

**THE STATUS OF AGRICULTURAL
EQUIPMENT FABRICATION INDUSTRY IN
EKITI AND ONDO STATES**

BY

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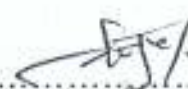
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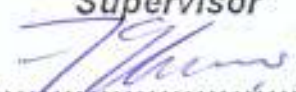
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CERTIFICATION

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DEDICATION

This project is dedicated to the Almighty God, the owner and the giver of knowledge and understanding. Also to my children Omolade and Grace.



ACKNOWLEDGEMENT

It is my pleasure to express my sincere and profound gratitude to God Almighty, the giver of wisdom understanding and ability, for his infinite love, provision and protection throughout the period of this study. My sincere appreciation goes to my project supervisor, Dr. L. A. S. Agbetoye for his advice, guidance and encouragement during the course of this project.

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O.D ISINKAYE

ABSTRACT

A survey study to establish the status of agricultural equipment fabrication industries was painstakingly carried out in Ekiti and Ondo States of Nigeria which are acknowledged agrarian states. The study assessed information on such items as type of equipment fabricated, scale of production, source and level of funding, source of power supply, type of equipment used in fabrication, problems associated with fabrication of agricultural equipment and their future prospects for large scale production.

Data analysis was done using descriptive statistics (frequencies and percentages). The student t-test was used to compare some of the data obtained from the two states for test of significance. Correlation statistics was also used to express the degree of association between the variables.

The results obtained revealed that:- Three categories of manufactures namely, Road side/ cottage (76%), small scale (18%) and established manufacturers (6%), were involved in fabrication of agricultural equipment in Ondo and Ekiti States. Furthermore, about 60 different types of agricultural equipment are being fabricated in Ekiti and Ondo States. An inventory of such fabricated equipment was compiled, indicating equipment type, mode of production, form of ownership etc.

Based on the results, it was concluded that the most common



and effective agricultural equipment fabrication industries in Ekiti and Ondo State is Road-side/cottage manufacturer. A lot of the agricultural equipment such as land preparation, spraying and harvesting equipment are not being produced in the area under investigation. Moreover, majority of the fabrication personnel are literate or half-literate but are not properly trained in the art of equipment fabrication. In the recommendations government were advised to pay more attention to Road-side/Cottage Manufacturers especially in relation to possible creation of centers where the manufacturers will have access to relevant technical, infrastructures and administrative facilities. Also to provide soft loan and other logistics to the equipment fabricators.

Furthermore the equipment fabricators were advised to expose themselves to new scientific and technical developments so as to sustain developments of their capacities. They should also document their design parameters with a view to ascertain performance specifications, machine life, esthetics and cost effectiveness in manufacturing.

It is believed that if agricultural equipment fabrication industries in Ekiti and Ondo states could be improved and more workshops are established this will in turn reduce unemployment and rural-urban migration among young school leavers. The economy of the states will also be improved.

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CHAPTER ONE

1.0 GENERAL INTRODUCTION

1.1 Introduction

Agriculture is a major component of the economy of Ekiti and Ondo States with over 70% of the population engaged in the sector. Their activities are connected with growing, harvesting and primary processing of all types of crops and with the breeding, raising and caring for animals. All these activities involve the use of one equipment or the other.

The modern equipment used in production and processing of agricultural products are majorly being imported into the country, not until 1987 to 1993 when **Structural Adjustment Programme (SAP)** and other economic policies were introduced due to economic recession in the country, that Nigerians began to look inward for the fabrication of agricultural equipment from locally available materials. The earliest effort in this regard was pioneered by Research Institutes such as the **Federal Institute of Industrial Research Oshodi (FIIRO)**, **Product Development Authority (PRODA)**, **Rural Agricultural Industrial Development Scheme (RAIDS)** Universities and Polytechnics. These efforts were later supported by the defunct **Directorate of Food, Road and Rural Infrastructures (DFRRI)**. Engineering companies were contracted by these establishments to

equipment, manufacture the prototype, prepare full working drawings and then manufacture about five units. The working drawings were then distributed to other workshops to reproduce or replicate the equipment.

The dwindling of the nation's foreign exchange resources has made the cost of imported machinery, spare parts and skills from abroad exorbitant (Aribisala,1991). The advent of **Structural Adjustment Programme** (SAP) about fifteen years ago created an urgent need for concerted effort to indigenise technologies for the exploitation of our natural resources (Anon, 2002). In a survey conducted by **Raw Material Research and Development Council** (RMRDC) in 1989 on Nigerian indigenous and emerging technologies/machinery for processing agricultural raw materials, it was discovered that about five hundred individual enterprises engage in the manufacturing activities.

Governments in Nigeria have been making concerted efforts to encourage local production of agricultural equipment but has been faced with some problems. Among these is the fact that industrial scale of agro-based raw materials depend largely on imported technologies and machinery (RMRDC,1998). Apart from the enormous attendant cost, the issue of unavailability of spare parts for the sophisticated equipment and in some cases relevant manpower to



operate and service the equipment have given rise to the need to look inward for locally fabricated equipment.

It is an established fact that the economic development of any nation depends considerably on the level of its industrial development. Industrial development can only be achieved when there is a strong industrial base. The level of manufacturing activity in Nigeria can be measured by the volume of output of locally manufactured goods.

The result of the survey carried out in 1989 by RMRDC indicate an upward movement in the involvement of Nigeria in industrial processing of our natural resources. This trend has been made possible by the emergence and growth of indigenous equipment manufacturers. The report also revealed that about seventy-three varieties of products of equipment were identified to be locally manufactured in Nigeria by the indigenous fabricators manufacturers and research departments. Igbeka (1997) reported that 95% of the enterprise involved in equipment manufacturing are located in urban centres. The reasons are not far fetched. At the urban centres, infrastructural amenities are moderately provided. Also, nearness to the market is considered.

Onawumi and Jekayinfa (2000) reported that most of the locally fabricated equipment are substandard and easily prone to corrosion,

wear, vibration and subsequently food poisoning. Tahir *et al.* (2001) reported a similar problem in Pakistan that the locally manufactured equipment did not follow standard design specifications, quality controls and fail to utilise proper raw material and manufacturing technology. This has constituted a major set-back in patronising locally fabricated agricultural equipment.

Chukwujekwu (1998) attributed some of these problems to the calibre of people that head and handle most of the existing fabrication companies in Nigeria. In his report, he pointed out that most of these companies are headed by those with limited engineering training who can copy an existing equipment or prototype but neither draw or interpret engineering drawing. Their knowledge of material properties are limited and therefore they can not make the adequate choice of material for a given situation.

Apart from established companies like Dizengoff, John Holt, Styer etc who assemble imported components of tractors and other machines, there exist today many fabricators including local blacksmiths with varying levels of educational background. The equipment they produce for users have different degrees of performance. There is therefore, the need to establish the status of equipment that are fabricated for agricultural operations with the aim of improving their performance.

Hence, the project was proposed with the following objectives.

1.2 Objectives of the Project

The major aim of the project is to investigate the status of agricultural equipment fabrication industry in Nigeria with particular reference to Ekiti and Ondo states. The specific objectives are:

- (a) To assess the agricultural equipment fabrication industries in Ekiti and Ondo States.
- (b) To document all the various agricultural equipment fabricated in the two states.
- (c) To determine and document the attributes of agricultural equipment fabrication industry in Ekiti and Ondo States.
- (d) To assess the problems associated with the fabrication of agricultural equipment in the two States.

1.3 Justification of the Project

Nigeria is among the developing countries making efforts to develop economically and technologically. No country will be said to have developed if she is still unable to feed her populace. Effort is being made by the government, corporate bodies and individuals to increase agricultural production in the country. This could not be

achieved without the use of modern equipment to reduce drudgery and other associated problems of traditional method of production.

Several policies have been formulated and research institutes established to make the country self sufficient in agricultural production. However, most of the equipment used are being imported arbitrarily into the country without sufficient spare parts and technical skill. The dwindling of the nation's foreign exchange resources has made the cost of imported machinery, spare parts and skills from abroad exorbitant. This has led to the emerging of indigenous fabrication industries.

The equipment they produce for users have difference degrees of performance, thus the study of the status of agricultural equipment fabrication industry in Nigeria will provide adequate information and give more opportunity to advise the stakeholders on how to improve on them.

CHAPTER TWO

LITERATURE REVIEW

2.1 An Overview of Agricultural Equipment in Nigeria

Nigeria is endowed with abundant natural resources, which can only be effectively exploited through the use of appropriate technology. The introduction of modern farm machinery in Nigeria has definitely made the farmer's job easier, especially in the areas of land preparation, planting and harvesting. However, certain aspects of equipment application or even suitability have been very critical to the end user, as at times, performance ratio of the equipment fall below an acceptable level. Most of the times it has been related to the performance of maintenance, inadequate machine specifications poor training of the farm personnel and lack of technical spare parts back – up from the supplier or its dealer. (Jaubart, 1987)

Ogazi and Aliyu (1991) reported that the production of any equipment or machinery requires the use of appropriate technology, manpower raw materials and finance. The industrial conversion of domestic raw material of Nigeria has over the years been hampered by the inadequacy of processing machinery from abroad. A good example is the iron ore that we have in abundance which has not been properly processed into iron and steel needed for the fabrication of equipment.

Raw Materials Research and Development Council (RMRDC) in 1989 carried out a survey to identify those equipment/ machinery that have been designed and fabricated locally. From the survey, it was revealed that about five hundred individual enterprises engaged in the activity, and are geographically spread all over the country. It was revealed and supported by Anon (2002) that the considerable concentration of activities is in the southern states where 85% of the firms are located. The equipment manufacturers exist in three categories namely Established, Cottage – level and Road side (Ogazi and Aliyu, 1991).

Table 2.1 shows the list of equipment fabricators registered with Raw Material and Research Development Council in Ekiti and Ondo States.

Table 2.1 : Lists of Equipment Fabricators Registered with RMRDC Council in Ekiti and Ondo States

(A) EKITI STATE.

Name Of Company	Address	Equipment Fabricated
M.A. Aborisade Eng. Constrution Company	9, Irona Street. Ado Ekiti	1. Gari Processing, 2. Rice Mill Equipment 3. Palm Kernel Oil Extractor.
Niuhities Metal Product.	28,off Aladesanmi way, Ado Ekiti.	1. Gari Processing, 2. Palm Kernel, Extractor, 3. Clay Moulding, 4. Nylon Production 5. Palm Oil Equipment.

(B) ONDO STATE

Name of Company	Address	Equipment Fabricated
Tamora (Nig.) Ltd.	Ilesa Road, P.O.Box 2257, Akure	1. Palm Kernel Oil. Equipment, 2. Foundry Products, 3. Gaari Processing Equipment, 4. Oil Palm Processing Equipment, 5. Fruit Processing Equipment 6. Saw Mill Equipment.
Okati and Sons (Nig.) Limited.	37,Oba Adesida Rd. Akure.	1. Hospital Equipment, 1. Metal Furniture, 2. Bicycle, 3. Wheel Chair, 5. Vehicle Body.
Muhayak Industry Ltd.	116, Oke Ogun St; Owo.	1. Saw Mill Parts, 2. Foundry Products, 3. Gaari Processing Equipment, 4. Oil Palm Processing Equipment, 4. Fruit Processing Equipment, 6. Pepper Grander etc
Segun Ageh (Nig.) Ltd.	Ilesa Road, Akure.	1. Gaari Processing Equipment 2. Oil Palm Processing Equipment, 3. Fruit Processing Equipment, 4. Saw Mill Equipment, 5. Palm Kernel Oil Equipment
Christ Love Olatunde Engineering Services	Champion Rd; Akure.	1. Food Processing Machine, 2. Saw Mill Equipment, 3. Metal Furniture, 4. Soap Production Equipment, 5. Mixer, 6. Moulder, 6. Dryer, 8. Pepper Grander etc.

Source: (R M R D C, 1998)

2.2 Technological Acquisition:

A large percentage of agricultural equipment are imported into the country except for few locally fabricated equipment. This is detrimental to the growth of the national economy. The table below shows the agricultural equipment imported between 1992 to 1998 in naira value.

Table 2.2: Agricultural Equipment imported to Nigeria between 1992 and 1998 (N'000)

	1992	1993	1994	1995	1996	1997	1998
(A)	699,345	424,867	541,319	887,641	344,771	2880,686	343982
Total(B) Imports	152907573	181924147	120870743	254701643	375293116	222934268	405664.6
% of A to B	0.46	0.23	0.45	0.35	0.09	1.20	8.48

Source: FSO 1999

As part of steps to be taken to reduce the drain in the national economy through the importation of agricultural equipment there must be technology acquisition on the part of individual engineers and developers, engineering institutions, research and development centres and industries.

Technology can be acquired in various ways which includes:

- i. Collaboration with overseas machine developers. This may work if such overseas collaborators are sure of deriving great benefit from such joint ventures. Some of the conditions to attract collaborators include favourable local market, stable political and economic policies, stable currency etc.

- ii. Through fundamental development by giving through basic design principles and progressive trial and error method.
- iii. Copy technology: This process consist of identifying needed machines disassembling various models of such machines/equipment, identifying the most efficient designs within the various models, copy such designs and develop them. Countries like Japan, India, Malaysia to mention but few adopted this approach and today, they are forces to be reckoned with in the filed of technology (Aderoba, 2000).

Each society designs how he want to acquire its own technology and how to improve on the already acquired technology. Federal government has made effort in this direction by establishing research institutes to assist the local equipment fabricators. Example are: Federal Institutes of Industrial Research (FIIRO), National Centre for Agricultural Mechanization (NCAM) Ilorin, Product Development Centre (PRODA, Enugu, Federal University of Technology and other Industrial Development Centres scattered all over the country.

Among their numerous objectives are to assist the local fabricators identify areas of needs, latest technology to be used and to train the would be fabricators. They are also in the best place to advise the government on the further line of action.

The most effective method of technology acquisition that could easily project the image of the country is this copied technology.

However, many local fabricators have been practicing this method, some have been coming out with wonderful performance, that their products could be favourable compared with the imported equipment.

Choudhary et al (1992) reported in Iran that the austerity measures introduced between 1980 and 1987 and the declaration by the government of the policy of self-reliance acted as a blessing in disguise for the local manufacturing industry. During the period, there were lots of adopted versions of the imported machinery. Nigeria has also gone through the period of austerity measure/structural adjustment programme between 1976 and 1985.

During this period, many fabrication workshops were established to produce locally agricultural equipment to meet the need of the farmers who could not afford the prices of the imported equipment.

2.3 Factors Affecting Agricultural Equipment Fabrication in

Nigeria:

Aribisala (1991) reported that most locally fabricated equipment are inefficient, unreliable and poorly finished and this is due to several factors some of which are stated below as reported by Ogazi and Aliyu (1991) and Agbetoye, (2004).

- i. Inavailability of funds/capital
- ii. Poorly equipped workshop (lack of necessary machinery and spare parts)

- iii. Inavailability of raw materials for fabrications
- iv. Inadequate infrastructure and essential services.
- v. Unskilled workshop expertise/Labour.
- vi. The nature of customers/user.

i. **Unavailability of funds/capital:** It is imported to note that lack of fund for purchasing necessary workshop machineries, materials, mass production of product and working capital has resulted in poor finishing of some of the locally fabricated equipment. Despite the establishing of finance houses e.g. Industrial Development Bank, African Development Bank etc to provide funds for the industries. Many of the fabricators could not provide collateral security required to secure bank loan. Many do not know how to go about it.

ii. **Poorly equipped workshop (lack of necessary machinery and spare parts):** Most of the equipment fabricators have encountered great difficulties in obtaining spare parts for their machinery as well as prime movers (electric motors). Many of the established manufacturers, research Institutes and development centres established by government has basic machines such as lathe, drilling, cutting, wedding machines but became moribund when spare parts could not be obtained to replace the faulty

parts. A large majority of these factories/workshops have no foundry and electroplating facilities (FOS,1999).

- iii. **Inavailability of raw materials for fabrications** : The major problem of the machinery fabricator is the absence of correct raw materials for fabrication. To develop a strong equipment manufacturing industry, the raw materials input must be assured. The largest raw materials input for the agricultural equipment fabrication industries is the different grades of alloy steel majority of which are being imported into the country. For example, cast iron and alloy-steel for special products are not readily available in the country.

The table below shows the imported Iron and steel bars, rods, angles, shapes and section between 1994 and 1998 in naira value.

Table 2.3: The imported Iron and Steel shapes

and sections between 1994 and 1998 in naira value.

Year	Amount (N)
1994	2,253,645
1995	6,459,246
1996	1,142,473
1997	14,110,910
1998	18,670,795

Source FSO (1999).

The steel companies and Iron rolling mills in the country are still performing below expectation, the plants are obsolete (Oyeyinka - Oyelaran et al., 1997).

iv. **Inadequate infrastructure and essential services.**

The inadequate or non provision of infrastructural facilities affect the transformation of Nigeria industrial production base. The epileptic nature of electricity and pipe borne water supply is also a major problem facing industrial development in the country. Aderoba (2000). Many towns and villages in the country are yet to be connected with the national grid. The cost of transportation is very high and many of our roads are in deplorable conditions. Telecommunication system in the country has been in deplorable condition, not until recently that NITEL has been trying to effect modernization through digitalization of its trunk network, introduction of new radio systems and use of satellite communication facilities. The introduction of mobile phone (GSM) is an improvement in telecommunication system. However, the cost of maintaining it is still on the high side.

iv. **Unskilled workshop expertise/Labour.:** Many of the fabrication workshops lacked skilled men at the level of operation, design, fabricate and assemble processing plants.

There is the need to stress that good design is important for both simple and robust machinery. There is an advantage in designing machinery in relation to its cost and the financial resources of the targeted entrepreneurs. The durability and suitability of the equipment also affects the amount of spare parts that needed to be stocked. For these reasons, there must be concerted effort to train enough engineers. Orientation of the universities and polytechnics of Nigeria trained engineers must be change from theoretical to practical and practicing engineers.

- vi. **The nature of customers/user:** The users of this equipment are biased against locally made products. This could be due to formal disappointment or story told by some one. There are some other users that has colonial mentality syndrome, they believe that only the imported materials are good. They are not convenient to be identified with locally fabricated equipment because of pride and ego busting.

There in an old adage that says: practice make perfect. The products produced locally if not bought, there is no way to continue production and to improve on their production will be difficult.

2.4 Prospects of Small Scale Equipment / Machine

Manufacture in Nigeria:

The nation is blessed with abundant natural resources that must be harnessed through the use of equipment/machines. There is need for machine design and fabrication in Nigeria that will suit our condition. Government in its efforts to encourage small-scale industry reviews its policies from time to time with the main objective to achieve an accelerated pace of industrial development (Igbeka,1997). In the year 2004, government enacted a law banning the importation of agricultural products

such as rice, cereal, poultry products etc. This is to encourage self sufficiency in agricultural product. Individual farmers and farmers organisation has been sensitised/empowered to go into massive production of agriculture product. For example, Federal Government has purchased several hundreds of tractors and implements which were also complemented by the State governments. The agro based raw materials will definitely increase which will in turn increase the demand for agro processing equipment. As at present, almost all the locally fabricated equipment in Nigeria are being sold locally. The developmental problems facing this country require the combined efforts of engineers and the industrialist in the field for mutually satisfying solution. The dependency syndrome that has characterised

our development strategy in the past years require that we should be in-ward looking in order to achieve self-reliance in our thrust in areas of national and rural development (Nwosu, 1987). The prevailing economic restructuring program of the nation has made it more difficult and expensive to obtain offshore services and machinery for our Agriculture. Added to this is the prevailing need for local sourcing of agricultural raw materials for our expanding industries, which has also intensified the need for increase in production.

In the development and production of locally fabricated agricultural equipment, the role of adaptation of machinery used elsewhere in the world could not be discarded. Being a late starter, Nigeria cannot afford to throw overboard the experience that have been accumulated by others that have preceded her in this area of development, hence there is need for systematic adaptation. There is hardly any agricultural equipment fabricated here that lacks a parallel elsewhere in the world (Chukwu, 1987). He further reported that the country's industrial base is yet to expand to be able to supply at reasonable prices, various items required for mass production of locally produced Agricultural machinery. In order to overcome the problem apart from research institutes, private sectors should be attracted to take over mass production of the equipment from the research institutions and centres. Until our industrial base expands, it

will remain relatively inexpensive to import spare parts for machinery than to produce them locally. Sometimes with machinery and equipment designers, greater use should be made of materials the country has in abundance. For example woods, plastics, mild steel and plates as this will cut down the production cost and make it readily available.

2.5 The Role of Engineers, Engineering Technologists, Technicians and Craftsmen in Agricultural Equipment Fabrication:

Nearly every activity related to food and fibre production and processing has an engineering dimension (Ige, 1987). The role of Engineers, Technologist, Technicians and Craftsmen in agricultural equipment fabrication can not be over-emphasised

2.5.1 The Engineers:.

Among other functions, the engineers are to design machines and systems for local industries for power, tools, and equipment for the mechanisation of agriculture. It is the duty of the engineer to supervise the preparation of the working drawing and authorise production of equipment.



2.5.2 The technologists:

The technologists in conjunction with the draughtsman prepare the working drawing to the engineer's specification. He is the next technical man in rank to the engineer, he directly supervises the equipment production procedures.

2.5.3 The technician:

He works more closely with the craftsman to ensure that specifications on the working drawing are physically adhered to as much as possible.

2.5.4 The craftsmen:

They are the welder, fitter machinist, and blacksmith. They perform all duties relating to metal cutting, joining, welding, and machining in the workshop.

2.6 The role of Government in Harnessing Capacities of Agricultural Equipment Fabrication in Nigeria.

Equipment manufacturing should be used as the tool for bridging the technology gaps between Nigeria and the developed world. Government have a strong role to play in development of harnessing capacities of agricultural equipment fabrication in Nigeria.

Governments, particularly the federal government, have established to encourage the establishment of organisations to

promote the development of small medium scale industries in Nigeria.

These organisations includes:

- i. Industrial Development Centres (IDCs) established in many state capitals to assist small scale industries with feasibility studies and technical advice.
- ii. Technology Business Incubation Centre (TBIC) established at Agege in 1993 with an enabling decree signed in 1995 with the mission of nurture the start and expansion of small and medium scale enterprises in Nigeria.
- iii. The National Office for Technology Acquisition and Promotion (NOTAP) was established by degree 70 of 1979 as a corporate institution with responsibility for promoting the acquisition of appropriate foreign technology required for facilitating the technological and industrial development of the country.
- iv. The regional Centre for Technology Management in Africa (RECTEM) established in Lagos is a Federal Government UNESCO response to the crying need for accelerated human resources development in the management of science and technology to enhance technological capability of African countries.

- v. The establishment of RAIDS (Rural agro-Industrial Development Scheme) as a unit of the Federal Ministry of Agricultural in 1981 to develop appropriate technologies to process agro-products such that the high post-harvest losses can be contained and at the same time serve as the vehicle of rural industrialisation.
- vi. Establishment of the National Science and Technology Centre Museum.
- vii. The National Agency for Science and Engineering infrastructure (NASENI) was established in 1992 to facilitate the attainment of a self reliant economy through the establishment of a national science and engineering infrastructure which will provide the necessary foundation for the local mass production of capital goods by private sector industries. This agency has tried to fulfil its mission by establishing development centres among which are:
 - Engineering Materials Development Institute (EMDI), Akure. The mission of the centre is to develop engineering process that can be duplicated and mass produce by entrepreneurs.

- Hydraulic equipment development Institute (HEDI), Kano. The centre is to develop the capacity for the local manufacture of hydraulic power equipment.
 - Centre for adaptation of Technology (CAT), Awka. The centre is to develop the technologies required by the electronic materials and equipment industries.
- viii. Establishment of National Centre for Agricultural Mechanization (NCAM), Ilorin with the aim and objective of developing locally fabricated agricultural equipment.

All these centres are being established in addition to several research institute such as the Federal Institute of Industrial research Oshodi, (FIIRO) and many other Universities of Technology and Institutions.

Aderoba (2000), reported that despite national and international attempts to accelerate engineering development seem to have little effect due to lack of fund and political will.

Many of the centres are being managed by uncommitted government functionaries and political appointees whose agenda may be the enrichment of themselves through graft and hoarding of vital technical information. Also, there is inadequate public enlightenment on the work and services rendered by the various promotional activities.

2.7 Locally Fabricated Agricultural Equipment in Nigeria: There are various locally fabricated agricultural equipment in the country ranging from simple tools to industrial equipment. Below are the list of some of the equipment.

Table 2.4 : Some Locally Fabricated Agricultural Equipment in Nigeria.

Type	Equipment
1. Tillage Equipment/Land Clearing	Cutlass, Plough, Hoe, Digger
2. Planting Equipment	Maize Planter, Broadcaster, Punch Planter, Row Planter, Fertilizer Distributor.
3. Crop Protection Equipment	Rotary Weeder, Slashers, Watering Can, Boom Sprayer, Knapsack Sprayer.
4. Harvesting Equipment	Cowpea Harvester, Sickle, Harvesting Knife(S), Cassava lifter, cutlass, Dehusker
5. Processing Equipment	
i. Mills	Maize Sheller, Bull Mill, Cassava Grater, Rice Mill, Hammer Mill, Roller Mill, Granulator, Palm Kernel Cracker, Chipper, Bone Crusher, Cassava Peeler.
ii. Extractors	Chipping Machine, Filter Press, Oil Palm Processing Equipment, Expeller, Dewatering Equipment.
iii. Mixers	Mixing Machine
iv. Cookers	Stove, Burner, Toaster, Electric Cooker, Gas Cooker.
v. Separators	Destopner, Separator
vi. Wood Processing Equipment	Wood Lathe, Wood Planner, Wood Saw.
6. Drying Equipment	Drum Drier, Oven, Aspirator, Cassava Drier, Tray Drier, Batch Drier
7. Materials Handling Equipment	Packaging Machine, Feed Pelletizer, Bucket Elevator, Tanks Conveyors, Molding Machine, Bottling Equipment, Canning Machine Pipes.
8. Workshop Equipment	Hammer, Nail Remover, Plainner, Leveler, Spanner, Tools Box, Rack.
9. Household Equipment	Pepper Grinder, Mixers/Homogeniser, Tray, Frier, Motter & Pestle, Stirrers, Pors, Cups Grating, Machine.
10. Livestock Equipment	Milking Machine, Feeding troughs, Water troughs, Incubator, Debeaking Machine, Cages, Storage tanks, and Milk pipes.
11. Transportation Equipment	Wheel barrow, Carriers, Trolleys, Chains

Sources: RMDRC (1989) and Ademosun 2002

Some of the locally fabricated equipment are shown in Figures 1 to 4 while two typical fabrication workshop in the study area are shown in figure 5.

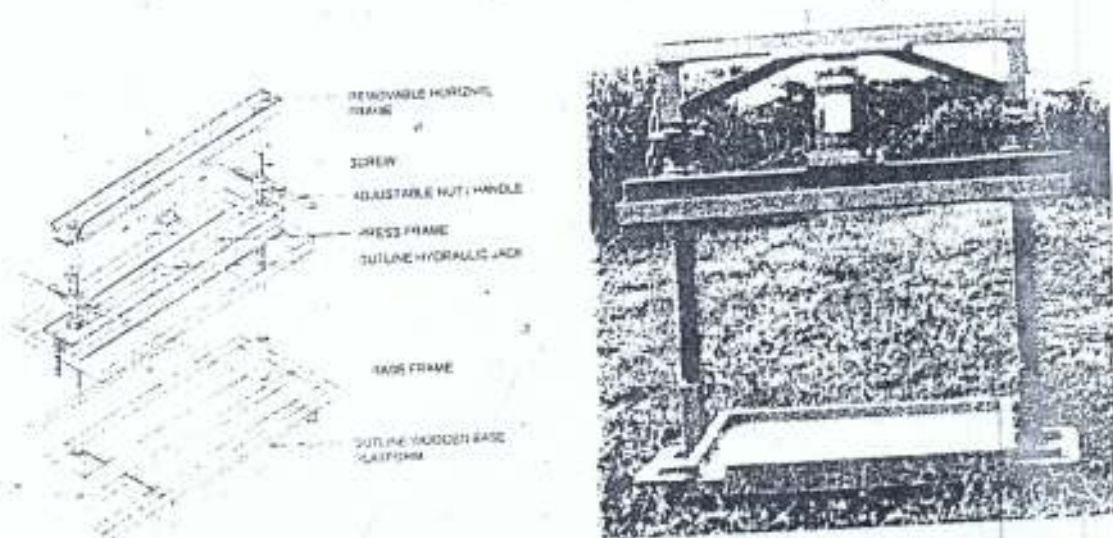
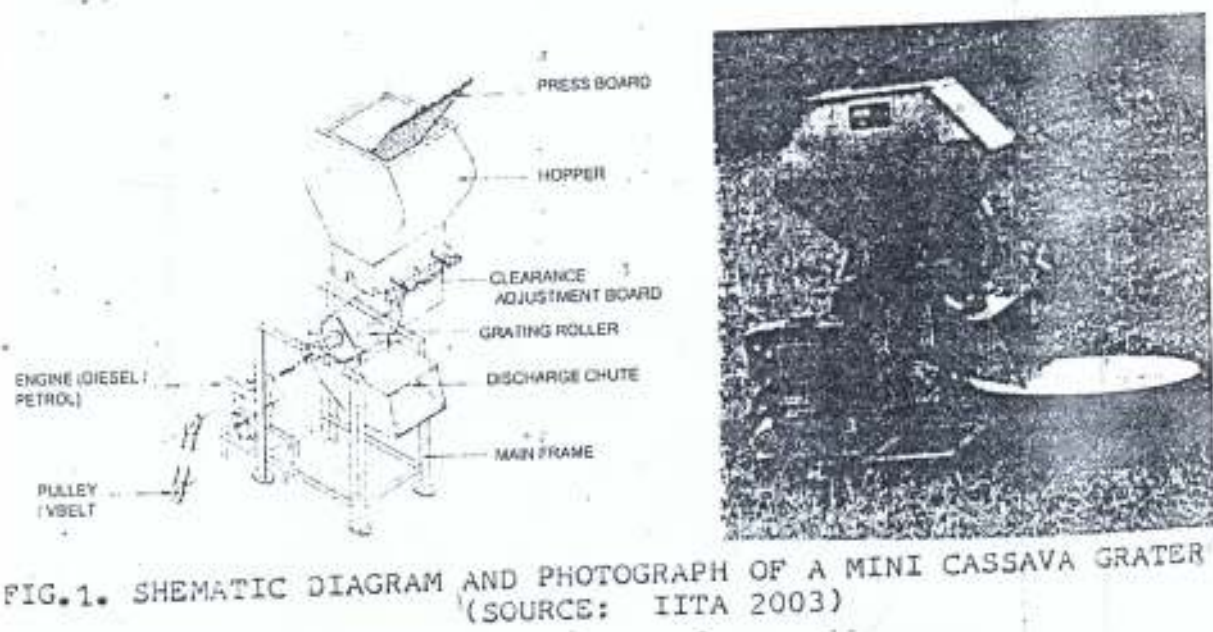




FIG.3. THE MOBILE GRATER-CHIPPER
(SOURCE IITA, 2003)

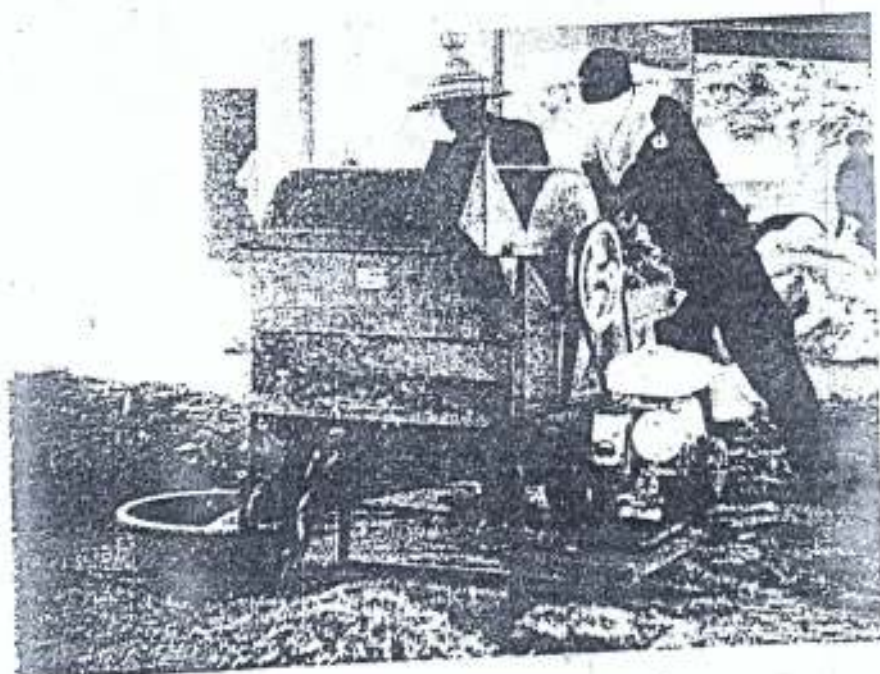
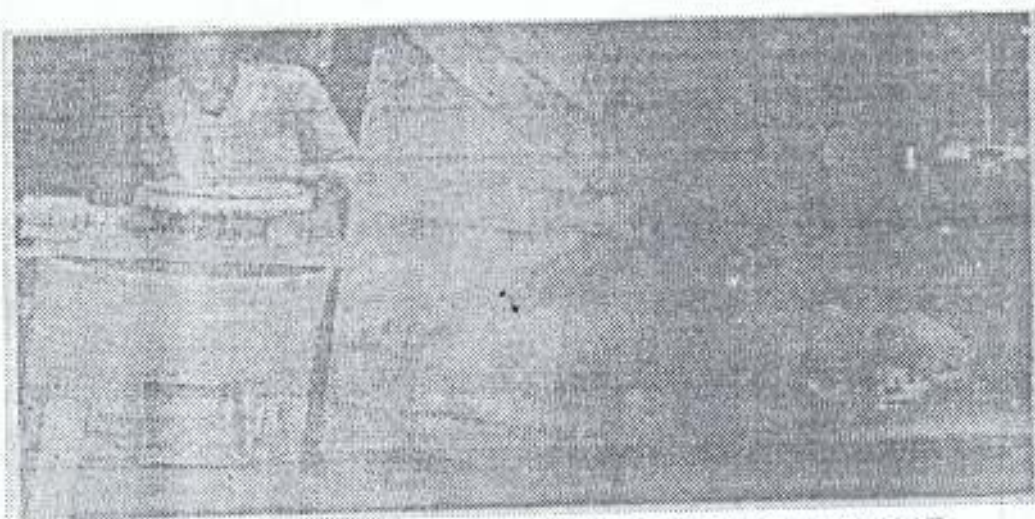
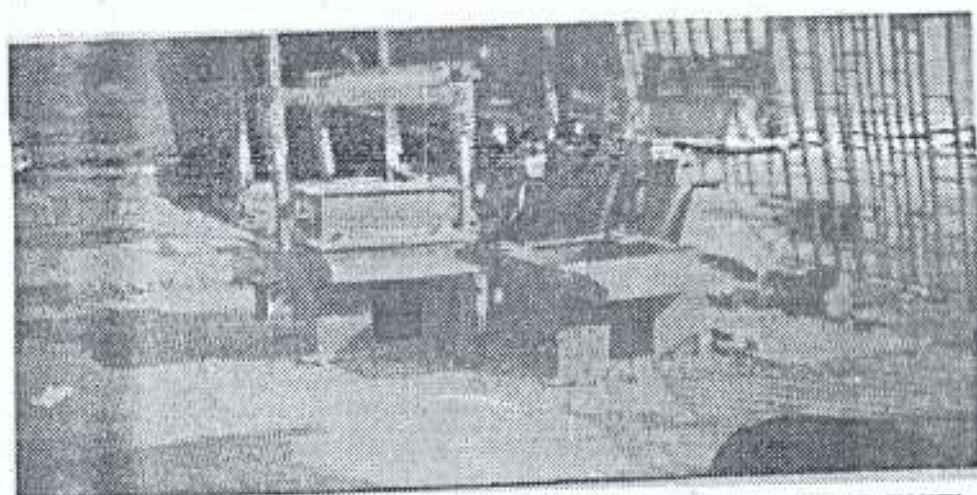


FIG.4. MULTI-CROP THRESHER
(SOURCE IITA 2003)



a. A ROAD-SIDE/COTTAGE WORKSHOP IN AKURE



b. A ROAD-SIDE /COTTAGE WORKSHOP IN ADO EKITI

FIG. 5. ROAD-SIDE/COTTAGE WORKSHOP

CHAPTER THREE

METHODOLOGY.

3.1 Plan and selection of Survey Area

The survey was conducted by distributing questionnaires to the functional agricultural equipment fabricators in the selected area and by interviewing them as the case may be.

3.2 Selection of Survey Area

The study was limited to Ekiti and Ondo States in the South Western part of Nigeria (as shown in figures 6 and 7) so as to get to all the possible categories of fabricators in the study area. These States which are agrarian with considerable number of agricultural equipment manufacturers of varying sizes and nature were chosen for the study with the hope that the work could be expanded to cover the whole country in future.

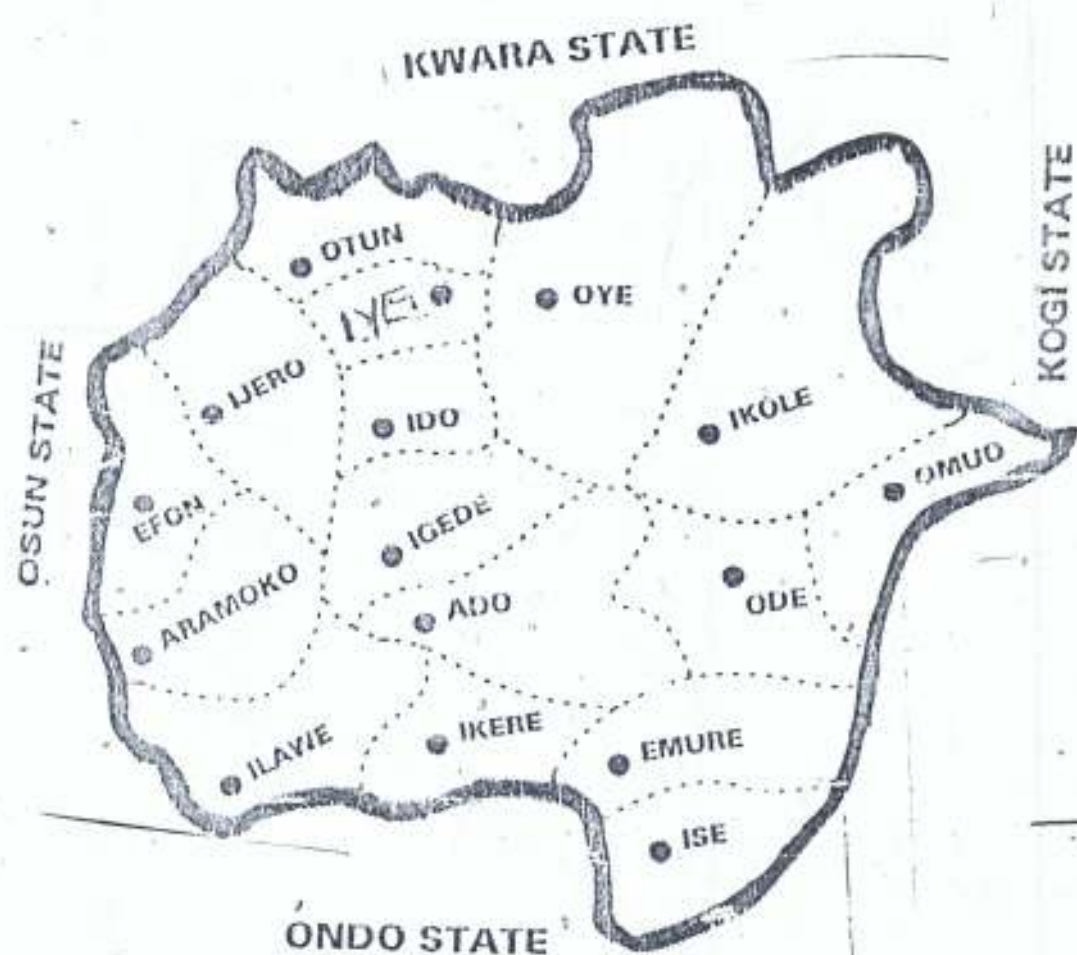


Fig. 6: MAP OF EKITI STATE

3.3 Design of Survey Questionnaire.

The questionnaire was designed to collect data on such items as: Name of the Industry, State, Town, Date of Establishment, Types of Equipment Fabricated, Equipment used in Fabrication, Source of Power, Form of Ownership, Staff Strength, Mode of Training of the Fabricators, Capital, Source of Raw Materials Availability and the Cost. Sample of the questionnaire is shown in appendix 1.

3.4 Survey Data Collection.

Eighty-five (85) copies of the questionnaire were produced and distributed, out of which 50 copies were completed and returned representing 58.9%.

The questionnaires were distributed to respondents in 16 towns in Ekiti and Ondo States. The author personally visited the fabrication workshops to administer the questionnaire and also to interview the fabricators. On-the-spot assessment of the various fabrication workshops were made.

Filling of the questionnaires were made by the fabricators,, but where the respondent could not read and write satisfactory, interpretation into the language understood by the respondent was done.

Some of the fabricators thought that the survey was a way of knowing the activities of their workshop by the government for the purpose of collecting Taxes/Government Revenue and therefore many of them were reluctant and even refused to give out information.

3.5 Collation and Analysis of Data.

The data collected from the respondents were collated and analysed. Descriptive statistics (frequencies and percentages) was used for data analysis (Tables 4.1 – 4.18). Also, the student t-test was used to compare some of the data obtained from the two states for determining level of significant difference.

The model is given as:

$$t - \text{test} = \frac{|\bar{X}_1 - \bar{X}_2|}{\sqrt{S^2P \left[\frac{1}{n_1} + \frac{1}{n_2} \right]}} \quad (1)$$

- Where
- $\bar{X}_1$ = Mean of data obtained from Ekiti State
 - $\bar{X}_2$ = Mean of data obtained from Ondo State
 - S^2P = Painted variance.
 - n_1 = Total number of respondents in Ekiti State
 - n_2 = Total number of respondents in Ondo State

$$S^2P = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{(n_1 + n_2) - 2} \quad (2)$$

S_1^2 = variance of data obtained from Ekiti State

S_2^2 = variance of data obtained from Ondo State

The parameters compared for significant difference ($P \leq 0.05$) are: level of professional registration, educational qualification, staff strength, number of respondents, year of experience and types of equipment produced.

To express the degree of association between variables, correlation statistics was used. The variables compared are: type of equipment produced, form of ownership, staff strength, source of power supply, mode of training, type of equipment used and capital source.

The correlation model is given as:

$$r = \frac{\hat{\beta}_1 S_x}{S_y} \quad (3)$$

Where $\hat{\beta}_1$ = least square slope

S_y = Standard deviation of y

S_x = Standard deviation of x

When $r \rightarrow 0$ little or no linear relationship

$r \rightarrow 1$ or -1 strong relationship

The correlations result is shown in Table 5.1

CHAPTER FOUR

4.0 PRESENTATION OF SURVEY RESULTS

4.1 Number of Respondents

Eight towns were visited in each State and 22 equipment fabrication workshops were located in those towns in Ekiti State representing 44% of the total workshops located in both states. In Ondo State, 28 workshops were located representing 56% of the total workshops located in both States as shown in Table 4.1 below.

Table 4.1: Numbers of Respondents

State	Town	Number/%
Ekiti	Ado	8
	Ikere	4
	Ikole	3
	Emure	2
	Ijero	2
	Ido	1
	Aramoko	2
	Omuo	0
Sub Total		22 (44%)

Ondo	Akure	10
	Iju	2
	Itaogbolu	0
	Owo	2
	Ikare	4
	Ondo	6
	Okitipupa	2
	Ore	2
	Sub Total	28 (56%)

From the result, one could observe that there are more fabrication workshops in the State capitals; Ado and Akure and the other big towns in the states. This could be as a result of:

- i. Large population: Akure is more populated than Ado-Ekiti there are more fabrication workshops so likewise the other towns.
- ii. Infrastructural facilities: The infrastructural facilities in the states capital are far better than other towns under them. Infrastructures such as electricity, pipe born water, good roads etc.
- iii. Marketability: Population aid marketing because there are many people to buy.
- iv. Cheap publicity: Many of the fabrication workshops are not buoyant enough to make paid advertisement. They prefer

to stay in the capitals or thickly populated area where they could display their products for people to see.

- v. Information: In many cases, people in the capitals are well informed than in the suburb. They have easy access to news paper and other information system.
- vi. Banking facilities: The banking facilities in the state capital and cities are far better.
- vii. Skilled Labour: It is in the state capital and other cities that we have concentration of skilled labour.
- viii. New Innovation: This is common in the cities.

4.2 Categorisation of Fabricators' Workshops/Industries

As a result of personal visitation to the fabricator's workshops/industries in Ondo and Ekiti States and the analysis of the returned questionnaires, three categories of workshops were revealed. The categories are classified thus:

- a. Road-side/cottage level manufacturers (RM)
- b. Small Scale Manufacturers (SSM)
- c. Established Manufacturers (EM)
- A. Road Side / Cottage Manufacturer (RM)**



These are the group of agricultural equipment fabricators or manufacturers comprising mostly welders whose workshop are very small and situated along the roadsides or beside their houses. Their

major manufacturing outputs are the common household crop/food processing equipment such as burr mill, knife, pepper grinder and small agricultural handling implements. The major characteristics of fabricators in this category is the possession of portable welding machine, with some black-smiting accessories, hand saw, dies and some small welding accessories which are portable and could be transported away after the close of the day's work. Their average output is one equipment per week and they are mostly one-man ventures with few local apprentices. Join - men are employed in real cases when there is an urgent requisition. The fabricators in this category do not make use of detailed working drawings for their equipment fabrications but rather adopt a copycat approach and because most of them have poorly equipped workshops, they hardly achieved fair copies of the foreign made equipment. Most of the fabricators in this category are either semi-illiterates or stack illiterates. 38 or 76% of the fabricator's workshop fall into this category as shown in Table 4.2

Table 4.2 Category of Fabrication Workshop.

State	Category	Number of Workshops	% by State	% by Total
Ekiti ndo	Roadside / Cottage Manufacturer.	21	42	
	Small scale Manufacturer.			
	Established Manufacturer.	1	2	
	Roadside / Cottage Manufacturer.	17	76	34
	Small scale Manufacturer	8	18	16
	Established Manufacturer	3	6	6

B. Small Scale Manufacturers (SCM).

The Small Scale Level Manufacturers are the equipment fabricators who are a little more advanced in their types of working machinery and the calibre of workers they possess than the road side manufacturers.

The work force in this group is well organised, with more sophisticated equipment that are fabricated. Detailed drawings are being used here for the production of the equipment. The owner and the workers of workshops in this category are fairly educated and teachable and most of their products are favourably comparable to the foreign products. The production of this category are still based on request/demand. Nevertheless their rate of production is far higher

than that of roadside manufacturer because of the additional working tools and machinery possessed by the fabricators. Their products are more than ordinary household processing equipment. It ranges from household to industrial processing equipment. Farm tools and some agricultural production equipment are being produced. Nine or 18% of the workshops are in this category.

C. Established Manufacturers (EM).

The fabricators in this category are well educated, the workshops are better equipped and they produce better products. They are the manufacturing outfits that produce fully developed and proven agricultural equipment such as

- a. Cassava processing equipment
- b. Edible oil extraction technology
- c. Palm kernel cracking technology
- d. Rice mill technology
- e. Wood processing technology

Equipment such as lathe machine, shaping machine, hi-tech welding machine etc are found in their workshops. They possess corps of professionals such as engineers, technologist, technicians, draughtsman, admin officer etc that work with them. The level of their production is higher than the other two manufacturers. Three or 6% of the workshops are in this category.

4.3 Date of Establishment

The dates of establishment of the various workshops were considered. The data taken was from 1951 to 2003. It was discovered that majority of the equipment fabrication workshops in Ekiti State were established between the year 1981 and 1990, that is 8 of the workshops were established during the period, representing 36.6% of the State. However, 14 out of 28 workshops were established during the period in Ondo State representing 50% of the workshop in the State.

Overall, 22 workshops were established during the said period representing 44% of the total workshops in the two States as shown in Table 4.3. This is in conformity with the early work done by RMRDC 1989 and Igbeka 2001. The establishment of most of the workshops between 1981 and 1990 has to do with the urgent need to produce food locally and the unabated decline in the value of Naira against U.S. dollar. One could also attribute it to the Structural Adjustment Programme (SAP) introduced by the then military government to sensitise Nigerian on the awareness to be self reliant in all aspects of economic endeavours, and to create jobs for the unemployed young school leavers.

Table 4.3 Date of Establishment

State	Date of Establishment	Frequency	% by State	% by Total
Ekiti	1951-1960	1	4.6	2
	1961-1970	3	13.6	8
	1971-1980	4	18.2	18
	1981-1990	8	36.4	44
	1991-2000	6	27.3	26
	2001-2003	-	-	2
Ondo	1951-1960	-	-	
	1961-1970	1	3.6	
	1971-1980	5	17.9	
	1981-1990	14	50	
	1991-2000	7	25	
	2001-2003	1	3.6	

4.4 Types of Equipment being Fabricated.

The workshops are engaged in various equipment fabrication which could be grouped into three as shown in Table 4.4a such as household equipment (knife, cooking stove, pepper grinder) small scale industrial processing equipment (palm oil processing equipment, bread making machines, tanks) and agricultural production equipment (grain planter farm tools etc). 30 or 60% of the workshops engaged in household processing equipment production, 13 or 26% engaged in small scale industrial processing equipment production.

While 7 or 14% engaged in agricultural production equipment. Most of the workshops base their production on request. They do not

stock/pile their fabrications. The comprehensive list of equipment fabricated are shown in Table 4.4b.

There are still many agricultural equipment that are not being fabricated in the two state. Such equipment as crop protection equipment (weeders, sprayer) tillage equipment (plough, harrow, tiller, ridger etc) and some other processing equipment. The fabricators should be encouraged and trained to focus their attention on the fabrication of such equipment.

Table 4.4a Type of Equipment Being Fabricated

State	Type of Equipment	Frequency	% by State	% by Total
Ekiti	Household processing equipment.	16	73	60
	Small scale industrial processing equipment.	5	23	26
	Agricultural production equipment (Crop & Livestock)	1	4	14
Ondo	Household processing equipment	14	50	
	Small scale industrial processing equipment	8	28.6	
	Agricultural production equipment (Crop & Livestock)	6	21.4	

Table 4.4b List of Agricultural Equipment that are being Fabricated In Ekiti and Ondo State.

Type			Equipment
1.	Tillage/Land Equipment	Clearing	Cutlass, Hoe
2.	Planting Equipment		Maize Planter, Punch Planter, Fertiliser Distributor
3.	Crop Protection Equipment		Watering Can
4.	Harvesting Equipment		Sickle, Harvesting Knife, Cassava Lifters, Cowpea Harvester Cutlass.
5.	Processing Equipment		Maize Sheller, Bull Mill, Cassava Greater, Rice Mill, Hammer Mill, Roller Mill, Palm Kernel Cracker, Sieve Shaker.
	i.	Mills	
	ii.	Extractors	Filter Press, Oil Palm Processing Equipment, Dewatering equipment
	iii.	Mixer	Mixing Machine
	iv.	Separators	Shaker
	v.	Wood Processing Equipment	Wood Lathe, Wood Planner Wood Sow
6.	Drying Equipment		Drum Drier, Oven, Cassava Drier, Tray Drier, Batch Drier
7.	Materials Handling Equipment		Tanks, Conveyor, Moulding machine, Bucket Elevator, Lynon Ceiling Machine
8.	Household Equipment		Pepper Grander, Mixers Tray, Fry Pan, Mutler & Pestle, Stirrers, Pots, Cup, Graters, Knives, Plates, Toaster, Stove, Electric Cooker.
9.	Livestock Equipment		Feeding trough, Water trough, Debeaking Machine, Cages, Storage Tank, Creates, Packers.
10.	Transportation Equipment		Wheel Barrow, Trolleys

4.5 Workshop Ownership

Table 4.5 shows the four forms of ownership identified in the 50 workshops reported. Twenty one or 95.46% of the workshops in Ekiti State are owned by sole proprietor while one or 4.54% is a liability company. In Ondo State 23 or 82.14% belong to sole proprietor while two or 7.14% belong to co-operative/partnership while 3 or 10.71% of the workshop in the state is Liability Company.

Table 4.5 Form of Ownership

State		Frequency	% by state	% by Total
Ekiti	Sole Proprietorship	21	95.5	
	Partnership	-		
	Government Asst.	-		
	Liability Company	1	4.5	
Ondo	Sole Proprietorship	23	82.1	88
	Partnership	2	7.1	4
	Government Asst.	-	-	-
	Liability Company	3	10.8	8

In total 44 or 88% of the workshops are owned by sole proprietorship, 2 or 4% are owned by co-operative/partnership while 4 or 8% are Liability Company.

4.6 Staff Strength

Among the 50 workshop reported various categories of workers are found as contained in the Tables 4.6, 4.8 and 4.9. It also shows number in post, years of experience and educational qualification. 194 workers were identified in the 50 workshops covered. Table 4.6 shows the staff strength in each workshop. Fourteen 14 or 28% of the workshops has between 1 and 2 workers per workshop, 24 or 48% has 3 to 5 workers per workshop, 8 or 16% has 6 to 10 workers per workshop and 4 or 8% has 11 and above workers per workshop.

In Ekiti State 6 or 27% of the workshops in the State has 1 or 2 workers per workshop, 12 or 55% has 3 to 5 workers per workshop and 1 or 5% has 11 and above workers per workshop.

In Ondo State 8 or 29% of the workshops has 1 or 2 workers per workshop, 12 or 43% has 3 to 5 workers per workshop, 5 or 18% has 6 to 10 workers per workshop and 3 or 11 of the workshop has 11 and above workers per workshop.

4.2.7 Staff Cadres

Eight (8) different cadres of staff were identified in all the fabricators workshops considered, they are as follows:

- i. **The Director/Manager:** whose duties involve the general management of equipment fabrication enterprise. In most cases they are the owner of the business while some workshops

employed paid workers as managers for monitoring of the daily operations of the workshop.

- ii. **Engineer/Technologist:** oversees the production department of the company. He supervises and authorises production of equipment. Very few of the workshops visited has a qualified engineer/technologist to supervise the production of equipment.
- iii. **The Clerk:** keeps record of the jobs booking and monitors all correspondence in and out of the company. He prepares the staff salary and most of the time act as Director/Manager's Secretary.
- iv. **The Craftsmen/Welder/Filter/Join Man:** performs all duties relating to metal cutting, joining and welding in the workshop. Almost all the roadside manufacturers are craftsmen/welder who are the manager/owner of the workshop.
- v. **Turners:** works directly on the lathe machines. They carried out the jobs involving turning, cutting and shaping on lathe machine.
- vi. **Blacksmith:** operate the furnace and does casting parts of equipment and electroplating of materials.
- vii. **Apprentices:** are the trainees. They does nothing than the learning of the work. In some cases, they does the cleaning of the workshop before and after the work. After the training many

of them are being employed back as join man/welder while some may establish their own workshops.

viii. Other Workers (Labourers/Watchmen): Workers in this category do all the menial jobs in the fabrication workshops. The labourers clean the surrounding of the workshop, while the watchmen provide the needed security for the raw materials, production equipment and fabricated equipment before eventually shipped to their owners. These types of workers are not found in roadside manufacturers' workshops because of the size and cost implication.

Table 4.6 Staff Strength

State	Staff strength	Frequency	% by state	%by Total
Ekiti	Between 1-2	6	27	
	3-5	12	55	
	6-10	3	14	
	11 & above	1	5	
Ondo	Between 1 - 2	8	29	28
	3 - 5	12	43	48
	6 - 10	5	18	16
	11 & above	3	11	8



Table 4.7 Mode of Training of the Fabricator

State	Mode of Training	Frequency	% by State	% by Total
Ekiti	Through apprentice/on job	21	95.5	
	Vocational Training	1	4.5	
	Others	-	-	
Ondo	Through apprentice / on job	25	89	94
	Vocational Training	2	7	4
	Others	1	4	2

Table 4.8 Educational Qualification

State	Qualification	Frequency	% by State	% by Total
Ekiti	B Sc. and above.	1	1.3	
	H. N. D.	-	-	
	N. C. E.	1	1.3	
	O. N. D.	3	3.9	
	N. T. C	3	3.9	
	WASC / NECO.	20	26	
	G4 / Modern School.	18	23.4	
	Certificate.	18	23.4	
	Primary School Certificate.	31	40.3	
	No Formal Education.	1	1.3	
			100	100

Ondo	B Sc. and above.	11	9	6.2
	H.N.D.	1	0.9	0.5
	N.C.E.	1	0.9	1
	O.N.D.	4	3.4	3.6
	N.T.C.	23	19.7	3.4
	WASC/NECO.	23	19.7	22.2
	G4/ Modern Sch. Certificate.	20	17.1	19.6
	Primary Sch. Certificate.	16	13.7	24.2
	No Formal Education.	8	6.8	4.6
	Total		100	100

Table 4.9 Years of Experience of Staff.

State	Years of Experience	Frequency	% by State	% by Total
Ekiti	1-5 years.	30	39	
	6-10 years.	21	27.3	
	11-15 years.	14	18.2	
	16-20 years.	6	7.8	
	21 & above.	6	7.8	
	Total		100.0	

Ondo	1-5 years.	45	38.5	
	6-10years.		26.5	
	11-15years.	31	12.8	
	16-20years.	15	10.3	
	21 and above.	12	12	
	Total	14	100	

4.8 Educational Qualification and Working Experience

Table 4.8 and 4.9 shows that educational qualifications and working experiences of the employees of the fabricators' workshops surveyed. Employees with sound education i.e. Technical Certificate and above are mostly found in EM and SSM workshops. This has contributed to the intellectual content of their job. Some workers (mostly engineers) in EM and SSM workshops have been invited to government initiated seminars and training workshops at one time or the other.

They also have better affiliation or link with appropriate professional bodies where latest technologies and discoveries are being discussed. This could be noticed in the better quality of products from their workshops as compared to those from RM workshops. From what the author could observe in the workshops surveyed, the

fabricators if given additional training especially in the art of draughtsmanship and job finishing would perform maximally as expected. It was discovered that some of them exhibit a good natural talent even without formal training. Giving them additional training will make the States and Nigerian to be self-reliant in the area of equipment fabrication.

4.9 Mode of Training of the Fabricators

Table 4.7 shows the data collected on the mode of training the fabricators in various workshops. Forty- six (46) or 94% of the workshops visited train their fabricators through apprenticeship, 3 or 4% through vocational training 1 or 2% through other means.

In Ekiti State out of 22 workshops 21 or 95.46% train their fabricators through apprenticeship while 1 or 4.54% through vocational training.

In Ondo State it was found that out of 28 workshops 25 or 89% train their fabricators through apprenticeship, 2 or 7% used vocational training while 1 or 4% used other means.

4.10 Source of Power Supply

The two major sources of power supply identified in the various workshops considered in the study are stated in Table 4.10. The source of power supply is NEPA (National Electricity Power Authority) and Generator. 18 or 36% of the total workshops depend mainly on

power from NEPA, 2 or 4% depend only on generator, 30 or 60% depend on both NEPA and generator for their power supply.

In the course of the Study, it was discovered that NEPA is not reliable in the whole of Ekiti State, Akoko and other villages in Ondo State other than the state capital. This has necessitated the concentration of fabrication workshop in Akure. The moment NEPA switched off the electricity, those that depend mainly on NEPA has to stop work until the power is being restored which could last for hours or days. Out of 22 fabricator workshops in Ekiti State 9 or 41% depend solely on NEPA, 2 or 9% depend on generator and 11 or 50% depend on both NEPA and generator.

In Ondo State 9 or 32% depend on NEPA, 19 or 68% depend on both NEPA and generator.

Table 4.10 Source of Power Supply.

State	Source of Power Supply	Frequency	% by state	% by Total
Ekiti	NEPA.	9	41	
	Generator.	2	9	
	Both.	11	50	
	Solar.	-	-	
Ondo	NEPA.	9	32	36
	Generator.	-	-	4
	Both.	19	68	60
	Solar.	-	-	-

4.14 Equipment Used

The fabrication workshops visited during the cost of study could be categorised into three parts based on the equipment used i.e, Large Production Equipment, Medium Scale Production Equipment and Cottage Equipment. All the roadside manufacturers are found with small simple tools. Thirty-eight (38) or 74% of the workshops visited are under this category. Nine (9) or 18% are cottage manufacturers or 3 or 6% are well equipped for Large Scale Production.

In Ekiti State, 4.55% was equipped for Small Scale Production, 21 or 95.45% were equipped for Cottage Production. While in Ondo state 3 or 11% were equipped for Large Scale production, 8 or 29%

were equipped for Small Scale Production and 17 or 61% were equipped for Cottage Production as shown in Table 4.11.

Table 4.11 Type of Equipment Used.

State	Equipment used	Frequency	% by State	% by Total
Ekiti	Cottage Equipment.	21	95.5	
	Small scale Equipment.	1	4.6	
	Large scale Equipment.	-	-	
Ondo	Cottage Equipment.	17	61	76
	Small scale Equipment.	8	29	18
	Large scale Equipment.	3	11	6

4.12 Mode of Production

Table 4.12 shows the mode of production of the workshop. It was discovered that the workshop do not embarked on stock piling of products. Their productions depend mainly on request. It was discovered that only 4 or 8% of the workshop under investigation stock pile or make continuous production of some products. 46 or 92% based their production on request.

In Ekiti State, 1 or 4.55% make continuous production of some products, 21 or 95.45% base their production on request. While in Ondo State 3 or 10.71% make continuous production of some equipment and 25 or 89.29% base their production on request.

Table 4.12 Mode of Production

State	Mode of Production	Frequency	% by state	% by Total
Ekiti	Continuous Production.	1	4.6	
	Production based on request.	21	95.5	
Ondo	Continuous Production.	3	10.7	8
	Production based on request.	25	89.3	92

4.13 Capital Source

Table 4.13 shows the capital source of the fabrication workshops. Forty – five (45) or 90% are from the personal savings of workshop owners, 2 or 4% sources their capital through thrift and co-operative

In Ekiti State 22 or 100% of the workshops sourced their capital through personal savings of the workshop owners. While In Ondo State 23 or 82.15% of the workshop source of capital is from personal savings of the owners, 2 or 7.14% sourced their capital through bank loan and 3 or 10.71% source their capital through thrift and co-operative society. Most of the fabrication workshops found it difficult to obtain bank loan because they could not provide the necessary collateral security for the bank loan and the government is not helping the matter by not rising to assist the fabricators.

This has grossly contributed to low growth of equipment fabrication in Ekiti and Ondo states. Majorities of the workshops are operating on very low scale (RoadSide Manufacturer).

Table 4.13 Source of Capital

State	Source of Power Supply	Frequency	% by State	% by Total
Ekiti	Personal Saving.	22	100	
	Bank Loan.	-	-	
	Thrift and Cooperative.	-	-	
	Government Assisted.	-	-	
Ondo	Personal Saving.	23	82.2	90
	Bank Loan.	2	7.1	4
	Thrift and Cooperative.	3	10.7	6
	Government Assisted.	-	-	-

4.14 Source of Raw Materials

Metal are the major raw material used in equipment fabrication workshops with few cases of wood and synthetic material.

Based on the level of production in Ekiti and Ondo State, majorities of their raw materials are still sourced locally. The study revealed in Table 4.14 that 100% of their raw materials are locally available. This is just to say that the raw material needed are readily available in the local market.

Table 4.14 Availability of Raw Materials

State	Availability of Raw Materials	Frequency	% by State	% by Total
Ekiti	Readily Available.	22	100	
	Not Readily Available.	-	-	
Ondo	Readily Available.	28	100	100
	Not Readily Available.	-	-	-

4.15 Price of the Raw Materials

Table 4.15 shows the judgement of the fabricator s on the price of raw materials. 32 or 64% of them confirmed that the prices of the raw materials are moderately okay. 14 or 28% says that the materials are expensive while 4 or 8% says the materials are very expensive.

Table 4.15: Price of Raw Materials

State	Price of the Raw Materials	Frequency	% by State	% by Total
Ekiti	Cheap.	-	-	
	Moderately Okay.	14	64	
	Expensive.	6	27	
	Very Expensive.	2	9	
Ondo	Cheap.	-	-	
	Moderately Okay.	18	64	64
	Expensive.	8	29	28
	Very Expensive.	2	7	8

4.16 Registration with Professional Body

Table 4.16 and 4.17 show the number of the fabricator workshops that registered with one professional body or the other, and the professional bodies registered with. 64% or 34 of the fabricator's workshops registered with one body or the other, while 36% or 16 of the workshop did not register with any professional body most especially those fabricators' workshops in the sub-burb. Some of the disadvantages are, they will lack necessary information, new innovation and the assistance from the government may elude them when ever it comes.

19 or 38% of the workshops registered with Welder and Blacksmith Association of Nigeria, 11 or 22% registered with Small Scale Indigenous Fabricators of Nigeria. While 4 or 8% registered with Council of Registered Engineers of Nigeria and related bodies.

Table 4.16: Registration with Professional Body

State	Availability of Raw Materials	Frequency	% by State	% by Total
Ekiti	Registered.	12	54.6	
	Not Registered.	10	45.5	
Ondo	Registered.	22	71.4	64
	Not Registered.	6	28.6	36

Table 4.17: Professional Body Registered With:

State	Professional Body	Frequency	% by State	% by Total
Ekiti	Welder and Blacksmith Association.	9	40.9	
	Small scale indigenous fabricator of Nigeria.	3	13.6	
	None	10	45.5	
	COREN/NSE/NIAS.	-	-	
Ondo	Welder and Blacksmith Association.	10	35.7	38
	Small scale indigenous Fabricator of Nigeria.	8	28.6	22
	None.	-	-	32
	COREN/NSE/NIAE.	4	14.3	8

4.18 Marketing of Products

All the agricultural equipment produced or manufactured in all the workshops studied were sold locally. (Table 4.18)

There is ready market for all the products. There is none of the workshops that produce sufficient enough or stockpile product that can make room for exportation.

Table 4.18: Marketing of the Products.

State	Mode of Marketing	Frequency	% by State	% by Total
Ekiti	Locally Sold.	22	100%	-
	Exportation.	-	-	-
Ondo	Locally Sold.	28	100%	100%
	Exportation	-	-	-

4.18 Comparative Analysis of Results

Some of the data obtained from the two states were compared for test of significant using student t-test. The result are shown in Table 4.19 to 4.24.

Table 4.19: T-test comparing professional registration in Ondo & Ekiti States.

	Variable 1	Variable 2
Mean	33.33333	26.2
Variance	297.3433	118.813
Observations	3	
Pearson Correlation	-0.31992	
Hypothesized Mean Difference	0	
Df	2	
t Stat	0.533462	
p (T<=t) one-tail	0.32353	
t Critical one-tail	2.919987	
p (T<=t) two-tail	0.647061	
t Critical two-tail	4.302656	

As shown in Table 4.19, there was no significant difference in professional registration in Ondo and Ekiti State. However, there are more fabricators that registered in Ondo than Ekiti State.

Table 4.20: T-test comparing educational qualification in Ondo & Ekiti State.

	Variable 1	Variable 2
Mean	13.86667	10.13333
Variance	212.5175	59.0675
Observations	9	9
Pearson Correlation	0.780159	
Hypothesized Mean Difference	0	
Df	8	
t Stat	1.138553	
p (T<=t) one-tail	0.143917	
t Critical one-tail	1.859548	
p (T<=t) two-tail	0.287834	
t Critical two-tail	2.306006	

Table 4.20 shows that there is no significant difference in educational qualification of the fabricators in both states. However, there are more fabricators in Ondo states with higher degrees which will enhance their better performance. Also there are more fabricators with no formal education in Ondo State than in Ekiti State.

Table 4.21: T-test comparing number of respondents in Ondo & Ekiti State.

	Variable 1	Variable 2
Mean	3.5	2.75
Variance	10	5.9828571
Observations	8	8
Pearson Correlation	#N/A	
Hypothesized Mean Difference	0	
df	7	
t Stat	0.83205	
p (T<=t) one-tail	0.216423	
t Critical one-tail	1.894578	
p (T<=t) two-tail	0.432845	
t Critical two-tail	2.364623	

The t-test shown in Table 4.21 no significant difference in number of respondents in both states. Never the less there are more respondents in Ondo State. This might be due to greater population and infrastructural developments in Ondo State.

Table 4.22. T-test comparing staff strength in Ondo & Ekiti States

	Variable 1	Variable 2
Mean	20	25.25
Variance	560.6667	194.9167
Observations	4	4
Pearson Correlation	0.832879	
Hypothesized Mean Difference	0	
Df	3	
t Stat	-0.7335	
p (T<=t) one-tail	0.258188	
t Critical one-tail	2.353363	
p (T<=t) two-tail	0.516375	
t Critical two-tail	3.182449	

From Table 4.22, it can be seen that, there is no significant difference in staff strength of the fabrication workshops in both states. The staff strength is about the same in the two states.

Furthermore, the t-test in Table 4.23 shows no significant difference in year of experience of the fabricators in the two States. However, there are more experienced fabricators in Ondo State than Ekiti State.

Table 4.23 T-test comparing year of experience in Ondo & Ekiti States

	Variable 1	Variable 2
Mean	20.02	20.02
Variance	178.802	148.607
Observations	5	5
Pearson Correlation	0.962817	
Hypothesized Mean Difference	0	
Df	4	

t Stat	-2.2E-16		
p (T<=t) one-tail	0.5		
t Critical one-tail	2.131846		
p (T<=t) two-tail	2.776451		
t Critical two-tail			

Table 4.24 T-test comparing type of equipment used in Ondo & Ekiti States

	Variable 1	Variable 2
Mean	33.36667	33.66667
Variance	2900.703	641.3333
Observations	3	3
Pearson Correlation	0.949044	
Hypothesized Mean Difference	0	
df	2	
t Stat	-0.01683	
p (T<=t) one-tail	0.49405	
t Critical one-tail	2.919887	
p (T<=t) two-tail	0.9881	
t Critical two-tail	4.302656	

So also the t-test in table 4.24 shows no significant difference in the type of equipment used in Ekiti and Ondo states. The type of equipment used are about the same.

GENERAL DISCUSSION OF RESULTS

5.1 General Comments: There is no significant difference in all the observations. One could conclude that the agricultural equipment fabrication workshops in Ekiti and Ondo States are about the same in terms of professional registration, educational qualification, staff strength, number of respondents, years of experience and type of equipment used.

The levels of equipment fabrication are about the same. Even though those with professional registration showed higher level of production, they are the fabricators that could enjoy government patronage. However, there are differences from one workshop to another in terms of equipment produced.

Table 5.1 Correlations Results

		Equipment produced	Form of ownership	Staff strength	Power supply	Training	Equipment	Capital source
Equipment produced	Pearson Correlation sig. (2-tailed)N	1 3	.956 .189 3	.111 .929 3	-.171 .891 3	.977 .056 3	.996 .059 3	.963 .175 3
Form of ownership	Pearson Correlation sig. (2-tailed)N	.956 .189 3	1 3	-.185 .882 3	.124 .921 3	.997 .052 3	.979 .129 3	.1000 .014 3
Staff strength	Pearson Correlation sig. (2-tailed)N	.111 .929 3	-.185 .882 3	1 3	-.998 .039 3	-.104 .934 3	.018 .989 3	-.163 .896 3
Power supply	Pearson Correlation sig. (2-tailed)N	-.171 .891 3	.124 .921 3	-.998 .039 3	1 3	.043 .973 3	-.079 .950 3	.102 .935 3
Training	Pearson Correlation sig. (2-tailed)N	.977 .137 3	.997 .052 3	-.104 .934 3	.043 .973 3	1 3	.993 .077 3	.998 .38 3
Equipment used	Pearson Correlation sig. (2-tailed)N	.996 .059 3	.979 .127 3	.018 .989 3	-.079 .950 3	.993 .077 3	1 3	.984 .115 3
Capital source	Pearson Correlation sig. (2-tailed)N	.963 .175 3	1.000 .014 3	-.163 .896 3	.102 .935 3	.998 .038 3	.984 .115 3	1 3

As shown in Table 5.1 the result of the correlations at 5% level of significance are:

- i. There is strong relationship between form of ownership, mode of training, equipment used, capital source and the type of equipment produced. The development (positive or negative) in any of the parameters will have positive or negative effect on the type of equipment produced.
- ii. There is no strong relationship between staff strength, power supply and the type of equipment produced. The development in any of the parameters (negative or positive) may not affect the type of equipment produced.
- iii. There is strong relationship between mode of training of the fabricators, type of equipment used, capital source and form of ownership. A new development in form of ownership may have effect on the other parameters.

5.2 Effect of form of ownership on the agricultural equipment produced

From the result in Table 5.1, there is strong relationship between the form of ownership and the type of equipment produced.

Majority (88%), of the workshops are owned by sole proprietorship. The effects are:

- i. The workshops are cottage in nature, could not afford the cost of mass production equipment.
- ii. Majority of the workshop owners could not afford the cost of employing well trained personnel to manage the workshop.

- iii. Household equipment and very few small scales industrial processing equipment dominated the list of equipment produced.
- iv. Majority of the equipment produced might not be compared with imported ones because of the mode of production.
- v. Decisions on production are not collective decisions and may be selfish.
- vi. No standard to follow either from the government or regulatory body.

5.3 Effect of staff strength on the agricultural equipment produced.

As shown in Table 5.1, there is no strong relationship between staff strength and the type of equipment produced. However majority 48% of the fabrication workshop has staff strength of between 1 and 2. Probably the owner and an apprentice. This is a pointer to the size of the workshop, type and size of the equipment produced. More so there is a limit to the type and quantities of equipment that could be fabricated by this category of fabricators, though he might possess the necessary fabrication equipment.

5.4 Effect of source of power supply on the agricultural equipment produced.

The result from Table 5.1 shows that there is no significant relationship between the source of power supply and the type of equipment produced.

However from Table 4.10, majority (60%) of the workshops depend on NEPA and generator for source of power supply. This might increase the cost of production and lower the profitability margin. Many of the equipment that will require long period of machining, cutting and welding might be deferred till when there is NEPA which is assumed to be cheaper.

5.5 Effect of mode of training on the agricultural equipment produced.

It was observed that there is a strong relationship between mode of training and equipment produced. (Table 5.1). This is because those fabricators that pass through vocational training are better off in fabrication. The higher the training the better the equipment that are produced both in quality and quantity.

5.6 Effect of the equipment used on the agricultural equipment produced.

relationship between the equipment used in fabrication and the type of equipment produced. Table 4.11 shows that majority (76%) of the workshops are Road-side/cottage manufacturers. The implications in that majority of the workshops are not equipped to produce complex and intricate agricultural equipment. Lathe machine, high-tech welding machine and many others are lacking in the workshops. They are only equipped to produce simple equipment that may not require serious machining or hi-tech welding. This forms part of the reason why majority of agricultural equipment (production and processing) are being imported into the states from neighbouring states and abroad. The few workshops that are equipped for large scale production could not function well due to obsolescence and frequent break down of machine.

5.7 Effect of capital source on the agricultural equipment produced.

The correlation result (Table 3.1) revealed a strong relationship between capital source and the type of equipment produced. To establish a medium scale fabrication workshop, a huge sum of money is needed. The cost of erecting a structure and to acquire necessary equipment runs to million naira, no wonder why the majority of the fabrication workshops in the study area are road-side /cottage

manufacturer because majority (90%) of the manufacturers source their capital from personal savings. In many cases this source of capital could not meet the capital needed for the establishment of a well equipped fabrication workshop.

5.8 Effect of staff qualification on the agricultural equipment produced .

Fabricators with no or little education dominated the staff list of the fabrication workshops.

The effects are:

- i. Many of the equipment that require serious engineering works e.g. calculation, detail drawing e.t.c are not being produced by this category of workers.
- ii. Material selection ability might not be adequate.
- iii. New innovations might not be introduced. Though there are some of the fabricators that are naturally gifted .They could have been better off if they have more education.
- iv. Majority of the equipment produced can not be favorably compared with the imported equipment.
- v. Good education bring enlightenment and development. Fabricators with higher education is likely to enjoy better patronage from the government and multinational company.

5.9 Effect of mode of production on the agricultural equipment produced

Majority (92%) based their production on request that is no continuous production. The effects are:

- i. There may not be perfection in production. There is old adage that say practice make perfect. The more often you produce a product the more improvement you will have on the product.
- ii. The cost of production may not be reduced. Mass and continuous production bring reduction in cost of production.
- iii. Repetition in mistakes.
- iv. The workshop may not break even.
- v. Lost of skilled personnel to a more vibrant and productive workshop.
- vi. Inability to pay the workers regularly.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The study of the current status of agricultural equipment fabrication in Nigeria with particular reference to Ekiti and Ondo States was carried out and the following conclusions were deduced based on the results obtained;

- (i) Majority (60%) of the agricultural equipment produced are small household processing equipment.
- (ii) Majority of the workshops in the study area were established between 1971 and 2000 as a result of economic recession during the period, which made importation of equipment more expensive and unaffordable.
- (iii) Very few of the fabricators registered with appropriate professional body (COREN). Hence some of their products are substandard.
- (iv) Majority of the raw materials needed for the agricultural equipment fabrication are readily available in the country at affordable prices. Hence there is no reason why the sector should not be developed.
- (v) Three categories of agricultural equipment fabrication industry were identified in Ekiti and Ondo States namely Road – side or

Cottage, Small Scale and established Manufacturers while majority of them (76%) are Road – side / Cottage Manufacturer. One could conclude that the status of agricultural equipment fabrication industry in Ekiti and Ondo state is cottage manufacturing.

- (vi) The epileptic supply of electricity in the country has contributed greatly to the under – development of agricultural equipment fabrication workshops. The scarcity and the high cost of fuel to operate power generators worsen the situation.
- (vii) The fabricators do not stock – pile their products. Local demand has not been fully met, talk less of production for exportation. They base this production on request.
- (viii) The use of generator and NEPA are the only source of power supply for the workshops. Majority 60% depend on both sources of power supply.
- (ix) Majority of the fabrication personnel are literate or half - literate but are not properly trained in the art of equipment fabrication. Training and retaining of this group of workers are required for better performance.
- (x) Among the staff cadres that were involved in manufacturing of agricultural equipment, females are not common. They were only used as cleaners and secretaries in few workshops. This

could be attributed to the stressful nature of the job and the hazard involved.

- (xi) Three types of workshop ownership were identified through this survey, namely, Sole proprietorship, partnership and Limited Liability Company. Majority of the workshop (88%) were owned by sole proprietorship.
- (xii) There are more fabrication workshops in Ondo State than Ekiti State.
- (xiii) Almost all the agricultural equipment fabricated are consumed locally.
- (xiv) A lot of the agricultural equipment such as land preparation, spraying and harvesting equipment are not being produced in the area under investigation.
- (xv) The status of agricultural equipment fabrication industries in Ekiti and Ondo states is Roadside/Cottage level manufacturing.

6.2 Recommendation to the Government.

- (i) Local production of agricultural equipment should be encourage by providing conducive environment. That is provision of pipe borne water, uninterrupted power supply and good communication system to aid production.
- (ii) Equipment fabrication training school should be established where all interested school leavers can undergo well structured

training programs before taking up the vocation as a discipline or profession.

- (iii) Sponsor collaboration with developed countries for technology transfer in the area of equipment design and fabrication.
- (iv) Government or the regulatory bodies should promote close inter – relationship among agricultural equipment fabricators / manufacturers with a view to fostering uniform standard, training and other development schemes.
- (v) They should provide soft loan and other assistance to agricultural equipment fabricators.
- (vi) Government should encourage and assist the equipment manufacturers in the area of importation of raw materials. Tariffs on the imported raw materials for agricultural equipment fabrication should be reduced or removed.
- (vii) Government should pay more attention to Road – side /Cottage Manufacturers especially in relation to possible creation of centres where the manufacturers will have access to relevant technical, infrastructures and administrative facilities.
- (viii) Importation of agricultural equipment that could be fabricated locally should be discouraged.

6.3 Recommendation to the Manufacturers

- i They should document their design parameters with a

view to ascertain performance specifications, machine life, esthetics and cost effectiveness in manufacturing.

- ii They should exposed themselves to new scientific and technical developments so as to sustain developments of their capacities.
- iii They should be registered with relevant professional bodies such as COREN, NIAE e. t. c. where latest technologies could be discussed.
- iv Agricultural equipment fabricators should provide after sales – service to their customers.
- v They should form themselves into group(s) to be able to speak with one voice and to be able to present their common problems to the government.

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APPENDIX

THE CURRENT STATUS OF AGRO-PROCESSING EQUIPMENT FABRICATION INDUSTRY IN EKITI AND ONDO STATE SURVEY FORM/QUESTIONNAIRE

Agriculture is the main sustenance of the economy of the old Ondo State (Ekiti & Ondo). About 75% of the population are involved in farming activities. Many of the farm produces are being processed locally using traditional methods thereby discouraging mass production and encouraging wastage, due to the lack of adequate processing equipment.

Research is presently being conducted to know the current status of agro-processing equipment fabrication industry in Ekiti and Ondo State. The researcher would be grateful if you would kindly complete the following questionnaire. I assure you that all your views will be treated as confidential, hence feel free to answer the questions.

If you have any questions, comments or suggestions relating to the survey, please contact;

ISINKAYE OLUWASUYI

Federal University of Technology

Agricultural Engineering Department

Akure, Ondo State.

QUESTIONNAIRE

1. Name of the Industry
State LGA
Town
2. Factory Location:
3. Date of Establishment:
4. Type of Equipment being fabricated (Tick which one is applicable)

Maize Sheller () Bull Mill ()
Rice Mill () Dicer ()
Maize Dehuler () Packaging Machine ()
Oven () Palm Oil Processing Equip ()
Aspirator () Pelletizer ()
Bottling Equipment () Toaster ()
Scorcher () Sieving Equipment ()
Pneumatic Conveyor () Bucket Elevator ()
Canning Machine () Tray Drier ()
Chipper () Knife ()
Debonning Machine () Feed Pelletizer ()

Drum Drier () Cassava Grater ()
 Milling Machine () Molding Machine ()
 Palm Kernel Cracker () Cassava Peeler ()
 Polisher () Smoking Equipment ()
 Burner () Dehusker ()
 Cooking Machine () Filter Press ()
 Bone Crusher () Cassava Grater ()
 Cassava Drier () Mizer ()
 Perboiler () Steeping tank ()
 Thresher () Cabinet drier ()
 Destoner () Dewatering equipment ()
 Expeller () Roller Mill ()
 Frier () Grading Machine ()
 Tank () Pepper grinder ()
 Incubator () Grater ()
 Gari processing equipment () Granulator ()
 Hammer mill () Roaster ()

5. Name other equipment that you fabricated other than the above

(a)..... (b).....

(c)..... (d).....

(e)..... (f).....

6. Source of power supply

NEPA () Generator ()

Both () Solar ()

7. Types of equipment used (Tick the appropriate)

Lathe machine () Foundry ()

Wood Lathe () Blacksmith Machine()

Welding Machine () Work Bench ()

Power Saw () Drilling Machine ()

Hand Saw () Cutting Machine ()

Iron Bending Machine () Electroplating Equipment()

Sheet Metal Roller ()

8. List other Machine/Equipment used in your industry

(a)..... (b).....

(c)..... (d).....

(e)..... (f).....

9a. Production capacity (Actual Production)

Equipment	Unit Production Per Week	Unit Production Per Month	Unit Production Per year

9(b) Source of raw material

Local () Imported ()

9(c) How available is the raw material

(i) Readily available ()

(ii) Not readily available ()

9(d) Price of the raw material

(i) Cheap ()

(ii) Moderately okay ()

(iii) Expensive ()

(iv) Very expensive ()

10. Form of ownership (Tick the appropriate)

Sole proprietorship () Family Business ()

Partnership () Liability Company ()

Cooperative ()

11. Staff Strength of the Factory

	POST	NO. IN POST	YEARS OF EXPERIENCE	EDUCATION QUALIFICATION
1.	Director			
2.	Manager			
3.	Engineer			
4.	Technologist			
5.	Sales Clerk			
6.	Account Clerk			
7.	Welder			
8.	Electrician			
9.	Join Man			
10.	Apprentice			
11.	Blacksmith			
12.	Turnner			
13.	Others			

12. Mode of training of the fabricators:

.....