur where the production of a commodity provides supplies for productive activities in other sectors. All these types of linkages must be nurtured for integrated rural growth.

The Igbo women of south-eastern Nigeria are endowed with many skills in crafts and technology. Examples include the traditional technology of clay pot-making which has been a big industry for centuries. Pottery used to be an important industry in many Igbo communities because of the abundant deposits of fine non-expanding clay mineral. The earthen pot is used for storage of grains, as a cooking and household utensil, as a water container and local water 'refrigerator', as a container for fermenting cassava, for storing and distributing palm-wine, for local brewing and distillery and as a musical instrument. Igbo women are also noted for their traditional weaving technology and artistry. The Akwete women weavers have been famous since the 18th century for the popular "Akwete textile" (Ijere, 1988). In fact when Prince Charles and Lady Diana visited Nigeria in 1983, they were marvelled

at the level of entrepreneurship of the women and the high level of sophistication of the traditional weaving technology. They called for the systematic upgrading of the technology and the encouragement of the women by government (*Daily Times*, May, 1982).

It is worthy of note that some of the rural crafts and technology industries provided the needs of the Igbo and others in south-eastern Nigeria during the Nigerian civil war (1967-1970), when the people were locked out of trade with other parts of Africa and the world. The cloth weaving industry, for example, provided most of the clothing needs of the people, suggesting that people can live on their own traditional crafts and technology.

Policy Issues and Programmes Relating to Women Entrepreneurship in Nigeria

The contemporary global economic and social upheaval led to the United Nations Declaration of 1994 as the International Year of the Family. This led the then First Lady of the Federal Republic of Nigeria to initiate the Family Support Programme (FSP). *FSP's Blueprint* was launched on 4th November, 1994 to replace the Better Life for Rural Women Programme (BLRW) initiated by the previous First Lady, Mrs. Maryam Babangida.

According to its mission statement, FSP aims at improving on the experiences of women in development programme by broadening its coverage and sharpening its focus. The specific objectives of FSP, among others, include:

i) eradicating negative social, economic and cultural factors affecting women and children
ii) assisting families identify economically viable enterprises for income generation and providing technical and financial support for their implementation
iii) assisting rural families increase their agricultural productivity as well and improve their nutritional status (FSP Blueprint, 1994).

It should be noted that both the Better Life for Rural Women Programme and the Family Support Programme have been implemented for 15 years without much visible impact on women entrepreneurs. The plight of the women continues unabated. Concerted efforts to correct the anomalies against women and to properly integrate them into the national development process continues. One such effort was through the Fourth World Conference on the Advancement of Women organised by the United Nations in Beijing, China, on September 4-15, 1995. At the end of the conference, a Platform for Action which comprised 12 critical areas of concern was adopted by the then First Lady of Nigeria, Mrs. Mariam Abacha. This led to the initiation of the then Family Economic Advancement Programme (FEAP), with the primary aim of activating the Family Support Programme. It has other objectives which are to:

i) provide loans directly to people at ward level with the capital needed to set up and run cottage enterprises
ii) provide opportunities for the training of ward-based business operations
iii) encourage the design and manufacture of appropriate plant, machinery and equipment
iv) create employment opportunities at ward level
v) improve the living standards of the people
vi) encourage producers at ward level to form co-operative societies (Blueprint of FEAP, 1997).

FEAP has however been integrated into other rural development programmes to become the Poverty Elimination Programme of the current Obasanjo administration.

All these programmes emphasize in their blueprints the need for research in the areas covered by their objectives. The findings of such research would from time to time be used to focus the objectives of the programmes properly for better results. But it seems that such research, especially as it concerns rural women entrepreneurship, is lacking or not emphasized. For example, no programme can reasonably help the rural women identify other economically viable enterprises if attempts are not made to find out the reasons why such women have abandoned or are not making profits from the traditional enterprises that have hitherto sustained them economically. This, among other issues, will be the focus of this research.

The Research Problem

The Igbo part of south-eastern Nigeria had for centuries been a centre of excellence for different crafts and technologies that are now moribund. In recent years, as modern mass-produced products have come to dominate world markets, most of the traditional Igbo handicrafts and industries are disappearing because they seem not to compete favourably with imported commodities. Even traditional skills that have not disappeared altogether have, in many cases, seriously deteriorated. Just as machine textiles replace hand-woven cloth, and synthetics replace cotton, metal and plastic utensils have come to replace earthen pots and ware. This process is intensified by the spread of capital intensive urban-based industries that threaten a wide range of indigenous cottage industries and artisanal activities that have long provided income for rural women. Such rural cottage industries include hand cloth weaving, rice pounding, *garri* processing, palm oil processing, pottery and others.

According to Dixon (1979), although these processes affect industries in rural areas, additional forces work specifically against women. The new heavy industries typically demand male labour while even in light instance – except when women are thought to be uniquely suited to certain skills - men often replace women as techniques are upgraded. For instance, the introduction of the modern kiln and the modern ceramic factory in Umuahia urban in eastern Nigeria favoured the male workers and shunted off women pot-makers of the nearby Isiagu community while the introduction of modern looms and the siting of textile factories in Aba urban did not integrate but rather devastated the rural women weavers in the nearby Akwete community (Alimba 1990, Ikeme and Uvere, 1995).

Many rural women entrepreneurs have been abandoning their enterprises for lack of effective competition with the modern urban-based industries and for lack of support and protection from government and other agencies. Most of these women now depend on unproductive peasant agriculture for marginal employment while most of the landless ones have migrated to the urban areas. It is common to see some of the migrated women in construction sites doing hard jobs such as mixing and carrying concrete, street hawking and begging, or other menial jobs that can hardly sustain them and their families. Worse still, most of these women are economic household heads. The young girls who could have found ready employment in some of these traditional industries are also forced to migrate to the cities. While some go into apprenticeship in the already congested urban handicraft and services such as hairdressing and cloth sewing, others are forced into socially undesirable activities such as street hawking, prostitution and stealing. The magnitude of the socio-economic

problems associated with technological change, especially as they relate to the rural women are not well understood.

No country or government can stop modern technology from overtaking the old. But the argument, especially for developing countries, is that the negative socio-economic consequences of the technological change should not be a destabilizing factor to people in enterprises that use the traditional technology, especially rural women. Rather, a system must be developed which aims at integrating the new technology with the old, hence making the people relevant and competitive in the changing environment. Only in this way will the much-needed rural linkages that engender sustainable rural development and growth be achieved.

Previous efforts by Nigerian governments to provide competitive skills to rural women have emphasized agrarian and technical skills that have had little or no traditional content. Examples include the Better Life for Rural Women Programme of the Babangida administration, the Family Support Programme and the Family Economic Advancement Programme of the past administration. They were directed specifically towards increasing food production and acquisition of skills in such enterprises as soap making and sewing while the traditional technical skills the women are familiar with were ignored. Laudable as these programmes seem, not much has been achieved because the skills they teach are beyond the comprehension of the mostly illiterate rural women. Hence, the displacement of rural women from their traditional income yielding non-farm activities.

The specific research problem therefore is that the socio-economic consequences of technical change as they affect rural non-farm women entrepreneurs particularly in the area chosen for the study do not seem to have been sufficiently established and used for improved technological policy that would engender rural linkages and enhance integrated rural development.

Research Questions

It is pertinent to find out the factors responsible for the situation in form of research questions. Could it be that the base-line data and information required to make appropriate technology policies are lacking? What are the relevant data and information? Is there no way of reaching the rural women entrepreneurs in order to understand their traditional production techniques and problems, to be able to suggest how to adapt or upgrade them, along with modern equipment or scaled-down technology? What are the levels of displacement and the socio-economic effects of this displacement or threat by modern technology on the rural women entrepreneurs and their households? Should all the socio-economic problems faced by rural non-farm women entrepreneurs be regarded as the consequences of technological change or are there other causes? What are these other causes? Other relevant questions follow. What are the implications of this technical change on the farm on one hand and, on the rural economy as a whole, on the other? Are there appropriate policy variables that could be used to achieve sustained technology policy for rural women entrepreneurs? What are they? Answers to these questions were sought in the course of this investigation.

Research Objectives

General Objectives: The research is centrally aimed at assessing the socio-economic consequences of technological change on the rural Igbo non-farm women entrepreneurs of south-eastern Nigeria and the implications of such consequences on rural farm and non-farm linkages.

Specific Objectives: The specific objectives of the research are to:

i) characterize the socio-economic and cultural attributes of the rural Igbo non-farm women entrepreneurs which should influence or be influenced by technological change;
ii) identify and assess the level of change in the local production systems associated with modern technology, and the perception by the women entrepreneurs over the change;
iii) assess the effects of variables related to new technologies on some socio-economic attributes of the rural women in terms of employment generation, migration, standard of living, level of income, and the linkage effects of these variables in the rural economy;
iv) find out the rate of entry of women into and exit from the traditional non-farm enterprises, the reasons for entry or exit and the level of apprenticeship by young women;
v) find out the type of alternative employment for the displaced women and identify the factors that might continue to influence or discourage non-farm women entrepreneurs from adopting innovations in the study area; and
vi) indicate the policy implications of these findings for appropriate technology policy intervention.

Expected Results and Impacts

Not much attention has been paid or effort made to identify the reasons why the rural women continuously abandon, while the younger ones refuse to take up, traditional non-farm enterprises that used to sustain them and their families. This research is expected to produce base-line data which will reveal the magnitude of positive and negative effects of new technologies on the traditional ones used by women in rural non-farm enterprises, and consequently, the effects on the socio-economic lives of the women entrepreneurs.

Relevant policies and programmes that could address the socio-economic problems of the rural non-farm women entrepreneurs, the displaced unemployed women, and the young girls, as a result of the changing technologies could be based on empirical findings, and designed intervention rather than policies 'unencumbered' by information as previously pursued in Nigeria. For example, the research will serve as a useful working tool to the government in redesigning the National Directorate for Employment (NDE), which aims to carry out mass employment especially for young school leavers. This programme was designed following an industrial training pattern rather than self-employment, based on locally available resources. It may also assist such government and non-governmental agencies, such as the Women Commission, the Family Support Programme (FSP), the Family Economic Advancement Programme (FEAP), the new Poverty Alleviation Programme (PAP) and non-governmental organizations in directing their assistance properly to the rural women through proper focusing of programme objectives.

Both the local, State and the Federal Government will have a clearer focus and better appreciation of the fact that the integrated rural development being pursued could only be achieved through the harnessing of the linkages between farm and non-farm enterprises. This can best be achieved by encouraging the rural non-farm entrepreneurs and by systematically developing the traditional non-farm technologies and enterprises hand-in-hand with the farm sector.

Chapter Two

Review of Literature and Conceptual Framework

Literature Review

Although literature abounds in the area of traditional and indigenous technology, the socio-economic impact of technological change on traditional industries involving rural women entrepreneurs in the developing economies has not provoked much concern. Hence, it is difficult to find written information on this area of knowledge especially relating to the area under study. Most literature on rural traditional non-farm technologies and activities either concentrates on the state-of-the-art technologies or the linkages of these technologies with the farm sector (Chuta and Liedholm 1979, Oludimu and Williams, 1987, Rains and Stewart et al 1987, Alimba 1990).

Literature has been reviewed on such areas as traditional and indigenous non-farm technology, the consequences of technological change, and technology change and rural linkages.

Traditional and Indigenous Non-farm Technology

Traditional technologies are technologies developed in traditional set-ups and have in most cases been transmitted unmodified through a particular lineage in the traditional setting. The community technologies provided household goods and agricultural tools to the community (Ikeme and Uvere, 1995). According to Garg (1976), the rural areas were practically self-sufficient until the introduction of large-scale mechanized technologies which made an impact in three directions: on product selection, on technology, and on organizational patterns. Indigenous technologies, on the other hand, are technologies which involved the exploitation of our indigenous human and material resources, and the adaptation by our own people of imported (or foreign) technologies to suit our environmental, social and economic needs (Umeh, 1982).

Therefore, indigenous technologies could be traditional or modified. According to Ikem and Uvere (1985), Nigerians have at one time or another in their history displayed a high degree of traditional technologies ranging from the agricultural and construction to medical and textile. They cited examples of blacksmithing in Awka, pottery in Okigwe, carving and sculpture in Benin, boat building in the riverine communities, and palm-oil processing in the eastern Nigerian villages. Furthermore, they observed that some of the technological products such as hoes were used in agricultural production, hand looms for processing cotton into textile materials, while the cribs and earthen pots were used for grain storage. This technological capacity is crude, operates on a small scale, and at cottage level.

Writing on the problem of technological displacement, Carr (1984) observed that the demand for these products traditionally made by village women is declining as incomes rise. Foods and drinks

processed from cereals, handspun cloth and earthenware goods, all have a low income elasticity of demand and are facing competition from "modern" products, often produced in urban-based factories.

The challenge is to take existing skills and adapt them (along with the help of upgraded equipment or scaled-down modern technology) to the manufacturer of new products (e.g. china) which have high income elasticity of demand. Many of the products, which are currently imported into the village from urban based factories or from overseas, could be made in the neighbourhood if the appropriate technology, training and retraining and other support services were available (Chuta, 1978).

In their study of rural non-farm enterprises in former Bendel State of mid-western Nigeria, (Oludimu and Williams, 1987), and former Anambra State of south-eastern Nigeria (Alimba, 1990) identified among others, metal works, blacksmithing, pottery, food and farm product processing, weaving, palm-wine tapping and gin distilling as some of the important rural non-farm activities performed in the Igbo part of Nigeria. They noted that pottery, weaving, farm product processing (e.g. oil palm processing) were dominated by women. They also noted that some of the traditional industries like pottery, weaving and cloth dyeing had been on the decline.

Consequences of Technological Change

Reflecting on the impact of modernization on rural women, Dixon (1979) observes that African women who brew beer in their villages look forward to the day when a new road will carry their products to the regional centre, only to find to their dismay that the road brings them imported beer instead; those who smoke and sell fish discover that new refrigerated warehouses and freezers undermine their business, while other locally produced foods and condiments give way to factory products. Furthermore, machine textiles replace hand-woven ones, metal and plastic utensils replace earthenware, and synthetics replace cotton.

Technical and vocational training is heavily biased towards the cities in locations, training, content and methods in developing countries. The skills taught relate to imported technologies and knowledge-system, and methods tend to be modelled on the industrial training used in developed countries, which is geared to formal employment rather than self-employment. They also fail to take account of local patterns of production (Jazairy and Alamgir et al, 1990). As they further observed, a glance in many villages in developing countries reveals a collection of workshops where a host of small-scale technical activities are carried out, often characterized by extra-ordinary ingenuity, in which disparate equipment is cobbled together for a wide variety of purposes. Also observed, these enterprises are particularly dynamic and the foundation of locally-attuned skills can be used to build a broad-based, rural directed approach to technical and vocational training. These local skills can be harnessed and upgraded to help alleviate poverty. The approach should be non-formal, rooted in the local community, linked to practical learning and matched with local supply and demand.

Commenting on the reasons for the worsening poverty of the rural women, Alamgir (1988) asserted that although there are many reasons for the worsening poverty of rural women, particularly important are population increase, the present world-wide economic crisis, civil conflicts, natural calamities, degradation of the environment, changes in traditional values, the disintegration of families due to rising incidence of divorce, separation and desertion under duress, increased male migration, an increase in households headed by women, and a weakening of household survival strategies. But one of the most destabilizing factors affecting rural women is their massive displacement from income

yielding enterprises by modern technologies. The more relevant approach would be to identify which non-farm activities rural women are already engaged in or used to be engaged in and then try to raise their productivity of labour so as to increase their earnings or to help transform their subsistent activities into income generating ones.

As variously observed, the rural poor suffers from a significant gap between their potential and actual productivity and the productivity gap of the poor rural women is much wider than that of poor rural men. Rural women will gain proportionally more if investment allocations and development efforts are shifted in their favour; they can go from a situation of being triply disadvantaged to one in which their contribution will have a multiplier effect in the household, in the community, nationally and, most important, in the future generation (Ijere, 1988). An increase in the productivity of women can lead to their economic empowerment and thereby raise the gross national product. (Okeke, 1995).

On why rural women need a higher hold on cash income, Dhamija (1981) gave two reasons for this: first, the number of households which are headed up by women are higher than most people realize and are on the increase especially in Africa. Secondly, even in male-headed households, it has been found that the interests of the family are often best served if women members have the means to earn and control cash incomes of their own as men tend to commit more of their resources to consumer goods, prestige or entertainment.

Technology Change and Rural Linkages

On the implication of improvement of non-farm enterprises on the farm in terms of linkages, Rains and Steward et al (1987), Oludimu and Williams (1987) clearly stated that as far as linkage effects are concerned, the magnitude of the rural non-farm sector depends on the increase in markets for farm products, on improved supplies of inputs and technology and on modernizing influences on attitudes to accumulation. Unless the non-farm sector of the rural economy is substantially uplifted, allocating greater resources to agricultural development programmes may not substantially enhance rural incomes and farmers' standards of living.

In studies carried out in rural areas of India and the Philippines (Ranis and Stewart, 1987), and some rural communities of eastern Nigeria (Alimba, 1990), some important roles played by traditional non-farm employment were identified as sustaining employment and incomes in the face of rising populations and threats of unemployment, providing seasonal occupation for farm workers during the less busy time of the year, contributing to equality and poverty alleviation by increasing the incomes of the poor, contributing to the export earnings of the country concerned, and performing the linkage functions thereby contributing to a dynamic and equitable growth cycle. Therefore, neglecting the traditional technology-based rural enterprises or allowing them to go extinct because of the encroachment of modern technology, is a clear threat to rural linkages and ultimately to rural development.

The current research will, based on the above reviewed work, aim to study the socio-economic impacts of new technology on the traditional ones especially on rural women entrepreneurs of the Igbo of south-eastern Nigeria, and highlight the implications of such impacts on rural linkages and growth.

Theoretical and Conceptual Framework

Economic Analysis of Technological Change

It is worthwhile to clarify the economic tools which are used to conceptualize technological (technical) change in order to focus the research properly. If the definition of *technology* as all the methods of production that have been developed or could be developed with the existing state of scientific knowledge is accepted, then technological change would refer only to advances in scientific knowledge from which new production methods can be derived. But technology has to be distinguished from technique. Some economists prefer to restrict it to mean only the techniques already developed and available at a given moment in time from which a choice can be made (Ellis, 1988). Therefore, this is a sub-set of those techniques which could be developed from existing scientific knowledge.

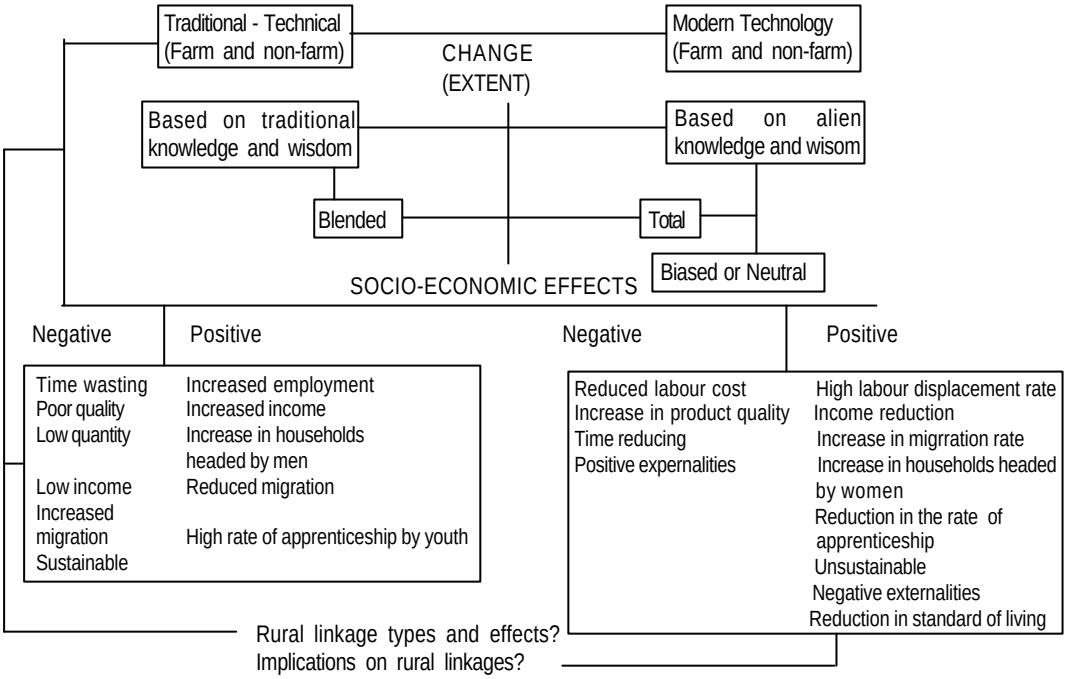
But technique refers to any single production method, that is, to a precise combination of inputs used to produce a given output. A technique may be represented by a single point on an isoquant or iso-product curve (Ellis, 1988). Technical (technological) change, in contrast, means a reduction in the quality of resources required to produce a given output; or alternatively, more output for the same level of resources. For practical purposes, technical change is usually defined as the proportional decrease in costs of production achievable by the innovation when both the old and the new techniques operate at their combinational optimal and when factor prices are held constant (Binswanger, 1978).

The conceptional framework as summarised in the figure below shows that the technology available to the rural entrepreneurs could be traditional or modern. Both could be farm or non-farm. Traditional technology based on traditional knowledge and wisdom could be transformed to modern technology which is based on alien knowledge and wisdom. This change could just be a blending by the modern technology, or total, depending on the extent. Both types have some socio-economic effects on the rural entrepreneurs, which may be positive or negative. They also have rural linkage implication.

The socio-economic effects of modern technology on the people could be “biased” or “neutral”. They are neutral when the technical change cannot be blamed for its (negative) effects such as labour displacement by capital due to their relative prices. They could be biased if there is a favouring of one resource use against the other, with social and economic implications. The consequences on the rural sectoral linkages that determine the rate of rural development and growth are of interest.

The research, therefore, focused on the extent of technological change in the study area, the form of the change (biased or neutral), the positive and negative consequences of the change, and implications on rural linkages.

A Diagramatic Summary of the Conceptual Framework



Chapter Three

Research Methodology

The Study Area

The study covered the five core Igbo speaking states of south-eastern Nigeria. They are Abia, Anambra, Ebonyi, Enugu and Imo States, all of which have 94 local government areas (LGAs). They have a population of 11.7 million people with about 75 percent or 8.78 million in rural areas, of which about 51 percent are women (National Population Census, 1991). South-eastern Nigeria lies between latitude 6°E and longitude 4°S and 7°S. The occupation of the Igbo people in the region is basically farming, combined mainly with non-farm activities in varying degrees. Some people in the delta area are involved in artisanal fishing. Some communities are especially noted for their traditional non-farm enterprises which form their major occupation while some complement farming with non-farm enterprises. Some rural non-farm crafts and technologies common in the area include palm-wine tapping, food and farm product processing such as palm-oil processing, cloth weaving and dyeing, pottery and wood carving. While men are mainly involved in wine tapping, blacksmithing, wood carving and metal work, the women are exclusively involved in agro-processing, cloth weaving and dyeing, pottery and local brewing. Some communities in the study area such as Akwete, Isiagu, Enugu-Ezike, and Awka, among others, are noted for their unique traditional non-farm enterprises.

The research focused specifically on the following traditional women enterprises:

i) cloth weaving
ii) pottery and clay work
iii) local brewing
iv) palm-oil processing, and
v) garri processing.

Sampling Procedure

A multi-stage sampling technique was adopted by sampling, first, the local government areas (LGAs) and secondly the communities in LGAs. The choice of the LGAs and communities was based on purposive sampling technique in the sense that one LGA noted for any of the chosen women enterprises was selected from each state. From each selected LGA, the community most noted for any of the enterprises was purposively selected. For example, in Abia State, Ukwa LGA was selected, and from it Akwete, a community historically known for their artistry in cloth weaving. In all, five LGAs were chosen from the five Igbo States, out of which five communities were selected.

A compilation was done to list all the entrepreneur households. From the list, 50 women entrepreneurs were chosen by the simple random sampling technique, and studied. Also 10 rural

women who are no more engaged in the traditional enterprises were identified in each of the communities and interviewed. Altogether, 250 rural women non-farm entrepreneurs were selected and studied in the five states. Panel survey was also adopted by forming panels from each group of the women entrepreneurs out of which detailed panel data were collected. An entrepreneur selected for the purpose of this study was a woman devoting up to 60 percent or more of her working time or available labour to the enterprise.

Data Collection Procedure

A reconnaissance survey was carried out in order to give the researchers an overview of the nature of the environment in the study area, after which, a final survey was conducted to collect primary data using structured interview schedule, and a focus group discussion (FGD) guide.

The FGD was used to collect qualitative information which was recorded on tape, and the groups used for the discussion were carefully chosen to include both the entrepreneurs still active in the industry, and those that had exited. Each group of discussants was made up of seven to nine women of productive age. The old and retired entrepreneurs supplied information on the old order and the perceived transformation. Young girls supplied information on their general perception of the traditional enterprises and their future employment plans.

The researchers were assisted by trained enumerators drawn from each village to interview the sampled respondents on a regular basis. Secondary information came from published and unpublished work that relates to the research and studies already done on these enterprises in the chosen areas.

Nature of Data Collected

The nature of data and information collected for each objective is given as follows:

Objective 1: The type of data collected for this objective includes the age of the women entrepreneurs, the highest level of education attained, marital status, type of religion, family size, headship position in the family, primary and secondary occupations, method of technical or technological acquisition, number of years spent in the non-farm occupation, and level of income from the non-farm activity. These data gave the general picture of the socio-economic and cultural attributes of the rural women engaged in the non-farm enterprises. These socio-economic variables were used to establish relationships with the other variables.

Objective 2: The objective sought information on the percentage change (if any) of the local production systems associated with the new technology, how the women entrepreneurs perceive the change associated with the new technology, and their own assessment of the new technology vis-à-vis local technology in terms of time spent in production and quality of products. This information, mainly qualitative, assisted the research in finding out reasons for the level of adoption or non-adoption of modern technology into the local production system, and also gave the researchers insight into whether the women actually perceived the effects of modern technology as positive or negative.

Objective 3: Information was sourced on the number of rural women employed as a result of the adopted new technology in relation to the old one, the level at which people of the area had accepted

the products from modern industry in place of the local products, the changes in the income of the women in the area as a result of the new system adopted, the level of income of women still in the traditional production system, and how their incomes flow into investment and consumption expenditures in the other sectors. The information helped in comparing, quantitatively, the impact of the new technology and production systems on the rural women entrepreneurs and their households. Also, it helped in establishing the effects on backward and forward linkages in the rural economy.

Objective 4: The nature of information sought here was the number of women entrepreneurs who enter into the traditional non-farm industry and the number that leave every year in the past two years. From each of the villages under study, their reasons for entry or exit and alternative job for those who exited and the rate of apprenticeship of young girls and women in these traditional industries was determined. The information gave the research insight into the future of the local enterprises.

Objective 5: The information to be sought included the level of assistance in cash or in kind ever received from both the government and non-governmental organizations by the women, either individually or in groups (e.g. support from such government agencies like the Women Commission, Better Life for Rural Women, Family Support Programme, or Family Economic Advancement Programme), from church organizations, where the women who left the traditional occupation went, the type of employment they engaged in, and other factors which continue to discourage women entrepreneurs. This information helped the research to establish the level of encouragement, and what would continue to disencourage the women, and the consequences of their displacement from these traditional enterprises.

Data Analysis

Use of Descriptive Statistics

Data generated were analyzed in two stages. The first stage was the preliminary analysis, after which a more elaborate analysis followed. The preliminary analysis involved use of descriptive statistics and also cross-tabulation of the quantitative data in order to investigate sets of relationships among variables. The cross-tabulation was in form of a two-way table as elucidated by Jolliffe (1986). Preliminary analyses involving descriptive statistics were used to analyze parts of objective 1 to 5, while cross-tabulation analysis was used on objectives 1, 2 and 3. It was necessary to conduct further analyses since the study seeks to investigate sets of relationships among some variables that relate to technological change and the consequences on the rural non-farm enterprises.

Inter-correlation Matrix Model

This was used to investigate how the selected socio-economic characteristics of the rural women entrepreneurs are interrelated with variables associated with technological change. Objective 2, 3 and 4 were partly satisfied by using the inter-correlation matrix model. The inter-correlation specified explicitly is of the form PxP correlation matrix of R.

Where

	P_1	P_2	P_3	$P_4 ... P_m$
$R = P_1$	$r_{11} = 1$	r_{12}	r_{13}	$r_{14}...,r_{1p}$
P_2	r_{21}	$r_{22}=1$	r_{23}	r_{24}
P_3	r_{31}	r_{32}	$r_{33}=1$	$r_{34}...,r_{3p}$
P_4	r_{41}	r_{42}	r_{43}	$r_{44}=1...,r_{4p}$
P_n	rP_1	rP_2	rP_3	$rP_4...,rpp=1$

Where

a) P_1, P_2, P_3 ..... Pn, Pm are the exogenous variables which the inter-relationships are sought.

b) r11, r12, rr13 ..., rPm are the coefficients to be determined, with diagonal values - 1, noting that correlation of a variable with itself is 1.

c) r_{11}, r_{21}, r_{31} ..., rPn, are the column coefficient determined as in b.

Note: If the inter-correlation matrix coefficient of rPm is less than 0.5, it is taken that there exists a poor relationship between the two variables, with such coefficients, but if greater than or equal to 0.5, there is a strong relationship (Bhattacharyya and Johnson, 1977).

Twenty-five identified socio-economic variables relating to technical change were inter-correlated. The variables include:

V_1 = Age of entrepreneur
V_2 = Educational attainment
V_3 = Type of religion
V_4 = Family size
V_5 = Number of social infrastructure/amenities available and functional in the area
V_6 = Amount of time spent in the enterprises per day (hrs)
V_7 = Average monthly income from enterprise (Naira)
V_8 = Average monthly expenditure on household (Naira)
V_9 = Number of female out-migrants from household
V_{10} = Age at time of departure (years)
V_{11} = Level of education prior to migration
V_{12} = Method of technical acquisition
V_{13} = Length of time in formal training
V_{14} = Amount of family labour used in enterprise (hours)
V_{15} = Number of apprentices in the past 2 years
V_{16} = Amount of working capital (Naira)
V_{17} = Level of technical change adopted (in percentage)
V_{18} = Number of years adopted

V_{19} = Membership or non-membership of organised group or society.
V_{20} = Amount of financial assistance received in the past 2 years
V_{21} = Number of people that entered the enterprise in the past 2 years
V_{22} = Number of people that exited from the enterprise in past 2 years
V_{23} = Percentage of non-farm income invested in farm activities
V_{24} = Number of positive effects experienced after adoption
V_{25} = Number of negative effects encountered after adoption

Multiple Regression Model

Regression analysis was used in objective 3 to determine the influence of some variables on the entrepreneurs who have adopted new technology in relation to their levels of adoption. Three functional forms were tested: the ordinary linear, the semi-logarithmic, and the double-logarithmic forms. Whichever model that has the highest R^2 value and shows many statistical significance variables was adopted following (Kmenta, 1971).

The stochastic implicit and explicit equation forms of the regression model were generally written as g and h respectively as follows: Implicit as:

$$Esv = F(X_1, X_2, X,3_{*-*}X_K, U) \quad (g)$$

Five regression equations would be analyzed to find out how the independent variables relating to technical change explained the five critical dependent socio-economic variables identified. The five dependent variables are:

Y_E = Level of income from enterprise (Naira)
S_L = Standard of living of entrepreneur in terms of monthly consumption expenditure (Naira)
N_E = Number of women employees or apprentices in the past two years
H_0 = Number of households (female) out - migration in the past two years
I_N = Amount of money invested from non-farm to farm in past two years (Naira)

Each of the five socio-economic variables served as a dependent variable which was regressed against the nine identified independent (explanatory) variables related to technical change. The explicit form of the regression equation is generally written as:

$$Esv = b_0 + b_1 X_1 + b_2 x_2 + b_3 x_3 + b_6 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6\, b_7 x_7 + b_8 x_8 + b_9 x_9 + U \quad (h)$$

Where

Esv = Each of the selected entrepreneurs socio-economic variable (dependent)
X_1 = Level of technical change in enterprise (estimated in %)
X_2 = Level of technical change adopted by an entrepreneur (in %)
X_3 = Amount spent in repairs of adopted technology (Naira)
X_4 = Amount spent in procuring raw material of new technology (Naira)
X_5 = Extra labour requirement due to adopted change (man hours)
X_6 = Number of entrepreneurs that exited due to technical change.
X_7 = Level of entry or apprenticeship due to technical change
X_8 = Number of positive effects of change on the production enterprise experienced.
X_9 = Number of negative effects of change on enterprise experienced.
b_0 = The intercept of constant terms
b_s = The coefficients of the independent variables
U = Stochastic error term with OLs properties.

Factor Analysis

Since many factors in the form of constraints were identified as being responsible for the poor growth of traditional technology industries or adoption of new technologies, and other factors as relating to the consequences of technology change on the entrepreneurs, all of which are theoretical, it was necessary to do a factor analysis on objective 5. Factor analysis is a method for exploring the structure of the data. The aim of the method is to account for the co-variances of the observed or manifest variables in terms of a smaller number of variables known as factors; where the factors are un-observable variables or theoretical concepts.

If n are observations on each of the variables $x_1, x_2, x_3..., X_p$, and we suppose that m are the underlying factors $F_1, F_2,...F_m$, where m < p, then the factor analysis model assumes that each X_1 (i = 1,2,...P) can be written as a linear combination of the factors and as a residual variable. In effect, for each, X_1 takes the role of dependent variable and F1, F2,...Fm are like explanatory variables. For example, in terms of observations, if X_{ij} is the observation on variable X_j for the $_i$th sample member then:

$$X_{ij} = \ddot{e}_1 F_i \quad 1 + \ddot{e}_j 2 F_i 2 + ..., + \ddot{e}_{jm} F_{im} + e_{ij}$$
$$(i = 1,2,...,n, j = 1,2,...,p)$$

Where

F_{ik} = The score on factor FK (k = 1,2,...m) and

e_{ij} = The value on the residual variable E_j for the ith sample member.

$F_1, F_2,...F_m$ are known as common factors (since every X_{ij} is written in terms of all of them) and E_j is known as a specific factor since it corresponds to X_j. All of the F_{ik} and e_{ij} are un-observable. The weights $\ddot{e}_{ji}...\ddot{e}_{jm}$ are usually called the factor loading (Jolliffe, 1986). The assumptions made here about the model, in order to estimate it, are that the common factors $F_1, F_2,....,F_m$ are independent of one another, and the specific factors $E_1, E_2,...,E_p$ are independent of one another and of the common factors.

The suitable numbers of factors were selected subjectively, and the factors produced were rotated with the hope of finding a readily interpretable sets of factors.

All the multivariate analyses adopted were based on the Statistical Package for Social Sciences (SPSS) programme. The qualitative data complemented the quantitative. Analysis of the qualitative data from the FGD guide was in terms of interpretation of the implicit and explicit folk concepts and verbatim quoting of the discussants' views.

Chapter Four

Data Presentation and Discussion of Findings

Socio-Economic Attributes of the Rural Non-farm Women Entrepreneurs of South-eastern Nigeria

Some socio-economic attributes of the rural non-farm women entrepreneurs such as age, gender, educational attainment, marital status, household size, type of religion, and type of non-farm enterprises engaged in, income and expenditure patterns and facilities available and functional in the areas constituted some of the independent variables in this study. These variables in one way or the other may have influenced or were influenced by technological change in the traditional enterprises. Data from 247 respondents were used for the analyses.

Age

Table 1: Age Distribution of Non-farm Women Entrepreneurs

Age Range	Frequency	Percentage
15 - 19	-	(0.9)
20 - 24	4	1.6
25 - 29	6	2.4
30 - 34	23	5.2
35 - 39	24	9.6
40 - 44	30	12.1
45 - 49	42	16.9
50 - 54	30	12.1
55 - 59	32	12.9
60 - 64	15	6.0
65+	49	19.8
Total	247	100.0

Age cannot be influenced by changes in technology but the attitude of the entrepreneur to technological change may be age-related. Table 1 shows that only four women entrepreneurs (1.6 percent) were of age range 15-24 years. Majority of the women entrepreneurs were aged above 65 years (19.8 per cent) suggesting a preponderance of the aged in those rural non-farm enterprises.

Table 2 is the cross-tabulation result of age range of the women entrepreneurs by the type of non-farm enterprise they engaged in. Analysis shows that entrepreneurs in pottery and local distilling were predominantly old, 60-65 years and above, while cloth weaving and *garri* processing had relatively

younger entrepreneurs, 55 years and below. Generally, it can be seen that most traditional non-farm women businesses were dominated by old retiring entrepreneurs. Continuity of these enterprises then calls for questions as those aged entrepreneurs are gradually retiring. Also, a question arises as to why younger people are reluctant to join some of the enterprises that help sustain their households.

Table 3 shows the age distribution of traditional non-farm women entrepreneurs by the level of technical change adopted in their enterprises. It is seen that adoption of technical changes involved more of women aged from 40 to 59 years. This age range constituted the majority who adopted about 31 percent of the innovations exposed to them in their enterprises. In fact, a hypothesis of inverse relationship between age and percentage adoption was accepted (as X^2 cal = 25.5 < X^2 tab = 28.4 at 10 percent significance level). This implies that age was inversely related to level of adoption of perceived change; that is, the higher the age of entrepreneurs the less innovations they adopted.

Table 2: Cross-tabulation of Age of Women Entrepreneurs by Type of Non-farm Enterprise Engaged in

Age Range	Less than 20	20-30	31-40	41-50	Above 50	Total
20-29	-	1	2	1	-	4
		(2.4)	(4.9)		(4.0)	(2.0)
30-34	1	7	2	4	3	6
	(2.9)	(8.5)	(3.3)	(4.5)	(12.0)	(2.4)
35-39	2	5	4	3	-	17
	(5.9)	(6.1)	(6.6)	(6.7)	(6.9)	
40-44	3	11	7	3	2	29
	(8.8)	(11.4)	(11.5)	(13.3)	(8.0)	(11.7)
45-47	2	14	9	6	5	36
	(5.9)	(17.1)	(14.7)	(13.3)	(20.0)	(14.6)
50-54	5	13	12	5	7	42
	14.7	(15.8)	(19.7)	(11.1)	(28.9)	(17.0)
55-59	8	19	13	9	2	51
	23.5	(23.2)	(21.3)	(20.0)	(8.0)	(20.6)
60-64	11	5	7	6	1	30
	32.4	(6.1)	(11.5)	(13.3)	(14.0)	(12.1)
65+	2	3	2	2	4	12
	(5.9)	(3.6)	(3.3)	(4.4)	(16.0)	(4.8)
	34	82	61	45	25	247
Total	(13.7)	(33.2)	(24.7)	(18.2)	(10.1)	(100.0)

Figures in parentheses are the column percentages.

X^2 Value = 8.62 X^2 tab = 18.3 *Reject if X^2 cal > X^2 tab.

d.f = 10 Sig. = 5%

Educational Attainment of Women Entrepreneurs

The level of education attained by a traditional woman entrepreneur is a key variable that may affect the attitude to change, assessment of change, and adoption behaviour. It may in turn influence the type and level of benefits or problems an entrepreneur gets from a change in technology (Table 4).

Table 3: Cross-tabulation of Age of Entrepreneurs by Percentage Adoption of Technical Change

	Estimated Percentage Change Adopted					
Age Range	Less than 20	20-30	31-40	41-50	Above 50	Total
20-29	-	1	2	1	-	4
		(3.1)	(5.3)	(11.1)		3.4
30-39	4	6	2	3	4	19
	(18.2)	(18.8)	(5.3)	(33.3)	(26.7)	(16.9)
40-49	3	12	13	2	5	35
	(18.6)	(37.5)	(34.2)	(22.2)	(33.3)	(30,5)
50-59	8	8	19	2	5	42
	(36.4)	(25.0)	(50.0)	(22.2)	(33.3)	(36.2)
60-69	6	5	2	1	1	15
	(27.3)	(15.6)	(5.3)	(11.1)	(6.7)	(12.9
70+	1	-	-	-	-	-
	(4.5)					
	22	32	38	9	15	116
Total	(19.0)	(27.6)	(32.8)	(7.9)	(12.9)	(100.0)

Figures in parentheses are the column percentages
X^2 Value = 8.62 X^2 tab = 18.3
d.f = 10 Sig. = 5%

Table 4: Distribution of Rural Non-Farm Women Entrepreneurs According to Educational Attainment

Highest Level of Education Attained	Frequency	Percentage
No schooling	39	15.7
Adult literacy	19	7.7
Primary incomplete	61	24.7
Primary complete	69	27.9
Secondary incomplete	30	12.1
Secondary complete	17	6.9
Tertiary/Post secondary	12	4.8
Total	247	100

Source: Field data, 1999

Table 4 shows that up to 15 per cent of the respondents had no formal education, 27.9 per cent completed their primary education, while only 5.7 per cent had one form of tertiary education or another.

Table 5: Cross Tabulation of Entrepreneurs' Level of Education and Ability to Assess Technical Change

	Perceived Technical Change			
Age Range	Total Change	Blended	Don't know	Total
No schooling	1	7	12	1
	(3.4)	(5.9)	(45.3)	(11.1)
Adult literacy	2	23	3	27
	(6.9)	(19.3)	(5.9)	(14.8)
Primary education	14	45	13	72
	(48.2)	(37.8)	(38.2)	(39.6)
Secondary education	8	39	4	51
	(27.6)	(32.8)	(11.8)	(28.0)
Post secondary	4	5	3	12
	(13.8)	(4.2)	(8.8)	(6.6)
	29	119	34	182
Total	(15.9)	(65.4)	(18.7)	(100.0)

Figures in parentheses are the column percentages.
X^2 Value = 36.83 X^2 tab = 23.2
d.f = 10 Sig. = 1%

Source: Field data, 1999

The women's ability to assess the type and magnitude of change available in their non-farm enterprises related to their levels of education. Up to 12 (35.3 per cent) women who had no formal schooling did not know whether or not there was any change in their production system (Table 5). Also, of the 182 entrepreneurs who agreed that technical change had taken place in their production systems, 15.9 per cent reported a total change in all their production systems, 65.4 per cent said the change was a blend of their traditional system (i.e. partial change), while 18.7 per cent could not establish any form of change.

A null hypothesis of no relationship between entrepreneur's level of education and ability to assess technical change was rejected at 1 per cent level of significance, implying that level of education has a relationship with an entrepreneur's ability to correctly assess the magnitude of technical change. Awareness and ability to know the magnitude of technical change in one's enterprise may affect level of adoption.

Table 6: Educational Level of Entrepreneurs by Percentage of Technical Change Adopted

	Estimated Percentage Change Adopted					
Educational level	Less than 20	20-30	31-40	41-50	Above 50	Total
No schooling	3	1	1	1	1	7
	(11.1)	(2.7)	(2.3)	(7.1)	(6.7)	(5.1)
Adult literacy	1	6	10	9	2	23
	(4.3)	(16.2)	(23.3)	(28.6)	(13.3)	(16.9)
Primary education	7	20	20	6	7	60
	(25.9)	(54.1)	(46.5)	(42.8)	(46.7)	(44.1)
Secondary	12	9	8	3	4	36
education	(44.4)	(24.3)	(18.6)	(21.4)	(26.7)	(26.5)
Post secondary	4	1	4	-	1	10
	(14.8)	(2.7)	(9.3)		(6.7)	(7.4)
	27	37	43	14	15	136
Total	19.9	27.2	(31.6)	(10.3)	(11.0)	(100.0)

Figures in parentheses are column percentages.

X^2 Value = 25.95 X^2 tab = 28.4

d.f = 20 Sig. = 10%

Source: Field data, 1999

Table 6 shows the distribution of educational levels of women entrepreneurs by the percentage of technical change adopted. It is seen that of the 27 entrepreneurs who adopted less than 20 per cent of the change exposed to them, 11.1 percent had no formal education, while 44.4 per cent had secondary school education. But of the 15 entrepreneurs who adopted 50 per cent and above of the innovations they were exposed to, only 6.7 per cent of them had no formal schooling, while 46.7 per cent had full primary education.

A null hypothesis of no positive relationship between level of education and percentage adoption was accepted at 10 per cent level of significance (X^2 cal < X^2 tab). This implies that educational level was not the major factor that influenced adoption of technical change among the women entrepreneurs studied.

This tends to support the oral information got from women especially from Akwete who worked as cloth weavers that what influenced their adoption of any change in their weaving enterprise was the decision of the officials of their local co-operative, after the officials had assessed such an innovation.

Marital Status

This tends to have implications on entrepreneurs household size, which is also affected by type of marriage. The implication of household size on rural enterprises is usually in terms of unpaid household labour supply (Table 7).

Table 7: Distribution of the Entrepreneurs According to Marital Status

Marital Status	Frequency	Percentage
Single	8	3.2
Married	156	63.2
Widowed	58	23.5
Separated	12	4.9
Divorced	13	5.3
Total	247	100.0

Source: Field Data, 1999

Data from Table 3 show that up to 63.2 per cent of the women entrepreneurs were married, while only 3.2 per cent were single. Also, of interest is that up to 23.5 per cent of the women were widowed, which in most cases made such women economic heads of their households.

Type of Religious Faith

Religion is a social variable capable of influencing most other variables in terms of enterprise choice, attitude to technological change and even adoption of technology (Table 8).

Table 8: Distribution of Respondents According to Type of Religion

Type of Religion	Frequency	Percentage
Traditional	30	15
Muslim	1	0.4
Catholic	78	31.6
Protestants	105	42.5
Others	9	3.6
Total	247	100.0

Source: Field data, 1999

Table 8 shows that most women entrepreneurs (42.5 per cent) were Protestant, 31.6 per cent were Catholic, while 15 per cent were traditional. Only 0.4 percent were Muslim, while 3.6 per cent did not disclose their faith.

Traditional religionists are usually influenced by traditional cosmovisions in what they do regarding their enterprises. Since most of the entrepreneurs were not of the traditional faith, they may not have been influenced much by their religion with regard to behaviour towards technical change.

Household Size

Household size is one of the important determinants of household labour supply to rural enterprises.

Table 9: Distribution of Respondents According to Household Size

Household Size Range	Frequency	Percentage
Less than 4	15	6.1
4 - 8	95	38.5
9 - 12	54	21.9
Above 12	6	2.4
Don't know	77	32.2
Total	247	100.0

Source: Field data, 1999

Table 9 shows that most of the entrepreneurs (38.5 per cent) had household sizes that ranged between four and eight persons. Only 6.1 percent and 2.4 per cent had household sizes that were less than four and above 12 persons respectively. About 32.2 percent of the respondents refused to disclose their household size on the reason that their culture does not permit counting of people in a household.

Table 10: Cross-tabulation of Household Size of Entrepreneurs by Number of Employees or Apprentices in Enterprise in Past Two Years

	Number of Apprentices Enrolled				
Family Size Range	None	1-2	3-4	5+	Total
Less than 4	7	4	3	-	14
	(9.6)	(23.5)	(7.9)		(8.3)
4 - 8	51	11	25	31	118
	(69.8)	(6.5)	(65.7)	(77.5)	(70.2)
9 - 12	15	2	9	7	33
	(20.5)	(11.7)	(23.7)	(17.5)	(19.6)
Above 12	-	-	1	2	3
			(2.6)	(5.0)	(1.8)
Total	73	17	38	40	168
	(43.4)	(10.1)	(23.6)	(23.8)	(100.0)

X^2 Value = 91.62 X^2 tab = 96.6
d.f = 78 Sig. = 10%

Source: Field data, 1999

Analysis of data from Table 10 shows that large sized households of about nine persons and above had less employees and apprentices enrolled in their enterprises than those with eight persons or less. This was because large-sized entrepreneur households seem to have enough labour that is usually unpaid, but is either learning the trade or helping their parents. But a hypothesis of no positive relationship between entrepreneurs household size and number of employees or apprentices was

accepted, since: X^2 cal < X^2 tab at 10 per cent level of significance. This implies that apprenticeship or employment levels into these enterprises did not grow according to growth in household size; rather it decreased as household size enlarged.

Economic Headship of Households

Women can become economic heads of their households especially if they become widowed, or divorced, or in cases where the husband becomes physically or financially handicapped. This situation may influence her adoption of new technology. She may only adopt if the risk associated with it is relatively low. This may be different for women whose husbands are the economic heads of the households.

Table 11: Percentage Distribution of Women Entrepreneurs According to Headship Pattern of Respondents Households

Headship	Frequency	Percentage
The man (father)	147	57.5
The Woman (mother)	46	18.6
One of the children	30	12.1
Don't know	24	9.7
Total:	247	100.0

Source: Field data, 1999

Table 11 shows that only 18.6 per cent of the women respondents were economic heads of their household, while 59.5 per cent had men as heads, and 12.1 per cent had their children as economic heads.

Household Migration Records

The high migration rate especially of the rural-urban and overseas types could be an indirect consequence of technical change, or a product of lack of change in the rural enterprise system of production.

Table 12: Distribution of Entrepreneur Households According to Migration Records

	Distribution of Out-migrants in Households						
Household Members	1 - 2	2-4	5-6	7-8	9.10	10+	Total
Male (sons)	71	52	26	13	4	1	167
	(42.5)	(31.3)	(15.5)	(7.8)	(2.3)	(0.6)	(100)
Females (daughters)	67	55	10	5	1	-	138
	(98.6)	(39.8)	(7.2)	(3.6)	(0.7)		(100)
Father	18	-	-	-	-	-	18
	(100)						(100)
Mother	4	-	-	-	-	-	4
Total	(100)						(100)

Figures in parentheses are column percentages.

Table 12 shows that 167 sons migrated from the households. Of this number, 71 (42.5 per cent) households had one to two of their male children out, while 67 (48.6 per cent) of them had one to two of the female children out. Eighteen households had their fathers and four households their mothers out, respectively.

Table 13: Distribution of Entrepreneurs' Children According to Age at Time of Migration

Age Range	Frequency	Percentage
Less than 15 years	22	11.8
15 - 20	128	68.4
31 - 45		12.3
46 - 60	11	5.9
Over 60 years	3	1.6
Total		100.0
Place Migrated to from Rural		
Rural	26	14.4
Urban	140	77.8
Overseas	14	7.8
Total	180	100.0

Source: Field data, 1999

From Table 13, it is seen that majority of the migrants were of the age range 15 to 30 years, and migration was mainly of the rural to urban type. This may have negative implications on the future of the rural enterprises in the area.

Table 14: Estimated Percentage of Technical Change Adopted by Number of Family Out-migration

Estimated Percentage Adoption	No. of Migrants					
	None	<3	3-4	5-6	7 and above	Total
Less than 20	10	1	4	-	1	15
	(40)	(5.0)	(14.8)		(20)	(16.7)
20 - 30	4	5	7	8	2	26
	(16.0)	(25)	(26)	(28.1)	(40)	(27.1)
31 - 40	3	7	8	13	2	33
	(12.0)	(35)	(29.6)	(61.9)	(40)	(34.4)
41 - 50	3	2	4	-	-	9
	(12.0)	(16.0)	(14.8)			(9.4)
Above 50	5	5	2	-	-	12
	(20.0)	(25)	(7.4)			(12.5
	25	20	27	21	5	96
Total	(26.0	(20.8)	(28.1)	(21.8)	(5.2	(100.0)

Figures in parentheses are column percentages.

X^2 Value = 46.19 X^2 tab = 36.7

d.f = 28 Sig. = 10%
Source: Field data, 1999

Data from Table 14 show that out of the 25 entrepreneurs who had zero migration from their households, 40 percent adopted only 20 percent of available technical changes, while only five percent adopted technical change above 20 percent. On the other hand, of the five entrepreneurs that had seven and more migrants, only 20 percent adopted less than 20 percent of the available technical change, while none adopted 50 percent and above.

Occupation Distribution of Non-Farm Women Entrepreneurs

Of the 247 women entrepreneurs under study, (Table 15), 34 (13.7 percent) were engaged in pottery, 82 (33.2 percent) were in cloth-weaving, 61 (24.7 percent) were in palm-oil processing, 45 (18.2 percent) were in *garri* processing while 25 (10.1 percent) were in local brewing and distilling.

Table 15: Distribution of Respondents According to Type of Traditional Non-farm and Farm Occupation

Non-Farm Business	Frequency	Percentage
Pottery	34	13.7
Cloth-weaving	82	33.2
Palm-oil processing	61	24.7
Garri processing	45	18.2
Local brewing/distilling	25	10.1
Total:	247	100.0
Farm Business		
Crop farming only	70	62.5
Animal husbandry only	7	6.3
Both	35	31.2
Total:	112	100.0

Source: Field data, 1999

A total of 112 women combined non-farming with farming business, mainly as secondary occupation. Of these, 70 (62.5 percent) were in crop farming only, seven (6.3 percent) in animal husbandry only, while 35 (31.2 percent) combined both cropping and some animal husbandry activities such as backyard poultry keeping or raising of small ruminants.

Employment and Apprenticeship Records in Rural Enterprises

The survival of rural enterprise may be related to the level in which people take up the enterprise and the level of youth apprenticeship.

Table 16: Estimate of Employees and Apprentices in Women Enterprises

Profile of Employment/ Apprenticeship	Apprentices		Employees	
	Frequency	%	Frequency	%
None	121	49.0	106	42.9
1 - 3	86	34.8	36	14.6
4 - 7	16	6.5	3	1.2
8 - 10	5	2.0	3	1.2
10+	2	0.8	1	0.4
Don't know	17	6.9	98	39.7
Total:	247	100.0	247	100.0

Source: Field data, 1999

From Table 16, 49 per cent of the women entrepreneurs had no apprentices learning the trade, while 42.9 per cent had not employed a helping hand. About 34.8 per cent had one to three apprentices, while 14.6 per cent employed one to three persons. Up to 6.9 per cent said they would not classify their children or relatives learning the trade as apprentices while 39.7 per cent would not identify such people as employees in their enterprises.

Table 17: Wish of Women Entrepreneurs on their Daughters' Adopting Enterprises

Decision Variable	Frequency	Percentage
Should take-up enterprise	65	26.3
Shouldn't engage in enterprise	67	27.1
Undecided	103	41.7
Child should decide	12	4.8
Total:	247	100.0

Source: Field data, 1999

Table 17 shows the women entrepreneurs' response when asked to indicate their wish concerning their children taking up their trade. Of the 247 women, 26.3 percent would wish their daughters took up the trade as a profession, 27.1 percent said their daughters should not take up such enterprises, 41.7 percent were undecided, while 4.8 per cent said that the children should decide.

A woman pot-maker from Isiagu who was opposed to daughters taking up the pottery enterprise had this to say: "I will be the last in this household to be engaged in this dirty and tedious job of pot-

making. My daughters must finish their education and find a better civil service job. Unless the suffering is lessened through modern ways, I will not recommend the job to even my enemy". (A woman FGD discussant, (1999).

Table 18: Estimate of Percentage Technical Change Adopted by Number of Workers in Entrepreneur's Employment

Estimated Percentage Adoption	No. of Employees					
	None	1-3	4-7	7-9	Above 10 +	Total
Less than 20	9			1		10
	(19.1)	-	-	(33.3)	-	(23.3)
20 - 30	12	11				23
	(25.5)	(47.8)	-	-	-	(30.7)
31 - 40	13	2		2		17
	(27.7)	(8.7)	-	(66.7)	-	(22.7)
41 - 50	5	3	1	1		10
	(10.6)	(13.9)	(100.0)	-	(100.0)	(13.3)
Above 50	8	7				15
	(17.0)	(30.4)	-	-	-	(20.0)
	47	23	1	3	1	75
Total	(62.7)	(30.7)	(1.3)	(4.0)	(1.3)	(106.0)

Figures in parentheses are column percentages.
X^2 Value = 29.46 X^2 tab = 19.4
d.f = 16 Sig. = 10%

Source: Field data, 1999

The percentage of technical change adopted seems to have no influence on the number of people employed by women in their enterprises or vice versa. Table 18 shows of the 47 entrepreneurs who did not employ any person in their enterprise, 19.1 percent adopted less than 20 percent, while 17 percent adopted 50 percent and above of the innovations they were exposed to. Only one cloth weaver at Akwuete who employed up to 10 people and above had adopted 41 to 50 percent of the change in the local weaving industry.

A hypothesis of no relationship between level of adoption and employment into rural enterprise by women was accepted at 10 percent level of significance. The implication is that the women adoption rate did not influence their level of employment in their enterprises.

Table 19 also shows that level of adoption of technical change did not affect the number of young women apprentices that go into the traditional trades. For example, of the 131 respondents, 52 (39.7 percent) did not have any apprentice learning the trade. Of this number, 17 (32.7 percent) adopted 31 to 40 percent of the technical innovations exposed to them. Also, a hypothesis of no relationship between adoption of technical change and number of apprentices in the local enterprises was accepted at 10 per cent level of significance. This implies that the apprentices they had did not join because of the change they noticed in the traditional enterprises.

Table 19: Estimated Technical Change Adopted by Number of Apprentices in Enterprises

Estimated Percentage Adoption	No. of Apprentices					
	None	<3	3-4	5-6	7 and above	Total
Less than 20	8	15	3	-	-	26
	(15.4)	(23.1)	(27.3)			(19.8)
20 - 30	14	18	3	-	-	35
	(26.9)	(27.7)	(27.3)			(26.7)
31 - 40	17	21	2	-	-	41
	(32.7)	(32.3)	(18.2)			(31.3)
41 - 50	8	4	2	-	1	14
	(15.4)	(6.2)	(18.2)		(50.0)	(10.7)
Above 50	5	7	1	1	1	15
	(9.6)	(10.8)	(9.1)	(100)	(50.0)	(11.5)
	52	65	11	1	2	131
Total	(39.7)	(49.6)	(8.4)	(0.8)	(1.5)	(100.0)

Figures in parentheses are column percentages
X^2 Value = 16.68 X^2 tab = 19.4
d.f = 16 Sig. = 10%

Source: Field data, 1999

Income and Expenditure Patterns of Women Entrepreneurs

It is widely accepted that income and expenditure distribution patterns of entrepreneurs in an area are important determinants of adoption of new technology and attitude towards technical change (Ezeh, 1997, Kanu, 1997). Since most of the negative consequences of technical change relate to the risk associated with the adoption of the change, and risk-taking has a relationship with income size, it follows that income and expenditure patterns of the entrepreneurs are important variables in analyzing the consequences of technical change.

Table 20 shows the income distribution patterns of women entrepreneurs studied. From the Table, out of the 247 women engaged in the various traditional non-farm primary occupations, 148 (59.9 percent) earned less than ₦5,000, 57 (23 percent) earned ₦5,000 to ₦10,000, while only 42 (17 percent) earned above ₦10,000 monthly from their operations. From the secondary occupation which was mainly farming, 171 (90.5 percent) of the entrepreneurs earned less than ₦5,000, while only 3 (1.6 per cent) earned above ₦10,000 from such activities. Other earnings, mainly remittances from relatives and friends, and gifts, were also generally low. It can be seen that what accrued to these women as income from all their yearly economic activities was generally low; and this may have affected their potential to adopt and use new technologies available in their enterprises.

Table 20: Distribution Entrepreneurs Households According to Yearly Income Earning Pattern

	Income Distribution Level (Yearly (₦)			
Income Earning Items	<5000	5000-10,000	10,000+	Total
Primary occupation	148	57	42	247
	(59.9)	(23.0)	(17.0)	(100)
Secondary occupation	171	15	3	189
	(91.5)	(7.9)	(1.6)	(100.0)
Remittances	91	4	1	96
	(94.8)	(4.2)	(1.0)	(100)
Gifts	116	-	1	171
	(99.1)		(0.9)	(100)
Others	5	-	-	5
	(100)			(100)

Figures in parentheses are the column percentages

Source: Field data, 1999

Table 21 shows the yearly expenditure patterns of the women entrepreneurs on their households on the listed items. It is seen for example, that 88.95 percent of the women spent less than ₦5,000 while only 1.7 percent of them spent above ₦10,000 on food. Savings were generally low among the entrepreneurs as about 95.4 percent of those who saved at all had less than ₦5,000 as average annual savings. Low savings may have led to low investment, including investment on new technology used in production.

Technical Change Availability, Adoption and Utilization

The level of technical change available, and the adoption and utilization levels will determine the type and level of consequences an entrepreneur may get. If the change in technology is never made available to the entrepreneur, such entrepreneurs may not have a direct consequence from such technology.

Table 22 shows that modern looms for cloth weaving were available to only 33.6 per cent of the entrepreneurs, but only 3.6 per cent adopted the innovation for use. Innovations such as clay mixing and moulding machines, and modern kilns, were never exposed to the entrepreneurs for possible adoption and use. The impact of such innovation on the rural entrepreneurs' may be indirect, on the demand side.

Table 23 shows that of the innovations exposed to the women entrepreneurs less than 20 per cent were used by 10.9 per cent, while 44.9 per cent of the women did not adopt any innovation at all. Of this percentage are women entrepreneurs who were not exposed to any technical change at all.

Effect of Technical Change on Income of Entrepreneurs After Adoption

Assessment of the effects of some innovation on adopters and non-adopters will help show the effects of new technology.

Table 21: Distribution of Households According to Yearly Expenditure Patterns

	Expenditure Distribution (₦)			
Expenditure Items	<5000	5000-10,000	10,000+	Total
Food	160	17	3	180
	(88.9)	(9.4)	(1.7)	(100)
Clothing	120	5	1	126
	(95.2)	(4.0)	(0.8)	(100)
Rent	44	1	-	45
	(97.8)	(2.2)		(100)
Education	93	34	3	130
	(71.2)	(26.2)	(2.3)	(100)
Health care	192	2	-	194
	(93.9)	(0.1)		(100)
Transport	112	2	1	115
	(97.4)	(1.7)	(0.8)	(100)
Electricity	33	-	-	33
	(100)			(100)
Fuelwood/Kero	161	1	-	162
	(99.4)	(0.6)		(100)
Water	38	-	-	38
	(100)			(100)
Extended family	119	2	-	121
	(99.9)	(0.1)		(100)
Remittance/gifts	131	1	-	132
	(99.3)	(0.7)		(100)
Entertainment	131	1	-	-
	(99.3)	(0.7)		
Savings	83	4	-	87
	(95.4)	(4.6)		(100)

Figures in parentheses are the column percentages.

Source: Field data, 1999

Table 24 shows that women entrepreneurs who indicated non-adoption of technical changes exposed to them had 54.4 per cent of them earning below ₦2000 from their enterprises monthly, while only 41.2 per cent of the adopters earned less than ₦2000. Nine of the non-adopters (6.6 per cent) earned income in excess of ₦10,000, while 11 (8.1 per cent) earned income in excess of ₦10,000 from their enterprises. This is, however, a loose indication of the positive effects of technical change on the rural non-farm entrepreneurs.

Table 22: Technical Changes in Non-Farm Enterprise Availability and Level of Adoption and Use by Entrepreneurs in South-eastern Nigeria

Technology Available	Available %	Adopted and Used by (%)
Modern looms for cloth weaving	33.6	3.6
Other modern weaving materials/techniques	100	73.2
Garri processing machines and other techniques	72.2	66.7
Palm-oil processing machines	80	54.1
Clay mixing and moulding	None	-
Modern kilns	None	-
Modern distilling system	20	8.0
Credit facilities	61	48.2
Modern marketing system (eg through co-ops)	92	54.6

Table 23: Estimated Percentage of Technical Change Adopted by Women Entrepreneurs

Level of Change (%)	Frequency	Percentage
Less than 20	27	10.9
20 - 30	37	15.0
31 - 40	43	17.4
41 - 50	14	5.7
Above 50	15	6.1
Not adoption	111	44.9
Total	247	100.0

Source: Field data, 1999

Table 24: Estimate of Average Monthly Income of Entrepreneur Adopters and Non-Adopters of Technology

Monthly Income Level	Non-Adopters		Adopters	
(Naira)	Freq.	%	Freq.	%
Less than 2000	74	54.4	56	41.2
2000 - 5000	31	22.8	43	31.6
6000 - 9000	22	16.2	26	19.1
10,000 +	9	6.6	11	8.1
Total	136	100.0	136	100.0

Source: Field data, 1999

Table 25: Estimated Percentage of Technical Change Adopted by Average Monthly Income of Women Entrepreneurs

Estimated Percentage Adopted	Average Monthly Income Distribution (Naira)					
	> ₦2000	2000-5000	5001-900	10,000-13,000	14001 +Total	
Less than 20	13	6	5	1	1	23
	(50.0)	(5.6)	(13.5)	(12.5)	(100.0)	(18.1)
20 - 30	4	12	15	4	-	35
	(15.4)	(22.2)	(40.5)	(50.0)		(27.6)
31 - 40	4	21	13	2	1	41
	(15.4)	(38.9)	(35.1)	(25.0)	(100.0)	(11.0)
41 - 50	3	7	3	1	-	14
	(11.5)	(13.0)	(8.1)	(12.5)		(11.0)
Above 50	2	11	1	-	-	14
	(7.7)	(20.4)	(2.7)			(11.0)
	52	54	37	8	1	127
Total	(20.5)	(42.5)	(29.1)	(6.3)	(0.8)	(100.0)

Figures in parentheses are column percentages
X^2 Value = 43.66 X^2 tab = 37.6
d.f = 20 Sig. = 1%

Source: Field data, 1999

The relationship between the percentage of technical change adopted by women entrepreneurs and their average monthly income is presented in Table 25. From the cross-tabulation, there seems to be no relationship between these two factors. However, the hypothesis that percentage change of technology adopted does not relate to the average income size realized by entrepreneurs was rejected (X^2 cal 43.66 > X^2 tab 37.6) at 1 percent level of significance. This implies that percentage adoption positively related to income level from non-farm enterprises.

The percentage of technical change adopted by women entrepreneurs does not seem to influence their sources of finance as seen from the cross tabulation (Table 26). It was expected that the more of modern techniques and technologies adopted by entrepreneurs, the more such entrepreneurs may qualify for loans from formal financial organizations.

Table 27 shows the relationship between percentage of technical change adopted by women entrepreneurs and total employment in enterprises in the past two years. Chi-square result shows that the hypothesis of no relationship between the two variables was accepted since X_2 cal 16.33 < X^2 tab 18.5 at 10 percent level of significance. This implies that any other factor could have influenced employment into the enterprises, not the level of adoption of technical change.

Table 26: Percentage of Technical Change Adopted by Source of Financial Assistance to Entrepreneurs

Percentage Adoption	Sources of Financial Assistance					
	Government	Non Government	Prof. Group	Formal Inst.	Non-formal Group	Total
Less than 20	-	3	-	4	2	9
	(20.0)		(44.4)	(9.1)		(15.3)
20 - 30	1	6	2	1	4	14
	(50.0)	(40.0)	(18.2)	(11.1)	(18.2)	(23.7)
31 - 40	-	4	7	4	3	18
		(26.7)	(63.6)	(44.4)	(13.6)	(30.5)
41 - 50	1	2	1	-	4	8
	(50.1)	(13.3)	(9.1)		(18.2)	(13.6)
Above 500	-	-	1	-	9	10
			(9.1)		(40.9)	(16.9)
Total	2	15	11	9	22	59
	(3.4)	(25.4)	(18.6)	(15.3)	(37.2)	(100.0)

Figures in parentheses are column percentages.

X^2 Value = 34.27 X^2 tab = 26.3

d.f = 16 Sig. = 5%

Source: Field data, 1999

Table 27: Percentages Technical Change Adopted by Total Employment in Enterprises in Past 2 Years

Percentage Change	Number of Workers Employed in Past 2 Years				
	None	1-4	5-9	10+	Total
Less than 20	15	5	6	1	27
	(23.9)	(15.2	(27.3)	(8.3)	(20.8)
20 - 30	14	12	4	3	33
	(22.2)	(36.4)	(18.2)	25.0)	(25.4)
31 - 40	25	8	5	3	41
	(39.7)	(24.2)	(22.7)	(25.0)	(31.5)
41 - 50	4	2	5	3	14
	(6.3)	(6.1)	(22.7)	(25.0)	(10.8)
Above 50	5	6	2	2	15
	(7.9)	(18.2)	(9.1)	(16.7)	(11.5)
Total	63	33	22	12	130
	(48.5)	(25.4)	(16.9)	(9.2)	(100.0)

X^2 Value = 16.33 X^2 tab = 18.5

d.f = 12 Sig. = 10%

Source: Field data, 1999

Table 28: Percentage of Technical Change Adopted by Farm Size (Hectares) Cultivated by Entrepreneurs

Percentage Adoption	Farm Size (Ha)				
	< 2.0	2-3	4-5	Above 5	Total
Less than 20	3	3	2	1	9
	(23.1)	(60.0)	(20.0)	(11.1)	(24.3)
20 - 30	5	-	4	5	11
	(38.5)		(40.0)	(55.6)	(37.8)
31 - 40	4	1	3	3	11
	(30.8)	(20.0)	(30.0)	(33.3)	(29.7)
41 - 50	1	1	-	-	2
	(7.7)	(20.0)			(5.4)
Above 50	-	-	1	-	1
		(10.0)			(2.7)
	13	5	10	9	37
Total	35.1	(13.5)	(27.0)	(24.3)	(100.0)

X^2 Value = 19.21 X^2 tab = 19.0

d.f = 24 Sig. = 10%

Source: Field data, 1999

Most of the rural women entrepreneurs combined non-farm activities with farming, leading to a flow of resources from one to the other. Table 28 shows a cross-tabulation of farm size by percentage of non-farm innovations adopted by the entrepreneurs. It was expected that the more non-farm innovations adopted by entrepreneurs, the more the farm size. But X^2 cal. 19.21 > X^2 tab 19.0 led to a rejection of a hypothesis of no relationship between the two variables. This implies that percentage of technical change adopted influenced farm size of entrepreneurs.

Table 29 shows a cross tabulation of percentage of technical change adopted and the income from non-farm activities that was invested in farming. Chi-square result shows that level of adoption influenced income from non-farm enterprises invested in farming (X^2 cal 16.21 > X^2 tab 15.3) at 10 percent level of significance leading to a rejection of the hypothesis of no relationship. This implies a more linkage of farm with non-farm enterprises as non-farm enterprises are modernized and improved.

Availability and Functionality of Social Facilities

It should be noted that the level of availability and functionality of infrastructures and amenities in an area tends to influence most other social and economic attributes of people in that area. Such variables as educational level, level of income, household expenditure, and adoption behaviour, among others, are affected by the level of infrastructural facilities available and functional in that area (Table 30).

Table 29: Percentage Technical Change Adopted by Income Flow from Non-farm to Farm Enterprises

Percentage Adoption	Percentage Income Invested in Farming				
	< 10%	10-30%	31-50%	> 50%	Total
Less than 20	5	9	1	-	15
	33.3	(19.1)	6.3		(19.0)
20 - 30	3	16	6	-	25
	(20.0)	(34.0)	(37.5)		(31.6)
31 - 40	4	15	7	1	27
	(26.7)	(31.9)	(43.8)	(100.0)	(34.2)
41 - 50	2	5	2	-	9
	(13.3)	(10.6)	(12.5)		(11.4)
Above 50	1	2	-	-	3
	(6.7)	(4.3)			(3.8)
	15	47	16	1	79
Total	(18.9)	(59.5)	20.3	(1.3)	100

X^2 Value = 16.21 X^2 tab = 15.3
d.f = 16 Sig. = 10%

Source: Field data, 1999

Table 30: Distribution of Respondents According to Availability and Functionality of Social Facilities

Percentage Adoption	Percentage of Respondents			
	Available & Available	Available/ Functional	Not Not Available	Available
Postal facilities	86.2	83.0	2.4	11.7
Health (clinics/hospitals)	91.1	77.7	4.9	5.3
Electricity	63.6	15.4	58.7	20.6
Portable water source	56.7	23.9	50.2	27.9
Good roads	24.3	25.1	46.2	56.3
Primary schools	91.9	76.9	5.3	2.4
Secondary schools	92.7	74.9	6.5	2.8
Daily markets	52.1	48.2	26.3	25.5
Four daily markets	65.2	53.8	24.3	21.5
Agro-processing industries	59.5	47.8	32.4	31.2
Agro-service centres	17.8	13.0	48.7	51.8
Bank facilities	55.9	24.3	53.8	27.9

Source: Field data, 1999

Table 30 shows the distribution of respondents according to the percentage of entrepreneurs that agreed or disagreed on the availability and functionality of the listed social infrastructure. From the table, for example, 91.1 percent of the respondents agreed they had medical facilities such as clinics but only 77.7 percent agreed that the facilities were functional in their areas. About 4.9 percent

reported that such facilities were available but not functional, while 5.3 percent reported that such facilities were not available to them at all.

The level of social facilities in the rural area can influence level of adoption of technical innovations and the benefits from such adoption. It can also affect rural linkages between farm and non-farm enterprises.

Results of Regression Analysis

Multiple regression analysis was undertaken to determine the influence of some independent variables related to technical change on some dependent variables associated with the effects of technical change on the non-farm women entrepreneurs. In all, five regressions, based on three functional forms, were run. The linear regression estimates were selected because they showed many statistically significant variables beyond the 10 percent confidence level, and they also had the highest values for the coefficient of determination (R^2).

Significance and Interpretation of Coefficients of Regression Data

To determine the impact of the independent variables on the annual income realized by farm entrepreneurs, t-values were computed from their corresponding regression coefficients and standard errors (Tables 31-35). The inter-correlation metrics were computed and were used to test for multi-collinearity. The problem of multi-collinearity did not arise in the study (see Appendix 1). According to Olayemi and Olayide (1981) any inter-correlation value of less than 0.5 can be considered as strong evidence of independence between the two variables; while any inter-correlation of 0.68 and above is strong evidence of the existence of multi-collinearity between the two variables.

All the coefficients in the inter-correlation table as shown in Appendix 1 are less than 0.5, thus the absence of multi-collinearity.

Summary of Regression Results

The summary of the regression results is reported in Tables 31-35 based on the linear functional forms which have the lowest standard error of estimates and invariably the highest number of significant variables.

Table 31: Summary of Regression Results of the Effects Technical Change Variables on the Level of Income of Non-farm Women Entrepreneurs of South-eastern Nigeria

Variables	Regression Coefficients	Standard Errors	t-Value	Level of Significance
X_1	-.2077	.0952	-2.181	.05
X_2	-.0365	.0261	-1.395	NS
X_3	-.2354	.1238	-1.200	.10
X_4	.2078	.1305	1.592	NS
X_5	.2386	.0649	4.289	.01
X_6	.4923	.3531	1.394	NS
X_7	7.1100	4.1613	1.709	.01
X_8	-.2383	.1121	2.125	.05
X_9	-.0806	.0514	-1.567	NS

Constant b = 1.4857 Degree of freedom (d.f) = 9
NS = Not significant at 10% level of confidence
R^2 = 0.421
R^2 = 0.325
Fvalue = 4.3684
SE of the Estimate 0.7021

The regression function of the effects of technical change variables on level of income of non-farm women entrepreneurs (Table 31) shows that the coefficient of determination R^2 was 42 percent. This percentage shows that the proportion of the observed variability (in levels of income generated by the women entrepreneurs) explained by the combined effects of the independent variables, is high. The estimated function can be regarded as a good fit, for according to Nwoko (1989), as long as the R^2 is up to 40 percent, the regression is a good fit at 90 percent confidence level or less.

It should be noted that the F-value of 4.3684 was significant at 99 percent level of confidence, thus indicating a strong influence of the nine independent variables associated with the income that accrued to different level of adopters of new technology (Appendix 1).

A cursory examination of the influence of each of the significant independent variables on the level of income realized by the entrepreneurs shows that: the level of technical change adopted by an entrepreneur - in percentage - (X^2) positively influenced the annual income from the enterprise. Also the amount spent in procuring raw materials for the new technology - in Naira - (X_4) and the extra labour requirements due to the adopted change (X^5) both had a negative influence on the level of income that accrued to the women entrepreneurs. The number of positive effects experienced from new technology (X_8) had positive influence, while the number of negative effects experienced by entrepreneurs as a result of technical change (X_9) had negative influence on their income.

Table 32: Summary of Regression Results of Effects of Technical Change Variables on Expenditure Levels of Women Entrepreneurs

Variables	Regression Coefficients	Standard Errors	t-Value	Level of Significance
X_1	5299.0393	2935.6525	1.805	.10
X_2	86.0353	642.0467	.134	.10
X_3	3320.0692	3148.9500	1.054	NS
X_4	-2648.9424	3571.7886	-.742	NS
X_5	-305.1778	1944.3674	.157	.10
X_6	9456.3711	4993.5385	1.894	NS
X_7	1.5236	1.6795	.907	NS
X_8	6653.9697	2638.4856	-2.522	.05
X_9	-710.5515	1101.0843	-.645	NS

Constant b = 125.2064
R^2 = .651
R^2 = .302
F = 1.864
SE = 7622.102

Table 32 shows that the regression function of the effects of technical change variables on expenditure levels of women entrepreneurs on consumption goods (taken as index of standard of living) has the coefficient of determination R^2 as 65 percent. This percentage shows that the proportion of the observed variability (in levels of expenditure of the women entrepreneurs) explained by the combined effects of the independent variables, is quite high, and can be regarded as a good fit.

The F-value of 1.864 was significant at 90 percent level of confidence, thus indicating a strong influence of the nine independent variables associated with the level of expenditure (as index of the standard of living) of the entrepreneurs.

Further examination of the influence of each of the independent variables that were significant on the level of expenditure shows that both the level of estimated change in a given enterprise (X_1), and estimated level of technical change adopted by an entrepreneur (X_2) had positive influence on the standard of living of the entrepreneurs in terms of their monthly expenditure. Extra labour requirement as a result of the adopted change - usually male labour – (X_5) had an inverse effect on the level of consumption expenditure by the women, while the number of positive effects from the change (X_8) as identified by the women, had a significant and positive relationship with their consumption of expenditure.

From Table 33, the regression function of the effects of technical change variables on level of employment in non-farm enterprises in the past two years shows a coefficient of determination (R^2) of 23 percent. This shows that the proportion of the observed variability (in level of employment into the non-farm women enterprises) explained by the combined efforts of the independent variables, is low, and cannot be regarded as a good fit. This is justified by Nwoko (1989), who maintained that as long as the R^2 is up to 40 percent, the regression is a good fit at 90 percent confidence level or less.

However, the level of estimated technical change in an enterprise (X^1), and the level of technical change adopted by an entrepreneur (X_2) had positive and significant influence, respectively, on the level of employment in the enterprises.

Table 33: Summary of Regression Results of Effects of Technical Change Variables on Level of Employment in Non-Farm Enterprises in Past Two Years

Variables	Regression Coefficients	Standard Errors	t-Value	Level of Significance
X_1	.3582	.1915	1.870	.10
X_2	.1212	.0529	-2.288	05
X_3	.0381	.2445	.156	NS
X_4	-.2544	.2652	-.959	NS
X_5	.1939	.1367	1.419	NS
X_6	.2792	.6143	.454	NS
X_7	-9.01388	.6378	-1.044	NS
X_8	.0742	.2274	.327	NS
X_9	-.1017	.1040	.978	NS

Constant 2.4119
R^2 = .232
R^2 = .113
F.ratio = 1.947
SE = 1.468

Table 34: Summary of Regression Results of Effects of Technical Change Variables on Female Out-migration from Entrepreneurs' Households

Variables	Regression Coefficients	Standard Errors	t-Value	Level of Significance
X_1	.0045	.2873	.0020	.10
X_2	-.0690	.0678	-.1293	05
X_3	-.1035	.3207	-.0475	NS
X_4	-.7879	.3213	.3086	NS
X_5	-.5556	.1619	.4407	NS
X_6	1.9668	.9795	.2561	NS
X_7	-.7754	2.1193	-.0986	NS
X_8	-.6358	.2876	-.3224	NS
X_9	1.9503	.1448	.2495	NS

Constant b = -19504
R^2 = .474 R^2 = .367 F = 4.405 SE = 1.615
NS = Not significant at 10 percent level of confidence.

Table 34 shows that the combined effects of the nine variables related to technical change on female migration from entrepreneurs' households has a coefficient of determination R^2 of 47 percent. This percentage is high enough and can be regarded as a good fit. The F-value of 4.405 was significant at 99 percent level of confidence, thus indicating a strong influence of the independent variables associated with level of female out-migration from households.

From the six significant variables, level of technical change adopted (X_2), was inversely related to level of out-migration from households. Also the extra amount spent on raw materials due to adoption (X_4) and the extra amount of labour needed after adoption (X_5), inversely influenced the rate of household out-migration. The number of positive contributions from adoption (S_8) and the number of negative effects associated with adoption (X_9) had inverse and positive influences on the level of household migration, respectively.

Table 35: Summary of Regression Results of Technical Change Variables on the Flow of Income from Non-farm to Farm by Women Entrepreneurs

Variables	Regression Coefficients	Standard Errors	t-Value	Level of Significance
X_1	5780.0988	2755.3339	2.098	NS
X_2	124.1420	620.3906	.200	.10
X_3	4018-7244	2869.4082	1.401	NS
X_4	-3795-8964	3006.4279	-1.263	NS
X_5	-144.9992	1761.1627	-.082	NS
X_6	19314.8091	4670.5443	2.208	NS
X_7	1.6092	1.6246	.991	.10
X_8	-6599.5768	2559.0356	-2.579	.05

Constant = -4359.3732
R^2 = .635
R^2 = .342
F = 2.172
SE = 7396.360

The combined influence of eight variables related to the effects of technical change on the flow of income from non-farm to farm by women entrepreneurs shows a coefficient of determination of 63.5 percent. The F-value was significant at 90 percent level of confidence, thus indicating a strong influence of the independent variables on the dependent.

From the three variables that were significant, the level of technical change adopted by the entrepreneurs was positively related to the amount of money invested from non-farm to farm enterprise. Also the income that accrued to the entrepreneurs as a result of adoption positively influenced the income the entrepreneur invested in the farming business. The number of positive results experienced by entrepreneurs (X_8) negatively influenced the fund flow from non-farm to farm activities. This may be because the more comfortable the women were with what they got from their non-farm business, the less they were willing to invest in farming.

Result of Inter-correlation Analysis

Inter-correlation matrix analysis was done in order to establish how the variables related to new technologies affected or were affected by some socio-economic attributes of the women entrepreneurs.

The highlights of the results show that in terms of employment as indicated by the number of apprentices within the past two years in relation to percentage change adopted, there was a low but positive relationship (r = .333). The level of relationship between level of adoption of technical change and the number of female out-migration from entrepreneur households was low but positive (r = .200). However, the level of technical change adopted by women entrepreneurs showed a strong relationship with the average number of women that had entered the enterprises in the past two years (r = 0.536). Also, there was a low but positive relationship between level of technical change adopted and average monthly expenditure on entrepreneur's household as a measure of standard of living (r = 0.419). Average monthly income from enterprise had a high and positive relationship (r = .512) with the level of adoption of technical change. The analysis also shows that the less the level of adoption of changed technology, the less the entrepreneurs invested in the farm (r = -394). This may be because entrepreneurs who adopted more of a changed technology were likely to invest more in the non-farm business, leaving little for investment in the farm.

Results of Factor Analysis

Factor analysis was used to identify and name those factors that might continue to encourage or discourage the activities of the traditional women entrepreneurs in relation to adoption of technical change. Since the purpose was to identify new factors, the interpretation boils down to identifying the variables having the highest loading for each factor. The variables loading highest were used in naming each extracted factor. Kaiser (1958) developed a rule of thumb: variables with a coefficient of 0.30 or more have high loading and may be used in naming a factor. The rule has generally been applied (Child, 1978, Ogunfiditime 1979, Alimba, 1999).

Results of Varimax Rotated Factor Matrix of Positive Effects of New Technology Adoption Variables

The variables that loaded high for the naming of the factors considered positive as perceived by non-farm women technology adopters are shown on Table 36. From these variables, three factors were identified for critical consideration.

Factor 1 that has Vo_2 - quantity of the product (.716), Vo_3 - quality of the product (.752), and V_{06} - cost of production (.514) loading highest was named "production and output relationship". Factor 2 was named "social and economic relationship" because it has V_{01} - level of income generated (.725), V_{07} - household quality of life (-.858), and V_{08} - household labour demand (-.667) loading highest. After careful consideration, factor 3 was named "employment and future of enterprises relationship" because V_{04} - number of workers employed – (.645), V_{05} - number of apprentices that join enterprise yearly (.601), and interest shown by children (.698) variables were loading very high.

Table 36: Varimax Rotated Factor Matrix of Positive Effects of New Technology Adoption Variables on Non-farm Women Entrepreneurs

Positive Effect Variables	Factor 1 Production & Output Relationship	Factor 2 Socio-Economic Relationship	Factor 3 Employment and Future of Enterprise Relationship
V_{01} Level of income generated (yearly)	.017	.725	.363
V_{02} Quantity of products	.716	.555	-.123
V_{03} Quality of products	.752	.445	-.098
V_{04} Number of workers employed	.063	-.535	-.645
V_{05} Number of apprentices that join (yearly)	.023	-.507	.601
V_{06} Cost of production	.514	.067	-.095
V_{07} Household quality of life	.073	-.858	.078
V_{08} Household labour demand	.052	-.667	-.455
V_{09} Interest shown by children	.215	-.245	.698
% of explained variation	40.5	20.1	11.2

Coefficients in the table represent regression weights.

For the factor "production and output relationship" the entrepreneurs identified quantity and quality of products produced, and reduced cost of production as relating to the improved production system adopted. This accounted for 40.5 percent of the issues relating to the positive effects of new technology adopted. On the factor named "socio-economic relationship", the level of income generated improved quality of life in relation to higher expenditure level, and reduced household labour demand of the enterprises was identified as the positive social and economic benefit of adoption as perceived by the entrepreneurs. The factor accounted for 20.1 percent of the positive effects of adoption on the entrepreneurs.

For the factor named "employment and future of enterprises relationship" women entrepreneurs who adopted improved production techniques perceived an improvement in the number of workers employed, number of apprentices that join yearly and the interest shown in their enterprises as positive indicators, and that continued improvement in their production techniques would further enhance these variables. This factor accounted for 11.2 percent of the adoption of innovation by the women entrepreneurs that adopted and used aspects of new technology in production.

Table 37: Varimax Rotated Factor Matrix of Negative Effects Associated with New Technology Adoption Variables on Non-farm Women Entrepreneurs

Negative EffectsVariables	Factor 1 (Inappropriate Technology Issues)	Factor 2 (Social and Marketing Issues)	Factor 3 (Sustainability & Environmental Issues
Xo1 Complexity of New Technology	.891	.206	.208
Xo2 Quality of product	.178	.892	.090
Vo3 Issue of repairs and maintenance	.244	.111	.865
Vo4 Labour displacing	.852	.036	-.018
Vo5 Marketing of product problems	.021	.803	.025
Vo6 Technology issues	-.048	.840	.101
Vo7 Issue of cost of new technology	.787	.183	.142
Vo8 Environmental issues	.311	.297	-.658
Vol9 Input availability	.318	.139	.654
% of explained variation	44.7	30.9	16.3

Coefficients in the table represent regression weights.

Table 37 shows the results of the variables that loaded high with the three factors identified as the critical negative factors that affected adopters of changed technologies in their rural enterprises.

Factor 1 had Vo1 - complexity of new technology (.891), Vo4, - labour displacing (.852) and Vo7 - cost of new technology (.787) loading highest, and was subsequently named "inappropriate technology issues". Factor 2 was named "social and marketing issues" because it arose from variables Vo2 - quality of products, (.892), Vo5 - marketing of product problems (.803) and Vo6 - technology extension issues (.840) which loaded highest. "Sustainability and environmental issues " was the name given to factor 3 because the variables relating to it, Vo3 - issues of maintenance and repairs (.865), Vo8 - environmental issues (-.658), and Vo9 - input availability (.654) loaded highest.

Factor 1 which accounted for 44.7 percent of issues relating to negative effects of new technology, was identified as relating to inappropriate technology issues because of the common complaint of entrepreneurs that some of the technologies exposed to them (such as the modern loom) were very complex. Some complained that some of the new technologies they adopted tended to displace some women entrepreneurs with men's labour, and others raised the negative issue of high cost of acquiring such new technologies which in most cases was beyond their financial capability.

The social and marketing issues the women entrepreneurs perceived as negative consequences of adoption accounted for 30.7 percent of the negative effect issues and were related to the quality of the products got from the new technology. Some women traditional cloth weavers of Akwete, Abia State, maintained that the product from the modern loom and thread adopted by some of them were inferior to the one weaved using traditional methods. Their traditional product was better priced in the

market, while the one done in the modern method had marketing problems. Also the quality of palm-oil processed using machine technology was perceived as inferior in quality to the traditionally processed product and more acceptable in the local market. Problems of marketing also faced the mass-production of such products as woven cloth, as the rural women lacked modern marketing capability. Usually, the rural market capacity was hardly enough to buy up the products, while some of the products could not compete with urban and imported foreign products in urban markets.

The "substainability and environmental" issues identified related to the problem of repairs and maintenance of modern machinery when it broke down. It accounted for 16.3 percent of issues relating to negative effects of new technology. Some cloth weavers complained that whenever the modern loom broke down, they had to wait for the repairmen from town who took too long to come; for the locally fabricated looms, women could easily carry out the repairs. Other complaints related to effluent and noise pollution from the processing machines as in the palm-oil and *garri* processing set-ups.

Results Varimax Rotated Factor Matrix of Reasons for Non-Adoption of New Technology by Non-Farm Women Entrepreneurs

Several reasons that continuously hindered adoption of non-farm technologies, regarded as variables, were identified and rotated and the variables with the highest loadings used in naming the two major factors that tended to continually inhibit rural women entrepreneurs from adopting changed technology (Table 38).

Table 38: Varimax Rotated Factor Matrix of Reasons For Non-Adoption of New Technology Variables by Some Non-farm Women Entrepreneurs

Constraint Variables	Factor 1 (Adoption and Adaptation Relationship)	Factor 2 (Extension and Rural frastructureRelationship)
Vo1 Cost of new technology	.992	.123
Vo2 Issue of adaptation	.798	.602
Vo3 Non-awareness of non- technology package	-.123	.994
Vo4 Low capital for adoption	-.123	.992
Vo5 Perception of traditional technology as better	.995	.921
Vo6 Associated infrastructure issues	.289	.323
% of explained variation	64.1	35.9

Coefficients in the table represent regression weights.

The first factor had Vo1 – cost of new technology (.992), issue of adaptation to new technology (.788), and Vo5 – perception of old technology as better (.995) having the highest loads were collectively named "cost of adoption and adaptation relationship". Factor 2 had Vo 3 – non-awareness of technological package (.994), Vo4 – low capital for adoption (.992) and Vo6 – "associated infrastructure

issue" (.323) loading highest. Factor 2 was therefore named "extension and rural infrastructure relationship".

Policy issues relating to factor 1 "adoption and adaptation relationship" which accounted for 64.1 percent of the issues should concentrate on issues relating to development of cost-effective technologies for the local women entrepreneurs, understudying the traditional technology the women entrepreneurs are used to, and developing `appropriate technologies' that would adapt to what they are used to. Also effective credit system targeted at women groups can help the women procure such relevant technologies.

For the second factor named "extension and rural infrastructure relationship" which accounted for 35.9 percent relating to reasons for non-adoption, it should have the policy thrusts as awareness creation through a well-packaged appropriate technology extension programme, capable of proving to the rural women that such new technology was superior to the ones they were used to. Furthermore, issues relating to complementary infrastructure in the rural areas should be addressed, as they are critical to effective adoption of improved technologies.

Social and Technical Problems of Adoption of Change in Non-farm Technology Among Women Entrepreneurs in South-eastern Nigeria

The study attempted to identify those perennial problems rural non-farm women entrepreneurs of south-eastern Nigeria continue to encounter in an attempt to adopt technical change. These problems have given rise to the perceived negative consequences of non-farm technology change. They continue to arise because most of the technologies are not resource-conserving and sustainable, while some social factors linked to the women entrepreneurs' personal characteristics also contributed. These factors are summarized under ten headings as follows:

Ten Identified Social and Technical Problems of Adoption of Change on Women's Non-farm Technology in Southeastern Nigeria

i) Inappropriate innovation

Some of the technologies did not address the main problems of the non-farm women entrepreneurs. Some were labour displacing, while some were labour intensive.

ii) General unawareness

Many mechanical, chemical and management innovations were not made known to the entrepreneurs sufficiently well. If adopted at all, adaptation was usually faulty.

iii) Incorrect identification of adoption domains

Researchers and developers misunderstood reasons for local practices and indigenous knowledge systems, and targeted innovations inappropriately.

iv) Local practices perceived better

Sometimes, traditional technologies and methods were adjudged better by local entrepreneurs. This tended to create confusion in entrepreneurs minds when adopting innovations, leading to haphazard adoption patterns.

v) Generation of new problems

Many innovations which local non-farm entrepreneurs adopted had generated new and more critical problems. Some mechanical technologies used male labour instead of female; some were difficult to repair and maintain, while others produced products inferior to the local technologies.

vi) High cost

The high cost of most of the chemical and mechanical technologies affected adoption. Sometimes, the payback period of these technologies were too long for the women entrepreneurs.

vii) Poor extension

Inadequate and at times, incorrect demonstration of a technology to end-user entrepreneurs diminished their interest and undermined the credibility of such innovation. In most cases, there was no non-farm technology extension teaching at all.

viii) Low operating capital

Most rural non-farm entrepreneurs operated with very low working capital. Credit was not available to them and sometimes they feared to owe. This inhibited effective demand for innovations.

ix) Poor infrastructure

Incentives such as rural infrastructure and social amenities which should complement technology change such as access roads, electricity, modern markets, credit, and portable water were not available. This hindered adoption of innovation that could elevate the women entrepreneurs.

x) Unsustainable technology

Most of the non-farm technologies were not resource-conserving (e.g. energy conserving machinery); most of them were not flexible for the entrepreneurs to adapt, adjust or manipulate to their benefit and continued use.

Assessment of Negative Socio-economic Consequences of Non-farm Technological Change in South-eastern Nigeria

Based on the identified social and technical problems that critically affected adoption of changed technologies in rural non-farm enterprises of south-eastern Nigeria, an assessment can be made as to whether the technologies are *neutral* or *biased* vis-à-vis the negative effects. It should be noted that an innovation is adjudged *neutral* when the technical change cannot be blamed for the perceived negative effects of the change. Technical change is *biased* to the negative effects if it can be blamed for the effects that occurred, such as favouring one resource use more than the other (Ellis, 1988).

Table 39: Assessment of Negative Socio-economic and Environmental Consequences of Non-farm Technical Change Among Women Entrepreneurs of South-eastern Nigeria

Type of Consequence	Description	Verdict (Neutral/Biased)
i) Difficult to adapt technology to production due to complexity:	Inappropriateness of technology to the problem of entrepreneurs	Technical change is biased
ii) Lower quality of product from innovation:	Inappropriateness of technology. Also wrong use of the technology in question.	Technical change is neutral and biased.
iii) Difficulty in repair and maintenance:	Unsustainable technical change.	Technical change is biased.
iv) Labour displacement leading to rural out-migration especially of youths.	Displacement of labour may be due to their relative prices. Other social factors may cause out-migration.	Technical changes is neutral.
v) Problem of marketing of Rural products.	markets may be small for the large quantity of products of of new technology. Also other social infrastructure that aid marketing may be lacking. Problems of low income elasticity of demand.	Technical change is neutral.
vi) Difficulty in awareness creation and adoption of innovation.	Limitation is imposed by lack of non -farm technology extension aimed at awareness creation and adoption stimulation.	Technical change is neutral.
vii) High cost of technical innovation.	Rural entrepreneurs are mainly resource-poor and need credit and other financial assistance, which are not easily available to them. Attitude of co-operation to pull resources together is lacking.	Technical change is neutral.
viii) Reduction in household standard of living	Investment in technical innovation in rural enterprises usually do not give sufficient returns due mainly to low income elasticity of demand of products, poor marketing outlets, poor competition with urban mass-produced goods etc; hence leading to low income and expenditure.	Technical changes is neutral and biased
ix) Negative externalities	This may have been in form of effluent, noise and other forms of pollution, especially from processing techniques.	Technical changes is biased.

Discussion of the Igbo Traditional Non-Farm Women Enterprises Studied in South-eastern Nigeria

It is necessary to attempt a brief discussion on each of the Igbo traditional non-farm women enterprises studied. The enterprises are pottery and clay work, cloth weaving, local beer distilling, palm-oil processing and *garri* processing

Pottery and Clay Work

The study on this village industry was carried out using the Isiagu community of Ivo Local Government Area (LGA) of Ebonyi State, South-eastern Nigeria. The community was purposively selected out of others that engaged in the enterprise because it is traditionally the most famous for pottery industry in this part of Nigeria.

For the community, pottery and other clay work used to be the primary occupation for more than 90 percent of the women, while farming was the secondary occupation. There was a large deposit of fine non-expanding clay suitable for this industry. Today, only about 40 percent of the women are engaged in this rural enterprise.

Clay was collected from local deposits, formed by hand into any shape intended without a well, and fired at low temperature without glazing. The women complained of the high cost of clay and the additive soil called "ujiji" because it is men that mine it.

Because of this skill among the Isiagu women, the then government of the Eastern Region of Nigeria, under Dr. M. I. Okpara established a modern ceramic industry in the community in the late 1950s.

By the time some of the women were about getting trained to adopt and adapt to modern pottery and ceramic technology, the factory was relocated to a more distant community, Umuahia, in the early 1960s. Though Umuahia equally had good clay raw material, the women there were not endowed traditionally in pottery. It may have been done out of political exigency as the then premier of the region was from Umuahia.

An aged woman potter in Isiagu when contributing to the Focus Group Discussion said: "The removal of that modern pottery factory from Isiagu was devastating to the women then, especially the young girls who had started becoming interested in the enterprise. Now, we are about the last generation who may practice this skill, as you can see that no young woman is interested. I do not blame them; the work is arduous and dirty for our young more educated women".

A few women producers hire lorries to take their goods to the distant market especially since the rail transport in Nigeria got moribund; but most of them sell to visiting traders. Output and income are irregular since open-air work depends on the weather, and skill, especially in the past, is passed on in the family.

In the 1990s, the State government promised to encourage local pot makers through the Better Life for Rural Women programme. The same promise continued under the Family Economic Advancement Programme (FEAP). The women were asked to form themselves into co-operatives, as a pre-condition for receiving government loans and other assistance. This they did, but no assistance came. They accused the wives of military heads of putting the money to personal use. This was how one of the leaders of the co-operatives put it:

"We were tricked into forming a co-operative and spending a lot of money in bribes to register it in the State capital in our effort to secure a loan. All our efforts to get even a *kobo* aborted as we got only promises. We only hear on radio that several millions of Naira have been disbursed to women's co-operatives in the State, but no women co-operative got anything. The wives of the military administrators and people in local government were the beneficiaries".

Policy inconsistency as one administration succeeded another seemed to rule out the possibility of women's groups getting any assistance either individually or collectively. The incumbent government with Mrs Olusegun Obasanjo as First Lady does not emphasize rural women's entrepreneurship. The National Poverty Alleviation Programme seems not to have been well focused to address the problems of such rural women.

Cloth Weaving

The Akwete community of the Ukwa-West LGA was purposively chosen for the study. This is because of the women's weaving artistry, which dates back to the 12th century. Akwete women are the most notable weavers in Eastern Nigeria, with the famous and unique "akwete" cloth.

According to a women's leader who has retired from active weaving, the weaving skill was acquired time immemorial through a divine vision shown to a blind woman settler in the area. Prior to that vision, the people of the area had always begged God to bless them with a skill they could use to feed their children as they lived on unproductive soil, and their men were only involved in artisanal fishing. God heard their prayer.

According to the women, the spirit that exposed the skill to them forbade them from teaching it to a non-Akwete. If an Akwete weaver teaches the skill to a non-indigene, she goes blind and the skill vanishes from the memory of the non-indigene. This oath of secrecy is renewed every year, with a performance they call "iku-odu". The women cited many instances of calamities that befell women who broke the oath. Hence, no other community near or far has been able to learn the Akwete weaving skill.

The weaving technology consists of a fabricated wooden loom and locally ginned wool.

On the survival of the weaving industry, a women leader said: "The technology and techniques of Akwete weaving have survived and will continue to survive because it is compulsory for every Akwete girl to learn the skill. In fact, once you are born a girl in the community, you are already a weaver whether you are taught the skill or not because the spirit must teach you in your dream. You can see that our young girls from all walks of life are engaged in the weaving". (Discussion with the leader of the women's weavers co-operative).

On extent of technological change in the industry, the women reported that when loans were given to them by the wife of the then Imo State, Governor Chief Sam Mbakwe, that technology was rejected because the product from it lacked "Akweteness". It differed from the texture of the cloth woven in the older technology. The major technology in wide adaptation by the weavers was the industrially ginned wool. Though they complained among other things that the wool, once used, makes a product lack original quality, it is still good enough. It enables them to weave faster, and produce cloth of varied designs; it was however costly. Young weavers preferred industrial wool, while the older women preferred the original wool.

Traditional Palm-Oil processing

Traditional processing of palm-oil and other buy-products is commonly carried out by women in Igboland, South-east Nigeria. Women from Nkanu and Enugu-Ezike communities of Enugu state were chosen for the study because the enterprise formed their major occupation. They used the traditional method to produce the "soft oil".

The process involves boiling the palm fruit, after separating it from the bunches. It is then pounded in a wooden mortar with a pestle, or with the feet in a concrete pit, until the mass containing oil, fibre and unbroken nuts is obtained. After kneading, the mass is sieved to remove the nuts and fibre and the liquid is then boiled to separate the oil and water. Oil then floats to the surface and is skimmed off. This process yields oil with lower fatty acid that is more acceptable for use in cooking.

The traditional methods of palm oil production have an extraction efficiency of less than 50 percent, is labour intensive and time-consuming. Fats and oils from palm oil are critical to the well-being of many rural communities as a source of energy. The production of palm-oil provides an important source of income for the rural women of south-eastern Nigeria not only in direct production work but also through processing of secondary products such as soap, snack foods, palm kernel cakes and cosmetics.

The major problem perceived by many of the women entrepreneurs in traditional oil processing is the tiring nature of the work. This has made young women reluctant to go into the business or even to help their mothers in the production. A girl in Akpugo community has this to say concerning taking up the enterprise as an occupation:

"My God cannot allow me to remain in this village as a palm-oil processor. The whole stage of production is suffering from fetching firewood for boiling the palm fruits to pounding in mortar or with the legs. It can make a young girl become instantly old and scraggy – so that no man will want to marry her. I would rather go to do any menial job in the town rather than stay in this village as a palm-oil processor". (FGD with girls at Akpugo Community, Nkanu East LGA, 1999).

However, some oil mills have been established in most of the rural areas, but these seem to be presenting a threat to the women's incomes. This is because the men (husbands of the women) who traditionally possess the ownership rights to the palm trees, now sell the palm fruits and bundles directly to the mills for instant cash, instead of leaving it to their wives for processing. Their major reason is that women (their wives) do not give them accurate accounts of the palm oil sold after processing. Also, women are deprived of the income from palm kernel which traditionally was the women's personal reward for processing palm fruits into oil. It also denied the household the income from the palm oil, as the men tended to keep the money from the sale of the palm fruits for themselves.

In order for the women to compete with the larger mills, and for the younger women to stay in business, it is crucial that they have access to improved but scaled-down oil extraction technologies. This would lead to enhanced rural employment, improve the women's income and relieve some of their arduous tasks.

Micro credit and other support services would help in the purchase of raw materials, even from their husbands, and after processing generate higher incomes. Of importance is the fact that the technology designed for the rural women should not be the type that reduces or changes the quality of the palm oil they produce which consumers perceive as better than that from the mills. If this is not achieved, women will lose the local advantage they enjoy and hence lose income.

Cases of loss of jobs by the rural women as a result of introduction of modern oil presser was not widely reported as a major consequence of change. The major problem has been that of reduced income; because many women (especially young ones) are reluctant to join the enterprise. However, the technology recommended for adoption at the rural level should involve the rural craftsmen in design and construction, as they can make it sustainable by providing local maintenance. This was the type of success story from Senegal palm oil processing (Jacobi, 1983). But the marketing problems similar to those suffered by women in Senegal as a result of bad roads, which exposed them to exploitative middlemen, should be tackled. This is because, most of the palm-oil processing communities visited lacked all-weather roads, which exposed them also to similar exploitation.

Local Brewing

Brewing of local beer by women is not, strictly speaking, a traditional enterprise of the Igbo women of South-eastern Nigeria. The skill was learnt from women from the middle-belt and northern Nigeria, who traditionally brewed a beer called *Burukutu*. Due to an interchange of culture, some Igbo women learnt it, and it is becoming popular in many communities.

Burukutu is brewed by fermenting millet for about five days. It is then ground, sieved and boiled overnight in a large earthen pot or metal drum. The product, watery but thicker than refined factory beer, has a similar intoxicating effect. Many consumers prefer it to factory beer, as it is more natural and does not have the side-effects of factory beer.

This *Burukutu* has come to provide a lot of women with jobs, especially those living in rural and peri-urban areas. The annual growth rate in women employment in the enterprise is about 8percent, while young girls and older women are keen on learning the trade. Many young girls learn it when helping their mothers in the local enterprise. A woman in this enterprise confirmed the lucrative nature of the business: "Our problem is how to produce this *Burukutu* (BKT) in sufficient quantities as the demand is high. You know that factory beer is becoming very costly for the poor and even for the middle-income consumers, as one bottle of the least quality beer is above ₦50. But a similar bottle of BKT is just ₦20, yet is gives you the same effect. Again, unlike your beer, it has no side effects; rather it nourishes the body". (Woman focus group discussant, Enugu South LGA 1999).

The major problem with BKT productions relates to the short shelf-life. If not consumed within a few days of production, it loses its taste or goes sour, especially where there is no refrigeration, as in many rural areas. This has affected the marketing of the product, especially in places far from the point of production.

However, it is a micro-enterprise which ought to be supported with credit, and other facilities. In addition, the production technology should be upgraded. This is especially with regard to use of firewood in boiling, which apart from adding to the production costs, is not environmental friendly.

The major technology change in this enterprise has been the introduction of grinding machines for the millet. Initially, grinding was done with stone, which was extremely arduous. Though the grinding machines were mainly operated by men, they have helped in increasing the production level of the women brewers, hence giving them higher incomes. Technical change at that level cannot be blamed for any problem related to such production.

Garri Processing

Garri, which is processed from cassava tuber, is one of the major foods traditionally produced by Igbo women of south-eastern Nigeria. Virtually all women in every Igbo community know the skill of *garri* production. However, some communities are noted to produce *garri* more than others for commercial purposes. Such communities include Nenwe and Nomeh in Enugu State, and Nkalagu in Ebonyi State. Data and information on this important women's enterprise were collected from these communities.

Garri production involves peeling, washing and grating of cassava roots. The grated mass is placed in a large cloth or fibre bag and weight is placed on the bag to press out the liquid. It is allowed to ferment for three to four days in the sun. When sufficiently dry (about 50 percent water content) the pulp is removed from the sack and sieved to remove fibrous material.

After sieving, the product is roasted, by constantly stirring a small amount in a shallow pan over heat. The roasted product is spread out to dry further and cool, producing a light, crisp, free-flowing granular powder which is creamy white in colour – *garri*. Shelf-life ranges from a few weeks or months to more than one year depending on packaging and moisture content.

The problem with the traditional method of processing is that the peeling and grating techniques are time consuming. Knife cuts on hands and from hand-grater are frequent. Also during roasting, the woman who stirs the *garri* on a fire endures a lot of heat and smoke. She is also exposed to cyanide gas for long periods.

Improved technologies for *garri* processing have emerged in the area, especially in the past two decades with positive and negative consequences.

Diesel powered mechanical graters and hydraulic de-watering presses have replaced hand-grating methods. The positive effect of these on the women processor is that they have reduced processing time and the drudgery associated with the traditional methods. The mechanical grater and press introduced in the villages studied had increased *garri* production. The time needed for grating, considered one of the most laborious steps in the process, had been greatly reduced. Also, de-watering time of three to four days had been reduced to half an hour. A woman processor has this to say of the positive effects of these technologies: "*Garri* processing nowadays is one of the easiest enterprises a women can embark on. We suffered when some of us were producing *garri* some 40 years ago, and even after the civil war in the 1970s when no such machines existed. The problem we have now has to do with roasting as the fire tends to smoke us like fish." (Woman focus group discussant from Nenwe in Aninri LGA)

However, the high cost of the technologies resurfaces as only men own and operate the machines. It is only in a few communities that women's co-operatives benefited from a UNESCO rural women development programme when they received processing machines. Such women now hire a male operator. But communities who were not so lucky find themselves exploited by men who own all the machines, and who are, in most cases, in unions that fix prices for any operation. At times the location of the processing factory is too far from the village.

One of the most negative consequences of the introduction of the *garri* processing graters and presses was that work traditionally done by women became men's work. This transfer of control resulted in transfer of income. Women seemed to have lost an important income source as one of the women FGD respondents says:

"Before the introduction of this mechanical grater and press, many indigenous women who could not start their own *garri* processing enterprise did the peeling, grating and de-watering for others at a fee. Such women cannot get the employment. Technology has also adversely affected the quality of *garri* we produce. This one-hour de-watering before frying without fermentation is not good enough".

(Woman discussant from Nomeh in Nkanu East LGA, 1999)

According to the women, the short time for de-watering has made for more production of *garri,* of less quality. Fermentation enhances the quality of *garri* by reducing the cyanide content. Such *garri* is rarely found in the urban markets where the demand for *garri* is usually higher than supply. It can only be got in rural markets, but the production is discouraging because it does not attract a commensurate price.

Many young women are involved in *garri* processing and marketing, hence the need for promotion of the *garri* industry as a women's enterprise.

Farm and Non-Farm Linkage Implications of Changes in Traditional Non-Farm Women Technologies in South-eastern Nigeria

This study has identified varied technological changes that have occurred in the non-farm sector of the rural economy of the area studied. But it seems that these technical changes have not led to sufficient and effective rural inter-sectoral linkages with the farm sector that are capable of engendering rural economic growth, and hence higher quality of life for the rural entrepreneurs' households.

The reasons for this may be associated partly with the perceived nature and structure of linkages in the rural economy of south-eastern Nigeria, the negative consequences of technical change and other social factors neutral to technical change – both of which hindered rural linkage effects. Note that rural linkages are here used to describe the manifold interactions between farm and rural non-farm activities in a developing economy (Renis and Stewart, 1987). The linkage types identified in the studied communities and the problems that tend to hinder their development and exploitation of their benefits are discussed.

1) Consumption Linkages –Where incomes generated by activities in one sector lead to demand for output in another sector. This may operate from farm to non-farm and conversely. The fact that the regression function of the effects of technical change variables on expenditure level of women entrepreneur has a coefficient of determination R^2 as 65 percent shows that there were high consumption linkages as a result of technical change.

However, much of such consumption expenditure was not on rurally produced goods and services. For example, more than 88.9 percent of the women households spent less than ₦5,000 on food, as most of the households produced much of what they consumed. The study estimated that over 80 percent of the rural consumption expenditure was on urban manufactured goods and services, indicating a high rural income leakage to the urban areas, thus retarding rural inter-sectoral consumption linkages.

For example, the women pot-makers of Isiagu in Ebonyi State are under threat from plastic products which households seem to prefer to earthen ware for domestic use. Women in Abia State prefer textiles from Aba factory to the Akwete hand-woven cloth because the former is cheaper. Therefore, much of the rural generated income was spent on urban mass-produced goods, with the obvious result of weakening rural consumption linkages through such rural income leakages.

2) Production Linkages – This may be backward or forward. Backward production linkages, which occur where productive activity in one sector requires input from another such as hoes and machetes, fertilizer for farming and earthen pots, was high in favour of urban industrial outputs. For example, fertilizer and other agro-chemicals and biological technologies represented over 75percent of the cost of variable farm inputs in the area studied. Given the high social and economic cost associated with the use of such technologies in agriculture, effective backward linkages between farm and non-farm activities can hardly be achieved. The high economic cost of using these technologies instead of resource-conserving ones represented a leakage out of the rural economy and a weakening of backward linkages. Also, the occasional displacement of such rural entrepreneurs as blacksmiths and rural labour force by tractorization has adverse social effects on the inter-sectoral linkages and on rural economic growth.

Forward Production Linkages – which occur where the production of a commodity provides supplies for the productive activities in other sectors, was also identified in the areas. This was mainly in form of processed and semi-processed agricultural products such as palm-oil, *garri*, and locally brewed beer, most of which serve as inputs to other productive activities. Forward production linkages tend to be the most visible in the area and if well harnessed, could lead to high rural economic growth.

The reason being that most of the production processes here made less use of urban purchased inputs, and the products have less direct competition with the urban mass-produced industrial products. Rather, such rural products enhance backward linkages with urban industries which yield income for the rural economy. Forward production linkages should be encouraged in the area, and the problems associated with technology change in the enterprises which tend to hinder the growth should be tackled.

Chapter Five

Summary of Findings, Conclusions and Recommendations

Summary of Findings

Changes in technology in traditional non-farm women enterprises have occurred over the years with positive and negative socio-economic consequences on the rural entrepreneurs. But technical change has been blamed for almost all the problems of the rural entrepreneurs wrongly or rightly. Research needed to be done, therefore, to identify the socio-economic problems of the rural women entrepreneurs and isolate those which can be linked to technical change and those which are related to both the women entrepreneurs' personal characteristics, agencies or institutions. This could help in formulating appropriate technology policy interventions. The main thrust of this research, therefore, was the identification of the socio-economic consequences of technological change on the Igbo traditional non-farm women entrepreneurs of south-eastern Nigeria.

A total of 250 rural non-farm women entrepreneurs in the five Igbo-speaking States of Nigeria, namely, Abia, Anambra, Ebonyi, Enugu, and Imo supplied the quantitative data, while about 50 women of different ages supplied the qualitative data. Data collection involved use of descriptive statistics, cross-tabulations, the multiple regression model, the inter-correlation matrix model and factor analysis. Analysis of qualitative data from the FGD was by interpretation of implicit and explicit folk concepts, and verbatim quoting of the discussants views. The major findings for the research are as follows:

a) Most of the women entrepreneurs were above 45 years of age, with various levels of schooling but mostly primary education. Most of the women were married and were mainly of Christian religious faith. Household size was mostly 4-8 persons, while most households were headed by a man (father). Household out-migration was mainly of male children, and age at migration was mainly 15-20 years and the areas migrated to were mainly urban. Households lived in areas purely designated as rural, where social facilities were mostly unavailable or available but not functional or both. Most entrepreneurs were engaged purely in non-farm activities while some combined both farm and non-farm activities in various degrees. Only about 17 percent of the women earned ₦10,000 and above from their rural non-farm activities. Most of the incomes earned were spent on consumption goods and services with negative saving in most cases.

b) Technical changes have occurred in many rural enterprises. Still, they were not available to some. The most available change was in cloth weaving, where up to 73.2 percent of the women had adopted the changes in one form or another. Generally, up to 44.9 percent of the non-farm women entrepreneurs had not adopted any change in their production

processes. Up to 27.1 percent of the women entrepreneurs did not wish their daughters would take up their enterprise as an occupation, while 41.7 percent of them were undecided.

c) Chi-square results from cross-tabulation analysis show that the percentage adoption rate positively related to income level realized from the non-farm enterprise. Also X^2 results show that age was inversely related to level of adoption of available changes, while educational level did not have a positive relationship with level of adoption, hence implying that educational level was not the major factor that influenced adoption of technical change among the women entrepreneurs. It was also found from the X^2 results that there was no significant relationship between adoption level of technical change and number of apprentices in the local enterprise. The percentage of technical change adopted was also found to influence farm size for women who combined farm and non-farm activities. This has linkage implications between the two rural sectors especially as it was also found that there was a positive relationship between the percentage of technical change adopted and the level of income flow from non-farm to farm enterprises.

d) The coefficient of multiple determination (R^2) resulting from regression analysis of the effects of technical change variables on the level of income of women entrepreneurs was 42.1 percent. This percentage shows that the proportion of the observed variability (in levels of income generated by women entrepreneurs) explained by the combined effects of the independent variables was high, and was significant at 99 percent level of confidence. It shows that the level of technical change adopted by an entrepreneur – in percentage – (X^2) positively influenced the annual income from the enterprise. Also the amount spent in procuring raw materials for the technology and the extra labour requirements due to the adopted change both had a negative influence on the level of income that accrued to the women entrepreneurs. From the regression results, the number of positive effect experienced from new technology had positive and significant influence on income, while the number of negative effects experienced by entrepreneurs as a result of technical change, had a negative influence on their incomes.

e) On the effects of technical change variables on expenditure levels of women entrepreneurs on consumption goods (taken as index of standard of living), the coefficient of determination R^2 was 65 percent; which was a good fit. From the result, the estimated technical change in a given enterprise and the estimated level of technical change adopted by an entrepreneur, both had positive and significant influence on the standard of living of the entrepreneurs in terms of their monthly expenditure on consumption goods and services. Extra labour requirements as a result of the adopted change (usually male labour) had a significant but inverse relationship on the level of consumption expenditure of the women, while the number of positive effects as perceived by a change, had a significant and positive relationship with their consumption expenditure.

f) The coefficient of multiple determination of the effects of technical change variables on level of employment on non-farm women enterprises in the past two years was low (R^2 = 23%). This cannot be regarded as a good fit. However, the level of estimated technical change in an enterprise, and the level of technical change adopted by an entrepreneur, all and positive and significant influence on the level of employment in the enterprise.

g) On the effects of technical change variables on the female out-migration rate from entrepreneurs households, the coefficient of determination R^2 was 47 percent. This percentage is high enough and can be regarded as a good fit since it was also significant at 99 percent level of confidence. The six significant variables were level of technical change which was inversely related to household out-migration, extra amount spent on raw materials as a result of adoption and extra amount of labour needed after adoption, both of which inversely influenced the rate of household out-migration. The number of positive contributions from adoption and the number of negative effects associated with adoption, had inverse and positive, but significant, influences on the level of household out-migrations, respectively.

h) The income flow from non-farm to farm as a result of technical change variables shows a coefficient determination of 63.5 percent; which was an indication of a strong influence, and was significant at 90 percent confidence level. From the result, the level of technical change adopted by the entrepreneurs showed a positive and significant relationship with the amount of money invested from non-farm to farm. Also, the income that accrued to the entrepreneurs as a result of adoption shows a positive and significant influence on the income that flowed from non-farm to farm; while the number of positive effects as a percentage by the entrepreneurs inversely related to income that flows from non-farm to farm.

i) Inter-correlation analysis was done in order to establish how the variables related to technical change influenced some socio-economic attributes of the rural women entrepreneurs. Most of the variables showed a high level of relationship among themselves. For example, the level of technical change adopted by women entrepreneurs showed a strong relationship with the average number of women that entered the enterprises in the past two years. Also, the average monthly income from enterprise had a high and positive relationship with the level of adoption of technical change.

j) Varimax rotated factor matrix identified a production output relationship, a socio-economic relationship and an employment and future of enterprises relationship as the three critical factors that suggest positive effects of technology change on the women entrepreneurs in the study area. On the other hand, inappropriate technology issues, social and marketing issues and sustainability and environmental issues were identified as critical factors that related to the negative effects of adoption of innovations in traditional non-farm women's enterprise. Furthermore, adoption, adaptation, extension and rural infrastructure issues were named as the sensitive factors that hindered and may continue to hinder adoption of new technology by the women entrepreneurs of the area. Policy issues to address each of the identified factors have been suggested.

k) Ten social and technical problems which tend to inhibit adoption of innovations in non-farm enterprises by women entrepreneurs and which relate to negative consequences of adoption in the area were identified to include: inappropriateness of technology, general unawareness, incorrect identification of adoption domain, better local practices, generation of new problems, high cost of innovation, poor infrastructure, and unsustainability of innovation. Based on these problems, technical change was assessed either as neutral or

biased to these problems and their associated socio-economic consequences on the farm entrepreneurs.

l) Three types of non-farm rural linkages were identified in the study area as consumption, backward and forward production linkages. The one that appeared to be more beneficial to rural entrepreneurs was forward production because it had minimum leakage effects on the rural economy. Implications of each type of linkage as they related to technical changes in south-eastern Nigeria were highlighted.

m) A discussion on the five rural enterprises studied was done with findings on flow to make them more relevant to the people of the area, particularly women.

Conclusion

Being dynamic, technology has resulted in varied changes in many aspects of non-farm production processes, especially in the last century. Faster changes are occurring and will continue to occur in rural enterprises. The challenge of the new millennium must border on intensive and extensive production processes in the non-farm sector which must be achieved if the needs of rural women entrepreneurs in the Third World are to be met and if the younger generation are to make a living from the enterprises. The answer is in rapid technological change. The consequences of technological change affect people and nations differently depending on the method of adoption and adaptation, and on the manipulation of other social and economic variables relating to technical change. For example, chemical, electrical and mechanical technical change gave rise to the Asian Tigers, but left most parts of Africa confused. Part of the Asian success story stemmed from the efficient and effective harnessing of inter-sectoral rural linkages. While not asserting that non-farm technical change has not got negative socio-economic consequences (some of which the research has identified), it is neutral to most of the perceived negative consequences. Rather, most of the socio-economic problems of the rural entrepreneurs are mainly systemic, relating mainly to factors not associated with technical change. Rather, they affect the effective and efficient adoption, adaptation and use of innovation for the better welfare of the entrepreneurs, especially in the rural areas.

Recommendations

Based on the findings and conclusions, the following recommendations are made:

i) The identified social issues relating to the rural women entrepreneurs, such as low level of education, gender bias, high rural out-migration rate of young girls, and poor social infrastructures that affect the efficient and effective exploitation of the benefits of technical change should be tackled holistically by government and non-governmental organizations (NGOs) in their rural development programmes. Specifically, there is need for a more efficient and effective adult literacy programme in the rural areas; vigorous campaigns against all forms of gender bias, and policies and programmes to stem the tide of rural out-migration of youths for urban opportunities. The poverty alleviation programme (PAP) of the incumbent government is called upon to address these issues.

ii) The positive consequences of technical change rooted in efficient adoption and adaptation, and effective rural linkages can only be exploited by provision of adequate and vital rural infrastructures and amenities such as all-season roads, electricity supply, portable water,

among others. Past attempts at rural enterprise development where government agencies and non-governmental organizations install, for instance, modern processing machines that are electricity dependent in some communities for the rural women, without electricity for its use, is an example of conscious misplacement of priority, which cannot lead to positive harnessing of technical change.

iii) For technical change to be appropriate and relevant, it must address the major problems which the old technology failed to address. This means that researchers and developers especially in Nigeria, must have the end-users of technology in mind and must not ignore the indigenous technical knowledge system of the local people, or their reasons for local practice.

iv) While it is assumed that technical change is neutral to economic cost of adoption, researchers and developers in Nigeria should aim at resource-conserving, and cost-effective technologies, with high marginal revenue productivity, especially for the women. This is more so as some technologies yield benefits only in the long future.

v) Most of the problems associated with innovation result from faulty adoption processes, due mainly to poor extension services. Inadequate information on the credibility and benefits of innovation tend to obliterate hope for the entrepreneurs. Non-farm extension programmes are imperative for rural entrepreneurship. Non-farm extension programmes similar to those of the farm should be established at all levels of government in Nigeria to aid the non-farm women entrepreneurs.

vi) Research and development practitioners must pay attention to non-farm technologies that are environment friendly, sustainable, those that do not displace women, and do not exploit the labour of women and children. Some of the machines such as the *garri* processing machines were found to be too heavy and complex for the women to operate, leading to men taking up the enterprise at the disadvantage of the women.

vii) Radical revision of the nation's technological policy to recognise and favour the indigenous technical and craft industries is imperative. This will enhance the development of simple, energy-conserving machines that are suitable to local conditions, and are less labour displacing. This study recommends the establishment of community polytechnics to exploit the indigenous technical knowledge especially of communities noted for technical know-how. Such polytechnics should be linked to the relevant research institutes, and institutions of higher learning, and other agencies for effectiveness. This has been the practice in some successful Asian countries.

viii) Rural credit and other forms of financial assistance are critical to group adoption of innovation. Unfortunately, the rural credit (micro-credit) system as practised in Nigeria in the past by programmes such as Better Life for Rural Women and Family Economic Advancement Programme (FEAP) were found to be faulty and ineffective. They used the big commercial banks that in the past failed in rural credit delivery, rather than community banks and other rural agencies. Again, the programmes were not sincere in efforts to alleviate the financial problems of the rural women entrepreneurs. A more sincere approach is recommended.

ix) The importance of genuine rural associations and societies in women's enterprise development has been identified. To this end, the States and local authorities should provide the enabling environment for the formation of such groups in the rural areas, based on their mutual felt needs and philosophy. Past attempts where groups were formed based on the government's laid down conditions before qualification for loans was faulty. Most women's enterprise groups in the study area could not secure loans mainly as a result.

x) A discussion on the five rural enterprises studies based on FGD exposed the opinions and perceptions of the women entrepreneurs, the aged and the young on the rural enterprises in terms of the problems, prospects, and some imperatives on how to improve and preserve those enterprises for the future.

xi) Forward production linkages which were identified as more beneficial in the area should be encouraged. To this effect, rural enterprises such as palm-oil processing, *garri*-processing, among others, that provide supplies for productive activities in other sectors should be encouraged and exploited. These linkage effects, if well harnessed, could lead to high rural economic growth. This must be by tackling most of the problems associated with technical change in such enterprises.

References

Alamgir M. (1988), "Some Lessons from IFAD's Approach to Rural Alleviation" In Lewis et al 1988. pp 93-109.

Alimba J.O. (1990), "Linkages Between Farm and Non-Farm Enterprises in Selected Rural Areas of Anambra State, Nigeria, Unpublished M.Sc. Dissertation, University of Nigeria, Nsukka, Department of Agricultural Economics.

Alimba J.O. (1995), "Linkages Between Farm and Non-farm Sectors of the Nigerian Rural Economy" in *Rural Development in Nigeria: Concepts Processes and Prospects*. E.C. Eboh (eds), Auto-century Publishing Company, Enugu.

Alimba J.O. (1999). "Consequences of Adoption of Technological Changes on Farm and Non-farm Enterprises in Southeastern Nigeria" Unpublished Ph.D Thesis, Submitted to the Department of Agricultural Economics and Extension, Enugu State University of Science and Technology, Enugu, Nigeria.

Rhattacharyya, G.K. and Johnson, R.A. (1977) *Statistical Concepts and Methods*, John Wiley and Sons Inc. New York.

Binswanger H.P. (1978), *The Economics of Tractors in South Asia,* New York Agricultural Development Council.

Child (1978), Quoted by Madukwe M.C. (1996) "Factor Analysis and Applications (Mimeographed) UNN. Department of Agricultural Extension.

Chuta E. (1978), "The Economics of the Gara (Tye-Dye) Cloth Industry in Sierra Leone" *African Rural Development Working Paper No. 25*, East Lansing: M.S.U, Department of Agricultural Economics.

Chuta E. and Liedhoilm C. (1979), "Rural Non-farm Employment: A Review of the State of the Art" *M.S.U. Rural Development Paper, No. 4* East Lansing, Department of Agricultural Economics.

Carr M. (1984), *Blacksmiths, Bakers, Roofing, Sheet Makers ..., Employment for Rural Women in Developing Countries,* I.T. Publications, London.

Daily Times of Nigeria (198), "Prince Charles and Lady Diana makes case for Rural Akwete Women" DTN Publications, May 5, 1982.

Dhamija J. (1981), *Women and Handicrafts: Myth and Reality*, New York Seeds Report No. 4.

Dixon R. (1979), *Jobs for Women in Rural Industry and Services*, Washington, WID.

Ellis F. (1988), *Peasant Economics; Farm Household and Agrarian Development.* Cambridge University press, Cambridge.

Ezeh N. (1997), "Gender Differences in Small-scale Rice Farmers' Access to Technological Inputs and Its Implications for Output in Enugu State of Nigeria". Draft Research Report Submitted to ATPS Dissemination Workshop, NISER, Ibadan, Nigeria.

Family Economic Advancement Programme (1997), *Blue Print.* Published by the Ministry of Women Affairs, Abuja, Nigeria.

Family Support Programme (FSPO) *Blue Print* (1994), Published by the Ministry of Women Affairs Abuja, Nigeria.

Garg M.K. (1976), "The Upgrading of Traditional Technologies in India" In *Appropriate Technology Problems and Promises*. Nicholas Jequer (ed) pp 174-188.

Ijere M.O. (1988), *Women Co-operatives and Rural Employment in Southeastern Nigeria.* Augo Century Publication, Enugu.

Ikeme A.I. and Uvere P.O. (1995), "Mobilizing Indigenous Technology for Agricultural and Rural Development" In *Rural Development in Nigeria, Concepts, Processes and Prospects*. E.C. Eboh (eds) Auto Century Publishing Coy, Enugu.

Jacobi, C. (1983), "Palm-Oil Processing with Simple Presses" *GAGE Magazine*, GATE/GTL Publications, Eshborn, Germany.

Jazairy I. and Alamgir M. et al (1990), *The State of World Rural Poverty: An Inquiry into its Causes and Consequences*. IT Publication IFAD, Rome.

JoHiffe F.R. (1986), *Survey Design and Analysis,* Ellis Horwood Ltd. Chicester.

Kaiser, L (1958), Quoted by Madukwe M.C. in "Factor Analysis and Application": Mimeographed UNN, 1996.

Kanu, K (1997), "Socio-economic Effects of Changes in Agricultural Technologies on the Rural Households of Enugu Agricultural Zone of Enugu State". Unpublished Bachelor of Agriculture Research Project. Department of Agricultural Economics and Extension, ESUT, Enugu,Nigeria.

Kmenta J. (1971), *Elements of Econometrics*, Macmillian Col. Inc. New York.

Nwoko S.G. (1989), "Methods of Social Research and Special Projects". Mimeographed, UNN. Department of Agricultural Economics.

Ogunfiditime (1979), Quoted by Madukwe M.C. 1996. "Factor Analysis and Applications, Mimeographed, UNN, Department of Agricultural Extension.

Okeke E.A.C. (1995), "Women Empowerment and Rural Development" in *Rural Development in Nigeria: Concepts, Processes and Prospects*: In E.C. Eboh (eds) Auto-Century Publication, Enugu.

Olayemi J.A. and Olayemi, S.O. *Elements of Applied Econometrics*. CARI, University of Ibadan, Nigeria.

Oludimu O. and Williams, S.B. (1986), "Contributory Role of Non-Agricultural Activities in Rural Economy: A Case Study of Bendel State of Nigeria". In *Agricultural Outlook*

Ranis G. and Stawart, F et al (1987), *Linkages in Development: A Philippines Case Study*, Manila, Philippines Institute of Development Studies.

Umeh, E (1982), "Indigenous Technology in National Development" Quoted by Ikeme A.I. and Uvere P.O. in *Rural Development in Nigeria*, E.C. Eboh (eds). Auto-Century Publishers, Enugu.

APPENDICES

Appendix 1: Testing for Multi-Collinearity By Use of Correlation Matrix of Independent Variables Related

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_9
X_1	1.000									
X_2	-.084	1.000								
X_3	.248	-.333	1.000							
X_4	.366	-.046	-.188	1.000						
X_5	-.020	-.282	.291	-.007	1.000					
X_6	-.161	-.027	-.048	-.122	-.225	1.000				
X_7	.164	-.108	-.026	-.367	.006	-.102	1.000			
X_8	-.194	-.243	.416	-.253	.190	.057	.031	1.000		
X_9	-.103	.077	-.005	.199	.086	.128	-.339	-.098	1.000	
X_{10}	-.130	-.311	.137	-.059	.461	.052	.172	.290	-.157	1.000

Appendix 2: ANOVA for Testing the Combined Efforts of the Nine Independent Variables Related to Monthly Income of Non-farm Women Adopters of Technologies in South-eastern Nigeria

	ANOVA	DF	Sum of Sq	Mean Square	F
Multiple R 0.6491	Regression	9	19.3807	2.1534	4.3684
R Square 0.4213	Residual	54	26.6192	0.4929	0.0003
Adjusted RS Sq. 0.3248	Total	63			
Standard Error 0.7021					

ANOVA = Analysis of Variance
DF = Degree of Freedom
F = F-statistics
Significant at 1%

Source: Field data

Appendix 3: ANOVA for Testing the Combined Efforts of the Nine Independent Variables Related to Technical Change on Level of Expenditure by Non-farm Women Entrepreneurs

	ANOVA	DF	Sum of Sq	Mean Square	F
Multiple R .8057	Regression	9	974703839.40	108300426.60	1.864
R Square .6508	Residual	9	522868043.11	58096449.23	
Adjusted R^2 .3017	Total	18			
Standard Error 7622.102					

ANOVA = Analysis of Variance
DF = Degree of Freedom
F = F-statistics
Significant at 10%

Source: Field data

Appendix 4: ANOVA for Testing the Combined Efforts of the Nine Independent Variables Related to Female Out-imigration from Entrepreneurs Household

	ANOVA	DF	Sum of Sq	Mean Square	F
Multiple R .8057	Regression	9	103.478	11.497	4.405
R Square .6508	Residual	44	114.836	3.609	0.0004
Adjusted R^2 0.3667	Total	53			
Standard Error 1.6155					

ANOVA = Analysis of Variance
DF = Degree of Freedom
F = F-statistics
Significant at 1%

Source: Field data

Appendix 5: ANOVA for Testing the Combined Efforts of the Nine Independent Variables Related to Technical Change on Sever of Employment in Non-Farm Enterprises

	ANOVA	DF	Sum of Sq	Mean Square	F
Multiple R0.4817	Regression	9	37.797	4.199	1.947
R Square 0.2321	Residual	58	125.085	2.157	.0627
Adjusted R^2 0.1128	Total	67			
Standard Error 1.6155					

ANOVA = Analysis of Variance
DF = Degree of Freedom
F = F-statistics
Significant at 10%

Source: Field data

Appendix 6: ANOVA for Testing the Combined Efforts of the Nine Independent Variables Related to Technical Change on Flow of Income From Farm to Non-Farm Enterprises

	ANOVA	DF	Sum of Sq	Mean Square	F
Multiple R 0.7967	Regression	8	950510289.895	118813786.236	2.172
R Square 0.6347	Residual	10	547061592.631	54706159.263	.125
Adjusted R^2 0.3425	Total	18			
Standard Error 2.1718					

ANOVA = Analysis of Variance
DF = Degree of Freedom
F = F-statistics
Not Significant at 10%

Source: Field data

Appendix 7: Inter-correlation Matrix of Selected Variables on Consequences of Adoption of Non-Farm Technical Change

Variables	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}	V_{16}
X_1	1.000	-.364														
X_2	-.264	1.000														
X_3	-.116	.442	1.000													
X_4	.204	-.081	-.090	1.000												
X_5	-.050	.058	-.091	-.076	1.000											
X_6	-.097	.122	.163	-.050	.077	1.000										
X_7	.187	-.162	.021	.520	-.314	.177	1.000									
X_8	.117	-.034	.060	.303	-.041	.247	.542	1.000								
X_9	.094	-.137	-.187	.021	-.087	-.090	.013	.081	1.000							
X_{10}	.304	-.099	.045	.030	-.004	.029	.198	.190	- .041	1.000						
X_{11}	-.257	.162	-.124	-.274	.249	-.096	-.491	-.407	-.134	-.115	1.000					
X_{12}	-.184	-.051	.041	-.007	-.186	-.225	-.054	-.010	-.043	-.015	-.305	1.000				
X_{13}	.055	-.066	-.086	.141	-.019	-.296	-.103	.159	.248	-.017	-.162	.425	1.000			
X_{14}	-.002	-.033	.167	-.072	-.263	.137	.114	.300	.021	-.004	-.306	.291	.221	1.000		
X_{15}	.099	.099	.117	.066	.125	-.023	.105	.183	-.006	-.118	-.160	.106	.233	.124	1.000	

Variables	V_{16}	V_{17}	V_{18}	V_{19}	V_{20}	V_{16}	V_{22}	V_{23}	V_{24}	V_{25}	V_{26}	V_{27}	V_{28}	V_{29}	V_{30}	V_{31}
X_{16}	.038	.164	.112	.258	-.054	.361	.307	.441	.011	-.051	-.415	.148	.005	.138	.233	1.000
X_{17}	-.185	-.198	-.254	.041	.251	-.015	.512	.419	.200	-.219	-.073	.117	.087	-.060	.333	-.0135 1.000
V_{18}	-.035	-.095	-.079	-.015	-.001	.107	-.015	-.088	-.163	.054	.132	.108	-.188	-.023	-.308	-.107 -.157 1.000
V_{19}	-.141	.088	-.220	.095	.172	.007	-.157	-.045	.001	-.304	.108	.123	.027	-.017	.282	.199 .261 -.053 1.000
V_{20}	-.138	.028	.129	-.252	.417	.105	-.404	.242	-.428	-.063	.253	.123	-.036	.073	.331	-.0129 .316 .237 .140 1.000
V_{21}	-.126	-.088	-.051	.021	.150	.093	-.020	.178	-.018	-.190	.046	.124	.082	.089	.179	-.118 .536 -.069 .039 .3261 1.000
V_{22}	-.037	-.249	-.069	-.035	.218	-.022	-.055	.178	-.096	-.053	-.088	-.061	.014	-.218	.046	-.013 .210 .225 .079 .212 .201 1.000
V_{23}	.054	.060	.026	-.098	-.099	.001	.074	.105	-.213	.011	-.113	-.226	.184	.045	.159	-.079 -.394 -.117 .107 -.076 .141 .142 1.000
V_{24}	-.132	.260	.1386	-.063	-.118	.106	-.018	.075	.136	-.094	-.109	.365	.185	.098	.174	.284 .065 .050 .180 .064 .059 -.107 .026 1.000

V_1 Age of entrepreneur
V_2 Educational attainment
V_3 Type of religion
V_4 Family size
V_5 Number of social infrastructure in an area
V_6 Amoung of time spent in entreprise per day (hrs)
V_7 Average monthly income from enterprise (Naira)
V_8 Average monthly expenditure on household (Naira)
V_{18} Number of years adopted
V_{19} Membership/Non-membership of a society
V_{20} Amount of financial assistance received
V_{21} Number of people that entered enterprise
V_{22} Number of people that left enterprise
V_{23} Percentage of non-farm income invested in farm business
V_{24} Number of positive effedts experienced after adoption

V_9	Number of female out-migrations from household
V_{10}	Age at time of departure (years)
V_{11}	Level of education prio to migration
V_{12}	Method of Technical acquisition
V_{13}	Length of time in formal technical training
V_{14}	Amoung of family labour used in enterprise
V_{15}	Number of apprentices in the past 2 years
V_{16}	Amount of working capital (Naira)
V_{17}	Level of technical change adopted

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