ASSESSMENT OF THE SOCIO-ECONOMIC EMPOWERMENT INTERVENTION OF RUBBER RESEARCH INSTITUTE OF NIGERIA (RRIN) ON RURAL RUBBER FARMERS IN EDO AND DELTA STATES

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CERTIFICATION PAGE

We certify that this thesis on "**Assessment of the Socio-Economic Empowerment Intervention of Rubber Research Institute of Nigeria (RRIN) on Rural Rubber Farmers in Edo and Delta States**was written by**Evelyn MUSA**with matriculation number **PG/SSC9904092**and it is ready for presentation to the Postgraduate Board of Studies of the Department of Sociology and Anthropology, Faculty of Social Sciences, University of Benin, Benin-City.

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DEDICATION

This thesis is dedicated to God Almighty for His infinite mercies and loving kindness over my life and to my lovely family for their unwavering support.

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ABSTRACT

This study focused on the assessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in Edo and Delta states. RRIN was formed with the aim of researching into rubber and latex trees for its economic purposes. Among its mandate is to also impact on the smallholder farmers who have chosen to farm rubber trees. Over the years, there have been series of complaints by the farmers which led to the development of empowerment intervention programmes by RRIN in order to educate these farmers on the best practices of rubber plantation. The general objective of this study therefore was to analyse the effect of the socio-economic empowerment intervention of (RRIN) on rural rubber farmers in Edo and Delta state, with the intent to determine the effect of the vocational trainings and new rubber based technology acquired by the smallholder rubber farmers while identifying the constrain they faced before and after RRIN intervention.

The study adopted the survey research design and the population of the study consisted of all the smallholder rubber farmers in the selected local government areas of Edo and Delta states respectively which was 853. The sample size of this study was 800 and the study adopted the multistage sampling techniques. Copies of questionnaires were administered to 800 respondents and764 were retrieved, valid and used for the analysis. Six (6) (RRIN) staff were also interviewed through the in-depth interview method. Quantitative and qualitative data collected were analysed using descriptive statistics and manual content analytical method respectively. Analysis of the data revealed that most of the respondents (47.49) had primary education in Edo while Delta had (26.75). Those who had tertiary education in Edo were (25.86%) and Delta state had (45.45%), implying that most of the respondents were literate and can easily comprehend and adopt new technological innovations.

The results showed a multiple response with fair distribution of impact of the technologies; 26.16% in Edo and 24.92% of the respondents agreed that they have benefited in knowledge enhancement on rubber management techniques n Edo and Delta respectively, and the intervention program has helped in improving their farm yield and also financial status. This means that the training impacted the farmers' economically. Constraints

identified by the farmers before the intervention include, inadequate funds, inadequate information on rubber technology, pests and disease control. It was concluded that though the intervention program has impacted the smallholder farmers, The research recommended that the intervention program should be a regular activity of the Institute.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The agricultural sector in Africa is a very important driver of the economy, as it employs up to 65 percent of the continent's labour force (Deutsche Bank Research, 2014). This claim draws attention to the inevitability of agriculture in national development. Sikwela and Mushunje (2013), explain that farming is the economic backbone of most rural areas in developing countries. They stressed that, farming contributes to overall economic growth by creating jobs, supplying food and raw materials to other sectors of the economy; and helping to generate foreign exchange. Correspondingly, Madeley (2010) explains that in Sub-Sahara Africa (SSA), agriculture accounts for approximately 21% of the continents Gross Domestic Product.

The place of Agriculture in national development cannot be over emphasized. Almost 80 percent of the rural population who reside and work in the rural areas of Nigeria engage in agriculture and agricultural related activities (National Bureau of statistics [NBS], 2005). The Agricultural sector in the 1960s provided the main source of employment for most rural and semi urban dwellers. In Nigeria, cash crops, (for example, cocoa, kola nut, oil palm, rubber) food crops such as yam, cassava, maize) form the integral part of agricultural production. Nigeria's wide range of climate variations allows it to produce a variety of food and cash crops, fruits and vegetables. Livestock development is also an important component of Nigeria agriculture with abundant social and economic potentials. A significant portion of the agricultural sector in Nigeria involves cattle herding, fishing, poultry, and lumbering, which contributed more than 2 percent to the GDP in the

1980s. These Agricultural produce were Nigeria's real fares during the 1960s and mid 1970s until oil outperformed them during the 1970s (Obue and Okekporo, 2015).

Decline in agricultural production in Nigeria began with the advent of the petroleum boom in the early 1970s. The boom in the oil sector brought about a distortion of the labour market. The distortion in turn produced adverse effects on the production levels of both food and cash crops. And food production could not keep pace with its increasing population, Nigeria began to import food. It also lost its status as a net exporter of such cash crops as cocoa, palm oil, and groundnuts and rubber. (Igbokwe, 1983).

Regardless of the oil, farming remains the base of the Nigerian economy, and the largest sector of the Nigerian economy, and employs two-thirds of the entire labour force, providing the main source of livelihood for most Nigerians. However, the sector faces many challenges, notably an outdated land tenure system that constrains access to land especially by smallholder farmers (1.8 ha/farming household), a very low level of irrigation development (less than 1 percent of cropped land under irrigation), limited adoption of research findings and technologies, high cost of farm inputs, poor access to credit, inefficient fertilizer procurement, distribution and low fertilizer application, inadequate storage facilities and poor access to markets, reliance on rainfed agriculture, low productivity due to poor planting material, and a weak agricultural extension system amongst others. All these have all combined to keep agricultural productivity low. (Giroh, Adebayo and Jongur, 2013).

Efforts by the government since the late 1970s to revitalize agriculture in order to make Nigeria food self-sufficient again and to increase the export of agricultural products have produced only modest results. It is noted however that Agriculture contributed 21.6

percent to Nigeria total Gross Domestic Product (GDP) in 2017 (Central Intelligence Agency [CIA] World Factbook 2018).

Over the years, a number of researches have been conducted to ensure the improvement of agriculture with the foremost intention to boost the yields from both plant and animal husbandry. Agricultural research in Nigeria started more than a century ago, with the establishment of research stations to promote the production and export of some high economic crops such as cocoa, oil palm and rubber. After political independence, Nigeria inherited the agricultural research system established by the colonial powers which focused mainly on export crops while little attention was paid to the production problems of subsistence farmers (Beintema and Stads, 2004). Subsequently, reorientation of the system started occurring gradually, because government sought to stimulate exports earnings and employment growth based on large-scale commercial agriculture. From the mid- 1980s, however, both donors and policymakers began to question the commercial orientation of agricultural research. This re-examination was due to the limited effectiveness of export- oriented growth, growing concern about poverty and inequality, and increasingly tight budgets. The needs of small-scale farmers became more prominent in policy discussions and the use of agricultural research to reduce pressing rural poverty began much in earnest (Alwang and Siege 2003). The focal aim of the foregoing was to make agriculture a veritable tool for human empowerment for better livelihood.

Empowerment is perceived by many scholars to be one of the key instruments used in reducing rural poverty and improving rural livelihoods. Blanchand, John, Alan, (1996); and Adams (2008) suggest that empowerment is the process of increasing the strength of individuals, teams or communities in order to be more efficient and efficient. It covers

spiritual, political, social as well as economic strength; it can also be developing confidence in one's own capacities. It encourages people to gain skills and knowledge that will allow them to overcome obstacles in life or work environment and ultimately help them develop within themselves in the society. Ikegwe, Ajiboye, Aromolara, Ayodeji, and Okorafor, (2014) made it clear that empowerment can also be an interactive process through which people gain or experience personal and social change, enabling them to take decision to achieve influence over the organisation and institution which affects their lives and the communities in which they live. Empowerment includes encouraging and developing the skill for self-sufficiency in the individual or a group to do their jobs magnificently with a focus on eliminating the future needs for charity or welfare.

The chief purpose of every empowerment effort is to positively impact on the livelihood of the people. In line with Sustainable Livelihood (SL) framework, Sconnes (1998) referred to livelihood as the activities, assets, and the access that jointly determine the living gained by an individual or household. Assets in this framework included human capital such as the education, skills and health of household members; physical capital like farm equipment; social capital such as the social networks and associations to which people belong; financial capital and its substitutes like savings, credit e.t.c.; and natural capital (the natural resources base). It is worthy of note that human capital is widely substantial as a key to successful livelihood diversification.

Declining research budgets, coupled with worsening poverty, has increasingly required formal priority setting of public agricultural research in developing countries to ensure that scarce research resources are allocated in ways that will have the greatest impact on the poor. It is in the light of this, that Alwang and Siegel (2003) suggested that there

should be a growing pressure to direct agricultural research towards the rural poor while policymakers must be called upon to explicitly consider poverty reduction objectives in resource allocation.

Since the 1970s, Rubber Research Institute of Nigeria (RRIN) has been the home of the most brilliant minds in conducting research into the improvement of rubber cultivation; rubber products as well as converting other latex-producing plants of economic importance into natural rubber; *(Heveabrasiliensis)*, and Gum arabic, (Acacia *Spp)*. Shaibu, Aliyu and Bakashi (1997) stated that following the enactment of the Nigeria Research Institute Act No.33 of 1964, and the promulgation of the Agricultural Research Institutes Decree No 35 of 1973, Rubber Research Institute of Nigeria (RRIN) was established and mandated to conduct research into rubber production, rubber products and other latex –producing plants of economic importance. Shaibu et al (1997) put forward the following amongst others, as the salient mandates of the institute:genetic improvement of rubber and other latex producing plants to ensure early maturity and improved yield; enhancement of the processing, preservation, storage and utilization of rubber producing plants; design and fabrication of simple implements and equipment for rubber production and processing; resolving socio-economic problems in relation to their cultivation, marketing and utilization in Nigeria; carry out extension research liaison with relevant federal and state ministries, primary producers, industries and other users of research results in connection with rubber production, processing and utilization in collaboration with Agricultural Extension Research Liaison Service (AERLS); and organising technical and vocational courses in areas relevant to rubber production. The target of this mandate is to empower the smallholder farmers in the rural areas to embark on large-scale rubber

production which will in turn increase the income status and improve living standard of the people.

Every empowerment effort produces results which can only be known subsequent to a meticulous investigation. That is why this study is focused on assessing the socio-economic empowerment intervention of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in Edo and Delta states, Nigeria.

1.2 Statement of the Problem

Although agriculture is perceived to be the most assured engine of development and a reliable key for industrialization in Nigeria, Okorji (2002) pointed out that the paradigm shift from agriculture to oil and to natural gas in the 1970s completely changed the scenario with the focus of economic planners centered on oil, neglecting the agricultural sector and thereby transforming Nigeria into a net importer of food and other agro-allied products. As noted by Byerlee (2000), research in Sub-Sahara Africa (SSA) is yet to generate broad sectorial productivity growth in agriculture and it is now coming under heavy scrutiny due to unimpressive aggregate growth rates and worsening poverty in the region.

It is pertinent to note that, in spite of these efforts to boost agriculture, crop and animal yields; specifically rubber production has not significantly improved in Nigeria. Omorusi, Orumnese, Ijie, Eseimuede, Izevbigie, Okundia and Musa (2015) have pointed out that the rubber industry is perceived to be one of the major contributors to the national economy and a source of pride for those directly involved in the industry, particularly, the small holders and rubber planters. Prior to the establishment of RRIN, small holder rubber

farmers have had to grapple with the problems of disease and pest control, poor seedlings, bush burning, and other challenges associated with traditional farm practices. Small holder farmers also faced the problem of regulation, control and research in rubber farming, processing and marketing because of the huge financial capital involved. This made rubber production, processing and utilization to be bedeviled with several obstacles until the emergence of RRIN.

It is also worthy to ask why activities in the rubber industry in spite of the bright prospects of production of natural rubber in Nigeria, suffered a significant decline (70-80%) in the last decade. Other problems of rubber production as pointed out by some scientists include the long gestation period of rubber trees and fall in prices in the international markets, (World Agro Forestry Policy Brief 2014). Analysis by Mark (2012) in the Punch newspaper decrying Low Budgetary Allocation to Agriculture in Nigeria and by Giroh et al; (2013) on the study; Analysis of Labour, Productivity and Constraints of Rubber in Niger Delta region of Nigeria respectively, reveal that Smallholder farmers in Nigeria often have constraints in farm crop production and some of these constraints include but not limited to; poor prices, pests and diseases, inadequate credit, shortage and high cost of labour, inadequate farm machineries, lack of market information, inadequate research/ extension support services, storage facilities problem, inaccessibility to cheap farm inputs and land tenure problem, e.t.c.

To improve rubber production in Nigeria, the Rubber Research Institute of Nigeria had embarked on new rubber-based intercropping development; improvement of rubber clones/ seedlings and vocational courses in rubber budding to address the issues of poor pricing, long gestation period, control of pest and diseases, e.t.c. targeting the smallholder

rubber farmers in the rubber growing areas of Nigeria. It is against this backdrop that this study is set out to assess the socio-economic empowerment intervention of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in Edo and Delta states.

1.3 Research Questions

This study provides answer to the following questions:

i. What is the socio-economic statuses of the small-holder rubber farmers
ii. How has the RRIN vocational training programs impacted on the rubber cultivation skills of the small holder rubber farmers?
iii. Has the improved rubber seedlings provided by RRIN enhance the yield of the small holder farmer in rubber production?
iv. What is the effect of some of the RRIN new rubber based technology on the income status of the small holder rubber farmers?
v. What are the constraints of small holder rubber farmers in rubber production before and after RRIN intervention?

1.4 Objectives of the Study

The general objective of this study was to assess the socio-economic empowerment intervention of Rubber Research Institute of Nigeria on rural rubber farmers in Edo and Delta States. The specific objectives are to:

i. describe the socio-economic status of small-holder rubber farmers in Edo and Delta States.
ii. Examine the effect of the vocational training programs by RRIN on rubber cultivation skills of the small holder rubber farmers in Edo and Delta States,
iii. ascertain if the improved rubber seedlings provided by RRIN has enhanced the yield of the small holder farmer in rubber production,
iv. examine the effect of some of the RRIN new rubber based technology on the small holder rubber farmers in Edo and Delta State,
v. Identify the constraints of small holder rubber farmers in rubber production before and after RRIN intervention.

1.5 Significance of the Study

This study provides relevant clues on the effects of training in rubber farming by RRIN on rural poverty alleviation and creation of employment opportunities for the rural dwellers in line with the Agricultural Transformations Agenda (ATA) of the Federal Government of Nigeria now known as the Agricultural Promotion Policy (APP) or (Green Alternative).

The various areas under discussion in this investigation helps to enlighten stakeholders on the mandate and activities of Rubber Research Institute of Nigeria and the attempts made by the institute in empowering rural farmers in Edo and Delta states to

ensure the alleviation of poverty among rural people. This study provides information for policy makers and funding agencies.

The outcome of this study creates an awareness of Rubber Research Institute of Nigeria intervention extension activities which will enable local farmers who have not yet key into it, to utilize the available opportunity.

It is expected that the study provides transfer of research-induced technology and information to farmers which are the only way to measure research benefits to society.

It is also envisaged that the investigation will give input to researchers on which innovations or innovation parts are effective at homestead levels, and what changes in accordance with the innovation are required at the research end.

The study also draws recommendations to correct, update and fill the knowledge gap in the existing literature as well as serve as a basis for further research.

Finally, it is hoped that the methods, findings, and key recommendations will be of considerable interest to impact assessment practitioners, donors, policymakers, and research managers in both the national and international agricultural research systems.

1.6 The Study Area

This study was conducted in Edo and Delta states. **Edo State:** Edo state is situated in the South-South zone of Nigeria. The State is located in 5^0 44'' and 7^0 34'' N equator and between longitudes '' 5^0 04 and 6^0 43'' E of the Greenwich Meridian. Edo Administrative unit (2015) explains that like any other state in Nigeria, Edo state is divided into three senatorial districts, namely: Edo South, Edo Central and Edo North. There are eighteen Local Government Areas in the state which are: Egor, Ikpoba-Okha, Oredo, Ovia North East, Ovia South West, Orhionwon, Uhunmwonde, Esan North East, Esan South

East, Esan West, Esan Central, Igueben, Etsako East, Etsako west, Etsako Central, Owan East, Owan west, Akoko-Edo. The state capital, Benin City, is situated in the southern part of the state and it is located at latitude 06^0 19IE to 6^0 21IE and longitude 5^0 341IE to 5^0 44IE with an average elevation of 77.8m above sea level. It is a city approximately 40 kilometres (25 miles) north of the Benin River. It is situated 320 kilometres (200 miles) by road east of Lagos. Benin had been the capital of Benin Kingdom that was established in the 13^{th} century. The City is estimated to have a population of 1,495,800 people. The people of the state are mostly farmers, rearing fish, and livestock and they produce varieties of crops such as cassava, rice, yam, plantain, pineapple, and Cocoa and Oil Palm. Apart from farming activities, the people are also into artisanship and trading. The state is also the centre of rubber industry in Nigeria where Rubber Research Institute of Nigeria (RRIN) is situated.

Delta State: Delta State is an oil and agricultural producing State of Nigeria, situated in the region known as the South-South geo-political zone with an estimated population of over 4.6 million people,**(population forcast, 2016)** and with a land area of 17,698 Km^2 and a tropical climate marked by two distinct seasons- the dry and rainy seasons. The average annual rainfall is about 266.7cm in the coastal areas and 190.5cm in the extreme north. Rainfall is heaviest in July. It has a high temperature, ranging between 290 C and 44^0C with average of 30^0C. It has ultisol soil with pH range of 4.5-5.5 favorable for the production of natural rubber (Aigbekaen, Imarhiagbe and Omokhafe 2000). The vegetation varies from the mangrove swamps along the coast, to rainforest in the middle and savanna in the north. Economic trees, which abound in the state, include Sapele wood, Iroko, Mahogany, Raffia palms, rubber and palm trees,Economically, Delta State is based around

the production of crude oil and natural gas as one of the main oil-producing states in the country. Key minor industries involve agriculture as the state has substantial oil palm, yam, rubber, and cassava crops along with fishing and heliciculture. In large part due to its vast oil revenues, Apart from farming activities, some are civil servants and some are into artisanship and trading. There state is divided into three senatorial districts, namely: Delta South, Delta Central and Delta North and It consist of twenty five Local Government Areas which are: Delta South- Bomadi, Burutu, Isoko North, Isoko south, Patani, Warri North, Warri South. Delta North: Aniocha North, Aniocha South, Ika North East, Ika South, Ndokwa East, Ndokwa West. Delta Central: Ethiope East, Ethiope West, Okpe, Sapele, and Udu.

1.7 Scope of the Study

This study was designed to assess the socio-economic empowerment intervention of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in Edo and Delta states. The centre of attention was the small holder rural rubber farmers. The research location were five (5) selected dominant rubber growing areas in Edo state namely: Orhionwon, Uhunwode, Ikpoba- Okha, Ovia South West and Ovia North East. And five selected dominant rubber growing areas in Delta state namely; Isoko south, Ika North East, Ughelli North, Ukwani, and Sapele. The study therefore directs its focus on the examination of the socio-economic status of the small-holder rubber farmers, the effect of the vocational training programs by RRIN on them, the effect of some of the RRIN new rubber based technology on them, and the constraints faced by the small holder rubber farmers in rubber production.

1.8 Conceptual clarification of Terms

Assessment: The process of gathering quantitative and qualitative data of what an organisation can do and interpreting its achievement to inform practice and provide feedback.

Empowerment: Empowerment means to enrich people with basic skills and education based training to enable them earn or improve on their means of livelihood.

Intervention: The process of creating and implementing a service, or event that is specifically designed to bring about a desired change. Or, an action taken to improve a situation

Intercropping: The practice of growing two or more crops in proximity.

Smallholder farmers: They are farmers who own small plots of land, which they use to farm subsistence crops, cash crops/tree crops.

Adoption: The action or fact of choosing to take up, follow or use something,

Research Institute: It is a legal entity or an establishment founded for carrying out research or technological development and the dissemination of the obtained results through education, publication or technology transfer as one of its main objectives and which fully reinvests the profits generated by these activities in the same activities. Any research institute will typically have some focus areas and disciplines where its staff would be carrying out research.

1.9 List of Abbreviations

RRIN- Rubber Research Institute of Nigeria

CFC- Common Fund for Commodity

IRSG- International Rubber Study Group

LGAs- Local Government Areas

IRDB- International Rubber Development Board

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Preamble

This chapter reviewed relevant literature of scholars in the area under examination, guided by the objectives of the study; it began with a discussion on the history of rubber as well an overview of Rubber Research Institute of Nigeria. It highlighted the socio-economic status and role of smallholder rubber farmers in some of the rubber growing areas in Nigeria and emphasized some empowerment intervention efforts of Rubber Research Institute of Nigeria such as; development of new rubber technologies, capacity building trainings to improve cultivation skills of the rubber farmers also making mention of some of the constrains rubber farmers face in rubber farming.. Other related concept that was examined includes; The Presidential initiative on natural rubber and the Natural rubber value chain. This section also contains the reassessment and re-examination of an applicable theory which forms the theoretical framework for this study.

2.2 History of Rubber

The very first attempt at cultivation of rubber was made in 1876 when an Englishman, Henry Wickham, collected seeds from Brazilian trees with the botanical name Heveabrasiliensis and sent them to Kew Botanic Gardens in London. IRSG (2020) explained that seedlings from the germinated seeds were sent to Ceylon (now Sri Lanka) but the results were disappointing; however, the following year, a few seedlings were sent on to Singapore, destined to be the basis of the natural rubber industry in Southeast Asia. The earliest references to natural rubber occur in accounts of the second voyage of the discovery of the New World by Christopher Columbus in 1495–96: there, he is reported to

have seen American Indians playing with balls that bounced and were made from the juice of trees. However, the first samples of the new substance were not to be sent to Europe for another 240 years when a French scientist, Charles de la Condamine, visited Ecuador and gave rubber its French term 'caoutchouc', derived from an Inca word with the literal meaning 'weeping tree'.

Natural rubber (Heveabrasiliensis) is a tropical perennial dicotyledonous plant which has a place with the group of Euphorbiaceae. Umar and Ugwa (2006) announced that, common rubber generation in Nigeria is accepted to have started around the year 1876 with the exploitation of local variety, Funtumiaelastica otherwise called indigenous wild rubber. Umar and Ugwa, (2006) further revealed the wild rubber tree gave poor yield of around 340 kg/ha/yr and bark recovery in the wake of tapping. These qualities posed some challenges to both scientists and farmers as they discouraged rubber farmers from its production and subsequently, the export of wild rubber dropped sharply. In a search for sources of natural rubber to supply the demand of a rapidly expanding automobile industry, there was a discovery of Knuth Mull *Heveabrasiliensis* which arrived Nigeria from Kew garden in England in 1895 with the first rubber estate planted at Sapele in 1903 and a second one at Nkisi in the then eastern region in 1912. By 1925, some 1,000 hectares of European owned estates existed in South-western Nigeria (Uraih et al, 2006). The *heveabrasiliensis* rubber tree was found to be the better yielding (about 3600kg/ha/yr) and quick bark regeneration capability after tapping (Ogowewo, 1989). The constant endeavour and expedition geared towards enhancing the yield and bark regeneration capacity of rubber attests to the fact that it was important a legal entity or an establishment like Rubber Research Institute of Nigeria (RRIN) be founded for carrying out research or technological

development and the dissemination of the obtained results through education, publication or technology transfer as one of its main objectives in Nigeria.

2.3 Rubber Research Institute of Nigeria (RRIN)

The Rubber Research Institute of Nigeria (RRIN) started in 1961 as a rubber station and later became a semi-autonomous Institute in 1976. The Institute's national mandate includes the development of rubber, rubber products and research into other latex producing plants of economic importance. Some of the research divisions are plant pathology and latex experiments, soil and plant nutrition, farming systems, socio-economics and statistics, extension and research liaison services, e.t.c (Shaib, Aliyu &Bakshi, 1997). The research programmes of the Institute included; techniques for production, multiplication and distribution of improved planting materials to farmers, improved agronomic and crop protection practices for smallholder farmers and the utilization of rubber seed and latex. Further research areas include the sourcing of other economically viable latex-producing plants (Shaibu et al 1997).

A recent documentary by the ministry of agriculture (2023) on an overview of Rubber Research Institute of Nigeria further revealed that Rubber Research Institute of Nigeria (RRIN) is the only Federal Government agency in Nigeria that has the mandate to conduct research and development on rubber and other latex producing plants of economic importance. Following the enactment of Nigerian Research Institute Act (No. 33) of 1964 and the promulgation of Agricultural Research Institutes Decree No. 35 of 1973, the Federal Government took over the organization of rubber production in the country and amalgamated the Rubber Research Station, Iyanomo with the Rubber Research Station,

Akwete (in the then East Central State) and became what is now known as Rubber Research Institute of Nigeria, The institute main station which occupies 2078 hectares of land is situated in Benin, Edo state, with a substation (324 Ha) at Akwete, Abia state and experimental stations at Igbotako (21 Ha) Ondo state and Manchok (25 ha) Kaduna state. The vision of the institute is to become a leading research centre for natural rubber, gum arabic and other latex producing plants in Africa, and to be a world-class research Institution. While its mission, is to continually provide innovations that will develop and transform the Natural Rubber, Gum Arabic and other aspects of latex industry, applying cutting edge scientific know how, delivered by motivated dedicated and highly trained manpower in a manner that sustains the ecosystem while providing maximum economic benefit to Nigeria. Rubber research institute of Nigeria was basically mandated to conduct research into rubber production, rubber products and other latex –producing plants of economic importance. Shaibu et al (1997) put forward the following amongst others, as the salient mandates of the institute:genetic improvement of rubber and other latex producing plants to ensure early maturity and improved yield; enhancement of the processing, preservation, storage and utilization of rubber producing plants; design and fabrication of simple implements and equipment for rubber production and processing; resolving socio-economic problems in relation to their cultivation, marketing and utilization in Nigeria; carry out extension research liaison with relevant federal and state ministries, primary producers, industries and other users of research results in connection with rubber production, processing and utilization in collaboration with Agricultural Extension Research Liaison Service (AERLS); and organizing technical and vocational courses in areas relevant to rubber production. According to (Esekhade et al., 2019; Umar et al, 2011).

RRIN's operations also include amongst others, collaboration with the Nigerian Export Promotion Council (NEPC), and their foreign partners such as the International Rubber Study Group (IRSG), Common Fund for Commodities (CFC) and World Agroforestry Centre (also known as ICRAF-International Council for Research in Agroforestry) to promote development of economically viable small-scale rubber businesses in Nigeria. Non the less, t is clear that agricultural research has actually been instituted to serve multifarious functions in relation to rubber production amongst these is to transfer the technology developed to industrialist and the smallholder farmers in order to increase their income and improve their livelihoods. This is a pointer that the smallholder rubber farmers have a great role to play in the rubber farming industry.

2.4 Socio-Economic statuses/Characteristics and Role of Smallholder Rubber Farmers

Smallholder farming systems are very diverse, and contribute considerably to global agricultural output of a variety of crops, producing the bulk of food in developing countries. Some of the smallholder farmers comprise the majority of the world's undernourished population and those living in absolute poverty (UN Millennium Project 2005). More often than not, smallholder farmers are characterized by marginalization, in terms of accessibility, resources, information, technology, capital and assets, but there is great variation in the degree to which each of these applies (Odoemenem and Obinne, 2010). With these qualifications, the Food and Agriculture Organization of the United Nations (FAO) adopted a 2- hectare (ha) threshold as a broad measure of a small farm (which is not inclusive of fishers and other small- scale food producers). The vast majority of smallholders live in rural areas, although urban and peri-urban smallholdings are an

increasingly important source of supply for developing urban areas (IFAD, 2011). However, Rubber smallholder farmers have significant role in the natural rubber industry as they are the primary producers and processors. Smallholders produce food and non-food products on a small scale with limited external inputs, cultivating field and tree crops as well as livestock, fish and other aquatic organisms. The smallholder rubber farmers hold about 70% of rubber farms and the remainder is held by large plantation owners (International Rubber Research Development Board, 2006). It is pertinent to add that while Edo and Delta states have the largest area of smallholding rubber farms, Cross-River state has the largest size of the estate (Aigbekaen et al; 2000). Some of the smallholder rubber farmers in the rubber industry in Edo and Delta StatesNigeria, includes; Paulosa Nig. Ltd.Brostine Nig. Ltd. and Iyayi Rubber Farms, Enghuat industries Limited, other rubber holdings are Hecksher Plantations Ltd and Michelin. Kb Omasheyirubber industries Nig Ltd. e.t.c. There are a number of places across the globe where rubber is cultivated both extensively and in smallholdings. Rubber husbandry is not embarked on everywhere in Nigeria but concentrated in certain geographical zones.

Rubber is grown both in large and smallholdings throughout the expanse of coastal plain sands of Southern Nigeria but the largest concentration of rubber is in the Midwestern Nigeria with approximately 56% holdings (RRIN, 1998). Rubber plants are mostly grown between 15^0N and 10^0S where the climax vegetation is humid, with temperatures ranging from 23 to 45 ^{0}C and well distributed rainfall of 1800 to 2000 mm on a well drained soil (Umar et al., 2011; Omokhafe and Nasiru, 2005; Aigbekaen et al., 2000). The precise areas where rubber is grown in Nigeria are Edo, Delta, Ondo, Ogun, Abia, Anambra, AkwaIbom, Cross River, Rivers, Ebonyi, and Bayelsa States (the traditional rubber zone

of Nigeria), where the amount of rainfall is between 1,800 mm and 2,000 mm per annum (Aigbekaen et al 2000): while Kaduna, Taraba and Benue States are known to be marginal rubber growing zone of Nigeria. To improve rubber production in Nigeria, a lot of schemes have been put in place. The outcome of these assortments of programmes is the empowerment efforts of Rubber Research Institute of Nigeria to smallholder rubber farmers.

2.5 Effect of Vocational Training Programs on Rubber Cultivation Skills of Small holder Rubber Farmers:

Most agricultural innovations are usually characterized by observability, triability and with the use of field visits, participants are shown how to raise rubber nurseries, plantation management, budding and budding techniques, diseases and pest control and tapping. Practical exercises/ field visit is similar to method demonstration, which is the process of showing farmers how to perform a particular agricultural practice. It is to enable farmers to learn by doing. Okwoche et al. (2007) reported that method demonstration was one of the most effective methods of teaching farmers. Giroh et al. (2007b) found out that education was significant with adoption of rubber innovation among farmers in the rubber belt of Nigeria. Farmers with more years of formal schooling tend to be more efficient in production presumably due to their enhanced ability to acquire technical knowledge.

Natural Rubber (NR) tree (*Heveabransilensis*) is a natural tree crop economically grown in plantations for its latex that oozes out when the stem is cut or tapped. Aside from latex, the rubber tree produces seeds and wood, which are likewise of monetary incentive to the cultivator. As for Agwu (2006), almost at least 52,000 distinct items are made directly or indirectly from it. its latex content is converted to numerous elastic substances,

for example, coagula, rubber smoked sheet, (RSS) and lots more that is utilized in the assembling of various industrial products ranging from automobile tires, balls, containers, shoes, hospital sanitary glove, bands and so on. The rubber seed oil has so many industrial applications such as formulation of liquid soap, hair shampoo, and skin cream, potash soap etc. The wood treated and untreated is used variously for swain timber, furniture parts, doors, panel and parts, medium density fibre board, ply wood, particle board, and many more (Omo-Ikerodah et al, 2015). The most important part of the rubber tree is the bark, which contains the latex producing tissues. The latex is a milky juice substance obtained from the rubber tree through tapping. It contains about 25 to 45% rubber by weight which is processed into products; such as crepe crumb and sheet rubber for onward processing into finished goods.

Table 1: World Rubber Production

Year	Natural Rubber	Synthetic Rubber	Total Rubber
2000	6,811	10,870	17,681
2001	6,913	10,483	17,396
2002	7,317	10,906	18,223
2003	7,986	11,414	19,400
2004	8,726	11,979	20,705
2005	8,921	12,025	20,946
2006	9,850	12,700	22,550
2007	10,057	12,829	22,886
2008	10,098	12,285	22,383
2009	9,723	11,488	21,210
2010	10,403	13,277	23,680
2011	11,239	14,091	25,330
2012	11,658	14,042	25,700
2013	12,281	14,199	26,480
2014	12,115	14,179	26,294
2015	12,314	14,460	26,774
2016*	2,921	3,635	6,556

***Jan-March. Rubber Production ('000 tonnes)**
Source: International Rubber Study Group (IRSG), 2016

It is clear from the table that in year 2000 to year 2005 there was steady increase in the total production of natural and synthetic rubber all over the world, from 2006 to 2008 the total production increased significantly, but in 2009 there was decline in the total production and in the year 2010 to 2015, the total production picked up again and there was steady and greater improvement. However, the total production for year 2016 is given only from January to March.

Natural rubber performs three main functions in the national economy of Nigeria: it provides raw materials for the agro-based industries and foreign exchange earnings as a net exporter of rubber, and lastly, it offers employment to a sizeable segment of the Nigerian farming population. Investment in rubber cultivation for the production of natural

and synthetic rubber varies from year to year. The varied amount of natural, synthetic, and total rubber produced in the world from 2000 to 2016 is presented in Table 1.

Nevertheless, in a recent analysis by the IRSG (2020) onGlobal Rubber Supply there was an indication that the world total rubber production dropped by 5.7% in 2020, with NR production (5.1%) contracted more than that of SR production (4.5%). The global NR production was disrupted severely by the confluence of loss of tapping days due to labour shortage owing to travel control measures on the COVID pandemic, and problems associated with containing leaf-fall disease in many producing countries. Producers in Indonesia and Vietnam were less affected by labour shortage as smallholders here rely extensively on family labour. Ramp up in operational rates for SR producers in Asia and Middle East in the second half of 2020 largely supported SR production, with recovery in downstream tyre demand and strong demand in the glove sector. Improving rubber varieties is paramount as it is helpful particularly to the smallholders in rubber farming.

2.6 Improved rubber seedlings and enhanced yield of the small holder farmers

According to (Imariagbe et. al, 2015) Rubber Research Institute of Nigeria (RRIN) adapted the exotic clones and tried to improve on their qualities by crossing them with the local clones. The results yielded latex outputs of about 2000 to 3000 kg per hectare per year which are called NIG 800 and 900 series clones (Omokhafe and Nasiru, 2005). The Institute (RRIN) ventured to develop the new clones based on the fact that there has been an increasing demand for rubber and its products. Worldwide, productivity trend was staggered over the past 40 years and always seems to be inadequate in meeting the growing demands (Umar, et al., 2011) The basic component of any crop production enterprise is the planting material. Improved planting materials with potentials for high

yield, wind and disease resistance. Spore (2007) reported that rubber farmers need more productive varieties or clones of natural rubber that are adapted to community conditions. Njukeng et al. (2011) also reported higher yields from rubber plantations where improved clones were used as planting materials. Farmers who adopted the use of improved rubber clones are likely to have increased yields from their plantations leading to the earning of more income.

The high yielding RRIN developed rubber clones boosted the Institute's latex yield and revenue generation. This also renewed rubber farmers' interest to the cultivation of natural rubber in Nigeria. This is why Nigerian government initiated a programme tagged "Presidential Initiative on Rubber Production, Utilization, Consumption and Marketing" in 2005 which took off in 2006 to enhance natural rubber production. Nigeria has a complete land region of 98,321 million hectares out of which just around 200,000 hectares are under rubber development that yields around 90,000 tons of rubber coagula per annum primarily originating from old and maturing manors (Kpolo, 1999); (Umar, et al., 2011).In an attempt to promote rubber production in Nigeria, the Federal Government initiated policies and programmes to motivate farmers to increase rubber production. The establishment of National Accelerated Industrial Crops Production (NAICP) programme in 1994 made improved planting materials available to farmers at highly subsidized rate. Similarly, Federal Government initiated a support on tree crops, and about 62,000 budded stumps capable of planting 124 hectares were distributed in some rubber growing states between 2004 and 2005 (Giroh et al., 2015). Again, due to the rise in world consumption and utilization of natural rubber as well as corresponding rise in price in the world market, Federal Government of Nigeria inaugurated the presidential initiative on rubber

production, utilization and export in the year 2005 which took off in 2006. The overall objectives of the programme were to increase both local production and utilization of Natural Rubber, export and to generate rural employment, increase farmers' income and standard of living. The target of the Presidential Initiative was to cultivate 360,000 hectares of land to be planted or replanted in Nigeria in a 12-year period, from 2006 to 2017. Starting with 20,000 hectares in 2006 and progressively increasing to 40,000 hectares per year up to 2017. The multiplicities of initiatives carried out on a global scale have no doubt produced results. There are indications that natural and synthetic rubber productions have been affected. This has changed the rate of rubber consumption the world over.

Table 2: World Rubber Consumption

Year	**Rubber Consumption ('000 tonnes)**		
	Natural Rubber	**Synthetic Rubber**	**Total Rubber**
2000	7,108	10,830	17,938
2001	7,039	10,253	17,292
2002	7,515	10,679	18,194
2003	7,797	11,177	18,973
2004	8,562	11,693	20,255
2005	9,049	11,731	20,780
2006	9,513	12,434	21,947
2007	10,138	12,576	22,714
2008	10,187	12,173	22,360
2009	9,289	11,228	20,517
2010	10,759	13,225	23,984
2011	11,034	13,856	24,890
2012	11,046	13,964	25,009
2013	11,370	14,164	25,534
2014	12,137	14,267	26,403
2015	12,167	14,564	26,731
2016*	3,040	3,606	6,646

***Jan- March**

Source: International Rubber Study Group (IRSG), 2016

Table 2 shows the diverse consumption rate of both natural and synthetic rubber recorded in the world between 2000 and 2016. The Table 2 evidently demonstrates that the

total consumption rate of natural and synthetic rubber across the world in the year 2000 to 2008 was steadily increasing, but in 2009, there was a decline in the total consumptions rate, and in 2010 to 2015 the total consumption rate increased greatly. Note that the 2016 total consumptions were recorded only from January to March. Nevertheless, there is also a recent analysis by IRSG (2020)indicating the world total rubber consumption contracted by 6.2% in 2020, with a deeper contraction for Tyre sector (-7.3%) over Non-Tyre Product sector (-4.2%). Strong recovery in China, supported by the commercial vehicle tyre sector, helped to offset part of the decline in the rest of the world. Global NR consumption declined by 7% in 2021 while SR consumption declined to a lesser extent by 6.3%. Efforts to contain the COVID pandemic has led to wide-ranging restrictions on passenger transportation, labour mobility and hours worked, which steered significant decline in economic activity globally and sales drop in global vehicles and tyres.

2.7 Effect of Some New Rubber Based Technology on Small holder Rubber Farmers:

According to Imarhiagbe, Anegbe, Otene and Musa (2015) Rubber Research institute of Nigeria through its research efforts has developed technologies such as improved clones of rubber (NIG 800 series, intercropping and integrates mini-livestock farming, use of fertilizer, pest and disease control, fire tracing techniques e.t.c, which have been released to farmers in order to increase their output and income. Natural rubber production takes a long gestation period (five to seven years) before the commencement of tapping posing disincentive to farmers. Giroh, Musa and Yustus (2020) revealed that Researchers have developed improved production practices to overcome this problem in both immature and matured plantations. through the adoption of minilivestock integration;

apiary (honey bee keeping). This can provide additional source of income to the farmers thereby sustaining the industry. Intervention by CFC/ RRIN FGN was to promote and develop commercially viable, socially acceptable and ecologically sustainable rubber-based agro- forestry systems for farmers in Nigeria. Integrating medicinal and aromatic plants with Rubber allows the knowledge, wisdom and practices of local rubber farmers to play fuller roles in identifying and finding solutions to problems of Conservation and sustainable development. It also aims at conserving farmers' prioritized indigenous plants, improving productivity of Rubber agro forestry by poor farmers, enhancing sustainability of farming systems, diversifying sources of income of farmers, improving farmers' livelihoods and providing readily available medicinal plant material for primary health care for rural farmers.

Natural Rubber Value Chain; Rubber has the potential to help in poverty reduction, if the current production, processing, and marketing techniques are optimally used, and maximized, then the potential gains will be realized by farmers who cultivate and market rubber products. Nigeria smallholder rubber farmers sell about 98% of their total production as raw unprocessed rubber lump and in doing so, profit margins are slim. Adding value to natural rubber could generate higher profits, decrease unemployment rate for the country's citizens and contribute to income generation for poor population. Natural rubber, unlike other agricultural products, is unique for several reasons; it is purely an industrial product hence it is highly technical, involving specifications and quality control of the product, which everyone involved in the marketing system, must abide with. Absence of organized marketing has been felt as one of the major bottlenecks in accelerating the growth of rubber production. The Farmers have to depend on various

marketing agencies to get a remunerative price for their produce, they in turn depend on rubber processors/manufactures before effecting their sales (Agbonkpolor, 2017). Hence Rubber Research gave out some Lohashppi machines to smallholder rubber farmers in some rubber growing states of Nigeria including Edo and Delta states to enable them process this natural rubber into rubber smoked sheets suitable and presentable for buyers and for export, thereby adding value to the rubber products for more income.

2.8 Constraints of smallholder rubber farmers

Prior to the establishment of RRIN, small holder rubber farmers have had to grapple with the problems of disease and pest control, poor seedlings, bush burning, and other challenges associated with traditional farm practices. Small holder farmers also faced the problem of regulation, control and research in rubber farming, processing and marketing because of the huge financial capital involved. This made rubber production, processing and utilization to be bedeviled with several obstacles until the emergence of RRIN. Other problems of rubber production as pointed out by some scientists include the long gestation period of rubber trees and fall in prices in the international markets, (World Agro Forestry Policy Brief 2014). Analysis by Mark (2012) in the Punch newspaper decrying Low Budgetary Allocation to Agriculture in Nigeria and by Giroh et al; (2013) on the study; Analysis of Labour, Productivity and Constraints of Rubber in Niger Delta region of Nigeria respectively, revealed that Smallholder farmers in Nigeria often have constraints in farm crop production and some of these constraints include but not limited to; poor prices, pests and diseases, inadequate credit, shortage and high cost of labour, inadequate farm machineries, lack of market information, inadequate research/ extension support

services, storage facilities problem, inaccessibility to cheap farm inputs and land tenure problem, e.t.c.

Mesike et al. (2009) has also affirmed that labour has been a critical factor in rubber production in Nigeria where production is done manually. Inconvenient working conditions (unattractive wages, inadequate medical and housing facilities) may be repulsive factors. The effect of this on the rubber industry are likely to manifest in the reduction of hectare of rubber cultivation, plantations may not be tapped resulting to low yield and income to the farmers and a reduction in foreign exchange earnings.. The varying conditions of rubber plantations especially number of tappable trees (natural capital) when properly tapped provide income (financial capital) and will have different impacts on participants' livelihoods. Mustapha (2011) reported a significant relationship between cultivated area of rubber smallholdings in Malaysia and increase in the production of latex. Farm size has been found to be one of the most important factors in natural production in Nigeria (Mesike et al., 2010). Other challenges facing the small-scale rubber farmers in Nigeria as reported by Abolagha and Giroh (2006) include: (1) Low levels of mechanization for yield improvement; (2) Aging rubber trees; (3) Lack of commodity Boards to support investors; (4) Poor investments in rubber farming; (5) Inadequate supply of raw materials (latex and cup lumps) to the processing plants; (6) Withdrawal of subsidies from pesticides, chemicals and farming implements; (7) Inadequate provision of credit facilities to the smallholders of rubber farms; (8) High production cost of NR; (9) Diversion of loans by farmers to other areas of needs; (10) Inadequate database for policy formulation and program planning; (11) Rural-urban migration culminating in scarcity of labour; (12) Weak agricultural extension

delivery services with poor feedback mechanism; (13) Inconsistency and instability in macro-economic policies which do not engender confidence in the economy and tend to discourage medium- and long-term investments; (14) Lack of involvement of stakeholders in program design; (15) Poor monitoring, evaluation and implementation of farming programs.

2.9 Theoretical Framework

Goal Attainment theory: This study is based on goal attainment theory. The goal attainment theory was propounded by Imogene King in 1961 but subsequently expounded it in 1981 and 1999. Afterwards, other scholars like McEwen, and Wills, supported it in 2007. The goal attainment theory emphasizes that the success of any organization is best judged by appraising its outcome so as to find out the extent to which the success it has recorded is in agreement with its set out goals. The theory is a systems model which is the outcome of a conceptual framework of three dynamic interacting systems that is; the personal system, the interpersonal system, and the social system. The personal system comprises the individual as "a unified being, or self, who perceives, thinks, desires, imagines, decides, and identifies goals to be achieved". The interpersonal system, represents the interaction between two or more individuals within the social system which work together to achieve set goals The social system consists of an organisation of individuals into groups or structures that have different functions , characteristics, origin or status, for example; family groups, races, religious affiliations, gender, wealth categories and social classes. These three systems (Personal, interpersonal and social system) constantly interact in the environment in order to accomplish the overall goals of any scheme. (King, 1981; 1999).

There are three fundamental assumptions of the theory. The first one holds that; within any system, the personal system exists. The second assumption is that, a system contains the interpersonal system and the third assumption is that the personal and interpersonal system operates in a social system. The various concepts related to this interpersonal system include interaction, transaction, communication, and stress.

Interaction is a process of perception and communication of persons represented by verbal and nonverbal behaviours that are goal-directed.

Transaction entails a process of interactions in which human beings communicate with the environment to achieve goals that are valued. Transactions are goal-directed human behaviours. Communication is a method by which information is given from one person to another either directly in face-to-face meetings or indirectly in order to reach stipulated goals.

Stress is a dynamic state in which a human interacts with the environment to maintain balance for growth, development, and performance (King, 1981; McEwen & Wills, 2007).

As it relates to the subject-matter of this study, the personal system is the smallholdings rubber farmers; Rubber Research Institute of Nigeria is the social system; while the relations between the former and the latter is the interpersonal system. The Rubber Research Institute of Nigeria has spelt out specific goals it intends to accomplish through its empowerment efforts. RRIN is to generate and deliver the institute's technologies, skills, knowledge, innovations and methods to different categories of clients for their empowerment. The smallholdings rubber farmers have certain goals they wish to achieve subsequent to their participation in the empowerment schemes. The assumption of

the goal attainment theory is that the extent to which these set out goals are accomplished will determine whether the whole scheme can be said to be successful or not.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter covers the methods that were used in conducting the study. These are: research design, population of the study, sample and sampling techniques, sampling procedure, method and instrument of data collection and method of data analysis.

3.1 Research Design

This study is an assessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria on rural rubber farmers in Edo and Delta states. A survey design was adopted because it was appropriate in eliciting personal information from the respondents. The study collected both qualitative and quantitative information from the respondents/participants in order to obtain the required data needed in examining issues of the socio-economic status of rural rubber farmers, thereby determining the effect of the vocational training programs by RRIN on rubber cultivation skills of the small holder rubber farmers in these States., ascertaining if the improved rubber seedlings provided by RRIN has enhanced the yield of the small holder farmer in rubber production, examining the effect of some of the RRIN new rubber based technology on the income status of the small holder rubber farmer in the selected locations, and identifying the constraints of the small holder rubber farmers before and after RIN intervention.

3.2 Population of the Study

The population of study consisted of all the small holder rural rubber farmers in five (5) selected local government areas in Edo and Delta states each, irrespective of their religious affiliation, socio-economic background, ethnic affiliation, sex, e.t.c., and the interviewees consisted of six (6) Rubber Research Institute of Nigeria staff who work closely with rubber farmers. However, the study was meant for only rural rubber farmers

who have benefitted from RRIN intervention. The total rubber farmers as at the time of this study in Edo were 426 and Delta 427 making a total of 853.

3.3 Sample Size and Sampling Design

The sample size of this study consisted of a segment selected from the population of the study. In other words, it was a subset of the population. Since the population in this study was known, the sample size was conveniently selected by the researcher using a multistage sampling procedure; A purposeful selection of 5 rubber growing LGAs out of 18 LGAs in Edo and 5 rubber growing LGAs out of 25 LGAs in Delta was made, followed by a clustered sampling where four (4) communities each was simple randomly selected using a ballot system, making a total of 20 communities selected from the list of communities that make up the LGAs, then from these communities, the farmers were proportionately selected to give the smallholder farmers an equal chance of being a part of the sample, thereby arriving at a sample size of 800 farmers targeted for the study. As for the in-depth interview, six (6) staff who work closely with rubber farmers were randomly selected from the Rubber Research Institute of Nigeria for this study, and one IDI session each was held for them making a total of six sessions. See the distribution of the sample size for Edo and Delta in table 3.1 and 3.1.1.respectively.

Table 3.1: Distribution of Edo State Rubber Farmers' Sample Size

LGA	Community	Population	Sample
Orhionwon	Sakponba	21	20
	Ebozobee	22	21
	Orogho	22	21
	Urhonigbe	31	30
Uhunmwode	Okeze	23	22
	Ugha	21	20
	Errua	23	20
	Ehor	19	18
Ovia South West	Iguoriakhi	31	30
	Urhezen	19	18
	Udo	30	28
	Iguelagidi	21	20
Ovia North East	Osasivbionba	22	21
	Odighi	20	18
	Iyowa	20	18
	Utoka	18	16
Ikpoba –Okha	Okha	15	14
	Imasabor	14	13
	Obanyator	16	15
	Iyanomo	18	17
	20 communities	426	400 respondents

Source: Field survey, 2022

Table 3.1:1. Distribution of Delta State Rubber Farmers' Sample Size

LGA	Community	Population	Sample
Isoko south	Olomoro	15	14
	Emede	17	16
	Uzere	18	15
	Irri	15	14
Ika North East	Owa-Oyibo	15	14
	Mbiri	11	10
	Umunede	14	13
	Emuhu	15	14
Ughelli North	Agbarho	12	11
	Arhagba	15	14
	Orogun	15	14
	Ughelli	19	18
Ukwani	Utagba-Uno	38	34
	Umutu	31	30
	Ossisa	29	28
	Ashaka	27	26
Sapele	Ugborhen	30	29
	Okokporo	32	31
	Amukpe	29	28
	Elume	30	27
	20 communities	427	400 respondents

Source: Field survey, 2022

Note: The sample size later dropped from 800 to 764 due to the fact that some copies of questionnaire were invalid to be used for the analysis; some were not properly filled or completed, a few were not retrieved from respondents, therefore, the study used a sample size of 379 in Edo State and 385 in Delta State making a total of 764.

3.4 Sampling Techniques

Multistage Sampling Procedure was used in selecting respondents for the study. It consisted of different stages as follows:

Stage 1: Purposive selection of five (5) rubber growing local government areasout of the (18) local government areas in Edo state and (5) rubber growing local government areas out of (25) LGAs in Delta state respectively.

Stage 2: From each of the local governments, a clustered sampling was employed where four (4) communities each were simple randomly selected using a ballot system, making a total of 20 communities selected from the list of communities that make up the LGAs.to give the smallholder farmers an equal chance of being a part of the sample.

Stage 3: Registered smallholder rubber farmers from each of the communities were also proportionately selected in order to accommodate those who have benefited from the RRIN empowerment intervention program, which made a total of 800 farmers targeted for the study. This was made possible from the Tree Crop Unit (TCU) of the Ministry of Agriculture of Edo State, Rubber Research Institute of Nigeria (RRIN) and Rubber Farmers Association of Nigeria (RUFAN). The population of small holder farmers in the selected LGAs in the states at the time of this study was 853. **See table 3.1 and 3.1.1**

3.5 Instrument of Data Collection

The instrument that was employed by this study in the collection of data was the questionnaire. The contents of the questionnaire consisted of both the close-ended and open-ended questions, administered to the selected respondents. In all, the structured questionnaire consisted of questions designed for the purpose of gathering data to meet the objectives of study. The structured questionnaire was divided into four (4) sections. Section A was on the socio-demographic characteristics of the respondents. This section elicited information from respondents on the following variables: age, sex, marital status, household size, educational level, farming experience, farm size, and extension visit e.t.c. Section B sought information relating to Rubber Research Institute of Nigeria's Empowerment efforts received by farmers. Section C sought information on effect of Rubber Research Institute of Nigeria's empowerment efforts on rubber farmers and section D focused on seeking information relating to the constraints faced by smallholder rubber farmers.

However, the in-depth interviewobtained full detailed information from the interviewees who work closely with the rubber farmers that were purposely selected for the study. The instruments that wereused for the interview in addition to the structured questionnaire were field note/diary, picture cameras and tape recorder.

3.6 Methods of Data Collection

The study employed both the quantitative and qualitative methods of data collection. In the qualitative method of data collection, which is the in-depth interview, the interview was conducted at the premises of the Rubber Research Institute of Nigeria (RRIN) where staff who work closely with rubber farmers in each section were

interviewed. While in the quantitative method of data collection, the structured questionnaire was administered to the respondents with the assistance of three (3) field assistants who ensured to a great extent that the questionnaires were filled correctly and collected at the right time, In all, questionnaire were administered to a total of eight hundred (800) respondents who were rubber farmers, butonly 764 were retrieved and used for the study due to the fact that some questionnaires filled by the respondents were invalid. And then six (6) Rubber Research Institute of Nigeria (RRIN) staff were interviewed as opinion leaders.

The secondary source of data collection was from text books, periodic journal, articles from the internet, magazines and newspapers both published and unpublished materials. This approach was preferred by the researcher because itenabled the collection of data from the representatives of the entire population under study. The structured interview was employed for collection of quantifiable data and to elicit information relating to specific issues that could be investigated in depth.

3.7 Methods of Data Analysis

The Statistical Package for Social Science (SPSS) version 24, descriptive statistical methods such as presentations in tables, percentages, ranking, bar andpie charts were used to present and analyze the quantitative datacollected (the questionnaire), For the qualitative data (the in-depth interview), the recorded audio files were replayed and then transcribed in order to analyse the qualitative data obtained during the different in-depth interview sessions. Manual content analysis was then performed on the transcribed replies, identifying reoccurring themes that were interpreted to support conclusions.

3.8 Validity and Reliability of Research Instrument

In order to ensure reliability of this study's instrument, a pilot test was carried out at Iguoriakhi rubber farm settlement in Ovia South- West Local Government Area of Edo State, before the main fieldwork. The semi structured questionnaire was distributed to 30 respondents and was tested using the Cronbach Alpha. This was to ensure that the items in the questionnaire were reliable and internally consistent.

3.9 Inclusion Criteria

1. Rubber farmers 18 years and above
2. Rubber farmers who have participated in capacity building trainings/workshop or received new rubber based technology information from Rubber Research Institute of Nigeria (RRIN)
3. Ability and willingness to give consent

3.10 Ethical Considerations

Adequate Concern was given to research ethics during the course of administering the questionnaires and conducting the various in-depth interview sessions; No monetary inducement was adopted in the distribution of the questionnaires; the willingness of the respondents to give their consents was respected. Consequently, respondents reserved the rights to participate or not to participate.

Informed Consent- Respondents were fully informed that the study was strictly for academic purpose and not for other purposes. It did not pry into their personal issues, beliefs, political conviction or breach their fundamental human rights.

Beneficiaries-Those who have participated in capacity building trainings/workshop or received new rubber based technology information from Rubber Research Institute of Nigeria (RRIN)

Confidentiality- The responses from the respondents were taken with utmost confidentiality. This was adhered to in order to avoid any kind of embarrassment that might accrue there from.

Anonymity- The rights dignity, integrity, privacy, and safety of the respondent were protected by being discreet.

3.11 Limitations

High Cost of materials and services was a major factor that served as limitation during the course of this research, the prices of fuel and transportation for moving from one place to the other during my fieldwork was very high, prices of materials and services during the period of the research was also very high.

Time and weather conditions, also served as a limitation, where at the peak of the rainy season, the farmers schedule changed and the researcher had to travel long distances several times to meet with the farmers at their convenient time which prolonged the time of the research work on the field.

Language was also a barrier, but the researcher had to pay an interpreter who is conversant with this type of research work to assist in relaying the message to the respondents who needed explanations on the research questions for their quick response.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

4.0 Preamble

This chapter presents and interprets both the quantitative and qualitative data responses on assessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria on rural rubber farmers in Edo and Delta States.

To address the specific objectives of the study, copies of questionnaire were administered to 800 farmers but 764 were used for the analysis due to the fact that some questionnaires were invalid to be used for the analysis; some were not properly filled or completed, a few were not retrieved from respondents, therefore, the study used a sample size of 379 in Edo State and 385 in Delta State making a total of 764.

The data is presented with tables and charts to explain, adequately, the established facts on the phenomenon and objectives the research was aimed to achieve. The headings for this data presentation and analysis are divided into two; as follows: socio-demographic characteristics of respondents, and the analysis of the other research objectives.

4.1a An Examination of the Socio- economic Status of the Smallholder Rubber Farmers in Edo and Delta States:

The first objective of this study was to examine the socio-economic status of the smallholder rubber farmers in Edo and Delta States. The findings arising from this, and the interpretations and discussions relating to this are presented in **tables 4.1- 4.10.**

4.1b Bio-Socio-Characteristics of the Respondents in Edo and Delta States

4.1.1 Age

The age distribution of the respondents is presented in Table 4.1. and figure 4.1. The result reveals that majority (23.22%) of them have ages lying between 51 and 55 years old in Edo State while that of Delta State lies between 46 and 50 years old (23.12%). This is followed by those with age range between 46 and 50 years (18.47%) in Edo State and between 51 and 55 years (21.3%) in Delta State. This indicates that rubber farming is dominated by people that are middle age with only few youths.

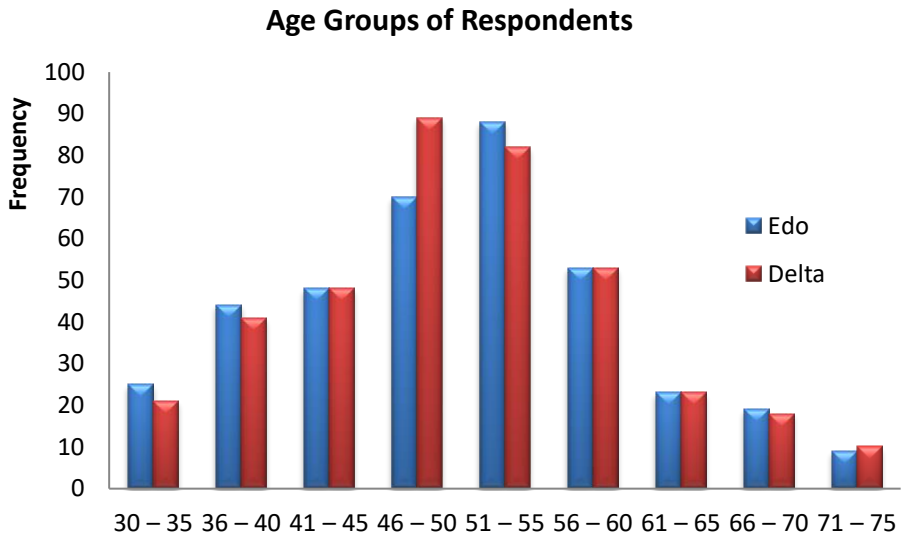
Table 4.1.: Age distribution of Respondents

	Edo		Delta	
Age (Years)	**Frequency**	**Percentage**	**Frequency**	**Percentage**
30 – 35	25	6.60	21	5.45
36 – 40	44	11.61	41	10.65
41 – 45	48	12.66	48	12.47
46 – 50	70	18.47	89	23.12
51 – 55	88	23.22	82	21.30
56 – 60	53	13.98	53	13.77
61 – 65	23	6.07	23	5.97
66 – 70	19	5.01	18	4.68
71 – 75	9	2.37	10	2.60
Total	379	100.00	385	100.00

Source: Field survey, 2022

It is worthy to mention here that out of the total 764 respondents used for this study, the youngest among them was 30 years old. This implies that young people do not show much interest in the rubber farming; rather are perceived pursuing white collar jobs. This may be due to the fact that most youths do not have patience to wait for about seven years after investing their capital before getting the returns from it. This confirms with the finding of Umar (2014) who reported that most young people are impatient to do farm works.

Figure 4.1: Age distribution of Respondents



4.1.2: Marital Status

Table 4.2 and figure 4.2 showed the marital status of the respondents. The table and charts depicts that almost all of the respondents, 77.84% in Edo State and 74.03% in Delta State were married; only 2.37% of them are single in Edo State and 2.34% of the respondents single in Delta State. 11.61% and 8.18% of the respondents were widowed and divorced respectively in Edo while those of Delta State are 15.32% and 8.31% respectively. This is in line with a prior expectations that advanced people in age ought to have been married.

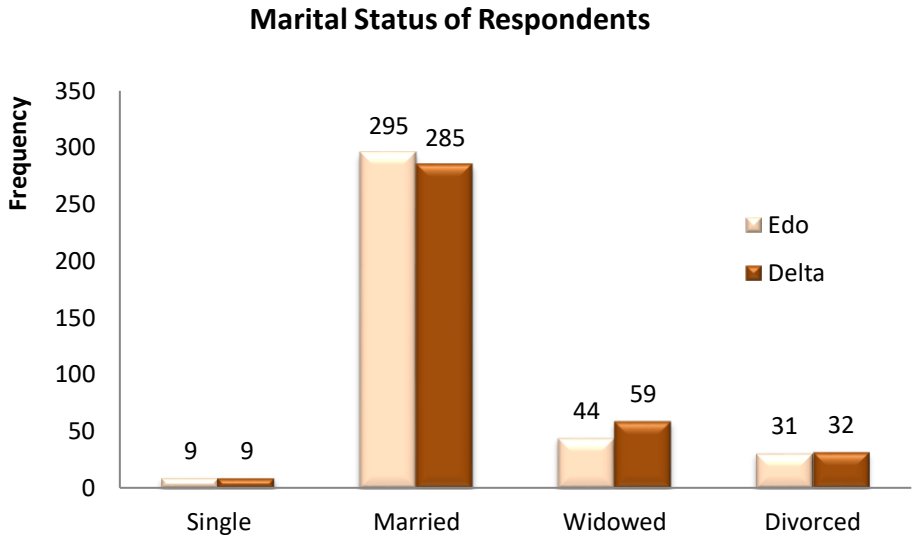
Table 4.2: Distribution of Marital status of the Respondents

	Edo		Delta	
Marital Status	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Single	9	2.37	9	2.34
Married	295	77.84	285	74.03
Widowed	44	11.61	59	15.32
Divorced	31	8.18	32	8.31
Total	379	100.00	385	100.00

Source: Field survey, 2022

This also implies that the respondents are responsible people are ready to do any legitimate jobs such as the rubber farming in order to cater for their families' needs.

Figure 4.2: Distribution of Marital status of the Respondents



4.1.3 Educational Status

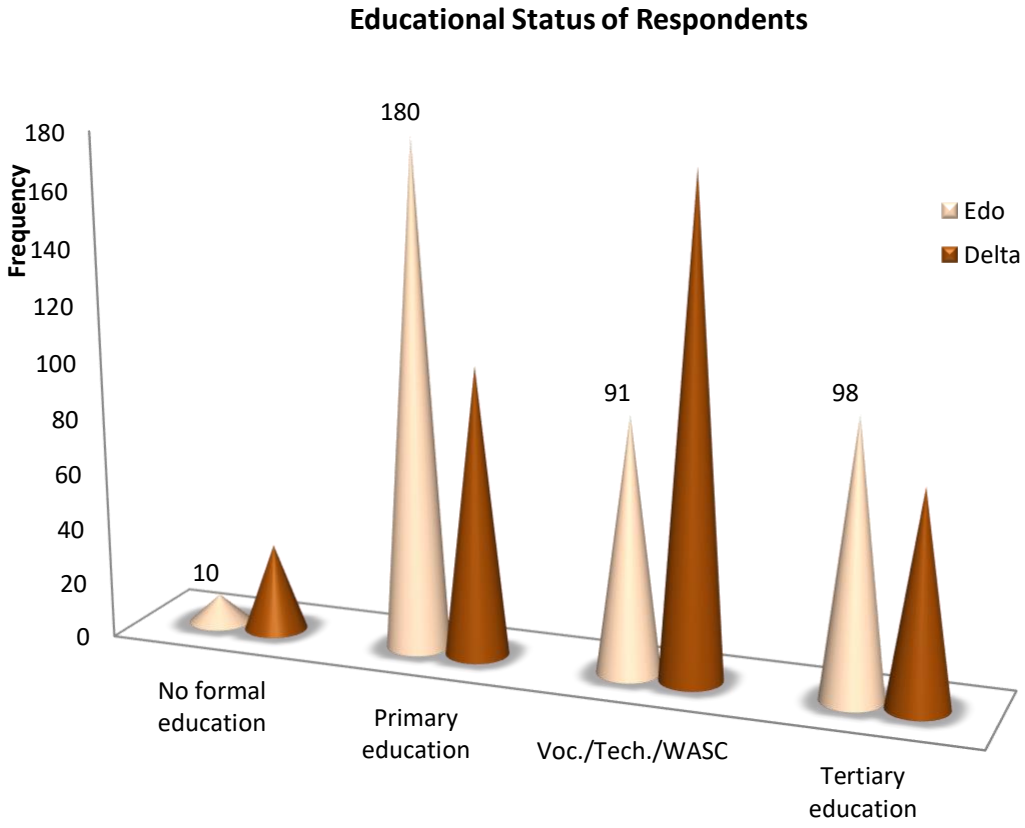
Analysis of the educational status of the respondents is shown in Table 4.3. and figure 4.3. The result depicts that most of the respondents (47.49%) had primary education in Edo State and that of Delta State had vocational and secondary education (45.45%). The educational qualification of the respondents in Edo State is followed by those with tertiary education (25.86%) while that of Delta State was primary education (26.75%). This implies that the respondents were literate and thus could easily comprehend and adopt new technological innovations as education is a paramount factor for adoption of any new thing (Umar, 2014).

Table 4.3: Distribution of Educational status of Respondents

	Edo		Delta	
Educational status	**Frequency**	**Percentage**	**Frequency**	**Percentage**
No formal education	10	2.64	31	8.05
Primary education	180	47.49	103	26.75
Voc./Tech./WASC	91	24.01	175	45.45
Tertiary education	98	25.86	76	19.74
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: field survey, 2022

Figure 4.3: Distribution of Educational status of Respondents



4.1.4 Household Size

Analysis of the household size of the respondents in Edo State as shown in Table 4.4 and figure 4.4 reveals that most of them had large family size, with a mean of 8 persons per house (34.67%). The household size of the respondents in Delta State as depicted in

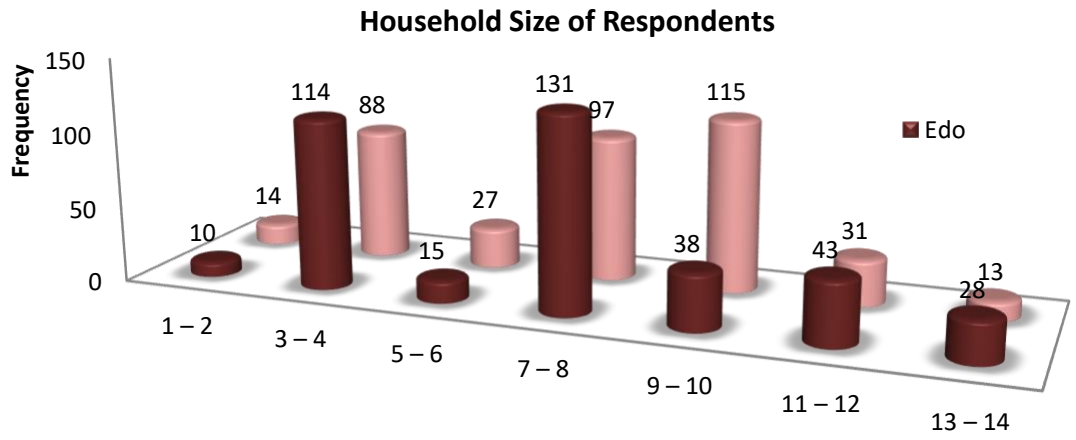
the table shows that most of them have large family size, with a mean of 9 persons per house (29.87%).

Table 4.4: Distribution of Household size of the Respondents

		Edo		Delta
Household size	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1 – 2	10	2.67	14	3.64
3 – 4	114	30.00	88	22.86
5 – 6	15	4.00	27	7.01
7 – 8	131	34.67	97	25.19
9 – 10	38	10.00	115	29.87
11 – 12	43	11.33	31	8.05
13 – 14	28	7.33	13	3.38
TOTAL	**379**	**100.00**	**385**	**100.00**
Mean	**8**		**9**	

Source: Field survey, 2022

Figure 4.4: Distribution of Household size of the Respondents



There were only 2.67% of the respondents that had household sizes between 1 and 2 in Edo State while in Delta State, 3.647% of the respondents that had household sizes between 1 and 2. This implies that, being African setting, the large household sizes may be used significantly as farm labour.

4.1.5 Rubber Farming Experience

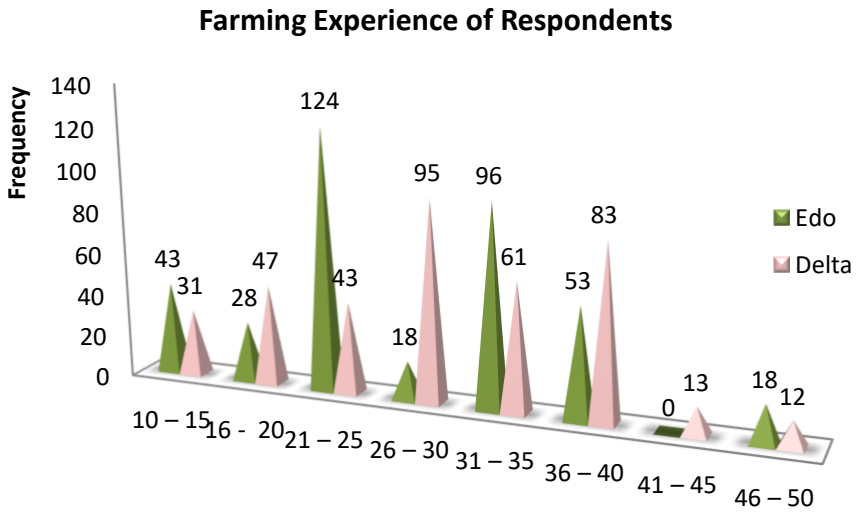
Table 4.5 and figure 4.5 presents the analysis of the rubber farming experience among the respondents. The result indicated that most of them in Edo State (33%) had been into the rubber farming between 21 and 25 years while majority of the respondents in Delta State (26.68%) had been into the rubber farming between 26 and 30 years. In Edo State, it is followed by those with farming experience between 31 – 35 years (25.3%) and between 36 – 40 years (21.56%) in Delta State. This implies that the rubber farmers were thus expected to be efficient in the business based on their long stay in the system as Zendillo, (2008) stated in his study on measuring experience that the greater impacts of business objectives are gained through experiences.

Table 4.5: Distribution of Rubber Farming Experience of the Respondents

	Edo		Delta	
Farming Experience (Years)	**Frequency**	**Percentage**	**Frequency**	**Percentage**
10 – 15	43	11.33	31	8.05
16 - 20	28	7.33	47	12.21
21 – 25	124	32.67	43	11.17
26 – 30	18	4.67	95	24.68
31 – 35	96	25.33	61	15.84
36 – 40	53	14.00	83	21.56
41 – 45	0	0.00	13	3.38
46 – 50	18	4.67	12	3.12
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

Figure 4.5: Distribution of Rubber Farming Experience of the Respondents



4.1.6 Rubber Farm Size

The rubber farm size analysis is presented in Table 4.6. The result shows that 74.67% of the respondents had rubber farm size between 1 and 6 ha in Edo State while 56.36% of the respondents had rubber farm size between 1 and 6 ha in Delta State. Only 1.4% and 2.34%of the respondents had rubber farm sizes between 19 and 21ha in Edo and Delta States respectively. This shows that majority of the respondents operated on small scale farm size. This may affect their efficiency in maximizing their rubber production capacities.

Table 4.6: Distribution of Farm size (ha) of the Respondents

	Edo		Delta	
Farm size (ha)	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1 – 3	18	4.74	13	3.38
4 – 6	265	69.82	204	52.99
7 – 9	35	9.30	76	19.74
10 – 12	18	4.74	21	5.45
13 – 15	25	6.67	43	11.17
16 – 18	13	3.33	19	4.94
19 – 21	5	1.40	9	2.34
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

4.1.7 Age of Rubber Plantation (Matured)

The analysis on the age of mature rubber plantation among the respondents is presented in Table 4.7. A total of 97.33% of the plantations were in the range of 6 and 21 years old in Edo State while a total of 87.53% of the plantations were in the range of 6 and 21 years old in Delta State. This implies that most of the respondents had rubber plantations in the optimal economic stage of latex yielding. There were only about 7.3% of the respondents in Edo and Delta States that reported to have their rubber plantation that age between 30 and 33 years; implying a declining stage of latex yield; that is, a diminishing return on latex yield has set in.

Table 4.7: Age Distribution of (Matured) Rubber Plantation of the Respondents

	Edo		Delta	
Age of Plantation (Years)	**Frequency**	**Percentage**	**Frequency**	**Percentage**
6 – 9	28	7.33	19	4.94
10 – 13	28	7.33	33	8.57
14 – 17	83	22.00	97	25.19
18 – 21	212	56.00	188	48.83
22 – 25	0	0.00	9	2.34
26 – 29	0	0.00	11	2.86
30 – 33	28	7.33	28	7.27
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

4.1.8 Age of Rubber Plantation (Young)

The study also analysed the age range of the young rubber plantations of the respondents (Table 4.8). The result shows that most of the respondents were truly in rubber business as all (100%) is reported to have young rubber farms with majority, 22.7% in Edo State and 26.75% in Delta State have their young rubber plantation reached tappable stage, 6 – 7 years. This implies that the respondents are serious with rubber business and this will in turn boost the production of rubber in Nigeria that will meet the yeaning aspiration of

the Federal Government of Nigeria to diversify the economy through agriculture and other none oil producing buisiness.

Table 4.8: Age Distribution of (young) Rubber Plantationof the Respondents

Age of Plantation (Years)	Edo		Delta	
	Frequency	**Percentage**	**Frequency**	**Percentage**
0 – 1	35	9.23	34	8.83
2 – 3	35	9.23	30	7.79
4 – 5	53	13.98	77	20.00
6 – 7	86	22.69	103	26.75
8 – 9	76	20.05	54	14.03
10 – 11	35	9.23	37	9.61
12 – 14	21	5.54	19	4.94
15 – 17	38	10.03	31	8.05
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

4.1.9 Respondents Contact with Extension Agents

Table 4.9 shows the respondents' contact with extension agents from either Rubber Research Institute of Nigeria (RRIN) or Michelin, Nigeria. The result reveals that 86% of the respondent had contact with the extension agents in Edo State while 88.8% of the respondent had contact with the extension agents in Delta. The result also shows that 14% of the respondents in Edo State are reported to have never met with any extension agent from any organization while 11.2% of the respondents in Delta State are reported to have never met with any extension agent from any organization. This implies that the extension agents in the study areas have tried in reaching out to farmers, and this has enhanced the awareness of new agricultural technologies and adoption among farmers in the study area. Note : the respondent's income earnings or revenue from rubber and intercropping was captured in 4.3.4 and 4.4.3 respectively.

Table 4.9: Distribution of Respondents Contact with Extension Agents

	Edo		Delta	
Contact with Extension Agent	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Yes	326	86.00	342	88.83
No	53	14.00	43	11.17
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

4.1.10 Respondents Membership with Cooperative Society

Table 4.10 depicts the analysis of the respondents' membership to cooperative societies. The result indicated that almost all (97.3%) of the respondents in Edo State belongs to one form or the other of cooperative society while about 95.06% of the respondents in Delta State belongs to one form or the other of cooperative society. This implies that these farmers are organized and thus can be easily reached by government and also have great opportunity to reach government for assistance.

Table 4.10: Distribution of Membership of Cooperative Society among the Respondents

	Edo		Delta	
Membership	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Yes	369	97.34	366	95.06
No	10	2.66	19	4.94
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

4.2 Effect of Vocational Training Programs by RRIN on Rubber Cultivation Skills of the Smallholder Rubber Farmers

The second objective of this study was to examine the effect of the vocational training programs by RRIN on rubber cultivation skills of the smallholder rubber farmers. To establish that, efforts were made by the researcher to determine the types of training provided for the farmers by RRIN. The findings arising from this, and the interpretations and discussions relating to this are presented thus:

4.2.1 Respondents Training Received

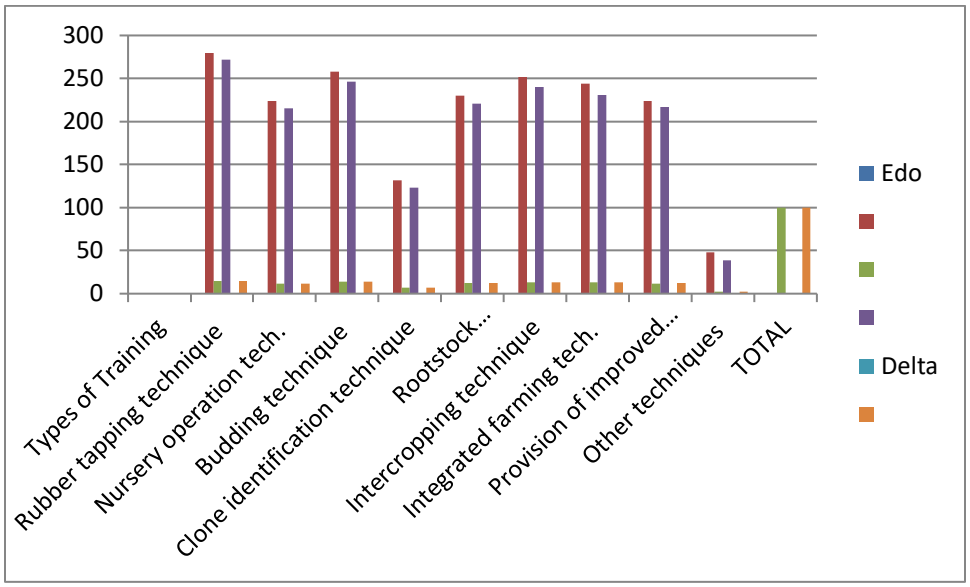
The analysis of the type of training rendered by RRIN to rubber farmers in the study area is presented in Table 4.11. The result shows that out of the nine technologies the respondents were trained in, there was multiple responses as almost all the respondents indicated interest in all the technologies with rubber tapping, budding and intercropping techniques recorded the highest turn up of the respondents in Edo and Delta States. The technology that had least turn up by the respondents in both states was the other technologies, such as the use of Alohan Rubber Sheet Processing Machine. This may be due to the expensive nature of the machine and its installation processes that is difficult for an individual farmer to afford.

Table 4.11: Distribution of Types of Training Received from RRIN by Respondents

Types of Training	**Edo**		**Delta**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Rubber tapping technique	280	14.80	272	15.08
Nursery operation tech.	224	11.84	215	11.92
Budding technique	258	13.64	246	13.64
Clone identification technique	132	6.98	123	6.82
Rootstock establishment/management	230	12.16	221	12.25
Intercropping technique	252	13.32	240	13.30
Integrated farming tech.	244	12.90	231	12.80
Provision of improved rubber clones/seedlings	224	11.84	217	12.03
Other techniques	48	2.54	39	2.16
TOTAL	**1892***	**100.00**	**1804***	**100.00**

* indicates multiple responses
Source: Field survey, 2022

Figure 4.6: Distribution of Types of Training Received from RRIN by Respondents



4.2.2 Respondents Training Impact

The impact of the training rendered by RRIN on the respondents is given in Table 4.12. The result indicated a multiple responses with fair distributions of impact of the technologies among the respondents. This means that the trainings have empowered the respondents immensely including economic enhancement.

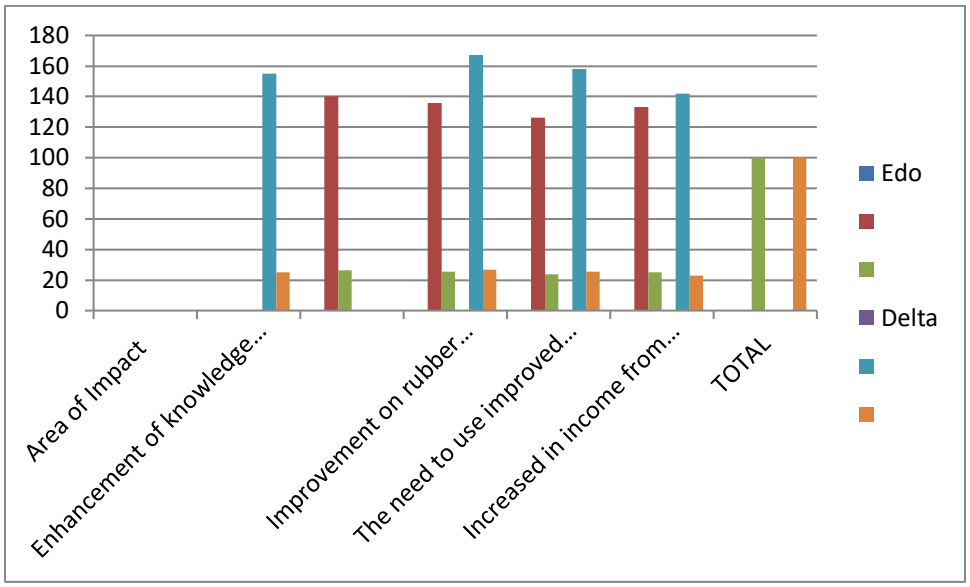
Table 4.12: Distribution of RRIN Training impacts on the Respondents

Area of Impact	Edo		Delta	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Enhancement of knowledge on rubber management techniques	140	26.16	155	24.92
Improvement on rubber skills management	136	25.42	167	26.85
The need to use improved rubber clones	126	23.55	158	25.40
Increased in income from rubber	133	24.86	142	22.83
TOTAL	**535***	**100.00**	**622***	**100.00**

* indicates multiple responses

Source: Field survey, 2022

Figure 4.7: Distribution of RRIN Training Impacts on the Respondents



This agreed with Zendillo, (2008) who said that knowledge is key in economic development every individual and nation at large.

In order to compliment the findings from the questionnaires, the qualitative data obtained from the in-depth interviews (IDIs) conducted shows how positively the training has impacted on the rubber cultivation skills of the smallholder rubber farmers. The interviewees were asked to fully comment on their thoughts about the subject matter, their responses are presented thus:

> Training is borne out of the need for the government to create awareness and improve the technical know – how of rubber farmers, increased productivity and ensure quality of products for local and international markets. Training and capacity building is a key element in the strategies aimed at ensuring that farmers adopt Good Agricultural Practices (GAP) by the use of improved planting materials for higher yields and intercropping. The training we have given and are still giving to smallholder rubber farmers therefore, are intended to impact knowledge and develop the skills of rubber contact farmers. **(IDI, 59 Years old/Male/ RRIN StaffI-17/12/2022)**

Another interviewee who has walked closely with the rubber farmers had this to say:

> Most rubber farmers in Edo and Delta have undergone series of training in different areas of interest, In technologies such asrubber tapping, budding and intercropping techniques e.t.c. I must say these training have really really been impactful**(IDI, 45 Years old/Male/ RRIN StaffI-17/12/2022)**

> Explaining further, a female staff who has also walked closely with the rubber farmers corroborated with the previous interviewees to show positive impact of the trainings on the cultivation skills of the rubber farmers. She had this to say:

> The impact of training rendered by RRIN to the smallholder rubber farmers cannot be underestimated. Before now, many of the farmers did not have the technical knowhow on rubber rootstock establishment, tapping and nursery operations, but as they began to attend our capacity building training workshops organized by the institute, they are made to do the practical in the field and also do a step down training forother rubber farmersin their areas but with RRIN supervision, the farmers have leant a lot.**(IDI, 55 Years old/female/ RRIN StaffI-17/12/2022)**

However, one of the interviewee had a different view,

> There is this new technology introduced to the farmers, the use of Alohan Rubber Sheet Processing Machine. It is expensive in nature and the machine installation processesis difficult for an individual farmer to afford talk less of to operate it.This technology has not really been fully embraced by most of the rubber farmers. So RRIN have asked the farmers to come as a group to be trained and they will install it for them, and also help link them with buyers of the rubber sheet they process with the machine, so that is part of value addition,**(IDI, 53 Years old/Male/ RRIN StaffI-17/12/2022)**

The in-depth interviewees submitted clearly that capacity of most of the rubber farmers have been built in rubber production and the training received by them are greatly

impactful. It has helped to sharpen their cultivation skills in rubber farming. But its slightly different with the Alohan rubber sheet processing machine.

4.3 Ascertaining if the Improved Rubber Seedlings (Clone) has Enhanced the Farm Yields of the Smallholder Rubber Farmers

The third objective of this study was to ascertain if the improved rubber seedlings has enhanced the farm yields of the rubber farmers. The result is presented thus:

4.3.1 Respondents Adoption of Rubber Clones

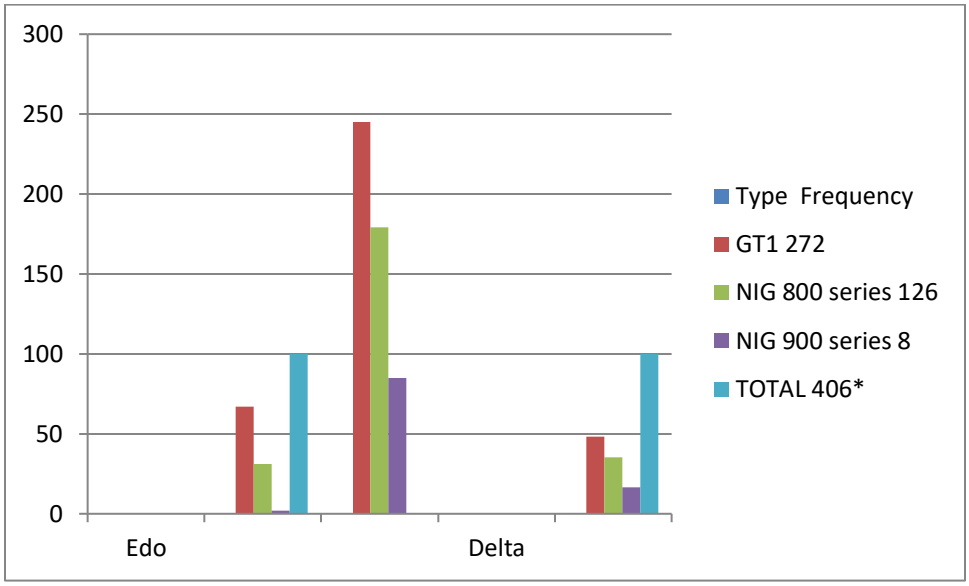
The study analyzed the types of rubber clones adopted by the respondents (Table 4.13). The result reveals that GT1 was mostly adopted in Edo (67.00%)and Delta States(48.13%). This followed by NIG 800 series (31.03%) and in Delta (35.17%). While NIG 900 series (1.97%)in Edo and Delta (16.70%). This implies that NIG 900 series is yet to gain acceptance compared to GT1 and NIG 800 series clones. This, therefore, calls for in-depth investigation and analysis as to why this clone (NIG 900 series) is yet to be adequately adopted by many farmers despite its good qualities.

Table 4.13: Distribution of Types of Rubber Clone planted by Respondents

		Edo		Delta
Type	**Frequency**	**Percentage**	**Frequency**	**Percentage**
GT1	272	67.00	245	48.13
NIG 800 series	126	31.03	179	35.17
NIG 900 series	8	1.97	85	16.70
TOTAL	**406***	**100.00**	**509***	**100.00**

* indicates multiple responses
Source: Field survey, 2022

Figure 4.8: Distribution of Types of Rubber Clone planted by Respondents



4.3.2 Reasons for Adoption Clones by Respondents

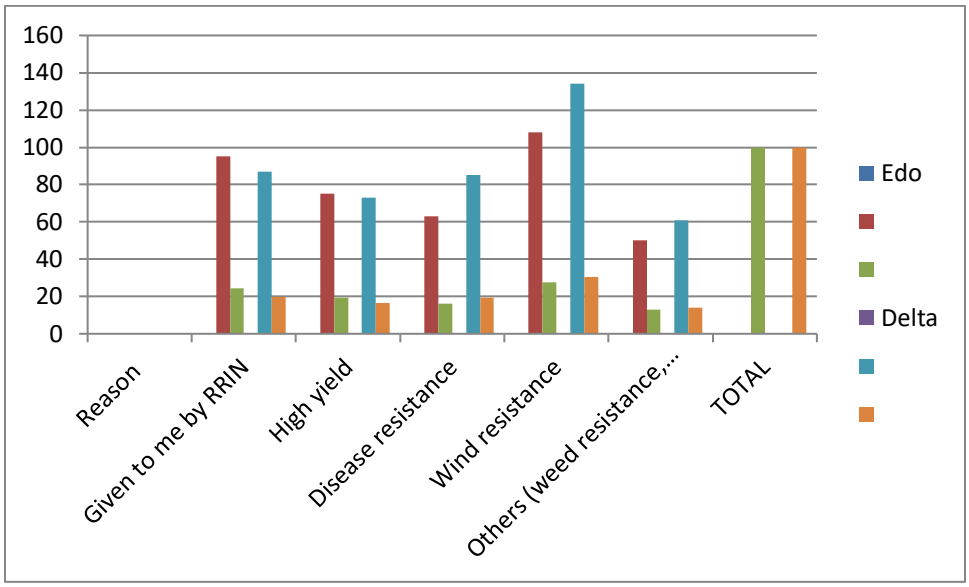
Table 4.14 presents the analysis of the reasons why the respondents adopted a particular clone/clone for planting in their farms. The result shows a multiple responses and that wind resistant type of clone ranked the highest reason (27.56%) in Edo and (30.45%) in Delta State.. This was followed by those that said because it was given to them by RRIN (24.36%) and (19. 77%) in Delta State.

Table 4.14: Analysis of the reasons why the respondents adopted a particular clone or clones

	Edo		Delta	
Reason	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Given to me by RRIN	95	24.36	87	19.77
High yield	75	19.23	73	16.59
Disease resistance	63	16.03	85	19.32
Wind resistance	108	27.56	134	30.45
Others (weed resistance, easy to handle)	50	12.82	61	13.86
TOTAL	**391***	**100.00**	**440***	**100.00**

* indicates multiple responses
Source: Field survey, 2022

Figure 4.9: Reasons why the respondents adopted a particular clone or clones



Other reasons claimed by the respondents as reasons for adopting a particular clone were weed resistance and the ease of handling of a particular clone which has the lowest percentages in Edo and Delta States. This implies that wind resistance is one of the best qualities in rubber plant that farmers are interested in. this could be due to the fact that wind storm usually cause a devastating havoc to rubber plantations as the tree is not as strong as some trees like Neem and Mahogany trees. (Umar, 2014).

The result also depicts that farmers believe in RRIN technologies and thus accept any given to them by the Institute. This is in line with the a prior expectation in that RRIN is a National Institute with mandate to develop and promote rubber and gum arabic production, utilization, consumption and marketing in Nigeria.

4.3.3 Rubber Yield Obtained by Respondents

The analysis of rubber yield obtained by the respondents is presented in Table 4.15. The result indicated that about 45% of the respondents had annual rubber yield between

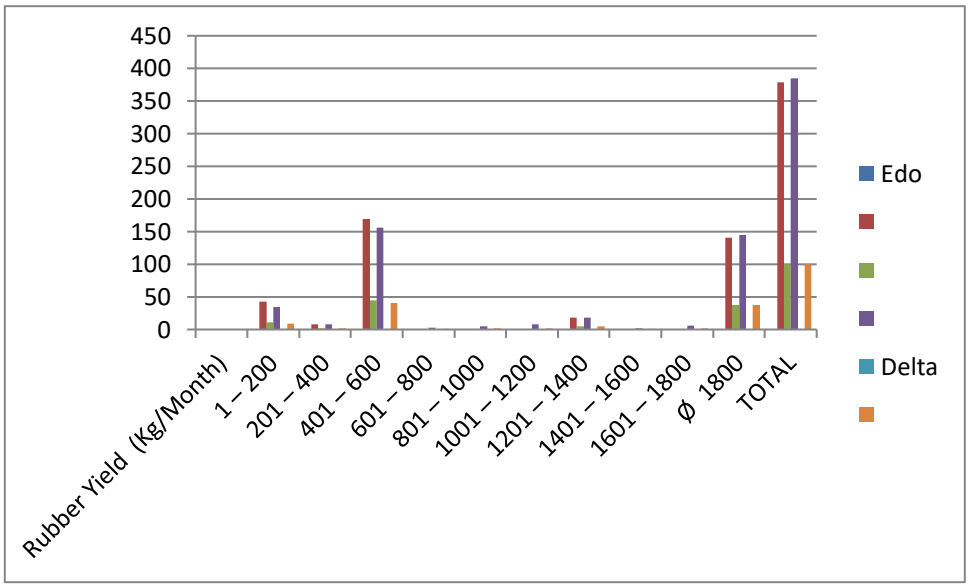
401 – 600 kg/month in Edo State while about 40.52% of the respondents had annual rubber yield between 401 – 600 kg/monthly in Delta State.

Table 4.15: Distribution of Rubber Yield among Respondents (Kg/Month)

Rubber Yield (Kg/Month)	Edo		Delta	
	Frequency	Percentage	Frequency	Percentage
1 – 200	43	11.33	34	8.83
201 – 400	8	2.00	8	2.08
401 – 600	169	44.67	156	40.52
601 – 800	0	0.00	3	0.78
801 – 1000	0	0.00	5	1.30
1001 – 1200	0	0.00	8	2.08
1201 – 1400	18	4.67	18	4.68
1401 – 1600	0	0.00	2	0.52
1601 – 1800	0	0.00	6	1.56
➢ 1800	141	37.33	145	37.66
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

Figure 4.10: Distribution of Rubber Yield among Respondents (Kg/Month)



This is followed by those that had about 1,800 kg/month in Edo and Delta States. This implies that the respondent farmers are doing the expected agronomic practices of rubber cultivation as majority of the respondents realized 600 kg/monthly (RRIN, 2002).

4.3.4 Revenue Obtained by Respondents from Rubber Yield

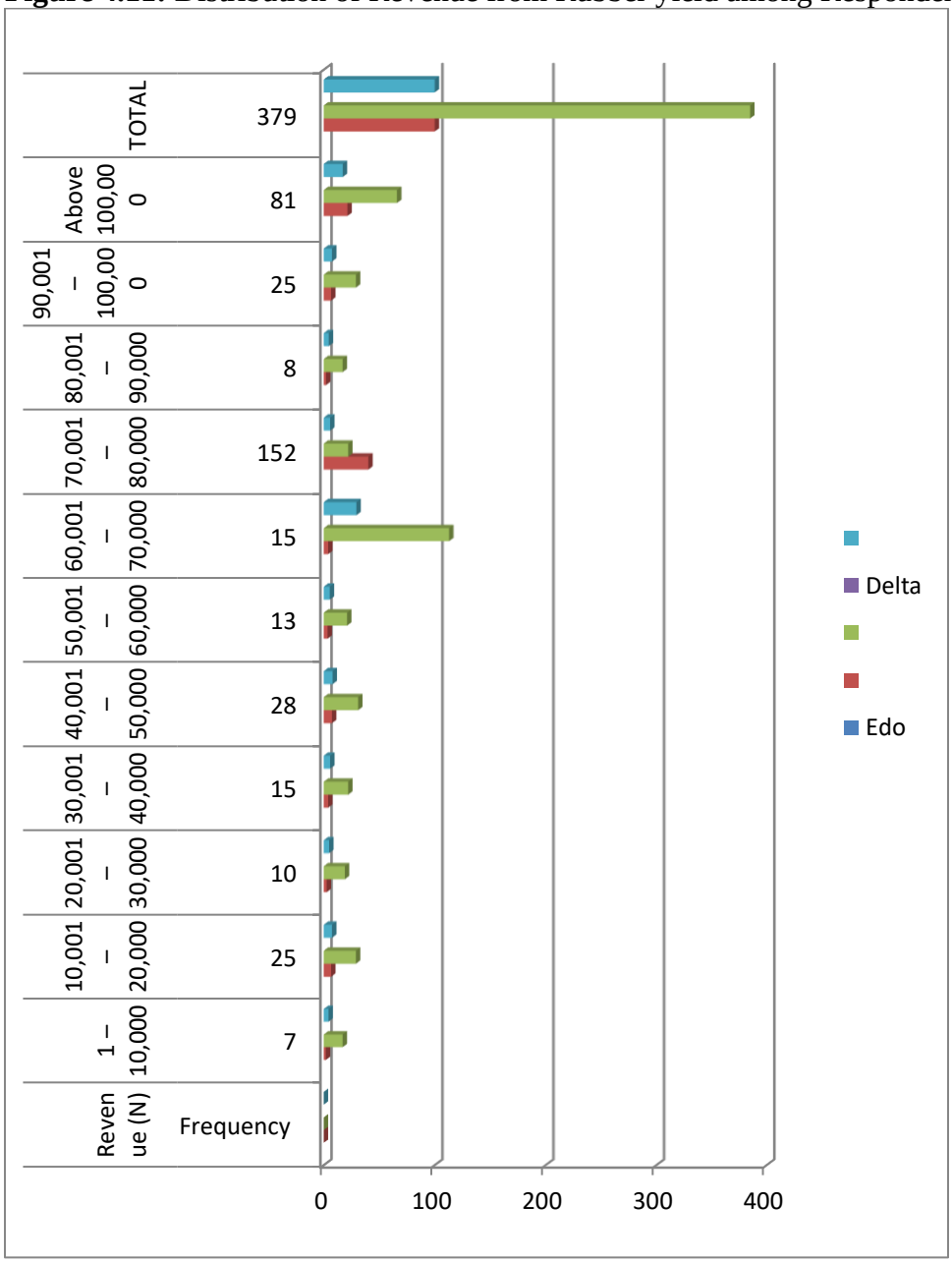
Table 4.16 presents the distribution of revenues obtained by respondent from rubber yield per month. The analysis indicates that majority (40.11%) of the respondents' generated revenue between ₦70,000.00 and ₦ 80,000.00 monthly from their rubber farms in Edo State. In Delta State, majority (29.5%) of the respondents' generated revenue between ₦60,000.00 and ₦70,000.00 monthly from their rubber farms

Table 4.16: Distribution of Revenue from Rubber yield among Respondents (₦)/Month

	Edo		Delta	
Revenue (₦)	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1 – 10,000	7	1.85	17	4.33
10,001 – 20,000	25	6.60	29	7.45
20,001 – 30,000	10	2.64	19	4.85
30,001 – 40,000	15	3.96	22	5.72
40,001 – 50,000	28	7.39	31	7.97
50,001 – 60,000	13	3.43	21	5.37
60,001 – 70,000	15	3.96	113	29.46
70,001 – 80,000	152	40.11	22	5.72
80,001 – 90,000	8	2.11	17	4.51
90,001 – 100,000	25	6.60	29	7.45
Above 100,000	81	21.37	66	17.16
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

Figure 4.11: Distribution of Revenue from Rubber yield among Respondents (₦)/Month



In Edo and Delta States, it is followed by those that generated revenue to the tune of ₦ 100,000.00 or more annually, 21.37% and 17.16% of the respondents respectively. This indicates that rubber farming is a money spinning venture when adhere to its appropriate agronomic practices, and can be a means to diversify the Nigerian economy.

The Qualitative data obtained from the in-depth interviews shows whether the improved rubber seedlings has enhanced the farm yields of the smallholder rubber farmers. The interviewees were asked to fully comment on their thoughts about the subject matter, their responses are presented thus:

> For some time now, there has been a continuous decline in the production of natural rubber in Nigeria. A number of plantations have been abandoned; matured rubber trees have been left untapped even in large operating estates because of low quality clones, a short supply of rubber tappers, drops in price of the commodity in international market, low quality of rubber, disease and pest infestation e.t.c..The decline in productivity of rubber estates and small holder rubber farms has been attributed to the neglect of smallholder rubber farmers and movement of tappers and other farm labour from rubber plantation estates to more competitive sectors. But since there is now an improvement of rubber seedling the yield of the farmers has greatly been enhanced, they generate more revenue in rubber and these smallholders rubber farmers are becoming more interested in rubber farming. **(IDI, 50 Years old/Male/ RRIN StaffI-17/12/2022)**
>
> **Another interviewee had this to say;**
> Rubber Research Institute of Nigeria (RRIN) adapted the exotic clones and tried to improve on their qualities by crossing them with the local clones. The results yielded latex outputs of about 2000 to 3000 kg per hectare per year which are called NIG 800 and 900 series clones. It is of high quality, disease resistant, and also weed and wind resistant.I am so sure it has enhanced the yields of the rubber farmers. **(IDI, 53 Years old/female/ RRIN StaffI-17/12/2022)**
>
> **To further corroborate what the other interviewees has said, this interviewee had this to say;**
> The Institute has developed high yielding rubber clones to boost latex yield and revenue generation. This has increased rubber farmers' interest in the cultivation of natural rubber. Improving rubber varieties has really helped smallholder farmers in rubber farming.**(IDI, 55 Years old/female/ RRIN StaffI-17/12/20**

All the interviewees affirmed that the improved rubber seedlings which are of high quality have enhanced farmers yield.A farmer no longer pick seeds anyhow from anywhere, but from the improved clones. And this hasfurther enhanced their yields for more income.

4.4 An Examination of the Effect of some of RRIN New Rubber Based Technology on the Income Status of the Rubber Farmers.

The fourth objective of the study was to examine the effect of some of RRIN Rubber Based Technology on the Income of the Rubber Farmers. The results of this analysis are presented thus:

4.4.1 Respondents Types of Technology Adopted

The analysis of technology adoption from RRIN by respondents is shown in Table 4.17. The result depicts multiple responses with fair distribution of adoption of the nine technologies among the respondents in Edo and Delta States.

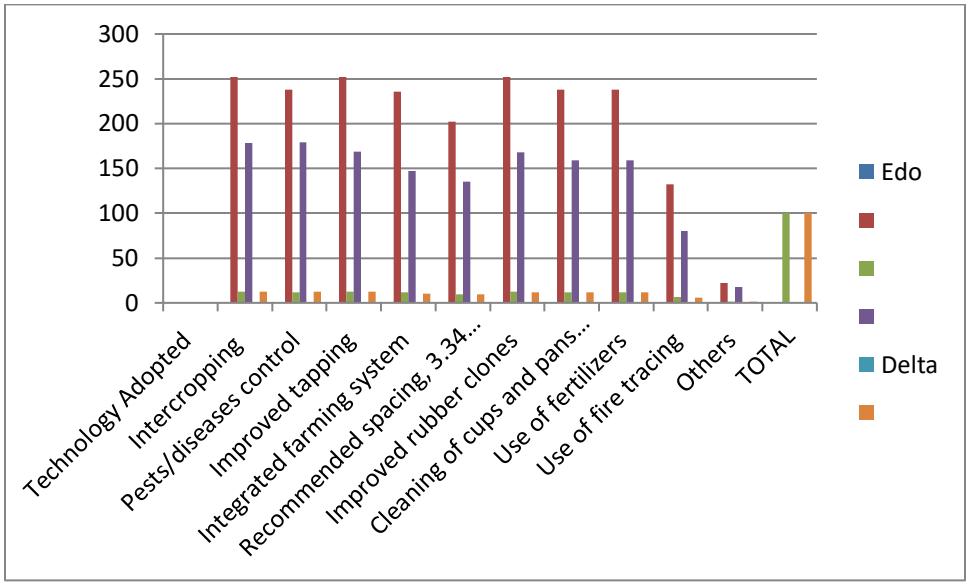
Table 4.17: Distribution of Type of Technology Adopted by Respondents

	Edo		Delta	
Technology Adopted	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Intercropping	252	12.22	178	12.80
Pests/diseases control	238	11.54	179	12.85
Improved tapping	252	12.22	169	12.15
Integrated farming system	236	11.45	147	10.59
Recommended spacing, 3.34 X 6.7m	202	9.80	135	9.68
Improved rubber clones	252	12.22	168	12.08
Cleaning of cups and pans B/4 tapping	238	11.54	159	11.41
Use of fertilizers	238	11.54	159	11.41
Use of fire tracing	132	6.40	80	5.75
Others	22	1.07	18	1.27
TOTAL	**2062***	**100.00**	**1391***	**100.00**

* indicates multiple responses

Source: Field survey, 2022

Figure 4.12: Distribution of Type of Technology Adopted by Respondents



This implies that the respondents were highly inquisitive to know more about rubber as this will help in enhancing their rubber production capacities that will translate to their economic empowerment.

4.4.2 Respondents Best Types of Technology Adopted

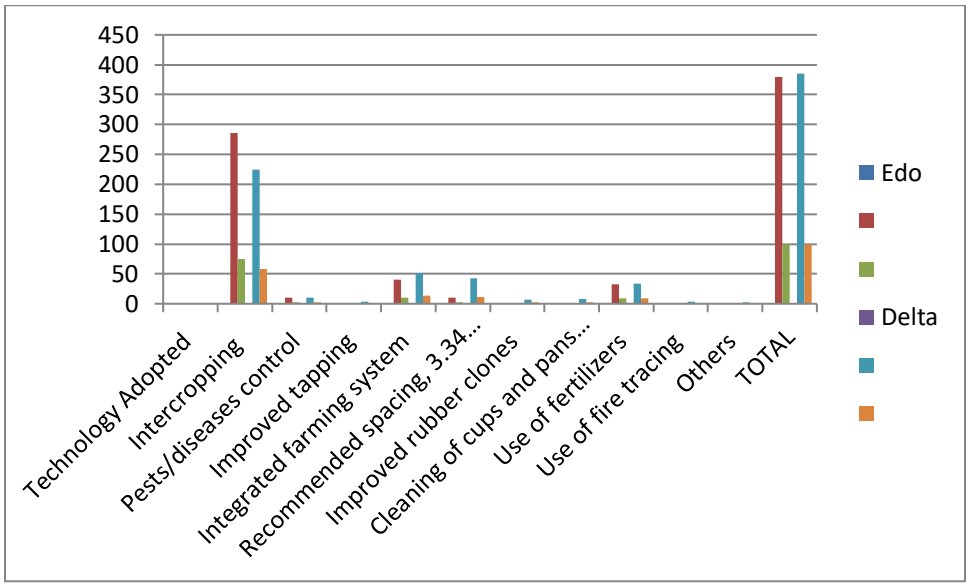
Analysis on the best type of technology adopted by individual respondent is presented in Table 4.18. The result shows that intercropping (75.3%) is reported to be the highest loved technology in Edo State, hence has the highest adoption rate. Similarly, intercropping (58.18%) is reported to be the highest adoption technology in Delta State. This is followed by Integrated Farming System technique, 10.7% in Edo State and 13.25% in Delta State.

Table 4.18: Distribution of the best Technology adopted according to the Respondents

Technology Adopted	Edo		Delta	
	Frequency	Percentage	Frequency	Percentage
Intercropping	286	75.3	224	58.18
Pests/diseases control	10	2.7	10	2.60
Improved tapping	0	0.00	3	0.78
Integrated farming system	40	10.70	51	13.25
Recommended spacing, 3.34 X 6.7m	10	2.7	43	11.17
Improved rubber clones	0	0.00	7	1.82
Cleaning of cups and pans B/4 tapping	0	0.00	8	2.08
Use of fertilizers	33	8.7	34	8.83
Use of fire tracing	0	0.00	3	0.78
Others	0	0.00	2	0.52
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

Figure 4.13: Distribution of the best Technology adopted according to the Respondents



Other technologies like Improved Tapping, Improved Rubber Clones, Cleaning of Cups and Pans before tapping and the Use of Fire Tracing techniques were considered less important among the respondents, hence none regarded them as the best technology to

adopt. The Intercropping and the Integrated Farming System techniques were probably considered the best due to their ability of quick return on capital invested.

4.4.3 Revenue Generated from the Best Technology Adopted

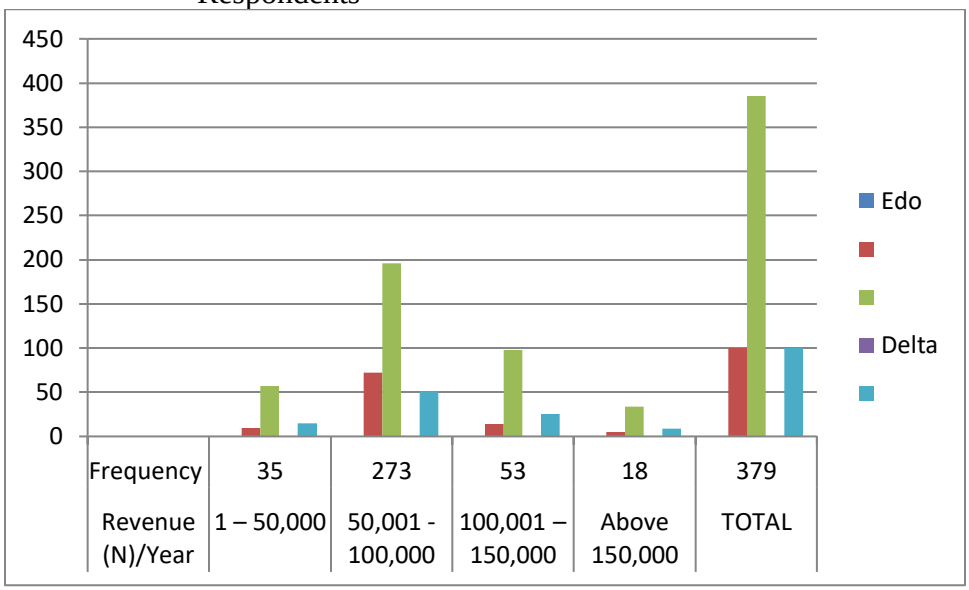
The study analyzed the revenues obtained from the best technologies adopted by the respondents from the RRIN trained technologies (Table 4.19). The result depicts that 72% of the respondents generated revenues between ₦50,000.00 and ₦100,000.00 annually in Edo State while about 50% of the respondents in Delta State generated revenues between ₦50,000.00 and ₦100,000.00 annually. This is followed by those that generated revenues between ₦100,000.00 and ₦150, 000.00 annually, 14% of the respondents in Edo State and 25.5% of the respondents in Delta State. The study also noted that the best technologies were Intercropping, Integrated Farming System or Pest and Diseases control.

Table 4.19: Distribution of Revenue generated from Adopted Technology **a**mong Respondents

	Edo		**Delta**	
Revenue (₦)/Year	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1 – 50,000	35	9.33	57	14.81
50,001 -100,000	273	72.00	196	50.91
100,001 – 150,000	53	14.00	98	25.45
Above 150,000	18	4.67	34	8.83
TOTAL	**379**	**100.00**	**385**	**100.00**

Source: Field survey, 2022

Figure 4.14: Distribution of Revenue generated from Adopted Technology **a**mong Respondents



This implies that for the other technologies developed by RRIN need more awareness campaign for the rubber farmers to know their importance in rubber cultivation and possible adoption.

The Qualitative data obtained from the in-depth interviews shows effect of some of RRIN Rubber Based Technology on the Income of the smallholder rubber farmers. The interviewees were asked to fully comment on their thoughts about the subject matter, their responses are presented thus:

> Intercropping has been practiced by the indigenous people for centuries. Many researchers have clearly identified the fact that intercropping is advantageous in boosting yield. There is increasing awareness of biological advantage from growing crops together rather than separately as mono-crops. Experiments have showed that yield advantages as high as 73 percent can be achieved with cereal – legume intercropping. Intercropping ensures both temporal and efficient use of resources. Intercropping may also provide a physical barrier to the spread of pests and diseases through crop stands. Cassava has been identified as a crop that may serve as a means of removal of white root rot disease from

soil, which is a major problem of young and old rubber trees. One of the most significant reasons for intercropping is that it brings about higher gross return per hectare. Also, farmers can be assured of early and quick returns on his investment on a given piece of land in one year. Rubber has a long gestation period of between 5 – 7 years a farmer, who has invested so much resources on his farm, will not like to wait for so long a time before he starts to get returns on his investment. Intercropping therefore, serve as a means of an early return on investment from his farm. **(IDI, 63 Years old/Male/ RRIN StaffI-17/12/2022)**

Another staff corroborated with what has been said and he had this to say;

Rubber Research Institute of Nigeria (RRIN) scientist has made a mark in introducing newly developed technologies to smallholder rubber farmers especially in Edo and Delta States, capacity building workshops have been organized by the institute times without number and field staff have visited these rubber farmers in their farms to ensure they are complying without challenges. Technologies that have been most adopted by farmers include but not limited to; recommended spacing,3.34x 6,7m, Proper cleaning of tapping cups/pans and knife before tapping, fire tracing, intercropping and integrated farming , e.t.c. This has helped to improve the quality of the rubber tapped and increased the income generated by rubber farmers who have adopted these new technologies of intercropping and integrated farming practices.**(IDI, 55 Years old/Male/ RRIN StaffI-17/12/2022)**

From the responses of the interviewees, it could be deduced that amongst other technologies rendered to the farmers, intercropping and integrated farming are greatly emphasized to the farmers, and these technologies are most loved by the farmers because it produces another means of income while rubber farmers are waiting for the rubber gestation period to be over.

4.5 Constraints Facing the Respondents in Rubber Cultivation

The fifth objective was to identify the constraints faced by the smallholder rubber farmers before and after RRIN intervention. The results /analysis are presented thus:

4.5.1 Constraints Facing the Respondents in Rubber Cultivation

The analysis of the constraints facing the respondents in the study area is presented in Table 4.20.1 and 4.20.2.

Table 4.20.1: Distribution of Constraints facing the Respondents before RRIN Intervention

	Edo		Delta	
Constraints	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Inadequate fund	224	11.01	179	8.87
High cost/inadequate farm inputs	196	9.64	138	6.82
Pests and diseases interference	238	11.70	124	6.14
Shortage/high cost of labour	182	8.95	193	9.55
Fall in price of rubber	216	10.62	146	7.25
Unavailability of improved planting materials	202	9.93	137	6.78
High cost of labour	182	8.95	207	10.24
Inadequate information on rubber technology	168	8.26	234	11.60
Poor/lack of market information on rubber	182	8.95	290	14.33
Unavailability of land	196	9.64	262	12.96
Others	48	2.36	110	5.46
TOTAL	**2034***	**100**	**2021***	**100.00**

* indicates multiple responses
Source: Field survey, 2022

Figure 4.15: Distribution of Constraints facing the Respondents before RRIN Intervention

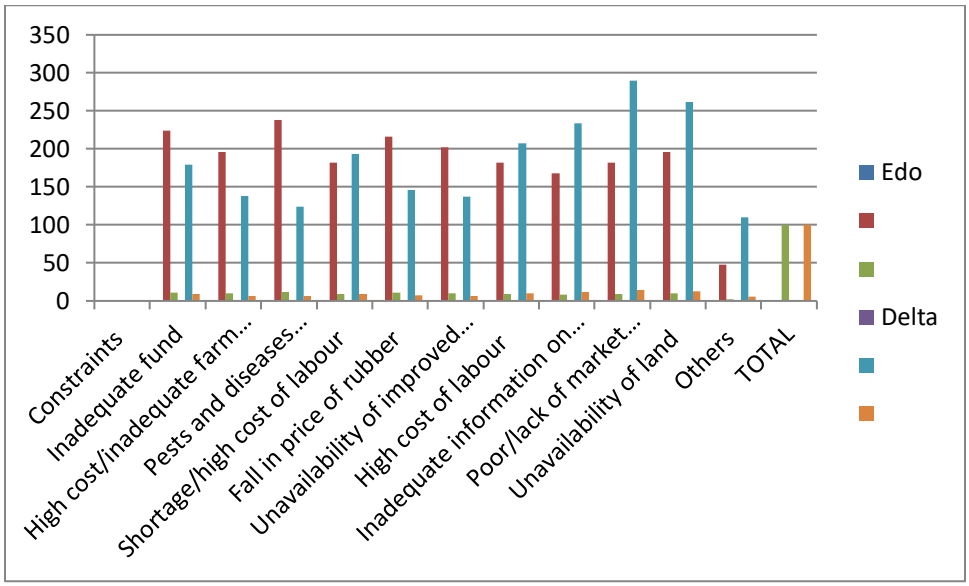


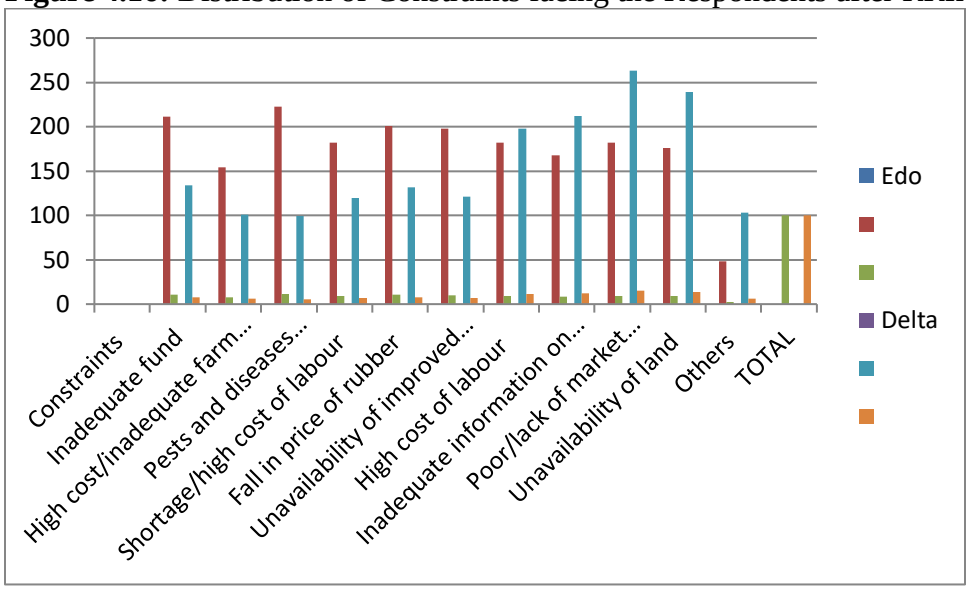
Table 4.20.2: Distribution of Constraints facing the Respondents after RRIN Intervention

	Edo		Delta	
Constraints	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Inadequate fund	211	10.96	134	7.78
High cost/inadequate farm inputs	154	8.00	101	5.87
Pests and diseases interference	223	11.58	99	5.75
Shortage/high cost of labour	182	9.45	120	6.97
Fall in price of rubber	201	10.44	132	7.67
Unavailability of improved planting materials	198	10.29	121	7.03
High cost of labour	182	9.45	198	11.50
Inadequate information on rubber technology	168	8.73	212	12.31
Poor/lack of market information on rubber	182	9.45	263	15.27
Unavailability of land	176	9.14	239	13.88
Others	48	2.49	103	5.98
TOTAL	**1925***	**100**	**1722***	**100.00**

* indicates multiple responses

Source: Field survey, 2022

Figure 4.16: Distribution of Constraints facing the Respondents after RRIN Intervention



The results in Table 4.20.1 revealed that the major constraints facing rubber farmers in Edo State before the RRIN intervention include: pests and diseases interference, inadequate fund, fall in price of rubber, unavailability of improved planting materials, and unavailability of land amongst others. While, top constraints facing rubber farmers in Delta State before the RRIN intervention included: poor/lack of market information on rubber, unavailability of land, inadequate information on rubber technology, high cost of labour, amongst others.

However, as revealed in Table 4.20.2, following the RRIN intervention, there were shifts in the constraints facing rubber farmers in both states. After the RRIN intervention in Edo state, the major constraints included: pests and diseases interference, inadequate fund, fall in price of rubber, unavailability of improved planting materials, shortage/high cost of labour, high cost of labour and poor/lack of market information on rubber. In Delta state, the major constraints faced by the rubber farmers after the RRIN intervention

included: poor/lack of market information on rubber, unavailability of land, inadequate information on rubber technology, and high cost of labour.

The result indicated multiple responses with a fair distribution among the respondents. This implies that all the problems listed in this study are itching as well as impeding factors to rubber business and development in the study area.

Nevertheless, the qualitative data obtained from the in-depth interviews shows the constraints faced by rubber farmers before and after RRIN intervention. The interviewees were asked to fully comment on their thoughts about the subject matter, their responses are presented thus:

> Pest and disease interference is a major problem experienced by the rubber farmers, this maybe as a result of pests being resistant to insecticides. Also Inadequate fund affects all the farmers and it is one of the most important and significant constraint of the rubber farmers.**(IDI, 45 Years old/Male/ RRIN StaffI-17/12/2022)**
>
> **Another interviewee had this to say.**
> Rubber production is both labour and capital intensive and therefore requires a large capital outlay and inadequacy of credit would stifle expansion of rubber production. Poor rubber prices is a significant factor also and problem for rubber farmers. Poor prices offered may be a disincentive to rubber farmers leading to decline in production. It has been identified that inaccurate pricing of natural rubber leads to low farm income and a disturbing problem of the rubber industry. This is due mainly to the activities of the middlemen who pass wrong price signals to the unsuspecting farmers.**(IDI, 55 Years old/Male/ RRIN StaffI-17/12/2022)**
>
> **Another interviewee also had this to say;**
> Shortage and high cost of labour is another problem experienced by farmers. This is as a result of the fact that the rubber growing belt is in the oil belt of Nigeria where active population are attracted leaving rubber cultivation to the

older and aged population. The attendant consequence may be reduction in hectares under cultivation and declining productivity.**(IDI, 45 Years old/female/ RRIN StaffI-17/12/2022)**

Another interviewee corroborated what has been said; he had this to say;
In spite of the problems of the decline in natural rubber production, research in rubber has evolved improved technologies that may stem the decline in rubber production. Faced with the need to improve productivity and production of the agricultural industry, the various governments in Nigeria initiated many policies and programmes that could lead to improvement in the rubber sub- sector. Some of these programmes included the establishment of Agricultural Transformation Agenda, which is aimed at value addition at the downstream sector of the industry, Green Alternative among others.**(IDI, 55 Years old/Male/ RRIN StaffI-17/12/2022)**

The response from the in-depth interview shows that the interviewees were unanimous in mentioning the constraints facing the rubber farmers. Majority of the problems keep reoccurring and this calls for the three tiers of government and other stake holders in rubber industry to collectively intervene in tackling the problem head long in order to through all possible means maximize rubber production potentials and efficiencies of the rubber famers in the study area.

4.6 Discussion of Findings

Based on the objectives of the study, it was found that:

Objective one: An Examination of the Socio- economic Status of the Smallholder Rubber Farmers in Edo and Delta States:

The study shows that almost all the respondents were advanced in age and are married with large family sizes, averaging 8 persons per house in Edo State and 9 persons per house in Delta State. The study also revealed that most (33%) respondents had long

time experience in rubber farming with most of them being in the system between 21 and 35 years in Edo State while most of the respondents in Delta State had been in rubber farming between 26 and 35 years. Respondents (47.49%) had primary education in Edo State and that of Delta State had vocational and secondary education (45.45%). The educational qualification of the respondents in Edo State is followed by those with tertiary education (25.86%) while that of Delta State was primary education (26.75%). Also majority (75%) of the respondents in Edo State and 56% of them in Delta State operate on small scale farm sizes. About all the respondents in both states also have their old and young rubber plantations.

These findings suggest that the preponderance of older farmers in rubber production portends serious danger to the rubber industry with declining productivity and likely reduction in hectares of rubber production. This result is in accord with previous studies (Otene et al., 2011). that rubber production in Nigeria are by older farmers as a result of rural – urban migration of the youth to the city centres for perceived white collar jobs leaving rubber production to elderly population. Family sizes of farmers provide sources of labour for production especially in Africa where agriculture is not mechanized. Large family size of respondents could be used as a vital source of labour for rubber production and other productive activities. Large family size can also put pressures on family heads in devising means of obtaining income to meet family needs. On the respondents educational status the results implies that the respondents were literate and thus could easily comprehend and adopt new technological innovations as education is a paramount factor for adoption of any new thing as in agreement with (Umar, 2014). Having majority of the respondents (75%) in Edo and (56%) operating on small scale farm sizes implies that

farmers operated at different levels of farm sizes which tend to affect their production levels. This result indicates that respondents are small holders. The result is line with several studies conducted which showed that natural rubber production in Nigeria are by small scale farmers who accounted for about seventy percent with the balance by estate holders (Abolagba et al., 2010; Mesike and Esekhade, 2014). Years of farming experience have been reported to provide a measure of managerial ability among farmers in Nigeria. The farming experience result indicated that most of them in Edo State (33%) had been into the rubber farming between 21 and 25 years while majority of the respondents in Delta State (26.68%) had been into the rubber farming between 26 and 30 years. In Edo State, it is followed by those with farming experience between 31 – 35 years (25.3%) and between 36 – 40 years (21.56%) in Delta State. This implies that the rubber farmers were thus expected to be efficient in the business based on their long stay in the system as Zendillo, (2008) stated in his study on measuring experience that the greater impacts of business objectives are gained through experiences. This also implies that the farming experience varied significantly among the farmers showing that respondents might have perfected their production of natural rubber with years of experience. On contact with extension agents, 86% of the respondents had contact with extension agents either from RRIN or Michelin Nigeria in Edo State while 88.8% of the respondent had contact with the extension agents in Delta. This implies that the extension agents in the study areas have tried in reaching out to farmers, and this has enhanced the awareness of new agricultural technologies and adoption among farmers in the study area. In Edo State, 97.3% of the respondents belong to one form of cooperative society or the other while about 95.06% of the respondents in Delta State belong to one form or the other of cooperative society. This implies that these

farmers are organized and thus can be easily reached by government and also have great opportunity to reach government for assistance.

Objective two of this study was to examine the effect of the vocational training programs by RRIN on rubber cultivation skills of the smallholder rubber farmers.

To establish that, efforts were made by the researcher to determine the types of training provided for the farmers by RRIN. There were nine (9) technologies the respondents were trained on during the empowerment scheme provided by RRIN to the rubber farmers based on which the respondents were assessed on their awareness and adoption. The result shows that out of the nine technologies the respondents were trained in, there was multiple responses as almost all the respondents indicated interest in all the technologies with rubber tapping, budding and intercropping techniques recorded the highest turn up of the respondents in Edo and Delta States. The technology that had least turn up by the respondents in both states was the other technologies, such as the use of Alohan Rubber Sheet Processing Machine. The in-depth interviewees also submitted clearly that capacity of most of the rubber farmers have been built in rubber production and the training received by them are greatly impactful. It has helped to sharpen their cultivation skills in rubber farming. But its slightly different with the Alohan rubber sheet processing machine. This may be due to the expensive nature of the machine and its installation processes that is difficult for an individual farmer to afford. These findings also agree with Giroh, Musa and Yustus (2020) who emphasized that Researchers have developed improved production practices to overcome long gestation problem in both immature and matured plantations. Through the adoption of minilivestock integration; apiary (honey bee keeping), and practice of intercropping, these can provide additional

source of income to the farmers thereby sustaining the industry. On the measure of training impact, the respondents all agreed that they have benefited in knowledge enhancement on rubber management techniques, aware of the varieties of rubber clones and their potentials as well as economic enhancement through adoptions of the RRIN developed technologies. These findings are also in line with (Giroh et al. 2010) that training is firmly rooted in the level of technological complexities that characterized agriculture. The need for training for capacity development subsumes a deficit situation in the knowledge, status and skill level of the practicing farmers as well as the availability of appropriate applicable information, the utilization of which will correct the problem situation.

The third objective of this study was to ascertain if the Improved Rubber Seedlings (Clone) has Enhanced the Farm Yields of the Smallholder Rubber Farmers

The study analyzed the types of rubber clones adopted by the respondents, The result revealed that GT1 was mostly adopted in Edo (67.00%) and Delta States(48.13%). This followed by NIG 800 series (31.03%) and in Delta (35.17%). While NIG 900 series (1.97%) in Edo and Delta (16.70%). This implies that NIG 900 series is yet to gain acceptance compared to GT1 and NIG 800 series clones. This, therefore, calls for in-depth investigation and analysis as to why this clone (NIG 900 series) is yet to be adequately adopted by many farmers despite its good qualities. And some of the reasons they gave for adopting these clones was that, apart from the fact that GT1 and the 800 series were given to them by RRIN they found out that it was high yielding, disease and wind resistant. This is in line with the observation of (Umar, et al., 2011) that the basic component of any crop production enterprise is the planting material. Improved planting materials with potentials

for high yield, wind and disease resistance and that one of the best qualities in rubber plant that farmers are interested in is wind resistant, high yielding and disease resistant types.

The study also reported that 45% of the respondents in Edo State had their rubber yield between 401 kg/month and 600 kg/month and 41% of the respondents in Delta State had their rubber yield between 401 kg/month and 600 kg/month. This was followed by those that had about 1,800 kg/month in Edo and Delta States. This implies that the respondent farmers are doing the expected agronomic practices of rubber cultivation as majority of the respondents realized 600 kg/monthly and this is in line with (RRIN, 2002). The rubber farmers in Edo State generated revenues between N70,000.00 and N80,000.00 monthly. In Delta State, majority of the respondents' generated revenue between ₦60,000.00 and ₦70,000.00 monthly from their rubber farms. In Edo and Delta States, followed by those that generated revenue to the tune of ₦ 100,000.00 or more annually, 21.37% and 17.16% of the respondents respectively. This indicates that rubber farming is a money spinning venture when adhere to its appropriate agronomic practices, and can be a means to diversify the Nigerian economy.

The Qualitative data obtained from the in-depth interviewees also unanimously agreed with these findings, implying that the improved rubber seedlings has enhanced the farm yields of the smallholder rubber farmers, with emphasis that Rubber Research Institute of Nigeria (RRIN) adapted the exotic clones and tried to improve on their qualities by crossing them with the local clones. The results yielded latex outputs of about 2000 to 3000 kg per hectare per year which are called NIG 800 and 900 series clones. It is of high quality, disease resistant, and also weed and wind resistant. The Institute has developed high yielding rubber clones to boost latex yield and revenue generation. This has increased

rubber farmers' interest in the cultivation of natural rubber. Improving rubber varieties has really helped smallholder farmers in rubber farming.

The Fourth Objective of the study was to Examine the Effect of some of RRIN New Rubber Based Technology on the Income Status of the Rubber Farmers.

The result depicted multiple responses with fair distribution of adoption of the nine technologies which were; Improved Tapping, Improved Rubber Clones, Cleaning of Cups and Pans before tapping, the Use of Fire Tracing techniques, Use of fertilizer, Pest and disease control, Intercropping and the Integrated farming system technologies among the respondents in Edo and Delta States. The result showed that intercropping (75.3%) is reported to be the highest loved technology in Edo State, hence has the highest adoption rate. Similarly, intercropping (58.18%) was reported to be the highest adoption technology in Delta State. This is followed by Integrated Farming System technique, 10.7% in Edo State and 13.25% in Delta State. Majority of the respondents in both states generated revenue between N50,000.00 and N 100,000.00 from intercropping and the integrated farming system technologies adopted annually. The Intercropping and the Integrated Farming System techniques were probably considered the best due to their ability of quick return on capital invested. These findings are in agreement with (Esekhade, Ugwa and Aigbekaen, 1996). The long gestation period of natural rubber (five to seven years) before the commencement of tapping and wide spacing of 6.7 m x 3.34 m, which gives about 450 plants/hectare discourages farmers to go into production. These problems were addressed by improved agronomic practices such as rubber based cropping pattern to ensure effective utilization of land and labour when rubber saplings are in the immature phase. Integrated farming (mini livestock, Honey bee production, snailery) and production of shade tolerant

crops such as cocoyam and edible mushroom) have also been developed in Nigeria. Intercropping during the immature unproductive stage of rubber provides one means of addressing the gaps in income suffered by smallholders after replanting or new planting of rubber. It also ensures efficient management of labour. Effective utilization of the avenues for intercropping has been advocated to put the land under rubber cultivation for maximum benefits. This implies that the other technologies developed by RRIN need more awareness campaign for the rubber farmers to know their importance in rubber cultivation and possible adoption.

The Fifth Objective was to Identify the Constraints Faced by the Smallholder Rubber Farmers before and after RRIN Intervention.

The result indicated multiple responses with a fair distribution among the respondents. The results showed that the major constraints facing rubber farmers in Edo State before the RRIN intervention include: pests and diseases interference, inadequate fund, fall in price of rubber, unavailability of improved planting materials, and unavailability of land amongst others. While, top constraints facing rubber farmers in Delta State before the RRIN intervention included: poor/lack of market information on rubber, unavailability of land, inadequate information on rubber technology, high cost of labour, amongst others. However, following the RRIN intervention, there were shifts in the constraints facing rubber farmers in both states. After the RRIN intervention in Edo state, the major constraints included: pests and diseases interference, inadequate fund, fall in price of rubber, unavailability of improved planting materials, shortage/high cost of labour, high cost of labour and poor/lack of market information on rubber. In Delta state, the major constraints faced by the rubber farmers after the RRIN intervention included: poor/lack of

market information on rubber, unavailability of land, inadequate information on rubber technology, and high cost of labour. This findings are in line with Giroh et al; (2013) on the study; Analysis of Labour, Productivity and Constraints of Rubber in Niger Delta region of Nigeria respectively, revealed that Smallholder farmers in Nigeria often have constraints in farm crop production and some of these constraints include but not limited to; poor prices, pests and diseases, inadequate credit, shortage and high cost of labour, inadequate farm machineries, lack of market information, inadequate research/ extension support services, storage facilities problem, inaccessibility to cheap farm inputs and land tenure problem, e.t.c. This implies that all the problems listed in this study are itching as well as impeding factors to rubber business and development in the study area, the study identified eleven problems that face all the respondents almost equally, which also implies that more empowerment intervention needs to be carried out by RRIN to reach the farmers regularly.

Theoretically, it has been established that the goal attainment theory emphasizes that the success of any organization is best judged by appraising its outcome so as to find out the extent to which the success it has recorded is in agreement with its set out goals. The Rubber Research Institute of Nigeria has spelt out specific goals it intends to accomplish through its empowerment intervention and capacity building programs. RRIN is to generate and deliver the institute's technologies, skills, knowledge, innovations and methods to different categories of clients for their empowerment. Every empowerment effort produces results which can only be known subsequent to a meticulous investigation. Therefore to fill this gap, this study is focused to empirically assess the socio- economic

empowerment intervention of Rubber Research Institute of Nigeria (RRIN) on the rural rubber farmers in Edo and Delta states, Nigeria.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study focused on the assessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in Edo and Delta states. RRIN was formed with the aim of researching into rubber and latex trees for its economic purposes. Among its mandate is to also impact on the smallholder farmers who have chosen to farm rubber trees. Over the years, there have been series of complaints by the farmers which led to the development of empowerment intervention programmes by RRIN in order to educate these farmers on the best practices of rubber plantation. The general objective of this study therefore was to analyse the effect of the socio-economic empowerment intervention of (RRIN) on rural rubber farmers in Edo and Delta state, with the intent to determine the effect of the vocational trainings and new rubber based technology acquired by the smallholder rubber farmers while identifying the constrain they faced before and after RRIN intervention.

The study adopted the survey research design and the population of the study consisted of all the smallholder rubber farmers in the selected local government areas of Edo and Delta states respectively which was 853. The sample size of this study was 800 and the study adopted the multistage sampling techniques. Questionnaires were administered to 800 respondents and764 were retrieved, valid and used for the analysis. Six (6) (RRIN) staff were also interviewed through the in-depth interview method. Data collected were analysed using descriptive statistics and manual content analytical method respectively. There were nine (9) technologies the respondents were trained on during the

empowerment scheme provided by RRIN to the rubber farmers based on which the respondents assessed on their awareness and adoption. The study reported that GT1 and NIG 800 series clones, the intercropping technique, integrated farming technique, tapping technique and fertilizers application technique were most loved and adopted by the respondents in both states. It is also reported that one of the best qualities in rubber plant that farmers are interested in is wind resistant, high yielding and disease resistant types.

On the measure of training impact, the respondents all agreed that they have benefited in knowledge enhancement on rubber management techniques, aware of the varieties of rubber clones and their potentials as well as economic enhancement through adoptions of the RRIN developed technologies.

The study also reported that 45% of the respondents in Edo State had their rubber yield between 401 kg/month and 600 kg/month and 41% of the respondents in Delta State had their rubber yield between 401 kg/month and 600 kg/month. The rubber farmers in Edo State generated revenues between N70,000.00 and N80,000.00 monthly. In Delta State, majority of the respondents' generated revenue between ₦60,000.00 and ₦70,000.00 monthly from their rubber farms. It was also reported that majority of the respondents in both states generated revenue between N50,000.00 and N 100,000.00 from intercropping and the integrated farming system technologies adopted annually. The study identified eleven problems that face all the respondents almost equally

The results showed a multiple response with fair distribution of impact of the technologies; the respondents all agreed that they have benefited in knowledge enhancement on rubber management techniques and the intervention program has helped

in improving their farm yield and also financial status. This means that the training impacted the farmers' economically. Constraints identified by the farmers before the intervention include, inadequate funds, inadequate information on rubber technology, pests and disease control. It was concluded that though the intervention program has impacted the smallholder farmers, The research recommended that the intervention program should be a regular activity of the Institute.

5.2 Conclusion

The main objective of the study was to assess the socio-economic empowerment intervention of Rubber Research Institute of Nigeria on rural rubber farmers in Edo and Delta States. The purpose was based on the glaring fact that though agriculture is perceived to be the most assured engine of development and a reliable key for industrialization in Nigeria; the country however is yet generate broad productive growth rate especially in tree crops.

The data for the study were collected from 764 respondents in five Local Government Areas each in Edo and Delta States. Descriptive statistical tools were used to analyze the data. The study thus specifically assess the effects of vocational trainings organized by RRIN on rubber cultivation of farmers which include improved rubber seedlings, intercropping, integrated farming, fertilizers application and other technologies developed by RRIN. The study revealed that GT1 and NIG 800 series clones, the intercropping technique, integrated farming technique, tapping technique and fertilizers application technique were most loved and adopted by the respondents. The respondents all agreed that they have benefited in knowledge enhancement on rubber management techniques. The study also reported that the respondents had their rubber yield between

400 kg/month and 1,800 kg/month; and generated revenues between N10, 000 andN100,000.00 monthly. It was also reported that the respondents generated revenue between N50,000.00 and N150,000.00 from intercropping and the integrated farming system technologies adopted annually. It can be concluded that rubber farming is a money spinning venture if adopted the proper agronomic practices required of it especially in the study area if not the eleven identified problems that face all the respondents.

5.3 Recommendations

Based on the findings in this study, the following recommendations are made.

For Rubber Research Institute of Nigeria:

1. Rubber Research Institute of Nigeria should continually organize training workshops for rubber farmers as this will continue to impact positively on their socio-economic status.
2. Rubber Research Institute of Nigeria should be involved in sensitization campaigns on the need for the rubber farmers to as well regard the other technologies developed by RRIN for them to adopt them, as these are also important in realizing better rubber cultivation output.
3. There is need for RRIN to concentrate on providing planting materials with high value fruit trees and make them available to farmers for integration with rubber.

For Government:

4. Government should assist the rubber farmers in acquiring land in order to cultivate rubber on large scale land instead of the small scale lands most of the respondents operate on. This may be through provision of soft loans to the farmers as this will address most of the challenges the respondents complained of. This should be given

urgent attention in order to meet the yeaning aspiration of Nigeria to diversify her economy through agriculture.

5. There should be collaborative efforts in the funding of agricultural research by Government, Non- Governmental Organizations (NGOs) and service users of research results to organize regular trainings and workshops on natural rubber.

For other stakeholders

6. There should be crop intensification and agro forestry through maximum utilization of land under rubber by the smallholder farmers.
7. Socio-economic programs should be aimed at enhancing smallholders farmers income and job creation by maintaining effective linkages between research scientist and farmers for technology developed and transfer of innovation for adoption by farmers for increased productivity and improved livelihood.

5.4 Contributions to Knowledge

The study has contributed to knowledge in the following ways by showing that:

1. Most young people are impatient to do farm works; therefore there is need to further research on how they can be interested and motivated to engage in it.
2. Rubber farming and integrated rubber farming is a money spinning venture if the proper agronomic practices are adhered to.
3. Rubber based agro forestry and mixed farming methodologies or systems serves as additional income to resource poor rubber farmers.
4. Agro forestry is a way of enhancing nutritional status of faming and soil because they produce protein, rabbit, and snails, honey which is nutritional.

5. Rubber based agro forestry helps to mitigate climate change and enhances biodiversity.
6. When farmers plant rubber and plant along with it economic fruit trees and rear animals, it helps for carbon siquensation, you have a cleaner environment.
7. Promoting adoption of improved farm practices for increased economic benefits is very critical for the smallholders' rubber farmers.
8. There is need to create or strengthen existing forum for exchange of information between research scientist and extension personnel on relevant technologies to be passed to smallholder rubber farmers.
9. Bringing scientist, agrochemical companies, input supply agencies, policymakers, non-governmental organization (NGOs) and farmers together to find pragmatic solutions to production constraints in the states under study is of paramount importance.

References

Abolagha EO, Giroh YD (2006). Constraints to sustainable development of rubber industry in Nigeria: A case study of Delta State. Moor Journal of Agricultural Research 7(1 & 2):42-48.

Abolagba, E.O., C.N Onyekwere., B.N. Agbonkpolor and H.Y Umar (2010). Determinants of Agricultural Exports. Journal of Human Ecology. 29. (3), 181 – 184

Adams, R. (2008). *Empowerment, participation and social work*. New York: Palgrave Macmillan.

Agbonkpolor, N.O. (2017)Natural Rubber value chains: A game changer for smallholders. Research in Agricultural and applied Economics. AgEconsearch http: AgEcon search .umn.edu. JEL codes:M31.Y10. Pp 1-35.

Agwu, A.E. (2006). Enhancing Natural Rubber (HeveaBrasiliensis) Production through Extension Service Delivery in South West Agricultural Zone in Nigeria. *Agricultural Sciences. Vol. 5* (2): Pp 7 -16.

Aigbekaen E.O, Imarrhiagbe E.O, &Omokhafe KO (2000).Adoption of Some Recommended Agronomic Practices of Natural Rubber in *Nigeria. J. Agric. Fish*. 1, Pp 51 – 56.

Alwang, J. & Siegel P.B. (2003).Measuring the Impacts of Agricultural Research on Poverty Reduction.*Agricultural Economics* 29,1–14.

Banmeke, T.O.A and Omoregbee,F. E. (2009). Farmers Perception of the Factors Militating against Rubber Production in Edo and Delta States of Nigeria. *International Journal of Agricultural Economics and Rural Development 2*(2): 33 – 39.

Beintema, N.M. &Stads.G.J, (2004).Investing in Sub-Saharan African Agricultural Research: Recent Trends.Vision 2020 Africa Conference Brief 8, IFPRI, Washington, DC, USA.

Blanchard, K.H, John, P.C, Alan, R (1996). Empowerment Takes More than a Minute. San Francisco. Berret –Koehler.

Byerlee, D. (2000) Targeting poverty Alleviation in PrioritySetting for Agricultural Research.*Food Policy* 25: 429–445.

Central Bank of Nigeria, CBN (2006).Central Bank of Nigeria Annual Report and Statement of Account Publication for Year ending 31st December, 2005. Abuja, Nigeria.

Central Intelligence Agency [CIA] World Factbook 2018). https://en.wikipedia.org/wiki /Economy_of_Nigeria. retrieved June 2018.

Deutsche Bank Research (2014). Agricultural Value Chain in Sub – sahara Africa: From a Development Challenge to a Business Opportunity. Retrieved from:https://www.dbresearch.com.*http://catalogue.unccdint/764_Agric_value_chain_SSA_DB.pdf.* Accessed; June, 2018.

Edo Administrative Unit (2015).Estimate of Benin City Population. Retrieved from http://population.city/nigeria/benin-city/

Esekhade, T.U, Ugwa, I.K and Aigbekaen, E.O. (1996): Suitability and Economic viability of intercropping in rubber on acid sandy soils of southern Nigeria. India Journal of Natural Rubber Research 9:36 – 39

Etsekade, T.U. Mesike, C.S., Idoko,, S.O., Okore I.K &Balogun, F. (2014). Gross margin analysis of rubber based cropping systems in Nigeria RRIN unpublished data.

Esekhade TU, Idoko SO, Okwu-Abolo C, Mesike S (2019). Improving rubber smallholder‟s livelihood through rubber based agroforestry systems and mixed farming-The Nigeria experience. Proceedings of the 2019 International Rubber Workshop, Benin City, Nigeria 02–05 September, 2019.

Ewuziem, J.E, Ironkwe A.G, Tokula M.H, &Onyenobi V.O. (2015).Livelihood Assessment of yam farmers in Omala Local Government area of Kogi State of Nigeria.Preceding of 49th annual conference of agricultural society of Nigeria (ASN) held at Delta state University Asaba Campus 9th to 13th November, Federal Ministry of Science and Technology Lagos, Nigeria. Nov. 10th 1989. Pp 1 – 12.

Giroh DY, Ephraim I J, Igbinosun FO, Ogwuche P 2007b. A quantitative analysis of adoption of natural rubber production technologies among farmers in southern Nigeria. J Sust Trop Agri Res, 21: 11 – 18.

Giroh, D.Y, Adebayo, E.F and Jongur, A.A.U. (2013).Analysis of Labour Productivity and Constraints of Rubber Latex Exploitation among Smallholder Rubber Farmers in the Niger Delta region of Nigeria. *Global Journal of Agricultural Research, 1* (3), 16-26.

Giroh, D.Y, Adebayo E.F &Tashikalma A.K. (2015).The Presidential Initiative on Natural Rubber as an Imperative for Diversifyin Nigerian Economy.Preceeding of 49th Annual Conference of Agricultural Society of Nigeria(ASN) held at Delta State University Asaba Campus 9th to 13th November. Pp. 234 - 238. https://brandongaille.com/19-nigeria-rubber-industry-statistics-andtrends/retieved *June, 2018.*

Giroh, D.Y, Musa. E. and Yustus F.S (2020) Analysis of Improved Production Practices in Small holder Natural Rubber Plantation for Sustainable Natural Rubber Industry

in Nigeria. European Journal of Applied Sciences, Volume 8 No 2, April2020; pp: 1-15. URL: http://dx.doi.org/10.14738/aivp.82.8423

Igbokwe, E.J. (1983). The Effect of Oil Production on the Agricultural Economy of Nigeria.1970-1980. Retrospective Thesis and Dissertations16518.https://lib.dr.iastate .edu/rtd/16518. Retrieved June 2018

Ikegwe, E.M., Ajiboye, Y. Aromolara, A.D. Ayodeji.A.A and Okorafor, U (2014). Human empowerment through skills acquisition: Issue, impact and consequences. A non parametic view.Journal of Poverty, Investment and Development.*An Open Occess International Journal, 5*(1), 94-101.

International Fund for Agricultural Development (IFAD) (2011). Rural poverty report: The Challenge of Ending Rural Poverty. Rome. Retrieved from: https:www.researchgate.net

Imariagbe, P. Anegbe, P. Otene, F.G & Musa, E. (2015). Factors Influencing Adoption of Rubber Based Technologies among Small-holding Rubber Farmers in Edo state, Nigeria. Preceeding of 49th Annual Conference of Agricultural Society of Nigeria (ASN) held at Delta State University Asaba Campus 9th to 13th November. Pp 355-350.

International Rubber Research Development Board (IRRDB) (2006).

International Rubber Study Group (IRSG) 2006

International Rubber Study Group (IRSG) 2016

International Rubber Study Group (IRSG) 2020. Rubberstudy.org/natural Rubber.

India Rubber Asia (2006).The complete magazine on rubber.November –December; pp 177.

King I. (1981). *A theory for nursing – systems, concepts, process.*New York: Delmar Publishers Inc.

King, I.M. (1999). A theory of goal attainment: Philosophical and ethical implications. *Nursing Science Quarterly, 12*(4), 292-296.

Kpolo, D.M (1999). Natural Rubber Production in Africa.*Rubber International Magazine, vol.* 1 pp 55 – 61.

Malaysian Rubber Board (2009).Annual Report. p137. Retrieved from www.rubberboard. org.my/report/2009/137

Mark, D. (2012). Mark Decries Low Budgetary Allocation to Agriculture. The Punch, July 23. 2012.

Madeley J. (2010).*Women Marginal Farmers – Mobilising for Change*. UK: Concern Worldwide.

Mesike, S.C. (2005). *Analysis of Determinants of Rubber Export Supply in Nigeria.* Unpublished master's thesis, Department of Agricultural Economics, University of Ibadan, Nigeria.

Mesike, S.C., O.E.D. Owie and R.N. Okoh (2009). Resource – Use Efficiency and Return to Scale in Smallholders Rubber Farming System in Edo State, Nigeria. Journal of Human Ecology 28(3). 183 – 186.

Mesike, S.C., G.A. Sagay and R.N. Okoh (2010). Optimum Replacement period for Rubber plantation in Nigeria.Quarterly International Journal of Agriculture 49(3). 257–270.

Mesike C. S. and Esekhade T. U.(2014): Rainfall variability and rubber production in Nigeria . African Journal of Environmental Science and Technology8(1): 54-57

Mustapha, N. H.N(2011), Technical Efficiency for Rubber Smallholders under RISDA's Supervisory System using Stochastic Frontier Analysis. Journal of Sustainability Science and Management 6(1), 156 – 168.

McEwen, M. and Wills, E.M. (2007).*Theoretical Basis for Nursing* (2nd Ed.) Philadelphia, PA: Lippincott Williams & Wilkins.

Ministry of Agriculture (2023) EPS 116// An overview of Rubber Research Institute of Nigeria. Newage TV www.youtube.com. https://youtu.be/VgNEu496ibE

National Bureau of Statistics (NBS) (2005) Poverty and the Middle Class: The Nigerian Case, NBS Working Paper IV.

Njukeng, J.N., P.M. Muenyi., B.K. Ngane and E.E. Ehabe (2011). Ethephon Stimulation and Yield Response of Some Hevea Clones in the Humid Forests of South West Cameroon. International Journal of Agronomy 2011: 1- 5.

Obue, A, and Okekporo.A.O. (2015).The Role of Agriculture in Economic Development of Nigeria. Preceding of 49th annual conference of Agricultural Society of Nigeria (ASN) held at Delta State University Asaba Campus 9th to 13th November. Pp 239-241

Odoemenem, I.U. and Obinne, C.P.O. (2010).Assessing the Factor Influencing the Utilization of Improved Cereal Crop Production Technologies by Small Scale Farmers in Nigeria.http:www.indjst.org/archive/vol 3.issue.2/ innocent-17.pdf.

Ogbebor, O.O. (2013). "The Sustainability of Agriculture in Nigeria Using Rubber as a Case Study" Electronic Theses and Dissertations.Paper 2312.http://dc.etsu.edu/etd/2312

Ogowewo, N. (1989). Past and Present Features of Natural Rubber Production. A paper Presented at the International Seminar on Applied Agricultural Research and Mechanized Farming inTropicalAreas.*http://krepublishers.com/02-Journals/JHE/JHE-33-0-000-11-Web/ JHE-33*

Okorji, N.C (2002). Creating an Enabling Environment for Increased Agricultural Production.in: Ezulike T.O and Aham J. Agricultural Technology Generation and Transfer Strategies for Food Security. 16th Annual Zonal REFILS Workshop South-east/South –South Zone of Nigeria. 19th -23rd Nov. 2002. NRCRI, Umudike 26-30.

Okwoche V, Okwu O, Ejembi S 2007. Obstacles to the development and delivery of extension educational programmes for farmers in Benue State. J Sust Trop Agri Res, 21: 23 - 26.

Omorusi,V.I Orumnese, K.O. Ijie, K.O. Eseimuede U, Izevbigie F.C, Okundia R.O & Musa.E (2015). Towards a Sustainable Improved Rubber Production in Nigeria: The Place of Plant Pathologist. Preceding of 49th annual conference of Agricultural Society of Nigeria (ASN) held at Delta State University Asaba Campus 9th to 13th November. Pp 592-597.

Omo-Ikerodah, E.O. Ajayi, O.I. Fagbemi, E.A. Imoren, E.A. (2015). Rubber Seed and its economic importance.Preceding of 49th annual conference of agricultural society of Nigeria (ASN) held at Delta State University Asaba campus 9th to 13th November 2015. Pp. 672-680.

Omokhafe, KO, Nasiru I (2005). Genetic improvement of *Heveabrasiliensis* in Nigeria.Proceedings of the International Rubber Conference.Modern Graphics, Cochin, India, pp13-17.

Otene, F. G., Obinne, C. P. O. and Egwumah, P. O. (2011). Evaluation of Utilization Level of Improved Rubber Management Practices among Farm Settlers in Edo and Delta States. International Journal of Agric sci,2(1):53- 60. Delhi, India.

Rubber Research Institute of Nigeria (RRIN), Annual Report, 1998, 2002.

Rubber Research Institute of Sri – lanka, RRIS (2002).Annual Review, pp 172.

Sconnes, I. (1998). 'Sustainable Rural livelihoods: A framework for analysis 'IDS working paper No. 72. Brighton: IDS.

Spore (2007). Natural Rubber Springs Back. A Bimonthly Bulletin of the Technical Centre for Tropical Agriculture (CTA) , Pp 11– 12. Spore (2007). Natural Rubber Springs Back. A Bimonthly Bulletin of the Technical Centre for Tropical Agriculture (CTA) , Pp 11– 12.

Shaibu, B. Aliyu, A &Bakashi, J.S. (1997). Nigeria: National Agriculture Research Strategic Plan 1996-2010. Department of Agricultural Sciences, Federal Ministry of Agriculture and Natural Resources, Abuja.

Sikwela, M.M. &Mushunje, A. (2013). The impact of farmer support programmes on Household income and Sustainability in small holder production: A case study of the Eastern Cape and KwaZuluNatal.South Africa. Africa journal of Agricultural Research.Vol.8 (21).pp 2502-2511.

UN Millennium Project (2005a). Halving hunger: It can be done. Task Force on Hunger. London, Sterling, VA, USA: Earthscan.

Uraih, O.B.C. Abubakar M., Balogun, F.E., Giroh, D.Y. Ogbebor, O.J. and Okwu, U.N. (2006).Assessment of Rubber Quality Consciousness among Smallholder Rubber Farmers in Farm Settlements of Edo and Delta States of Nigeria.*Journal of Sustainable Tropical Agricultural Research*.19: Pp 46 – 51

Umar, H.Y. Ugwa, I.K (2006). Global Evaluation of Natural Rubber Production (1894 – 2004): The Nigerian experience. *Nigeria Journal ofTropical Agriculture*, 8(1), Pp 164-175.

Umar, H.Y. (2014). Economic Analysis of Gum Arabic Marketing in North–Eastern Nigeria. A thesis submitted to the Department of Agricultural Economics and Extension, Faculty of Agriculture as a Partial Fulfilment Required for the Award of Ph.D. Agricultural Economics, Kogi State University, Anyigba, Nigeria.

Umar, H.Y. Giroh, D.Y. Agbonkpolor, N.B. &Mesike, C.S. (2011). An Overview of World Natural Rubber Production and Consumption: An Implication for Economic Empowerment and Poverty Alleviation in Nigeria.*Human Ecology.*Vol.33(1): Pp 53 – 59.

World Agro Forestry Policy Brief (2014).Investing in Rubber Agro forestry in Nigeria. World Agro Forestry Centre No. 25.

Zendillo, E. (2008). *Remark at the plenary session of the World Economic Forum* Davos, Switzerland.

APPENDICES

APPENDIX A: Pictures

Rubber Plantation

Rubber plantation 1

Rubber plantation 2

Rubber plantation 3

Rubber plantation 4

Rubber tapper/rubber plantation

Typical rubber tree with latex

Rubber /plantain intercrop


RUBBER RESEARCH INSTITUTE OF NIGERIA BENIN CITY

Field visit

APPENDIX B: Questionnaire

A QUESTIONIARE FOR RUBBER FARMERS IN EDO AND DELTA STATE.

Topic Assessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria on rural rubber farmers in Edo and Delta states.

Department of Sociology and Anthropology,
University of Benin, Benin –City,
Edo State, Nigeria.
22nd November, 2022

Good day sir/ma,

This is a "Questionnaire'' for a research on "Assessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in Edo and Delta States. The general goal of this study is to find out the socio-economic intervention empowerment efforts of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in your state. Other specific objectives are to: examine the socio-economic status of small-holder rubber farmers, determine the effect of the vocational trainings by RRIN on rubber cultivation skills of the small holder rubber farmers, ascertain if the improved rubber seedlings provided by RRIN has enhanced the yield of the small holder farmer in rubber production, examine the effect of some of the RRIN new rubber based technology on the income status of the small holder rubber farmers and to identify the constraints of small holder rubber farmers in rubber production in your State.

Your state is among those selected for the research .Your responses will assist in meeting the goal of this research and it is therefore requested.

While, I ask for your responses to the items on this questionnaire, i promise that information supplied will be kept confidential, and for the purpose of the research only.

Thank you,

Yours Sincerely,

.....
Evelyn Musa.

Research Topic: Assessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria on rural rubber farmers in Edo and Delta States.

SECTION A: Bio-socio-economic status of smallholder rubber farmers

(Please tick as appropriate)

1. Age in years: (a) 21-30 (b) 31- 40 (c) 41- 50 (d) 51-60 (e) 61-70 (f) 70 and above.
2. Sex: (a) Male (b) Female.
3. Marital Status: (a) Married (b) Single (c) Widowed (d) Divorced.
4. Household size: (a) 1-4 (b) 5-8 (c) 9-12 (d) >12).
5. Educational Qualifications: (a) No formal Education (b) Primary school(c) Vocational/ technical school/ WASC (d) Tertiary education (OND, NCE, HND, B.Sc. B.A.
6. Farming experience: (<10), (11- 20), (21- 30), (31-40), (>40).
7. Farm size (Hectares):---------- Ha
8. Any contact with extension agents in last one year? : (a) Yes (b) No
9. Membership of Co-operative society: (a)Yes (b) No.
10. What is the age of your rubber plantation?: (a) ----------(yrs) (b)----------(yrs)

SECTION B: RRIN empowerment efforts received by rubber farmers

Have you received any vocational training on rubber cultivation? (a)Yes (b) No

If Yes, in what Areas? (You can tick more than one)

S/N	Type of training received	Yes	No
11	Training on rubber tapping techniques		
12	Training on business nursery operations		
13	Training on rubber budding techniques		
14	Training on rubber Clone Identification		
15	Training on rubber rootstock establishment/ management		
16	Information on intercropping		
17	Information to engage in integrated farming system		
18	Provision of improved rubber clones/seedlings		
19	Others		

Have these trainings in any way enhanced your rubber cultivation skills. (a) Yes (b) No

SECTION C: Effect of RRIN empowerment effort on rubber farmers

In which of the following areas has the trainings received benefited you?

S/N	**Areas**	**Yes**	**No**
20	Enhancement /increase in knowledge of rubber management techniques		
22	Improvement in rubber management skill		
23	Use of improved rubber clones		
24	Increase in income		

Effect of improved rubber clones on farm yield of farmers

25. Which of these clones are you aware of? (a) NIG 800 series (b) NIG 801 series (c) NIG 802 series (d) NIG 803 series, (e) GT1 (f) NIG 900 series.

26. Which clone are you using? (a). ----------

27. Please give reasons for your answer ----------

Effect of some on the new rubber based technology on rubber farmers

Which of these rubber based technologies have you adopted (You can tick more than one)

S/N	Rubber based technologies	Yes	No
28	Intercropping under rubber		
29	Pest/ Disease control techniques		
30	Improved tapping techniques		
31	Integrated farming systems		
32	Recommended spacing(3. 34x6.7)		
33	Improved rubber clones		
34	Cleaning of latex cup and pan before tapping		
35	Use of fertilizers		
36	Use of fire tracing technique		
37	0thers		

38**.** Which of these technologies serves as source of additional income.----------

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39. How much income do you derive from your rubber based technology adopted

(a) ≤ 50,000 (b) 51, 000 – 60,000 (c) 61, 000 – 70,000 (d) 71, 000 - 80,000 (e) 81,000–90,000 (f) 91,000 - 100,000 (g) 101,000 & above

40. What is your level of rubber output in the last one year?----------kg

41. What is your income level in the last one year from rubber? N----------

SECTION D: Constraints faced by smallholder rubber farmers before and after RRIN intervention

S/N	Constraints	Yes	No	Before	After
42	Inadequate Credit				
43	High Cost/Inadequate Farm Inputs				
44	Pest/diseases interference				
45	Shortage of labour				
46	Fall in prices of rubber				
47	Unavailability of improved Planting Materials				
48	High cost of Labour				
49	Poor/Inadequate Information on Rubber technology				
50	Poor/Lack of market information				
51	Inadequate Land				
52	COVID 19				
53	Others				

APPENDIX C

AN INTERVIEW GUIDE FOR KEY STAFF OF RRIN WORKING CLOSELEY WITH RUBBER FARMERS IN EDO AND DELTA STATES.

Topic:AnAssessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria on rural rubber farmers in Edo and Delta states.

Department of Sociology and Anthropology,
University of Benin, Benin –City,
Edo State, Nigeria.
22nd November, 2022

Good day sir/ma,

This is an interview guide for a research on "An Assessment of the socio-economic empowerment intervention of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in Edo and Delta States. The general goal of this study is to find out the socio-economic intervention empowerment efforts of Rubber Research Institute of Nigeria (RRIN) on rural rubber farmers in these states. Other specific objectives are to: examine the socio-economic status of small-holder rubber farmers, determine the effect of the vocational trainings by RRIN on rubber cultivation skills of the small holder rubber farmers, ascertain if the improved rubber seedlings provided by RRIN has enhanced the yield of the small holder farmer in rubber production, examine the effect of some of the RRIN new rubber based technology on the income status of the small holder rubber farmers and to identify the constraints of small holder rubber farmers in rubber production in these State.

You are among those selected for the research interview .Your responses will assist in meeting the goal of this research and it is therefore requested.

While, I ask for your responses to the items on this interview, i promise that information supplied will be kept confidential, and for the purpose of the research only.

Thank you sir/ma,

Yours Sincerely,
.....
Evelyn Musa.

Interview Guide

1a. What are the challenges of rubber farmers in rubber production before RRIN empowerment intervention?

b. What are the measures taken by RRIN to overcome these challenges?

c. What are still the major challenges of rubber farmers in rubber production after RRIN empowerment intervention?

3. What are the technologies developed by RRIN and what is the farmers level of adoption of these technologies developed by RRIN?

4. Are the rubber farmers yield enhanced by the improved clones developed by RRIN?

5. Discuss the major sources farmers can derive income from before gestation period of rubber is over?

6. How has the RRIN vocational training programs impacted on the rubber cultivation skills of the small holder rubber farmers?

7. Has the improved rubber seedlings provided by RRIN enhanced the yield of the small holder farmer in rubber production?

8. What is the effect of some of the RRIN new rubber based technology on the income status of the small holder rubber farmers?