LABOUR UTILISATION AND PRODUCTIVITY IN COCOA PRODUCTION IN ONDO STATE, NIGERIA

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ABSTRACT

The current estimation of the Nigerian population claimed that the rural sector harbours over 75 per cent of Nigeria's population, yet it is most unlikely that labour supply distribution is in favour of the farm sector. Nevertheless, the cocoa export requirement for the nation's foreign earnings anchors very auspiciously on human labour productivity which makes labour-use pattern and productivity of serious consideration. This study empirically examined labour utilization and productivity in the cocoa sector of Ondo State. Primary and secondary data were used for the study. Two hundred cocoa beans farmers were randomly selected for the study across the study area. Descriptive statistics, costs and returns analysis, income expenditure ratio, stochastic labour input use requirement cost frontier function were applied in the empirical analysis. The generalized likelihood ratio test and the student t-test were used to test the working hypotheses.

The study revealed mean age of the farmers as 56 years implying that an average farmer is physically active. Given the gender disparity, there was a little female participation in producing cocoa while 73.0 per cent of the farmers were males. An average farmer has spent 26 years in cocoa production. It was observed that 55.0 percent of the farmers have large family size of 5 to 8 members thus, capable of meeting immediate labour requirements. Average age of cocoa farms of 24 years indicates marginal diminishing returns to labour. Farmers travel average of 11.3 kilometers, no close proximity of farms from farmers' settlements.

Empirical results shows that to augment the traditional source of farm labour (family labour), sharecropper labour was the major labour-type significantly utilised (67.0 percent) by the farmers. Adult male labour was responsible for the largest proportion of labour utilized averaging about 69.0 per cent in terms of gender categorisation of labour. The cost and returns analysis revealed that cocoa beans production is profitable with gross margin of ₦15,092.00 per hectare and income-expenditure ratio of ₦0.29 for every one naira invested .

The Cobb-Douglas labour input-use requirement (cost) frontier estimates obtained indicated that only 5.5 percent of the sampled farmers are utilizing labour exactly on the labour factor requirement (cost) frontier, while 94.5 percent are cost inefficient in their labour allocations because they overused labour above the minimum cost frontier. The degree of overuse of labour is measured at 4.9 % which indicate by how much cocoa farmers exceeds the percentage of labour efficiency in the cost frontier. None of the farmers allocated farm labour below the minimum cost efficiency frontier since no farmer has labour-use allocative efficiency index of less than unity.

The coefficients of the parameters estimated from the input-use requirement (cost) function using stochastic labour use frontier observes that real value added of raw cocoa produced (₦), expenditures on labour use (₦) and expenses on agrochemicals sprayed (₦) have *a priori* positive signs and are statistically significant at 5 per cent level. As unit price of raw cocoa and input prices are being increased, there would be increase in (cost) labour demand to meet the labour use requirement resulted thereof.

The coefficient of determinant of inefficient labour allocation is positive for age of farmers and highly significant at the 5.0 % level. This is the most important policy variable for efficient labour (cost) allocation among the cocoa farmers in the study area.

CERTIFICATION

I certify that MR AWOLALA, DAVID OLUFEMI of the Department of Agricultural Economics and Extension, Federal University of Technology Akure, Ondo State, Nigeria did carry out this research work under my supervision.

..... 04/10/06

Igbekele A. Ajibefun (Ph. D)
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Date

DEDICATION

This project is dedicated with humility to the greatest epitome of love, JEHOVAH, who has being my fortress, infusing strength unto me. I also dedicated this work to my cherished parents Mr. Lawrence A. and Mrs. Comfort O. Awolala who have being my motivators.

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1.0 INTRODUCTION

1.1 Overview of the Nigerian agricultural sector

Nigeria is the most populous country in the Sub-Sahara Africa (SSA) with a population of 125 million or about one-fifth of the total population of the region. Nigeria is also an oil exporter and the second largest economy in SSA with a GDP of $55.5 billion in 2003. With its richly endowed human and natural resources, Nigeria has the potential to build a prosperous economy and provide for the basic needs of all of the population but today Nigeria is among the poorest countries in the world. GNP per capita, at about $320 is below the level at independence forty years ago and below the $370 gained by 1985. About 70 per cent of the populations live on less than $1 a day and 90 per cent of the populations live on less than $2 a day (Ukeje, 2004).

Agriculture is the largest sector in the economy accounting for nearly 40 per cent of Gross Domestic Product (GDP) and a source of wage employment for almost 67 percent of the workforce in Nigeria. The slow growth of agriculture and food production has resulted in growing food imports and food insecurity. Households spend up to 70 per cent of their income on food and yet nearly 50 per cent of the children below 5 years are malnourished (Adekanye, 1988).

Classified by the World Bank as a low-income economy, Nigeria had an estimated population of about 71 million persons with an annual growth rate of 3 per cent in 1980. Approximately 27 per cent of the population lives in the urban in 1980 and the statistics increased to 43 per cent in 1999, indicating rural–urban drift. In terms of agricultural exports, Cocoa remains the most important in terms of foreign exchange earnings. Annual production reached a peak of 303 thousand tonnes in the early 70's and declined thereafter until 1985. Annual production has remained relatively constant in the last 10 years, fluctuating between 130 and 160 thousand tonnes, and production is almost exclusively on small, family-owned farms (World Bank Development Report, 2001).

In spite of government massive investment in agriculture during the period 1970–1985 the performance of the sector was undermined by the two bouts of drought experienced during the period and the disincentives created by the macroeconomic environment. As a result of the decline in agricultural output, domestic food supply had to be augmented with large imports. Food imports accounted for 15.3 per cent of total imports and 1.6 per cent of GDP. The performance of the agricultural sector under SAP was the best during the period under review. The data available indicates that there has been little increase in agricultural productivity from 1976-2002 (Ukeje, 2004).

These trends have serious implications for the economy and livelihoods in Nigeria. These outcomes reflect the limited quality and quantity of inputs utilizations in agricultural production. The major problems militating against agricultural production such as exports in Nigeria have been identified as inefficient use of available material and human inputs. Production has not been lifted beyond the small capacity-utilized resource level. It has failed to meet up with the excellent performance of the mechanized scale of productivity of the developed countries of the world despite the huge engagements of labour in Nigeria.

It becomes imperative therefore to examine the pattern of labour utilizations and productivity in cocoa production in the hands of the smallholder farmers who characterized the largest percentage of the Nigerian cocoa sector.

1.2 Historical development of cocoa in Nigeria

1.2.1 Origin of cocoa

Cocoa originated from South America and in ancient times spread to Central America where it was needed to prepare a chocolate drink. It was also a form of currency for trading purposes and for payment of tribute to the king. In the 16th century, Spanish began large-scale cultivation of cocoa in Central America which later spread to the French, British, and South-West Indies countries of Jamaica Martinique and Suriname in the 17th century and to Brazil in 18th century. From Brazil it was taken to Sao-Tome and Fernando Po (now part of equatorial guinea) in 1840; and from there to other parts of West Africa, notably Ghana, Nigeria and Ivory Coast. Late Chief Squiss Ibaningo introduced cocoa into Nigeria from Fernando Po in 1874. He planted his cocoa seed at Opobo in River State - passing through the Agege Botanic garden from Opobo enroute Moor Plantation, Ibadan. Cocoa entered its first phase of convenient cultivation in 1902 around Ibadan.

The first export of cocoa beans from Nigeria into the international market was in 1910 with about 3,000 metric tonnes consignments. The highest annual cocoa beans production in Nigeria was 307,000 metric tonnes during the 1970/71 cocoa seasons. This production encourages the World Bank to extend its loan for cocoa development in Nigeria in 1972. The money was invested as part of the fund used for the establishment of the Cocoa Development Unit (CDU) in 1972. The export figures are briefly shown below in Table 1.

Table 1. Distribution of the cocoa production and export data: selected years ("000 metric tonnes)

Year	1910	1930	1950	1970	1971	1990	1997
Cocoa production	n.a	n.a	n.a	304.80	256.60	244.00	157.00
Cocoa export	3.00	53.00	102.00	196.00	307.00	160.00	120.00

Source: National cocoa development committee, 2005.

n.a - not available.

Given the above data, annual production rose gradually from 3,000 tonnes in 1910 to 307,000 tonnes in 1970/72 season except during the two World Wars in 1914-1918 and 1939-1945. It was noticed that beginning with 1970, only half of the estimated metric tonnes produced were exported in that year. The difference was likely due to the fluctuations in the world market prices that may not be favourable, there were some local small scale consumptions in the processing of certain by-products such as soap, cream, wine, local beverages and food, animal feeds etc. This decline in the production-export ratio continues till 1997 as shown in Table 1. However, annual production began to full from 1985/86 seasons which were attributed to the advent of the petroleum sector which led to the neglect of agriculture, non-availability and non-affordability of cocoa production inputs. On privatization of cocoa trade in 1986, prices paid to farmers for their high quality cocoa beans improved. Recorded production for 1997 was 120,000 metric tonnes. Cocoa farmers in a bid to make excess profit embarked on adulteration of quality cocoa beans with poor quality beans. This retarded demand for Nigeria cocoa which hitherto had been rated premium quality cocoa in the international market (NCDC, 2005).

1.2.2 Introduction of cocoa and the Nigerian economy

Cocoa (*Theobroma cacao*) is a major economic tree crop of the tropical forest, notably in the West Africa where foreign earning from its export form the significant part of the Sub-continent's economy (Mayhew and Perry, 1988).

This crop of Latin American origin had dictated the economic and political fate of many countries of the world of which Brazil, Costa Rica, Cote d'Ivoire, Trinidad, Ghana and Nigeria are prominent. Thus, cocoa has become an international crop. A major primary product derived from the cocoa beans is chocolate. It has been a very important beverage on meal tables for most households in the Americas, the Asia, Europe and Africa. However, most of the producing countries of raw

cocoa beans consume between range of 5-10 per cent of the commodity compared with the importing countries of the developed world (ICCO, 1994).

This all-important tree crop was introduced into Nigeria in the late 19th century. It has become the largest single source of foreign exchange earnings until the emergence of Petroleum which eventually relegated the economic tree crop to the second place in the Nigeria economy. The dawn of further challenges in cocoa beans production and its exports emerged.

Nigeria was the world second largest cocoa producer in the 60's with an average production between 250,000 to 308,000 metric tonnes for export each year given rise to nearly 50 percent of the Nigeria's revenue at the time. The eminence role of cocoa in the Nigeria economy dated back to the pre-Colonial era is indicated in Table 1. Not long, there was a dramatic downward trend in cocoa production in 1971 such that the dominion of the nation's export market declined to 216,000 metric tonnes in 1976, 150,000 metric tonnes in 1983 and 120,000 metric tonnes in 1986. Eventually, Nigeria's market share of the world cocoa trade reduced to about 6 per cent till date. Nigeria, once a strong competitor of the world cocoa market is now ranked the fifth largest producer of raw cocoa beans in the world as shown in Table 2.

Table 2. World production of raw cocoa in the major producing countries: 1993-2003 (metric tonnes).

Countries/ Year	Cote d'Ivoire	Ghana	Indonesia	Brazil	Nigeria	Cameroon	Malaysia	Ecuador	Other Countries	World Total
1993	697.00	312.00	234.00	304.00	130.00	99.00	190.00	70.00	295.00	2360.00
1994	883.00	255.00	251.00	276.00	142.00	97.00	204.00	79.00	282.00	2469.00
1995	862.00	310.00	238.00	215.00	144.00	107.00	120.00	83.00	271.00	2352.00
1996	1265.00	404.00	284.00	222.00	163.00	117.00	116.00	103.00	265.00	2939.00
1997	1130.00	323.00	327.00	193.00	157.00	121.00	102.00	101.00	265.00	2709.00
1998	1113.00	409.00	331.00	173.00	165.00	114.00	57.00	30.00	263.00	2655.00
1999	1197.00	398.00	393.00	138.00	198.00	121.00	79.00	75.00	230.00	2829.00
2000	1412.00	435.00	412.00	124.00	168.00	112.00	39.00	95.00	305.00	3027.00
2001	1175.00	396.00	408.00	152.00	186.00	125.00	35.00	84.60	263.60	2825.20
2002	1264.70	340.60	455.00	123.60	185.00	131.00	25.00	80.70	255.60	2861.20
2003	1320.00	497.00	425.00	162.60	165.00	145.00	40.00	88.70	270.70	3114.00
Average	1222.10	399.27	400.00	189.00	162.40	129.50	57.60	83.20	265.80	2865.30
%	42.60	13.80	14.00	6.50	5.60	4.50	2.00	3.00	8.00	100

Source: Derived from cocoa producers' alliance extra ordinary general assembly report. June 5-7:2002
Quarterly bulletin of cocoa statistics. Vol. XXX No.1, cocoa year 2003/04.
Percentages derived from ratio of individual country figures to the world total.

An in-depth review of the share of individual producing country as a percentage of world total production revealed a great disparity among the producing nations. Table 3 shows this wide variation in the production of raw cocoa among major producers in the world. In 1993, Cote d'Ivoire which was the highest producer was 26.56% far ahead of Ecuador, the least producer in that same year. In 1998, the margin difference was found to be widened as Cote d'Ivoire was still ahead of Ecuador by 40.79%. Malaysia was the least producer of raw cocoa recording 1.28% of the world production in 2003.

Nigeria's share of the world raw cocoa total production has been fluctuating over the years. No significant improvement has been made to distinguish itself as a major producing country in the world. In 1993 through 1995, there was a persistent rise in the percentage of the nation's share to world raw cocoa aggregates. However, in 1996, there was 0.57% decline in Nigeria's share of cocoa production. The fluctuations continue until 2001 when another decline was recorded till 2003.

Cocoa production in Nigeria has not been impressive compared with her leading African counterpart Cote d'Ivoire which maintains its position as the leading world producer of cocoa in the world. This necessitates a careful study to determine the factors responsible for the decline in the level of productivity of cocoa farmers, their pattern of labour-use in their operations and determine the magnitude of the profitability in Ondo State, one of the leading cocoa beans producing States in Nigeria.

Table 3: Production of raw cocoa by major producing countries as a percentage of world annual total: 1993-2003.

Countries/ Year	Cote d'Ivoire	Ghana	Indonesia	Brazil	Nigeria	Cameroon	Malaysia	Ecuador	Other Countries
1993	29.53	13.22	9.92	12.88	5.51	4.19	8.05	2.97	12.50
1994	35.76	10.33	10.17	11.18	5.75	3.93	8.26	3.20	11.42
1995	36.65	13.18	10.12	9.14	6.12	4.55	5.10	3.53	11.52
1996	43.04	13.75	9.66	7.55	5.55	3.98	3.95	3.50	9.02
1997	41.71	11.92	12.07	7.12	5.80	4.47	3.77	3.73	9.78
1998	41.92	15.40	12.47	6.52	6.21	4.29	2.15	1.13	9.91
1999	42.31	14.07	13.89	4.88	7.00	4.28	2.79	2.65	8.13
2000	46.65	14.37	13.61	4.10	5.55	3.70	1.29	3.14	10.08
2001	41.59	14.02	14.44	5.38	6.58	4.42	1.24	2.99	9.33
2002	44.20	11.90	15.90	4.32	6.47	4.58	0.87	2.82	8.93
2003	42.39	15.96	13.65	5.22	5.30	4.66	1.28	2.85	8.69

Source: Computed by the author from cocoa producers' alliance extra ordinary general assembly report. June 5-7:2002 . Quarterly bulletin of cocoa statistics. Vol. XXX No.1, cocoa year 2003/04.

Despite, the reduction of trade in the world market, cocoa continues to retain its image as a means of foreign earnings to the nation and livelihood to millions of Nigerians. Cocoa tree holds substantial promise, virtually all the parts of cocoa fruits are of economic importance including the pod, husk and mucilage, the bean testa and even spoilt discarded beans. Cocoa beans especially notably favoured and it is of diverse use to different people. To the farmer, it is an important income generating tree crop primarily for the household financial upkeep. To the processor, the raw material produces a number of consumables for profit maximization while to the researcher, his concern is to ensure a continued existence of better yielding varieties from time to time to enhance good performance. Cocoa is a promising tree crop but not without challenges. Cocoa is still the major agricultural commodity export of the nation despite its declined contribution to the total national export earnings during the past two decades. It remains the Nigeria's biggest agricultural export crop till now (ICCO, 1999).

Cocoa is only superceded by the enormity of foreign exchange earnings of petroleum. Cocoa beans now exported to 19 countries is contributing about 28.0 percent into the nation's economy second only to crude oil. Thus, Nigeria is one of the leading world exporters of raw cocoa beans. Imoudu (1995) confirmed that cocoa is one of the major foreign exchange earners to the country and it has contributed immensely in improving the revenue generation of the producing states especially in the Southwestern Nigeria. In Ondo State, one of the leading producing states in Nigeria, an average production rate of 46.17 percent of the total national cocoa production has been maintained between 1980 and 2003 as indicated in Table 4.

Table 4. Cocoa production in Ondo State as percentage of Nigeria aggregate: 1980-2003

Year	Nigeria aggregate production (tonnes)	Ondo State production (tonnes)	% Share of Ondo State in Nigeria aggregate production
1980	170000	74595	43.9
1981	150000	69595	46.4
1982	156000	95193	61.0
1983	183000	91790	50.2
1984	156000	96941	62.1
1985	115000	88748	77.2
1986	151000	68347	45.3
1987	120000	57705	48.1
1988	100000	72584	72.6
1989	145000	110457	76.2
1990	160000	71214	44.5
1991	155000	72173	46.6
1992	160000	81276	50.8
1993	110000	51620	46.9
1994	140000	78649	56.2
1995	140000	69525	49.7
1996	150000	54749	36.5
1997	157000	43898	29.3
1998	150000	41181	27.5
1999	148000	28817	19.5
2000	153000	31154	20.4
2001	148000	45875	31.0
2002	185000	54218	29.3
2003	165000	64906	39.3
Average	166813	68531	46.2

Source: Ministry of agriculture and rural development, Ondo State, 2004
Quarterly bulletin of cocoa statistics Vol. XXX No.1, cocoa year 2003/04.

The annual revenue accruing to the State's account each year is further shown in Table 5.

Table 5. Annual revenue accruing to Ondo State government account: 1980-2003

Year	Cocoa graded in Ondo State (tonnes)	Revenue from grading (₦' Million)
1980	74595.00	1.04
1981	69595.00	1.43
1982	95193.00	1.38
1983	91790.00	1.34
1984	96941.00	1.77
1985	88748.00	1.37
1986	68347.00	9.76
1987	57705.00	32.67
1988	72584.00	59.13
1989	110457.00	39.16
1990	71214.00	38.26
1991	72173.00	43.49
1992	81276.00	28.33
1993	51620.00	42.07
1994	78649.00	79.79
1995	69525.00	117.67
1996	54749.00	109.94
1997	43898.50	110.58
1998	41181.50	56.25
1999	28817.00	94.20
2000	31154.50	83.23
2001	45875.00	151.30
2002	54218.50	180.42
2003	64906.00	209.65

Source: Ministry of agriculture and rural development, Ondo State, 2004.

At present, cocoa is grown in commercial quantity in 14 States in Nigeria namely Ondo, Edo, Ekiti, Osun, Ogun, Delta, Oyo, Cross River, and Akwa Ibom States also substantial quantities are also grown in Abia, Taraba, Adamawa, Kogi and Kwara States (NCDC, 2005).

Cocoa has brought development fortune to the rural areas, roads and bridges have been constructed to the farmsteads where the raw beans are being sourced. The health and educational needs of the farmers and their families have also been given priority. Cocoa production has been a significant employer of labour, it has provide employment to the farmers, merchants and the landless farmers across several boundaries ranging from adults to the youths and between genders in the Southwestern Nigeria.

1.3 The structure of agricultural production in Nigeria

1.3.1 Characteristics of Nigerian agricultural sector

Nigeria is the most populous country in Africa with a total population of about 125 million. Although, Nigeria does not have the highest proportion of urban population in sub-Saharan Africa (in several of the countries of francophone Central Africa, for example, close to 50 per cent of the population lives in the major city or cities) nevertheless, Nigeria has more large cities and the highest total urban population of any Sub-Saharan African country. The vast increase in food demand generated by the growth of cities and expansion of transport system were amongst the major driving forces of agricultural production and modernization through the 1990s. It plays important role in reducing pressures on scarce land and rural environmental resources. Migration from the rural areas to urban centres is a common livelihood activity which remains a continuing social process (DFID, 2004).

Despite the dramatic pace of urbanization, the incidence of poverty remains higher in rural than urban areas - poverty rates were estimated in 1995 at 51 per cent in rural areas and 37 per cent in urban areas. Per caput incomes in towns and cities are roughly a third higher than in rural areas. Wage differentials alone do not fully explain the reasons for migration to urban areas. Another major

factor has been the neglect of infrastructure in rural areas. Many people have moved to urban areas for better economic or educational opportunities due to inadequacies of markets, good transportation facilities, schools, and health facilities. Projections suggest that the number of people living in Nigeria's towns and cities will reach 100 million by 2020 (DFID, 2004).

Although young males are the predominant category of rural-urban migrants but also young females now increasingly join this movement to take advantage of greater educational and occupational opportunities in the cities thereby leaving the rural areas in which migrants now occupies with a demographically unbalanced population of women, younger children and older people.

Improvement of country's road networks has been important in stimulating the scale of seasonal labour migration. For example, it has become feasible for Hausa and other northern workers to come south to work as hired labour in the cocoa belt and elsewhere at the onset of the rains and later return to their home villages in time to plant their own crops. In the 1960s and 1970s, many of the youth moved from the middle belt to the booming cocoa producing areas and cities in the north. On their return, they set up non-farm activities, with farming remaining a secondary activity – migration took people out of household farm labour and out of the farm (Yunusa, 1999).

More than 70 per cent of the working adult populations of Nigeria are employed in the agricultural sector directly and indirectly. Small farm-holders, account for about 81 per cent of total farm holdings. They are usually subsistent farmers lacking in capital and in modern techniques of farming. They are constrained by many problems including those of poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and environmental degradation, and inadequate research and extension services. Only 10 per cent of agricultural production is further processed industrially in Nigeria. Energy and water shortages, credit constraints, poor knowledge of potential markets, and transport problems are important infrastructure impediments to increasing this share.

Agricultural labour was traditionally specified by gender, men had certain tasks and women had others, although the specific divisions varied by culture and ethnic group. As working age men have left the rural areas, the resulting labour gap has normally been met by others, usually wives or children, or by hired labour. In other cases, the tasks have been modified or not performed. The departure of men has helped to generate a lively market for rural wage labour. In many areas, male and female labourers are commonly hired to perform agricultural tasks such as land preparation, weeding, and harvesting, which in the past were done either by household labour or traditional work parties. In turn, the growth in demand for hired labour has fostered an increase of seasonal and longer-term intra-rural migration.

In the remote areas, however, finding hired workers is often difficult. The absence of men has led to neglect of such tasks as land clearing and heavy work that are generally performed. It has been found that, in forest areas from which there has been much male migration, thickly overgrown land that has been left as fallow for extended periods is often not cleared for cultivation, and instead, the same areas of land are used repeatedly, leading to rapid declines in soil fertility and yields. As a result, land degradation has occurred in these low-density areas (DFID, 2004).

Eventually, the structure of Nigerian agricultural sector and methods of production have remained the same since independence more that four decades ago. The farming population comprises predominantly smallholder, subsistence peasants farming on average, about two hectares of land and usually on scattered holdings. Farming activities are also carried out mainly with traditional, rudimentary technology consisting mainly of hoe and cutlass. Since agricultural production is mainly rain fed in Nigeria, the farming systems had largely depended on the broad ecological zones resulting from the disparity in the intensity of rainfall. In response to these constraints, different farming systems have been identified in Nigeria based on vegetation types and land use practices. Different cropping patterns have also been identified within these farming systems.

1.4 Problem statement

The seasonal relationship between the periodical changes in labour use patterns and different labour operations meant to be timely-performed exert a limit to the proportion of household labour that can be depended upon. Several farming operations are rainfall dependent in Nigeria, which especially enjoys both dry and wet seasonal changes. Nearly all farm work is concentrated in the wet season. A slight delay will be costly particularly at very short wet season. At such times, a peak is attained in the demand for labour in a most alarming manner. Labour supply becomes the conspicuously scarce factor of production.

Therefore, extent to which the stock of labour is utilized in farm employment is viewed as a function of the net utility derived from the returns to that labour and the disutility of the loss of expenditures of time on non-farm activities at such periods.

The responsiveness of the labour supply in the farming communities to further opportunities for profitable employment alternatives in the industrial sector poses obstacles to the extended use of labour in agricultural production. It is the nature of the small farmers' responses to the rural labour shortages that reveal their values and constraints to which they feel subjected (Cleave, 1974)

Good knowledge of the characteristics of the farming households is quite important in the study of labour use pattern and productivity. Certain households' characteristics influence the average level of technical efficiency of the farming families. Better educated, young and resource rich farmers tend to be more dynamic and productive than old, poorly educated and resource scare farmers. This situation has been traced to the smallholder nature of Nigerian agriculture where timely and appropriate decisions are required to achieve optimum output and returns to farming, factors influencing the level of efficiency of every farmer (NISER, 1999).

A serious threat to smallholder agriculture has also been linked with rural labour wages and employment in traditional agriculture. Productivity is determined by consumption in the first place, but in turn, consumption is a function of the worker's wage. Workers with very low wages may not

be nutritionally fit, with the physical strength and stamina that could enhance higher productivity. Consequently, the link between rural labour wages and productivity has thrown small farmers into confusion in determining the efficiency wage (Basu, 1994).

Of serious concern is the variation in the gender dimension of labour utilization on how wages are assigned and valued for men and women. Women's labour tends to be undervalued because of perceived low opportunity cost of their time. They are usually expected to perform a conjugal responsibility in the family, again drafted to the farm as part of a normal domestic activity (FAO, 1999). Following the UN submits on Women's Development, a wave of women empowerment programmes has reengineered women's participation on economic preoccupations which have yielded changes in the traditional pattern of gender responsibility on labour utilization pattern and the productivity of labour as more females are entering into the agricultural wages markets (NISER, 1999).

A very important fact emerging from the foregoing is that smallholder farming in Ondo State has not been impressive. Hence, to enhance sustainable production and earnings, the labour use pattern and productivity need to be examined to assess the performance of cocoa beans production in Ondo State.

1.5 Justification for the study

Labour has been identified as the most important factor of production in agriculture. The cost and timeliness of labour are very crucial to efficient farming operations and yield optimality. It is never a doubt, therefore, that human labour is about the only form of farm labour supply to the smallholder farmers in agricultural production in Nigeria. Smallholding farming has significantly contributed over 85 per cent of the total domestic agricultural output. It becomes true that human labour mainly accounts for the domestic food supplies in Ondo State, Nigeria.

Nigeria's agricultural system is labour-intensive rather than capital-intensive. At present there are no indications that cocoa farming will be mechanized in Ondo State in the foreseeable future. Therefore, the hope to continue to maintain the export requirement for the nation's foreign earnings anchors very auspiciously on human labour productivity. This assertion does not just underscore the importance of human labour in small scale farming system. It goes further to elicit concern and research interest in issues that affect farm labour use pattern and productivity in Ondo State.

The rural population of Nigeria has been estimated to be accounted for as much as 75 per cent of the total population in the Late 1970's, within the same period the sector accounted for only 57 per cent of the nation's total labour force. Worse still, the rural farm population constituted only 16 percent of total active labour force in Nigeria. Granted that much less percentage of the economically active population is employed in agriculture in developed economics, it is sad that Nigeria's agricultural system is still human labour intensive.

Various studies on farm labour supply and utilization confirm that human labour on the farm is not homogenous and job contents differ. The studies also confirmed that separate wage rates obtain for the labour categories. Hence it is difficult for the small farmers to determine the marginal productivity of labour utilized and how efficient their technical allocation of economic inputs (Nweke, 1980; King, 1992)

Commentators on farm labour supply have observed that the total supply of labour depends on some socio-economic and institutional factors. Empirical evidence and even *a priori* observation have shown an apparent skew of available farm labour force to comprise mostly old people to the exclusion of the young within the active working age. This has been attributed to farm drudgery, malfunctioning of social infrastructures at the rural level, poor farm incomes and the low life expectancy in rural societies. As a result, young ones with the requisite education to cope with the challenges of modernizing food crops production are compelled to opt out to the modern sectors in search of better economic opportunities and improved standard of living. This trend has not helped

labour productivity since farming is now left with few energetic young men who reside in villages perhaps only due to unavoidable circumstances (Adebayo, 1999).

Although present estimations of the Nigerian population indicate that the rural sector still harbours over 75 per cent of Nigeria's total population, yet it is most unlikely that labour supply distribution is in favour of the farm sector. This study therefore focused on the labour use pattern and its productivity in smallholding agricultural practices in Ondo State. The responsiveness of farm labour supply to profitable employment alternatives in other sector, the need to optimize labour in the farm, as well as the role of exogenous factors determining labour-use efficiency make labour the most crucial limiting factor in smallholder agriculture. These constraints to labour-use by technical, seasonal and socio-economic requirements of farm operations inhibiting labour productivity further stressed a detailed analysis of this study.

1.6 Objectives of the study

The main objective of this study is to analyze the pattern of labour utilization and productivity in smallholder cocoa production in Ondo State, Nigeria. The specific objectives are to:

i. identify the socioeconomic characteristics of the cocoa farmers in the study area.
ii. examine the pattern of labour-use among the cocoa farmers.
iii. estimate the profitability of cocoa beans production in the study area
iv. determine labour-use efficiency for the cocoa farmers in the study area.
v. analyse the determinants of inefficient labour-use in the cocoa sector of the study area.

1.7 Hypotheses for the study

The working hypotheses for the study are that:

H_{o1}: labour-use efficiency indices of the farmers are not affected by their socioeconomic characteristics.

H_{o2}: there is no efficiency differential between households heavily dependent on hired labour and those heavily dependent on family labour in the study area.

CHAPTER TWO

2.0 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Concepts and measurements of productivity

Productivity has been a key issue for agricultural development strategies for many years because of its impact on economic and social development. It is generally believed that the surest means through which mankind can raise itself out of poverty to a condition of relative material affluence is by increasing productivity. Productivity improvement creates the wealth that can be used to meet present needs and for investments to better meet the needs of the future.

Productivity in its broad sense is a measure of how efficient and effective resources are used as inputs to produce products and services needed by the society in the long run. It is the rate of flow of output when compared with rates of flow of resources used in producing the output of goods and services. In financial terms, productivity is the value of output divided by the cost of inputs used in a given period. The basic resource inputs consist of labour, capital and natural resources (Burggraf, 1984). Since resource inputs seldom grow much faster than population, obviously the main source of increase of output per capita is through the growth in productivity.

There is a direct relationship therefore between individual resource productivity and nation building, because improvement in productivity of each worker or farmer leads to improvement in earnings of investors as well as more financial capital for management, and more revenue for government. Improvement in productivity is the most important factor in attaining growth in the economy and this is more so for agriculture which provide means of livelihood for over 65.0 per cent of the populace through subsistence production which is a predominant feature of agricultural production in Nigeria (Onitiri, 1983).

Productivity measures the relationship between the quantity and quality of goods and services produced and the quantity of resources needed to produce them i.e. factor inputs such as labour, capital and technology (Okojie 1995; Roberts and Tybout, 1997). Mali (1978) defines it thus: "The measure of how resources are being brought together in organizations and utilized for accomplishing a set of results. It is reaching the highest level of performance with the least expenditure of resources".

Productivity is often seen as output per unit of input. Hence, higher productivity connotes achieving the same volume of output with less factor inputs or more volume of output with the same amount of factor inputs. Thus, increased productivity could result from the reduction in the use of resources, reduction in cost, use of better methods or improvement in factor capabilities, particularly labour.

2.1.2 Definitions of productivity

Within a broad framework, it is possible to have different interpretations or perceptions of productivity. To some scholars, Productivity means the ability to accomplish some specified objectives irrespective of the quantum of resources used. This is often referred to as output-centered productivity. To another class of people, productivity will be synonymous with the ability to allocate resources judiciously and to avoid waste. This represents the cost-oriented concept of productivity. The latter class of adherents stress cost-consciousness and in most cases look out for opportunities to insist on budget ceilings. This cost-oriented conception of productivity is a sharp contrast to the output-centered type. While the former stresses the need for economic use of resources, the latter put emphasis on the achievement of objectives. The output-centered argument is based upon the premise that the conservation of resources amounts to creating a false economy especially when the basic objectives of an economy or establishment are yet to be achieved (Burggraf, 1984).

Adam Smith was of the opinion that division of labour was the basis of efficiency and productivity while Sangha (1964) the French Physiocrats believed that surplus resulted only from agriculture when labour is utilised. He stated that the same amount of labour if utilised in the manufacturing sector could not yield surplus. What is now regarded as productivity was termed production and the rate of production. The term product net was applied to the difference between the gross output from agriculture and the cost of producing it, including the subsistence of the cultivators.

For conceptual or analytical simplification, the term labour productivity is commonly used to refer to the volume of goods and services produced per worker within some specified period of the year, month, week, day or hour (Prokopenko, 1997). The adoption of this simplified concept do not take cognizance of the fact that labour productivity is a unit resulting from the interdependent contribution of labour and other factors of production. However, the practice of using labour, especially direct labour, as the most common factor in measuring productivity is due partly to the fact that labour inputs and costs can be ascertained and quantified more easily than those of other factors, and partly due to a legacy of classical economic and Marxist thought which not only tend to regard labour as the sole source of value but also tend to regard all forms of indirect labour as 'unproductive' labour (Kasper, 1994).

In most cases average annual yield per hectare does not significantly vary in one country compared with another section in the country. This is explained by the fact that no matter how the land is prepared for planting, the soil has its limitations beyond which production per hectare may not be expected to increase. If, however, output per farm worker or per man-hour expended in producing a given amount of output is calculated, substantial differences in productivity exist among individual countries (Prokopenko, 1997).

Average productivity of a farmer from a developed economy is several times higher than that of his compeers in Nigeria. This difference is traceable largely to technical factor, with the use of a

tractor a farmer could plough almost 100 hectares a day as against about 2 or 3 hectares in Nigeria, where the farmer spends the whole day using simple implements such as cutlasses and hoes (Ojo, 1991).

2.1.3 Measurements of productivity in agriculture

Agricultural productivity is a term widely used but not easily defined. Nonetheless, most economists would agree that the term "agricultural improvement" assumes more than the acceleration of the volume of output but also productivity (Lingard, 1975). Productivity is not production nor is performance. Production and performance are components of productivity efforts, but are different.. The concept of productivity is commonly associated with production because that is where it is most visible, tangible and measurable. This implies that productivity is a combination of effectiveness and efficiency. How well resources are brought together and utilized is indicated by comparing the magnitude and amount of output (effectiveness), with the magnitude and amount of input (efficiency) (Mali, 1978). The ratio thus becomes an index of the definition and measurement of productivity.

$$\text{Productivity index} = \frac{Effectiveness}{Efficiency} \equiv \frac{OutputObtained}{InputExpended}$$

$$Productivity\ index = \frac{(Output/Input)CurrentYear}{(Output/Input)BaseYear} X100$$

Productivity has further been defined as the increased efficiency with which inputs are processed into outputs (Lingard and Rayner, 1975). Although the ideal measure is total factor productivity (TFP) which relates total input to output, the most commonly used measure are partial productivity measure, where changes in an output are related to changes in one factor of production, in most cases to land and labour.

The two variants of productivity measurements cited in the literature: total factor productivity (TFP), otherwise known as multifactor productivity, and partial productivity. Roberts and Tybout (1997) and Tybout (1992), assuming a neo-classical production function at the sectoral or industrial level, define total factor output to be a concave function of the vector of inputs and time (a proxy for shift in technological innovation). To them, the elasticity of output with respect to time is the total factor productivity.

In a more general sense,

TFP = Total output /Weighted average of all inputs

Critical among these factor inputs are labour, capital, raw materials and purchase of spare parts, and other miscellaneous goods and services that serve as inputs in the production process. In a more practical sense, these factor inputs are reduced to the weighted average of labour and capital (Okojie, 1995; Roberts and Tybout, 1997).

The second variant, partial productivity (PP) is defined as:

PP = Total output /Partial input

The partial input could either be labour or capital. This can be measured at the national level, sectoral level, industry or factory level. Existing studies on productivity measurement show a predilection for productivity per labour input. Several reasons have been put forward for the choice of labour as against other factors of production. First, Ilyin and Motyler (1986) view labour as the "means and end of production".

Labour is the only factor that creates value, influences its prices and those of other factors and sets the general level of productivity. Second, it is the most easily quantified factor of production (Okpechi, 1991). And finally, given the low technological base of developing countries' economies, the quest for improved managerial capability and effectiveness should give the human factor appropriate recognition and attention. While labour productivity seems to be the most convenient to use, it is however important to note that this approach has an important limitation. It treats labour as

being homogenous instead of differentiating it according to age, sex, education, and application of skills, aptitude, among others. Nevertheless, this study applies productivity per worker as opposed to per capital or total factor productivity.

There are no serious measurement problems with single crop farms. In such farms, productivity could be determined in physical terms or in value terms. That is, a measure of productivity would simply be the ratio of physical output, e.g. tonnes or hectares of millet, to the total man hours employed in production of that crop (Kendrick, 1977). Similarly, the total value could be used in lieu of the physical measure. If put in simple arithmetic terms:

Productivity = Net output /Effort input

Consequently,

Efficiency of Labour Productivity = Net Output /No. of mandays per unit of Labour

Attempts have been made to estimate labour productivity within the framework of developed time limits referred to as the "working hours" or "mandays" utilised in undertaking food crops production as follows: One manday is the amount of work accomplished by an adult male, working for 8 hours while a woman's labour is measure as two-third of a manday. Similarly, a child under 15 years old is assumed to contribute one-third of a manday (Adegeye, 1982). This estimation of mandays of farm labour is in consonance with the various categories of farm operations including bush clearing, land preparation, planting, weeding and harvesting. This study therefore would estimate labour productivity based on the above measurement.

2.1.4 Efficiency and productivity

The terms of efficiency and productivity are closely related. They are often used interchangeably for convenience. However, they are slightly different. Measurement of productivity and efficiency both involve an assessment of the outputs per unit of input. The difference is that efficiency is measured relative to a frontier which takes account of difference in scale.

Productivity is defined as output per unit of inputs that can be expressed in terms of partial measure such as labour productivity or Total Factor productivity (TFP). Where input prices are added, physical measurements can be converted into measures of unit costs which serves as cost based productivity measures. However, same measure of inputs and outputs are used to measure efficiency, only that the scale of production and other environmental factors affecting production process such as technical change exert influence on efficiency.

Efficiency of a production system or unit means a comparison between observed and optimal value of its output and inputs. The comparison can take the form of the ratio of observed to maximum potential output obtainable from the given inputs or ratio of minimum potential to observed input required to produce the given output or some combination of the two. In these comparisons, the optimum is defined in terms of production possibilities, and efficiency is technical.

The frontier method of measurement has been efficient in measuring the productivity of all factors employed in a given production agricultural process. It has appealing attributes that combine both statistical and econometrical methods of estimating productivity and efficiency of a firm. The frontier measurement classifies agricultural production on the production frontier as efficient while operating below the production frontier is a measure of inefficiency. Therefore, there is the need in this study to determine the labour-use efficiency of the cocoa producers in the study area. The stochastic measure of efficiency is found appropriate for use in estimating the efficiency of cocoa farmers in this study.

In the African setting, several studies have been carried out on the determinants of technical efficiency among farmers. Some efficiency studies in African agriculture include Adesina and Djato (1997); Ajibefun and Abdulkadri (1999); Ajibefun, Battese and Daramola (2002); Ojo and Ajibefun (2000); Weir (1999) and Townsend *et al* (1998).

2.1.5 Labour-use requirement frontier model

This is simply defined as the minimum amount of labour required to produce a given level of output. Labour requirement frontier is the target of every firm. Labour-use efficiency is attained when the actual labour employed is on the labour requirement frontier i.e. $L_i = L_i^*$ where L_i is actual labour used, L_i^* is the labour requirement frontier. Hence, if $L_i > L_i^*$ it implies overuse of labour, termed labour inefficiency.

Two different definitions of optimality or efficiency in the use of labour have been applied by scholars such as Kumbakhar and Hjalmarsson (1997) on labour-use in Swedish social insurance offices, Ncube and Heshmati (1998) on employment in Zimbabawe's manufacturing industries; and Kumbhakar, Heshmati and Hjalmarsson (2002) on labour-use in Swedish banking.

Supposing panel data exist, Masso and Heshmati (2003) expressed the function as:

$$L^*_{it} = f(W_{it}, Y_{it}, Z_{it}, t : \beta) \qquad (1)$$

where L^*_{it} is the labour requirement frontier (optimal), Y_{it} is real value added (output), W_{it} is real wage, Z_{it} is a vector characterizing the production process and the environment (economic policy variables), β are unknown parameters that are associated with determinants of optimal labour-use. Finally, variable t denotes time, by which changes in technology was modeled.

The first approach is the relationship between the actual labour used by firm i at time t (denoted as L_{it}) and the labour requirement function as:

$$L_{it} = L^*_{it}\, e^{uit} \qquad (2)$$

where $u_{it} \geq 0$, u_{it} was interpreted as technical inefficiency. $u_{it} = 0$ will mean that the employer uses labour efficiently i.e. implying that $L_{it} = L^*_{it}$, no inefficiency exist in using labour. The term $e^{uit} = L_{it} / L^*_{it} \geq 1$ measures labour-use inefficiency for u_i and $_i$.

This approach was estimated using standard stochastic function techniques in which distributional assumptions were made on the inefficiency and random error terms. Taking logs, and appending an error term, labour-use can be expressed as:

$$\ln L_{it} = \ln L^*_{it} + v_{it} \qquad (3)$$

where v_{it} is the independently and identically distributed error term with zero mean and constant variance. The labour-use model is specified as a factor input requirement function in which labour is specified to be a function of independent variables. The empirical estimation was based on translog functional from for modeling labour equipments function using a simultaneous maximum likelihood estimation method.

In the second approach, estimation of labour-use efficiency was based on the residual from the labour requirement model (3). Using FRONTIER 4.1 (Coelli, 1996), and considering the residual plus intercept as a dependent variable, a labour requirement stochastic frontier model (see Battese, Heshmati and Hjarlmarsson, 2000) was estimated and efficiency point for each observation computed. The estimable equation then become as:

$$v_{it} = \alpha_0 + u_{it} + w_{it} \qquad (4)$$

where the random error term w_{it}, are assumed to be *i.i.d* normally distributed with $N(0, \sigma^2 w)$ and independent of the inefficiency u_{it}. The latter are non-negative, that is, random variables assumed to account for the inefficiency in labour-use, given the levels of output and the quasi-fixed capital input. They are obtained as truncations at 0 of the $N(m_{it}, \sigma^2 w)$ distribution of v_{it}.

The degree of labour overuse is explained by a time trend, ownership and export orientation:

$$m_{it} = \zeta_0 + \zeta_1 G + \zeta_2 G_{it} + \zeta_3 G_{ib} + \ldots + G_{in} \qquad (5)$$

where G_r are variables affecting the labour-use efficiency and m_{it} is the average of the normal distribution truncated at 0. The lower m_{it}, the higher the labour-use efficiency.

This frontier model based on (4) and (5) treated as an inverted factor requirement model was estimated by the method of maximum likelihood. Thus, overuse of labour is defined as:

$$OL_{it} = \exp(U_{it}) \qquad (6)$$

OL_{it} measure is >1, where the amount of excess to 1 indicates percentage overuse of labour. OL_{it} is estimated by assuming distributional assumptions on the parameters of its distribution.

In this study however, labour alone is assumed to be a flexible, single factor production process in the cocoa beans economy of the study area, this boils down to a labour requirement function (See Pindyck and Rotemberg, 1997). The approach that will be used is sufficiently different from those described earlier. It is a labour input use requirement model derived from stochastic frontier approach of measuring efficiency in which the Cobb-Douglas production function is used for estimation using the maximum likelihood estimation method.

2.2 Literature review

2.2.1 Labour utilization in agricultural production

In the attempt to assess the pattern of labour utilization in smallholder agriculture, it is important to know how labour is currently utilized, what factors influence the level of its utilization and the capacity of these factors to change.

Until recently, discussions on labour utilization in agriculture in the underdeveloped world have centred on the existence or nonexistence of underemployment. The focus was whether labour could be transformed to the industrial sector without shortages emanating. It has become singly obvious that the problem is the future of industry to provide enough employment opportunities, so

interest has swung toward the capacity of agriculture not to spare labour but rather to absorb it (Clark and Haswell, 1970).

Therefore, what is the amount and type of operations performed by the different classes of labour? What are the factors influencing labour-use in smallholding agriculture as a production input?

2.2.2 Labour supply and seasonal distributions

Although there are many regions of high population density in tropical Africa, for the most part, the population is thinly scattered. The economy is ore properly etherized as one of "land surplus" in which adult equivalent labour supply is a limiting factor in production.

Throughout tropical Africa, the amount, duration, and reliability of rainfall, pose the main bottlenecks for the farmers since temperatures are generally high enough to sustain plant growth throughout the year. Hence, the duration of the growing season is closely related to seasonal rainfall but agricultural activities is confined to the wet season, unless water-control systems such as irrigation are available to allow farming to continue throughout the dry season (Swindell, 1985).

Since farming is restricted to the wet season, there is an uneven spread of farm workloads and it is the FLOW not just the STOCK of adult equivalent labour that is of importance. Frequently, the size of farms cultivated is directly related to the labour force available at the peak periods of activity in the cultivation cycle. The problems associated with supply of labour remains a unique crucial importance to the farmers. In essence, the timing of specific agricultural operations can be critical, and need to be performed within short period of time to achieve good yield.

Labour inputs can vary significantly from day to day during the cultivation cycle. The length of working day may depend on whether arduousness or urgency is required. The length of fallow affects labour requirements, where bush has regenerated over a long period of time a correspondingly greater effort is needed during land preparations. Farming operations can be divided

into four basic components namely, land preparations, planting of materials, weeding and finally, harvesting. The jobs are divided between the genders. Land preparations are usually performed by men because of its drudgery and energy requirements, planting of materials is done by both gender, weeding is commonly associated with women while harvesting operations are both shared by the gender (Swindell, 1985).

The complimentary of farm operations between the genders is quite apparent, but the cultivation cycle is usually started by large inputs of male labour during preparation implying that enough men must be available before rains begin to hinder burning. Significantly, of all jobs on the farm, it was the land preparations which employed most hired labour usually provided by local or migrant workers, to augment the farming household labour supply.

2.2.3 Actual time spent on farm operations

Although some scattered data are available, little comparative information in the working hours of African farmers has been published. Measured on an annual basis, the amount of time spent on farm work is relatively small throughout tropical Africa (Clark and Haswell, 1970). According to the analysis of farm surveys undertaken by Cleave (1974), men are said to be devoting less than 1000 hours per year to agricultural work with an average of 1000 hours, compared with 3,000 hours for Egypt and Asia.

These working hours per year on farming by Africans are low by international standards, however, the standards of working time of a full or short working week are transitory and are largely socially determined (Clark and Haswell, 1970). In Africa, the number of hours varies significantly from one farming system to the other. Arid regions have lower inputs because of shorter growing seasons while in the humids land clearing and preparations take up more time (Swindell, 1985).

The traveling to and from the farm also affects a significant part of the working day especially where settlement is concentrated away from farms. Of the Nupe villages of Northern Nigeria surveyed by Baldwin, those in Mokwa District were on average of 3-8 miles from the farms

while those of the neighbouring Kutigi District were 2.4 miles. The average working day (including travels) in these two areas was 8.4 and 7.0 hours respectively. Baldwin explained the difference by the different distances traveled apparently of foot. On the basis of Baldwin observations, an average Mokwa farmer spent 600 hours a year walking to and from his fields. In Kutigi, about 350 hours would have been spent on travel and 650 hours on farms. It is expected that fewer visits to the farm would have been made and longer days spent working by the Mokwa farmer once on the farm. It is however possible that 140-160 days represent the least possible spread of agricultural operations (Clark and Haswell, 1970).

The presence of commercial crops can make significant differences in the amount of hours devoted to farm activities. In the Nile Plains of Uganda, it takes 188 man hours equivalents to produce an acre of cassava, groundnuts and pigeon-peas, compared with 592 hours for cotton. It was further observed that in the same area soil compositions affected labour input utilization. Sweet potatoes grown on the lighter valley soils of the Nile Plains required 352 man hours equivalents per acre compared with 494 on heavier upland soils.

Granted the hours spent on farming by Africans are low by the world standards, one has to bear in mind that fallowing is widespread, man-land ratios are low and the combination of both farm and non-farm activities may be of a different order than Asia or South America. In addition, one of the problems of studying African farming is that many rural small farmers combine farming with petty trading, crafts and domestic industrial work in varying proportions which alter labour supply utilization seasonally from one year to another. Farm and non-farm work are both competing while involving in non-farm activity (Swindell, 1985).

Poorer farmers may have to sell their labour in order to maintain subsistence levels during the "hungry season", period prior to the harvest season when stock of food may be at their lowest ebb or even unavailable (Swindell, 1985). Seasonal variations in non-farm activities are very pronounced and seem to be the norm.

2.2.4 Allocation of agricultural labour by age and gender

The hours spent on farm work by women shows much more variations than men. Cleave (1974) observed that African women spend between 51 and 1,195 hours per year on farming which reflects the relative importance of women as farmers in different regions and gender division of labour among different societies.

The role of women is still crucial in the acceptance and success of new farming practices and crops species because their introduction has repercussions on the allocation of farm labour. Work is about material production and social transactions. The value of work depends on the category of worker who performs it, which may rest upon distinctions of gender, age and skill. The causes of division of labour are not always plain or autonomous, they are located within a complex of social, economic and political relationships. A more common categorization is based on custom, especially the division between male's and female's work (Swindell, 1985).

Throughout the sub-continent Africa, there is a customary gender division of labour according to farming operations and crop-types. It primarily stems from socio-biological distinctions between heavy work and a lighter work. Heavy work such as clearing and land preparations are usually done by men while lighter jobs such as weeding and harvesting are commonly done by women. These natural differences are culturally determined and may undergo sociological transformation to underwrite the dominance of a gender or the other.

Among some Muslims such as the Hausa, Fulani of Northern Nigeria, women are kept in seclusion (Purdah) and contribute less than 5 percent of the total farm labour. Seclusion thus, is a sign of economic status, which changed the patterns of labour supply and gender division of labour. However, in some cases, men have used gender differentials to underwrite their own positions. This seems to be particularly true where new techniques and crops have been introduced which yield cash incomes. Nevertheless, there seems to be a widespread, but not exclusive division of labour, where women cultivate food staples and men, tree crops.

It can be argued therefore that the division of labour is not simply by custom, but arises from necessity as the patterns of farming change new techniques are introduced and household economy becomes restructured to meet new circumstances. The notion that men have traditionally stood outside the workforce in African agriculture is not true. The labour inputs of adult males may be limited in the number of hours, but the timing and effort dispensed say on, land preparations are of crucial importance to a successful food crops farming.

As Guyer (1984) has pointed that women may provide most of the labour for root crops such as cassava, cocoyam etc. while labour supplied by men is important in the cultivation of yam, but jointly combined to cultivate rice, millet and sorghum. The allocation of farm work according to age has not received much attention as the gender division of labour in African societies. This is perhaps, because developed economies oriented observers are accustomed to thinking of children and the elderly as insignificant elements in the economically active part of a population (Schildkrant, 1980).

Thus, labour inputs in agriculture are frequently calculated in terms of adult equivalents. Different values are allotted to men, women, children and the aged. For instance, while index of 1.0 is assigned to men of 15-64 years, 0.5 is assigned to the adult women of same age group. Children of 7-14 years are assigned 0.5 as women above 65 years were assigned same index of 0.5. Division of labour may be associated with gender and age. However, for both genders the arrangement of farm work and the time spent on the farm may strongly be influenced by many exogenous factors such as the level of labour productivity.

2.2.5 Labour demands in southwest Nigerian cocoa systems

In Nigeria, the proportion of households engaging sharecroppers increases with returns. The most likely explanation for this is a higher labour input on a per hectare basis for farms under a sharecropping arrangement and the strong motivation for that labour to maximize output in order to maximize the size of the workers' share. Also a higher use of casual workers among high

productivity farms is common in the Southwestern Nigeria. There is a reduction in salaried labour utilization as the farmer moves up in productivity class. Family labour, specifically child labour, farmer's own labour, and spouse's labour are all frequent with low productivity farmers. Overall, the proportion of households using only family labour arrangements is nearly double the proportion among high yielding producers and the proportion indicating family child labour use declines by more than half from the low to the high productivity class of producers (Gockowski and Oduwole, 2001).

Given the establishment of different labour types used in cocoa production in Nigeria, various types of labour allocations have been observed. (Gockowski and Oduwole, 2001) have identified nine categories of labour type *a priori*:

i. *Personal labour*—the producer's own labour input.

ii. *Extended family labour*—work provided by member's of the producer's extended family.

iii. *Paid casual labour*—defined as workers hired on a piece rate or daily basis to effectuate a particular task.

iv. *Sharecropping*—the supply of labour by a third party in exchange for a share of the harvest proceeds (typically one-third or one-half).

v. *Paid salary labour*—defined as paid workers hired on a semi permanent basis to effectuate multiple tasks associated with the production of cocoa and paid either a monthly salary or a lump sum at the end of harvest.

vi. *Family child labour*—the work contribution by the children residing in the household.

vii. *Paid extended family labour*—defined as paid workers hired on a piece rate, or daily basis who belong to the producers' extended family.

viii. *Spouses' labour*—the work contribution by the household head's spouse.

ix. *Reciprocal labour*—non-monetary labour exchange between the producer and a group of other producers where tasks are undertaken together by the group.

These labour categories have been most employed in the seven major labour tasks associated with cocoa production in Nigeria.

2.2.6 Labour-use requirement in cocoa production

The productivity of a farmer's cocoa production system can potentially influence the choice of labour used. Low levels of productivity through their effect on revenues could constrain the producer's labour options and lead to greater utilization of low cost labour choices.

In cocoa production, certain jobs are crucial to it which has been characterized under different notable labour tasks described as follows:

Clearing /weeding the understorey of the cocoa farm

This is a task usually undertaken twice a year prior to the harvesting season in September/October. The typical practice is to slash the vegetative growth at ground level using a sharpened machete. Depending on the amount of undergrowth, clearing one hectare typically requires between 3 to 7 mandays of labour. An average Nigerian cocoa farmer would require between 28 and 47 mandays of labour for clearing an average farm size of 4.7 ha in Nigeria.

Agrochemical application

The high incidence of cocoa blackpod disease and capsids (plant sucking bugs) obliges the spraying of fungicides and insecticides. It is estimated that one person with a backpack sprayer can apply fungicides/insecticides to approximately 1.0 ha per 6-hour workday, implying that an average 23 mandays application of pesticides would be required six times in a year on cocoa farms.

Harvesting cocoa pods

Harvesting cocoa requires some experience to be able to identify ripe from unripe pods. To produce a marketable cocoa bean (the mean quantity sold per producer) would require harvesting somewhere on the order of 47 000 cocoa pods. Assuming one person can harvest approximately 650

pods per day, a total of 72 person days would be required to harvest the cocoa produced by an average farmer.

Cocoa pod breaking

After the cocoa pods have been harvested they are broken open and the wet beans extracted from the mucilage of the pod prior to fermentation. At a rate of 2000 pods per person-day, a total of 24 mandays would be required.

Cocoa pods transportation

After the wet beans have been separated from the pods, they are then transported usually back to the farmer's concession where they will be fermented and dried. To produce about 1700 kg of dry marketable cocoa beans, it would require transporting approximately 4300 kg of fresh beans. Suppose a person could carry 50 kg of fresh beans per trip, taking 105 minutes per roundtrip, the labour demand for transport is found to be 25 mandays.

Fermentation.

Cocoa beans are usually fermented for 4 to 7 days depending on the interest of the farmer. The process involves mixing the beans every 48 hours.

Sundrying.

It is estimated that the fermentation and drying of about1700 kg marketable size would require 28 mandays of labour.

The above tasks form the bulk of the annual labour demands on a producing cocoa farm. Operating an average of 4.7ha of a cocoa farm and producing a marketable size, the total annual labour demand for the tasks mentioned above is estimated at 219 mandays. About 68 per cent of the total annual labour demand occurs during the harvest season from October to December. Using a coefficient of 125 mandays per tonne of cocoa, the reported production of 180000 tonnes of cocoa in 2001 would have required 22.5 million person days of on-farm labour, representing full time employment for approximately 98000 persons. It is estimated that 16 person days of labour are

required to ferment and dry one tonne (Ministere de la Cooperation Francaise, 1993). Full time employment is here defined as 230 workdays per year.

2.2.7 Intensity of labour-use in the cocoa sector of Nigeria

A major difference between Nigeria and other cocoa producing countries in West Africa is the preeminent position of sharecropper labour. In Cameroon, Côte d'Ivoire and Ghana, while important, sharecropping was never utilized by more than 30 per cent of producers. In Nigeria, it is the most frequently mentioned labour type utilized by 70 per cent of cocoa producers. This is followed in importance by the producers' own labour by 52 per cent of cocoa producers, a much lower value than in the other cocoa producing countries of Africa. Nigeria, with more than one hundred million inhabitants has evolved a cocoa production system unlike any other in West Africa (Gockowski and Oduwole, 2001).

Hired casual labour is another important labor source employed by about 31 per cent of the cocoa producers. Slightly more than one in every four farmers usually employed paid salaried workers but reciprocal labour exchange frequently used in Ghana and Cameroon is of minimal importance in Nigeria.

A task-by-task examination on various types of potentially hazardous activities in cocoa production in Nigeria indicates worst forms of child labour among the cocoa producing households (CPHs) who are employing family children. Heading the list is the drying of cocoa beans. Pods transport was the next most frequently cited activity in which children were employed. Given the long distance between the home and the cocoa plantations, this task could pose serious risks of hernia and other physical injuries if loads are too heavy (ILO, 2001).

The "worst form" concerns with regards to cocoa production are the employment of children for clearing the cocoa plantation and their employment in applying pesticides. One in every 14 cocoa producers has employed family children to clear cocoa farms. This task is most often achieved using

a sharpened machete with a steel blade of approximately 50 cm in length and weighing about 600–700g. Proper handling of machetes is a requisite skill for the slash and burn farming systems of Southern Nigeria. But there are risks. Under the hot and humid conditions common to the Southwestern Nigeria, the perspiration generated by slashing often causes the grip to slip resulting in frequent and serious lacerations. The clearing of cocoa fields using the adolescents for several hours at a time may probably be considered a normal part of the social development process. However, more serious is the prolonged use of younger children in such activity.

One of the concerns about working children is the impact of work on their human development, including the impact on their schooling. The average amount of labour supplied through the employment of family child labour was found to be 311 days among about 14 per cent of the farmers in the Southwestern Nigeria. The proportions of this total reveal that 15–17 year age group supplies the largest part and that girls supply almost an equal amount of labour as boys.

As farm size increases the proportion of households using only family labour and/or reciprocal labour declines significantly among the smallholder class compared with the large class producers. Conversely, the employment of casual, salaried labour, and sharecropping arrangements all increase. These labour types appear to be the preferred means of mobilizing the additional labour required on larger farms.

One of the most striking characteristics of the cocoa sector of the Southwest Nigeria is the high proportion of land that is under sharecropping arrangements. Most farmers operate cocoa farms under such arrangements. The most common tenancy arrangement was a one-third share to the sharecropper, and a two-thirds share to the owner, with the owner responsible for purchased inputs and the sharecropper supplying the required labour. The number of cocoa farms placed under sharecropping arrangements increases with farm size as does the proportion of total farms such that about 62 per cent of farms are sharecropped among the smallholder farmers whereas the proportion is about 75 per cent among large scale producers (Gockowski and Oduwole, 2001).

2.2.8 Child labour in cocoa production

There is a growing concern that some agricultural goods in developed countries markets are being produced under "exploited" forms of labour practices. Children workers are still being exploited in West African cocoa fields such that the intensity of child abuse in many cocoa plantations triggered an international outcry in 2000 and resulted in a US congressional protocol giving US chocolate companies four years to make significant progress to solving the problem. Politicians promised that if this objective was not achieved they would draft laws requiring US chocolate makers to put a "no child slavery" label on their goods after guaranteeing no forced child labour was used (Cartier, 2004). Cocoa is a temperate plant that grows only within 20 degrees of the equator and is susceptible to many diseases. Cote d'Ivoire leads the list of major producers, followed by Ghana, Indonesia and Nigeria. West Africa provides 70 percent of the world's cocoa, grown on family farms less than 5 hectares while there are about 109,000 children working in dangerous conditions in Cote d'Ivoire, the source of 4 percent of the world's cocoa (US State Department, 2003). Peter McAllister of the International Cocoa Initiative said there was no definitive figure on how many children were forced labourers in West Africa.

Of all the regions, Sub-Saharan Africa has the highest child labour rate. The vast majority of these working children are unpaid family workers, involved in agricultural work, predominantly on farms operated by their families (Nkamleu, 2005). The consideration of this thorny issue of child labour is vital to the development of many of African's youngest citizens, who will determine the future of Sub-Saharan Africa and central in the fight against poverty. The most common response to child labour has been to legislate against it (White, 1994; Bonnet, 1993). However, legislation typically covers the formal sector whereas, in the case of Africa, we are mainly dealing with an agricultural

society in which child labour occurs within the household. It was revealed that by far the greatest numbers of children employed on cocoa farms are children leaving in the household, whether family or foster child (IITA, 2002). In particular, there has been persistent report that children are being used in cocoa production in Nigeria.

As Nigeria joins the rest of African countries to observe the year of the African Child for 2004, effort were made to consider the depth of poverty among Nigerian children, and how the poverty of social policy aggravates and deepens poor outcomes for the children. In spite of enormous natural wealth and a congenial geography, Nigerian maintains a place of dishonour among the poorest of nations. More tragically, Nigeria occupies the lowest rung in human capital amongst African poor nations. Poverty, especially amongst children, in Nigeria is a human tragedy. More so, in the context of oil and non- oil wealth generated from the Nigerian soil (Amadi, 2004).

The proportion of children who live persistently in extremely poverty in Nigeria is very substantial. According to the estimate in the "Poverty Profile for Nigeria: 1985-1996", 64.7million people out of a national population estimate of 116 million (as at 1996) were poor. However, the current estimate of poverty in Nigeria is now found to be 70 per cent. There are no exact statistics on the percentage of children who live in extreme and relative poverty. Nevertheless, the household indices of poverty would give an estimate of how many children live in poverty. About 55.7 per cent of Nigerian households live in poverty, while 31 per cent live in extreme poverty. Thus, it becomes clear that more than 80 per cent of Nigerian children live in poverty, and about 60 per cent in extreme poverty, defined as those who live on less than a dollar a day (NEEDS, 2004).

There are several human development issues associated with this hidden or invisible form of child labour that warrant scrutiny—specifically the hazards posed to children when working in certain tasks and most importantly the compromising of this future generation especially through negative effects on children's schooling.

Some authors argued that African rural societies do not consider child labour as a delinquent activity, and that productive activity of a child living in a rural and traditional environment is a means of social integration and should be likened to teach the child survival skills (Bekombo, 1981; Grootaert and Kanbur, 1995). This view does not see child labour in traditional environment as a problem *per se*, but as a form of "on-the-job" training. Nevertheless, childhood is probably the best time for acquiring knowledge from the formal education system if we consider schooling as an investment in human capital, which yields a return in the labour market. In that sense, it is rational to view education as the preferred alternative to child labour (Grootaert, 1998).

Hence, the understanding of the behaviour of the cocoa farming household in their decision of whether to send a child to school and/or to work, decisions taken at the household level and not at the child level, could assist to formulate better appropriate education and labour policies to remove obstacles to one of the most important long term objectives of any poverty conscious economy- the building of tomorrow human resources.

2.2.8.1 Hazardousness of agricultural work to children

i. Farm machinery and motor vehicles are not designed for operation by children and their use requires training. These are the most common sources of accidents.

ii. Children are more vulnerable to heat-related illnesses and injuries than adults.

iii. Cutting tools designed for adults are especially dangerous for children.

iv. Children are more susceptible to fatigue than adults, putting them at further risk of accidents.

v. Children's immature physiological systems make the risks of exposure to pesticides, fertilizers, and crop dust, toxic chemicals and exhaust fumes even more acute than for adults.

vi. Heavy lifting, awkward postures (stooping, kneeling, reaching) and repetitive work can injure and damage growing spines and limbs.

vii. Children risk injury, illness or even death from biological hazards associated with farm animals, wild animals, reptiles, insects, and certain plants.

viii. Poor housing and sanitation in migrant labour camps in many parts of the world adds an additional health risk for children (ILO, 2003)

Several studies have examined the determinants of child labour and schooling in rural Africa (Andvig, 2001). However, as the global movement against child labour on cocoa grows, the need for more precise analysis of child involvement in production in the Southwestern Nigeria where the bulk of the nation's cocoa is being produced has become apparent.

2.2.9 Labour-use efficiency and requirement frontier

Labour is an essential resource in the production process and the efficiency of its employment is crucial for their performance. Thus, efficient labour-use which is an integral part of measuring labour productivity worthy of consideration.

Labour-use efficiency refers to the minimum amount of labour that is technically necessary to produce a given vector of output Y_0. Labour-use inefficiency therefore, implies that more labour is used than is technically necessary. Literature on dynamic adjustment in panel data framework is extensive such as Arrelano and Bond (1991); Judson and Owen (1997) and Nerlove (1996). However, incorporating a flexible adjustment parameter (as opposed to a restricted constant one) and integrating this with labour-use efficiency is a recent development.

Haouas, Yagoubi and Heshmati (2002) presented a dynamic adjustment model of labour in terms of factors affecting the speed of adjustment on Tunisian manufacturing industries. The adjustment process was industry and time specific. Labour requirements function was specified in terms of observable variables and was used to model the desired level of labour-use. A flexible Translog functional form was used to evaluate alternative specifications where the labour requirement is a function of wages, output and capital stock. The empirical result shows that in the long run, labour demand responds greatest to output, followed by capital stock changes, and least by wage.

The systematic relationship between efficiency and adjustment rates shows that industries less efficient adjusted faster than those most efficient as they would eliminate their inefficiency faster. In other words, industries closer to the labour requirement frontier recorded a lower speed of adjustment than those farther away. The labour -use efficiency estimated as the ratio of optimal to the observed level of labour-use indicated that the rate of overuse of labour ranges across industries from 64.8 percent to 9.7 percent over the period of the study.

Masso and Heshmati (2003) studied the optimality and efficiency of labour-use among Estonian manufacturing enterprises. A dynamic adjustment labour-use model where both the long run optimal level of employment and the speed at which actual labour used is adjusted to the optimal were modelled as functions of several variables.

It is a model which allows for labour inoptimality, that is, deviations from the long run employment target, while inefficiency refers to the use of excess labour to that of the minimum amount required by the labour best practice technology to produce a given level of output. It is assumed that labour is the only variable input after an investment decision is made. The empirical results show that in the long run, labour responds greatest to wages, followed by value added and capital stock. Speed of adjustment and labour-use optimality and efficiency showed much greater variations over firms than over time.

The approach that will be applied in this study is a labour input requirement model which is derived from the stochastic frontier approach of measuring efficiency in which the Cobb-Douglas production function is used for estimation using the maximum likelihood estimation method. The frontier efficiency measurements will be used to determine the labour-use requirement frontier for cocoa production in Ondo State, Nigeria.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 The study area

The study was carried out in Ondo State, Nigeria. The State is situated in the Southwestern geopolitical region of Nigeria. It lies on the tropical part of West Africa. It is located within longitude $4^{0}3^{1}$-6^{0} Eastern Greenwich and $5^{0}45^{1}$- 8^{o} 15^{1} Northern Equator.

Ondo State covers an area of 14,606 km^2 with the population of 4,011,407 residents based on the 2005 population estimates. Farming is the major occupation of the people. About 80% of the populations earn their livelihood from smallholding agricultural production systems. Agriculture thus is responsible for the largest percentage of the revenue generated by the State. Annual temperatures averages 25°C with a relatively high humidity and rainfall of about 2000mm enable the State to be an agrarian environment suitable for farming.

Ondo State has a vast area of arable land which is predominantly known for agricultural activities as the main means of livelihood. The inhabitants of Ondo State grow a wide variety of tree crops which produce fruits, leaves, timber and other useful products, among these are cocoa (*Theobroma cacao*), oil palm (*Elaeis guineensis*), rubber (*Hevea* braisleensis), kolanut (*cola acuminata*), citrus (*Citrus sinensis*), coconut (*Cocos nicifera*), mango (*Mangifera indica*), coffee (*Coffea arabica*), cashew (*Anacardium occidentale*) and guava (*Psidium guajava*) among others. These Local Government Areas are also noted for the production of food crops such as cassava (*Manihot spp*), maize (*Zea mays spp*), yam (Dioscorea *spp*), plantain and banana (*Musa spp*), melon (*citrulus spp*), cocoyam (Colocasia *spp*) and several vegetable crops and legumes.

3.2 Source of data and sampling technique

Secondary and Primary data were used for the study. Secondary data on cocoa production were obtained via sources such as research publications, statistical bulletins, annual reports etc. Primary data were collected using a well-structured questionnaire, administered at the farm level among the cocoa farmers in the study area. A multi-stage sampling technique was adopted for the study. Purposive sampling technique was applied in the selection of the four Local Government Areas (LGAs) namely Idanre, Ondo East, Ile-Oluji and Odigbo Local Government Areas among the eighteen LGAs in State because they are mainly the largest cocoa producing areas of the State. Five villages were randomly selected from each of the four Local Government Areas. Ten cocoa farmers were randomly selected at interval of every odd number for each house from the producing villages such that fifty farmers were thus randomly selected from each local government area. A total of 200 respondents made up of cocoa beans farmers were sampled for the study.

Data were collected on the socioeconomic characteristics of the smallholder cocoa farmers including gender, age, marital status, education, household size, rural farm income etc Further data were obtained on cost of mandays of labour, farm distance traveled by farmers, labour supply by different classes of labour, different labour outputs per manday and costs data on other inputs influencing labour productivity in the study area.

3.3 Techniques of data analysis

Descriptive statistics such as frequency distribution, minimum, maximum, means, pie chart and bar charts etc were used to analyze the first and second objectives of the study comprising the socioeconomic characteristics of the cocoa farmers and the pattern of labour-use among farmers in the study area. The gross margin analysis was employed to estimate the profitability of cocoa beans production in the study area while income-expenditure ratio was also applied to confirm the gross

margin estimation. The stochastic labour-use requirement frontier function was applied to estimate the labour requirement frontier of the sampled farmers. The determinants of labour-use inefficiency in the cocoa sector of the study area were also determined.

3.3.1 Gross margin analysis

Gross margin analysis was used to determine the profitability of the cocoa output of the smallholder farmers. The gross margin (GM) was determined using this relationship:

$$GM = TR - TVC$$

where GM = Gross margin (₦)

TR = Total revenue (₦)

TVC = Total variable cost (₦)

If $GM > 0$, then cocoa production is considered profitable.

3.3.2 Input requirement efficiency measure: model of labour-use frontier

The labour-use efficiency of the cocoa farmers in the study area was estimated using the *input-requirement frontier model* (Battese, 2000). Battese *et al* (2000) proposed the input-requirement frontier model, in which the amount of labour used is a function of farm output. Farm production process was characterized by the implicit function:

$$H(L, Y, \ldots\ldots Y_n) = 0 \qquad (7)$$

where L is labour and $Y_1, \ldots, Y_n$ are n outputs produced, using labour. Explicitly solving for L gives,

$$L = h(Y_1, \ldots\ldots\ldots\ldots, Y_n) \qquad (8)$$

The relationship in (8) defines the production possibility frontier given the level of L. Labour was expressed as a function of output levels ($Y_1, \ldots\ldots, Y_n$). Equation (8) was also viewed as input requirement function (Diewert, 1974). The partial derivatives of h (.), with respect to Y_i, h_i (.), 1,...n, are the marginal productivities of labour associated with Y_i(MP_i) by the relation,

$$h_i(.) = \frac{1}{\partial Y_i / \partial L} = \frac{1}{MP_i} \qquad (9)$$

concavity of the production frontier requires that the matrix H=(h_{ij}(.), i, j=1,...n) be positive definite where,

$$h_{ij}(.) = \frac{\partial^2 h(.)}{\partial Y_i \partial Y_j} \qquad (10)$$

The input requirement function in (8) gives the minimum amount of labour required to produce a given output Y^0. Since a farm may be using more than what is technically necessary to produce the output vector Y^0. The relationship in (8) was therefore specified as,

$$L = h(Y_1, \ldots\ldots, Y_n)e^{\gamma} \qquad (11)$$

where $\gamma > 0$ is interpreted as technical inefficiency. It measures the percentage by which the input was used over the minimum amount required to produce Y^0. If $\gamma = 0$ for a farm, it is said to be technically efficient in the use of farm labour.

$$\frac{h(Y_1, \ldots, Y_n)}{L} = e^{-\gamma}. \qquad (12)$$

Thus, equation (12) was used as an index of labour-use efficiency. Given the output vector Y^0, demand for labour will depend on (i) the production technology (ii) technical inefficiency and (iii) factors outside the control of the farm. Since such factors can either be favourable or unfavourable, v takes both positive and negative values, viz. With this modification, the input requirement function in 3 can be written as:

$$L = h(Y_1, \ldots.Y_n)e^{\gamma + v} \qquad (13)$$

The input requirement frontier was obtained by setting $\gamma = \bar{0}$. It is stochastic because of the presence of v. The general implicit stochastic cost frontier is defined by the Cobb Douglas cost frontier described as: $L_i = g(Y_i, K_i; \alpha) \quad \exp(V_i + U_i), i = 1,2,\ldots\ldots,n. \qquad (14)$

where L_i is the minimum amount of labour input of the ith enterprise, g is a suitable function, such as Cobb Douglas function; K_i represents input prices employed by the ith enterprise in production and measured in naira; and α is the parameters to be estimated. V_i and U_i s are random errors and assumed to be independent and identically distributed truncations (at zero) of the N (μ, σ^2_u) distribution. U_i provides information on the level of labour allocative efficiency of the ith firm.

A Cobb-Douglas labour-use inverted factor requirement (cost) frontier function was modeled showing the minimum labour demand required to produce output Y relative to some input prices in the study, given explicitly as follows:

$$\ln L^*i = \alpha_0 + \alpha_Y \ln Y + \alpha_W \ln W + \alpha_M \ln M + (v_i + u_i) \quad (15)$$

where

L_i = actual amount of labour utilised (man-days)
Y = real value added of raw cocoa produced (₦)
W = expenses on labour use (₦)
M = cost of agrochemicals sprayed (₦)
v = the two sided, independent normally distributed random error with $N(0, \sigma^2_v)$
u = non-negative error term, obtained as truncations at 0 of the N (m_i, σ^2_u)

3.3.3 Determinants of labour-use inefficiency

Labour-use cost efficiency function U_i obtained from equation (15) was estimated to determine the degree of overuse of labour in cocoa production in the study area, thus represented in equation (16).

$$\text{Hence } m_i = \delta_j + \delta_{1j\ Age} + \delta_{2j\ Experience} + \delta_{3j\ Education} + \delta_{4j\ Family\ size} + \delta_{5j\ Distance} \quad (16)$$

Where $_j$ = number of enterprise

m_i = average of the normal distribution truncated at 0
age = age of the cocoa farmers (years)
experience = experience in cocoa farming, given by the number of years
education = the number of years of schooling completed by the cocoa farmers
family size = the number of members of the household living together
distance = farm distance traveled in getting to the farm

3.4 Test of the hypotheses

The generalized likelihood ratio test statistics was applied to test the first null hypothesis of the study that labour-use efficiency indices of the farmers are not affected by their socioeconomic characteristics, that is, H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$.

The generalized likelihood ratio statistics (λ) is defined as:

$$\chi_c^2 = -2\ \ell n\ [\ L(H_0)/\ L(H_1)]$$

where $L(H_0)$= value of the likelihood function of parameter estimates evaluated at the restricted model.

$L(H_1)$= value of the likelihood function of parameter estimates evaluated at the full model.

The generalized likelihood ratio statistics has a mixed chi-square distribution with degree of freedom equal to the numbers of parameters excluded in the unrestricted model. The decision criterion is such that the null hypothesis would be rejected given that the computed χ_c^2 is greater than the χ_0^2 tabulated at 5.0 per cent level of significance and a given degree of freedom.

The t-ratio test evaluating difference between two sample means was used to test the hypothesis that there is no efficiency differential between households that depend heavily on hired labour and those that depend heavily on family labour, that is H_o: $\bar{X}_1 = \bar{X}_2$.

The t-test relationship is specified as:

$$t_{com} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2}}\ \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$\overline{X}_1$ = means of labour-use indices of households dependent on hired labour

$\overline{X}_2$ = means of labour-use indices of households dependent on family labour

n_1 = number of sampled households heavily depend on hired labour

n_2 = number of sampled households heavily depend on family labour

S_1 = sampled variance of labour-use indices for hired labour

S_2 = sampled variance of labour-use indices for family labour

The t-ratio was obtained by making comparisons between the sampled means of labour-use indices in households that heavily depend on hired labour and those heavily depend on family labour in the study area. The decision criterion is such that the null hypothesis would be accepted given that the computed t_{com} is less than the t_{tab} at 5.0 per cent level of significance and a given degree of freedom, that is, $t_{com} < t_{(\alpha/2,\ n1+n2-2\ d.f)}$, then H_o will be accepted.

3.5 Limitation of the Study

There are inter-temporal issues which are embedded in the estimation of gross margin analysis for cocoa production in the study area. Cocoa is a perennial crop, for which maintenance costs are incurred for years up to the fruiting stage. Thus, our gross margin estimation does not include those costs but begins with actual maintenance expenses from the period of stable actual production of raw cocoa from the cocoa plantations for which earnings are recorded.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Farmers socioeconomic characteristics in Ondo State

This chapter presents the results and discussions of the socioeconomic characteristics of the cocoa farmers studied. Some of the characteristics discussed are gender, age, level of education, marital status, farming experience, family size and the farm size cultivated. Good knowledge of the characteristics of the farming households is important in the study of labour-use pattern and productivity. Information on these characteristics provides the socioeconomic context for understanding issues on household average level of labour efficiency. Some farm-specific characteristics are also considered such as age of farms, and the distance of farms away from settlements. These farm characteristics become imperative since efficient use of labour in production activities and farming conditions of the sampled farmers rest on the performance of the farms.

4.1.1 Distribution of respondents by gender

Agricultural labour is commonly categorized by gender. The frequency distribution presented in Table 6 shows that female cocoa producers accounted for 27.0 percent farmers sampled while 73.0 per cent of the respondents are male cocoa farmers. This distribution indicates that majority of the sampled cocoa farmers in the study area are males. This is attributed to the magnitude of labour requirements in cocoa production. This gives good explanation on the little female participation in producing cocoa beams in the study area.

Table 6. Gender distribution of the respondents

Gender	Frequency	Percentage	Cumulative percentage
Female	54	27.0	27.0
Male	146	73.0	100.0
Total	200	100.0	

Computed from field data, 2005

4.1.2 Distribution of respondents by age

Age is an essential factor to labour productivity especially in agricultural labour employments. The age distribution of the cocoa farmers sampled shown in Table 7 indicated that 28.0 percent of the cocoa farmers aged between 51 to 60 years while 24.0 percent of the farmers are in 41 to 50 years age bracket. Using Ringe-Metzger and Diehl (1993) age classification of four categories, children (0-9 years), youth (10 – 15 years), adult (16 – 60 years) and old people (61 years and above) as basis for analysis, the study revealed that 66.0 percent of the sample cocoa farmers were in the adult age bracket implying that majority of the farmers were physically active while a few as 34.0 percent of the sample constitute the old people category.

Table 7. Age distribution of the respondents

Age	Frequency	Percentage	Cumulative percentage
21 – 30	4	2.0	2.0
31 – 40	24	12.0	14.0
41 – 50	48	24.0	38.0
51 – 60	56	28.0	66.0
61 – 70	44	22.0	88.0
Above 70	24	12.0	100.0
Total Mean = 56.4 years	200	100.0	

Computed from field data, 2005

The age summary statistics of the farmers sampled in Ondo State revealed that the minimum age was 28 years and the maximum age was 87 years with the mean age of about 56 years.

4.1.3 Distribution of respondents by years of education.

The years of education distribution of the respondents shows that 34.5 percent of the farms have no formal education. Nevertheless, 38.0 percent had between 7 and 12 years of formal

education. The study revealed that 65.5 percent of cocoa farmers had at least one year of formal education. About 22.0 percent of the respondents had six years of education.

Table 8. Educational distribution of the respondents

Years of education	Frequency	Percentage	Cumulative percentage
0	69	34.5	34.5
1 – 6	44	22.0	56.5
7 - 12	76	38.0	94.5
> 12	11	5.5	100.0
Total	200	100.0	

Mean = 6.4 years

Computed from field data, 2005

The summary statistics of the educational status of the cocoa farmers in Ondo State revealed the minimum of 0 year and the maximum of 16 years with the mean of 6.4 years of formal education. Table 8 outlines the distribution of the educational status of the sampled cocoa farmers.

4.1.4 Farming experience of the respondents

Experience in farm work has a unique direct link with efficiency. Farming experience enhances sound judgment to discern appropriate time to demand extra labour, in what optimal quantities and at what wage rate. Given the farming experience distribution in Table 9, it was shown that 38.5 percent of the cocoa farmers have spent between 21 to 30 years in producing cocoa beans. About 27.0 percent of the sampled farmers have been into cocoa beans production for more than 30 years signaling good effect on labour utilization. Most farmers in the study area are expected to have a long standing knowledge of allocating labour inputs and optimal labour use thereby recording efficient labour utilization in the study area.

Table 9. Distribution of farming experience of the respondents

Years	Frequency	Percentage	Cumulative percentage
1 – 10	23	11.5	11.5
11 – 20	46	23.0	34.5
21 – 30	77	38.5	73.0
31 – 40	34	17.0	90.0
41 – 50	17	8.5	98.5
> 50	3	1.5	100.0
Total	200	100.0	

Mean = 26.3 years

Computed from field data, 2005

The summary statistics of the farmers' experience in cocoa beans production in Ondo State indicates the minimum of 3 years and the maximum of 30 years with a mean of about 26 years of farming experience.

4.1.5 Distribution of household by size

Household composition largely determines the manner in which a household would respond to seasonal labour changes. It was revealed that 48.5 percent of the respondent farmers have large families while additional 42.5 per cent of the sampled farmers have moderate numbers of family members. The farmers will be able to meet their time-bound labour activities since 91.0 per cent of the sampled farmers have enough family members that can be utilised especially during periods of peak labour demands.

Table 10. Family size distribution of the respondents

Household size	Frequency	Percentage	Cumulative percentage
< 6	18	9.0	9.0
6 – 10	85	42.5	51.5
> 10	97	48.5	100.0
Total	200	100.0	

Mean = 9.10

Computed from field data, 2005

The summary statistics of the sampled cocoa farmers in Ondo State revealed that the average family size was 9 members. The household composition indicating the distribution of family size of the sampled farmers is shown on Table 10.

4.1.6 Farm size distribution of the respondents

Daramola and Adunbi (1996) classified tree crops cultivation into small farm (less than six hectares), medium scale (between six and ten hectares) and large farm (hectarage above ten). Given this classification, the distribution shown in Table 11 above indicates that 59.5 percent of the respondent farmers are small scale cocoa farmers while 71.0 percent of the respondents are medium scale cocoa farmers in the study area. It was observed that only 5.0 per cent of the sampled farmers are large scale cocoa farmers in the study area. The higher percentages of small scale cocoa farmers recorded in the study area are attributed to the difficulties associated with getting farmland for cultivating tree crops usually experience by many immigrants who are not natives. Many farm holdings are scattered far away through family inheritance such that ownership is by the extended families approval, a serious hindrance to stable ownership and perpetual cocoa beans production on such lands in the study area. The prevailing poor capital-base status of an average Nigerian farmer also exerts a limit to the size of farm a farmer can efficiently managed.

Table 11. Distribution of farm size of the respondents

Farm size	Frequency	Hectarage	Percentage
<6.0	119	84.05	59.5
6.0 – 10.0	71	117.32	35.5
> 10.0	10	103.17	5.00
Total	200	304.54	100.0

Mean = 5.57 ha

Computed from field data, 2005

The summary statistics of the farm size of cocoa beans production in Ondo State indicates a total of hectares of 304.54 hectares with an average farm size of 5.5 hectares. This average is higher than the farm size of an average Nigerian cocoa farmer of 4.7 hectares indicating the competitive status of Ondo State as one of the leading cocoa producers in Nigeria.

4.1.7 Distribution of age of cocoa farms in the study area

The study revealed that 6.0 percent of the cocoa farms cultivated by farmers are still below 5 years while another 16.5 percent of cocoa farms fall between 6 and 15 years of existence. Hence production efficiency is guaranteed. Nevertheless, the distribution further indicates that a proportion of 32.0 percent of cocoa farms in the producing regions are within their active production years to give optimal yield to the farmers. It is worthy of note that 45.5 percent of cocoa farms have already aged beyond their peak production years of 25 years, it is an indication of marginal diminishing returns to labour in the nearest foreseeable future which could pose serious threat to labour productivity in the study area. The average age of cocoa farms for farmers in the study area is 23.7 years as revealed by the summary statistics of the distribution.

Table 12. Age distribution of cocoa farms in the study area

Farm Age (Years)	Frequency	Percentage	Cumulative percentage
< 5	12	6.0	6.0
6 – 15	33	16.5	22.5
16 - 25	64	32.0	54.5
> 25	91	45.5	100.0
Total	200	100.0	

Mean = 23.7 years

Computed from field data, 2005

4.1.8 Distance of farms from settlements

The distribution shown in Table 13 gives explanation on the proximity of the cocoa farms to the farmers' settlements in the producing zones of Ondo state. It was observed that 27.5 percent of cocoa farms in the study area are farther to the farmers with 6 to 10 km range. This is a far proximity in view of their major means of getting to their farms which is mainly by trekking while bicycling is also common. Only very few farmers could afford the cost of transportation through motorcycle in the study area. This would not afford efficient time to be spent on farms considering the distance traveled and the strength of an average labour. On the other hand, 19.5 percent of farms are farther away from labour by at least 16km in the study area.

Table 13. Distribution of farm distance traveled by the respondents

Distance (Km)	Frequency	Percentage	Cumulative percentage
1 - 5	46	23.0	23.0
6 – 10	55	27.5	50.5
11 – 15	51	25.5	76.0
16 – 20	23	11.5	87.5
> 20	25	12.5	100.0
Total	200	100.0	

Mean = 11.3 km

Computed from field data, 2005

The average farm distance obtained from the summary statistics indicated that an average cocoa farmer in Ondo state would traveled 11.3km away to his nearest farm.

4.2 Labour use pattern on cocoa farms in Ondo State

Decline in the efficient use of labour and productivity continue to be recurring difficulty limiting farm output and stagnating overall performance of Nigerian agriculture. Marginal diminishing returns to labour have been noted for tree crops such as cocoa and current increasing wave of globalization have introduced compelling need to regularly monitor pattern of resource use such as labour, an invaluable factor of production in agriculture. This would engender high labour productivity and returns through appropriate intervention strategies.

This section provides a detailed analysis on labour-use pattern by cocoa beans producers sampled in Ondo State. Emphasis is on identification of the type of labour employed as well as the pattern of use across the producing regions.

4.2.1 Labour type used on farms by category

Traditionally, family labour constitutes the major and cheap source of labour in small holder agriculture, particularly in Africa, Asia and the Latin America. In Africa, this is attributed to the sociocultural nature of farming household (large families) and subsistent scale of agricultural production.

As cocoa beans began to generate substantial part of the Nigeria's foreign exchange in the agricultural sector, favourable policy drives had been made to encourage its large scale production, hence, demand for labour has become intense, necessitating shift of labour supply towards several categories of hired labour types in cocoa beans production. Figure 1 below indicates the distribution of different types of labour utilized in the study area.

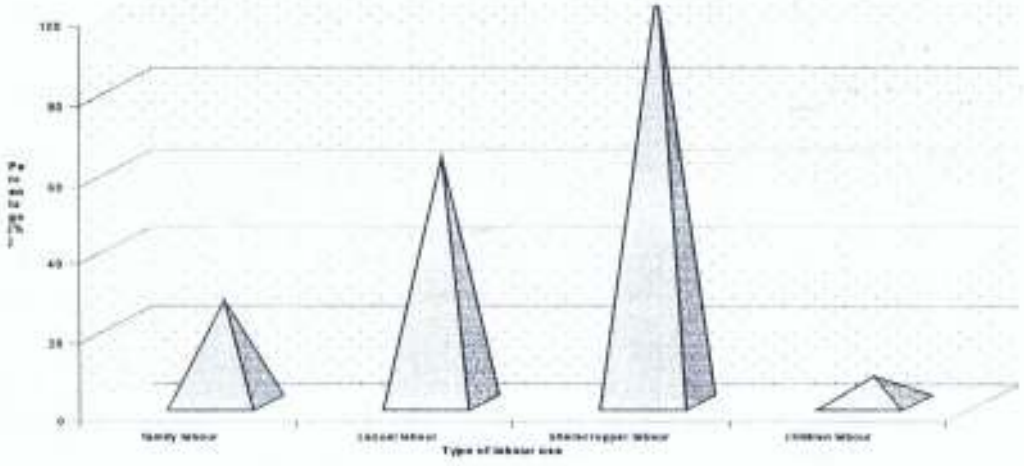

Figure 1. Labour-use distribution by type across producing zones in Ondo State

The distribution shown Figure 1 confirms the work of Gockowski and Oduwole (2001) on labour use in cocoa production that sharecropper labour is the major type and the most witnessed type of labour in cocoa production in Nigeria. It reveals that sharecropping labour is the main type of labour used in the study area responsible for 52 per cent of the total labour types utilized while casual labour (31.5 per cent), family labour (13.0 per cent) and children labour (3.5 per cent) are also other types of labour utilised in the cocoa sector of the study area.

4.2.2 Gender categorisation of hired labour (mandays)

Akanji et al (1999) classified labour utilisation by gender as the adult male, adult female and children labour categories upon which the gender classification of labour use in this study is based. The amount of labour offered measured in adult male equivalents for different classes of gender is presented in Table 14. It indicates the proportion of labour-use measured in mandays by the adult male labour, the adult female labour and the children labour across all the cocoa beans producing regions, given that one manday of labour is taken to be 8-hours work equivalent of an adult man (Adegeye, 1982). It was observed that adult male labour accounted for the largest proportion of total labour-use with all producing regions average of about 69.0 per cent. In the study area, adult female and children labour were about 13.0 per cent and 18.0 per cent respectively.

In terms of variations across the study area, adult male labour responsible for over 70.0 per cent in both Ondo East and Ile Oluji /Oke Igbo producing areas, while the least of 64.0 percent was observed in Idanre. On the other hand, Odigbo was responsible for the highest use of female labour with 18.68 percent. Idanre reported highest use of children labour accounted for 18.85 percent in the producing region.

Table 14. Gender categorisation of labour-use (mandays)

Producing region	Adult male		Adult female		Children		Aggregate	
	No	%	No	%	No	%	No	%
Odigbo	39.34	65.22	11.27	18.68	9.70	0.16	60.31	100
Ondo East	43.23	75.10	5.80	0.10	8.53	14.81	57.56	100
Ile Oluji/Oke Igbo	43.30	71.44	9.18	15.14	8.13	13.41	60.61	100
Idanre	36.25	64.06	9.66	17.07	10.67	18.85	56.58	100
All regions average	40.53	68.95	8.97	12.74	9.25	15.74	58.76	100

Computed from field data, 2005

The low participation of women in labour is a reflection of the need for greater marginal returns to labour in agriculture. Women are already preoccupied with domestic and procreative

responsibilities in the family amidst farm work. The proportions of labour-use given male, female and children labour and the amount of mandays supplied are further presented in Figure 2.

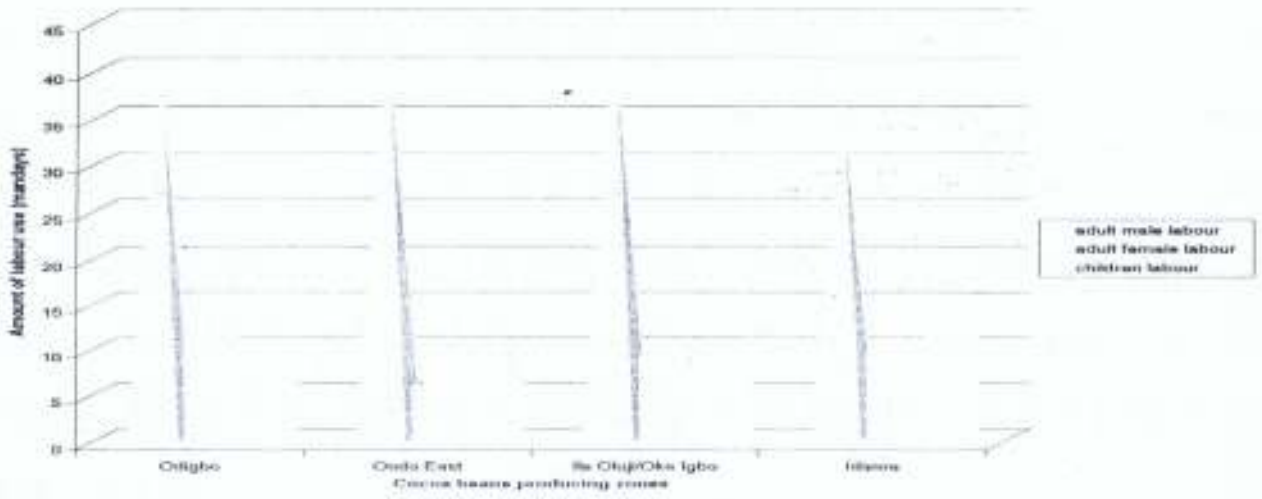

Figure 2. Gender categorisation of labour-use across producing zones

In all the producing regions, adult male labour was heavily utilized. There was fluctuation in the use of adult female labour and children labour across the study area. The highest utilization of adult female labour was witnessed in Odigbo and least utilized in Ondo East. Idanre recorded the highest use of children labour while Ile Oluji /Oke Igbo least utilized children labour in their cocoa production.

4.2.3 Gender labour-use pattern by specific farm activities

In agricultural production, certain labour activities are usually specified by gender such that men, women and children works have been delineated which determines the value of their labour (Swindell, 1985). Further detailed analysis of Figure 3 of the classification of specific labour activities performed by different gender revealed that in cocoa production gender division determines type of operations expected to be performed. It was noted that the highest proportion of male labour were used mainly for understorey growth clearing and spraying of agrochemicals which are the most strenuous labour activities in cocoa beans production, they are regarded as male's work due to its

drudgery afterwards while usage of male labour in operations such as pods harvesting and fertilizer application was minimal. The distribution of the utilization of female labour in terms of mandays supplied shows that they are not conspicuously used in clearing but in spraying, pods harvesting and fertilizer applications. Women and children are usually expected to perform activities such as fetching of waters during spraying, gathering of pods already harvested and the removal of the fresh beans which is the most labour intensive in cocoa harvesting requiring many mandays. Higher mandays of labour were also dispensed by both the females and children than the males in fertilizer application. These labour activities in cocoa sector of the study area are traditionally allocated to the females due to their delicate physiological nature and for children because such labour tasks are less energy demanding.

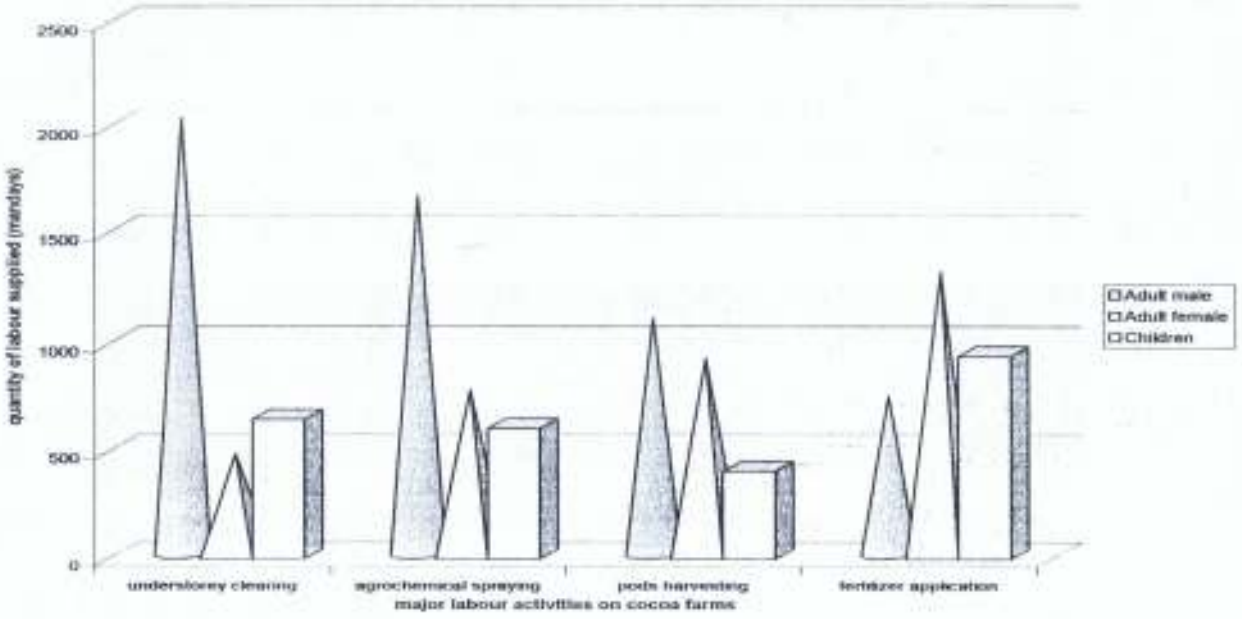

Figure 3. Labour-use pattern based on gender division in Ondo State

4.2.4 Labour utilization by specific farm activities

Allocation of labour usually varies with farming activities. While some labour tasks require skilled hired labour, for others, household labour is sufficient. The cost and availability may preclude the use of hired labour of different classes for activities such as understorey clearing, agrochemical spraying, pods harvesting and fertilizer application which are the most labour intensive operations in cocoa beans production. Table 15 presents the utilization of labour by specific activities across the study area.

Table 15. Distribution of labour-use by specific activity (mandays)

Producing region	Understorey clearing		Agrochemical spraying		Harvesting		Fertilizer application		All	
	No	%	No	%	No	%	No	%	No	%
Odigbo	30.61	22.79	51.64	38.45	36.70	27.33	15.32	11.40	134.27	100
Ondo East	31.41	28.04	29.34	26.19	36.76	32.82	14.49	12.93	112.0	100
Ile Oluji/Oke Igbo	32.39	26.24	39.21	31.76	35.72	28.93	16.11	13.05	123.43	100
Idanre	31.39	24.59	45.87	35.94	36.37	28.50	13.98	10.95	127.61	100
All regions average	31.45	25.29	41.52	33.39	36.38	29.26	14.97	12.04	124.32	100

Computed from field data, 2005

The labour use distribution by specific activities in cocoa beans production in Table 15 shows that the use of hired labour was very minimal in all the producing areas for understorey clearing (25.29 percent) and fertilizer application (12.04 percent). This is confirms the work of Gockowski and Oduwole (2001) which observed that slashing of vegetative understorey growth in cocoa farms are done just twice in a year prior to the harvesting season while fruiting fertilizers are also applied once throughout a productive season.

Labour was engaged more on agrochemical spraying and cocoa harvesting operations given the averages of 33.39 percent and 29.26 percent respectively. Further analysis indicated that in Odigbo, labour was intensely used in agrochemical spraying. For understorey clearing, Ondo East reported 28.04 percent labour use and highest use of labour for harvesting such that 32.82 percent of labour use was engaged. The use of labour for other activity was relatively low across all the study area. The implication is that the demand for labour use varies from one region to another and depends on the expediency of particular operations at given points in time. Figure 4 below shows further description of labour-use by specific labour operating in mandays across all the producing regions in Ondo state.

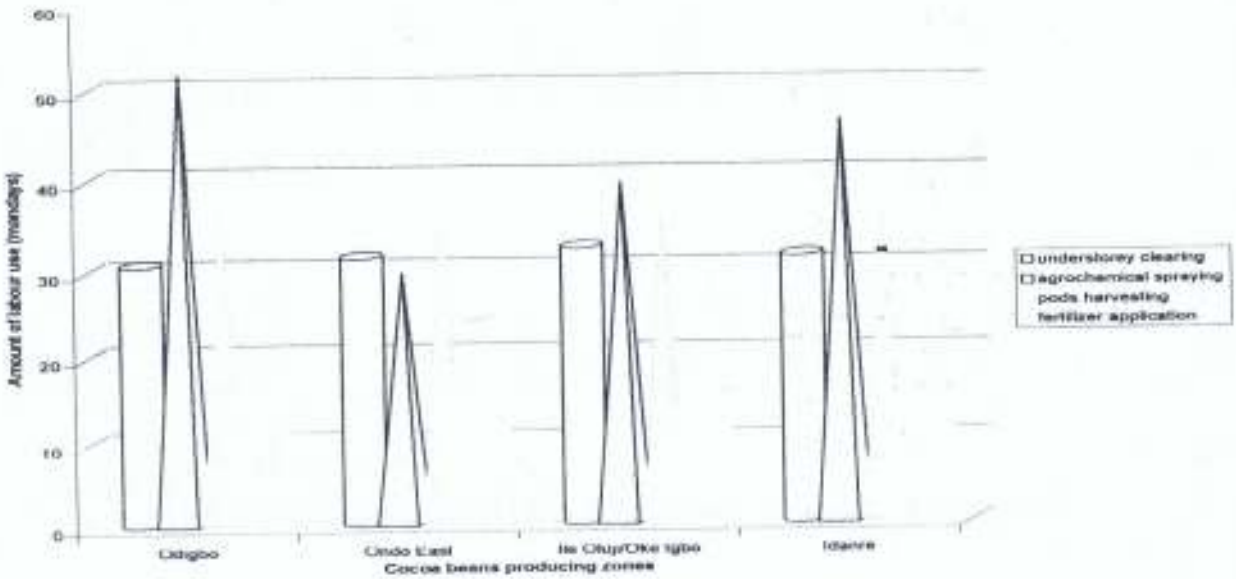

Figure 4. Labour utilization by specific farm activity in Ondo State

In all the cocoa producing regions, agrochemical spraying utilized the highest amount of labour mandays except in Ondo East, followed by the harvesting operation. Slashing of the understorey growth was next on the labour utilization chart and fertilizer application was least in labour mandays utilized because of its insignificance in cocoa production in terms of labour demands.

4.2.5 Decomposition of labour demand (shortage) by period of operation

Since farming is mostly restricted to the wet seasons there is an uneven spread of farm labour demand and it is the flow of adult equivalent labour that is important. Most often, cocoa beans cultivation is directly related to the labour force available at the peak periods of activity in the cultivation cycle. The problems associated with supply of labour remains a unique crucial importance to the farmers. Figure 5 gives the composition of labour shortage by the period of labour task associated with cocoa beans production in the study area.

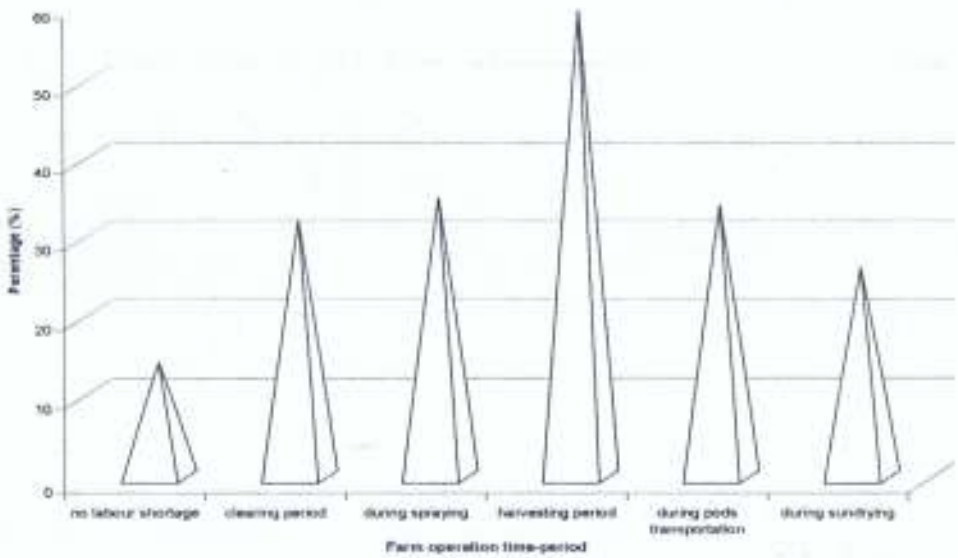

Figure 5. Distribution of labour shortage by period of operation

Farmers (57 per cent) admitted that serious labour shortage is usually experienced during the harvesting period of their cocoa pods. The spraying of agrochemicals and pods transportation after harvesting were the next periods at which fluctuations of labour away from farm work are also witnessed sporadically across the study area.

4.2.6 Distribution of labour supply inhibitors in the producing zones

Despite the dramatic pace of urbanization, the incidence of poverty remains higher in the rural than urban centres which has erupted worsening living conditions among the farmers in the cocoa beans producing areas. This has created ominous effect on labour supply and its distributions. Figure 6 beneath shows the distributions of various causes of hindrances on labour supply in cocoa beans production in Ondo State.

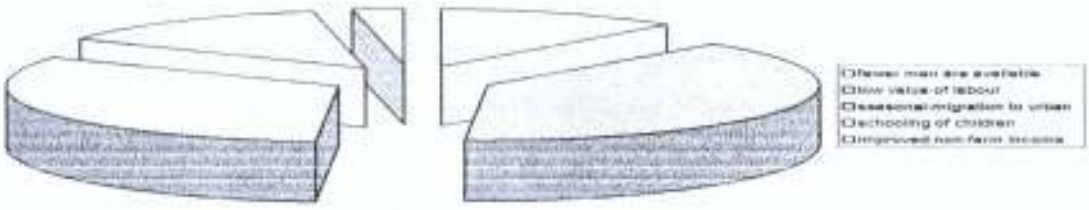

Figure 6. Distribution of labour supply inhibitors in the producing zones

The low value of farm wage (labour payments) was the highest (38.0 per cent) source of labour inhibition in the study area. This was followed in occurrence by the seasonal migration (33.0 per cent) of labour to the urban sector in search for more promising non-farm employments alternatives. The schooling of children (14.0 per cent) was another problem though very insignificant followed by the non-availability of adult men to supply labour (12.0 per cent) as at when mostly needed.

4.2.7 Structure of farm labour wages in the study area

One important factor of variations in the gender disparity of labour-use is how wages are assigned and valued for men and women. FAO (1999) observed that women's labour tends to be undervalued because of perceived low opportunity cost of their time. Women are expected to fulfill conjugal responsibility in family production while often drafted to the farm as part of a normal domestic activity. Thus, a female workday when paid-for is at best averagely put at 75.0 percent of an adult male equivalents in terms of its comparative worth. Table 16 outlines the average labour wages showing gender inequality across the cocoa beans producing regions.

Table 16. Average labour wages by gender across producing regions (₦/manday)

Producing region	Adult male	Adult female	Children	Average wage
Odigbo	392.40	273.23	316.60	327.41
Ondo East	500.00	320.16	299.05	373.07
Ile Oluji/Oke Igbo	296.70	254.10	243.90	264.90
Idanre	380.30	285.09	292.90	319.43
All regions average	392.35	283.14	288.11	321.20
Gender index of wages	1	0.72	0.73	

Computed from field data, 2005

The average labour wages shown in Table 16 across the producing zones by gender disparity confirmed very low rural labour wages in farm productions. Given the all regions average, the amount paid to each gender category per workday varies from one region to another. As depicted in Table 16, average wage rate for adult male hired labour was highest in Ondo East (₦500.00). Other cocoa producing regions with higher average wage rate for adult male hired include Odigbo and Idanre, since they are readily available in the rural and high naira value was placed on their labour.

All regions average for adult male hired labour stood at ₦392.35. Similar trend was also observed for adult female hired labour with Ondo East recording the highest wage of ₦320.16 per manday. Across all the regions, the average wage for female hired labour was ₦283.14. For children, Odigbo recorded the highest wage of ₦ 316.60 while Ile Oluji /Oke Igbo recorded the lowest of ₦ 243.90. Children hired labour wage average is ₦ 288.11 across all the producing regions.

A gender index of farm wages was computed at 0.72 and 0.73 across all zones. This is the ratio of female and children's wages to the male wage and it reflects the equity consideration in the valuations of labour. It was observed in the study that children index deviated from the Upton's index (1972) of 0.75 and 0.55 for women and children respectively. This is a strong indication that in the absence of enough adult men to take on rural employments because of search for better employment alternatives in the urban sector, cocoa beans farmers have sought to employ more of children labour considerably.

4.3 Profitability of cocoa beans production in Ondo State

Gross margin analysis is estimated in this section to determine the profitability of cocoa beans production in Ondo State. The gross margin provides clue on the extent to which a bean producer recoup his short run operating costs.

4.3.1 Gross margin analysis

The determination of gross margin from cocoa beans production calls for the knowledge of both the revenue and the cost of various varying inputs utilized.

The gross margin per hectare, defined as the difference between gross revenue per hectare and total variable costs of production per hectare is shown in Table 17. It is referred to as returns over variable costs. This serves as a proxy measure of profitability. Table 17 shows the costs and returns in cocoa beans production across the cocoa producing local government areas in Ondo State.

Table 17. Costs and returns in cocoa production across the study area in Ondo State

GM Parameters	Pooled data	Ondo East	Odigbo	Idanre	Ile Oluji/ Oke Igbo
Cocoa beans yield (kg/ha)	422.79	504.87	391.38	314.38	580.54
Cocoa beans (₦/kg)	149.36	147.40	150.00	150.06	150.00
Revenue (₦/ha)	66845.42	74417.83	58707.00	47175.86	87081.00
Labour and material inputs					
Cost of agrochemicals (₦/ha)	18582.80	19757.37	17977.61	13556.82	23039.41
Cost of transportation (₦/ha)	12585.37	11022.34	11617.93	10624.22	17077.02
Cost of labour (₦/ha)	20585.24	21676.45	18067.54	11569.90	31027.08
TVC (₦/ha)	51753.42	52456.16	47663.08	35750.94	71143.51
GM (₦/ha)	15092.00	21961.67	11043.92	11424.92	15937.49
IER	1.29	1.42	1.23	1.32	1.22

Computed from field data, 2005

The computations in Table 17 revealed that cocoa beans production in Ondo State returned positive gross margin with the value of ₦15,092.00 per hectare in the study area. This indication that a gross margin greater than zero is recorded confirmed that raw cocoa beans production is profitable.

Across the producing regions, Table 17 further shows that Ondo East local government area has the highest gross margin with a value of ₦21,961.67 per hectare, while Odigbo local government area had the lowest gross margin with a value of ₦11,043.92 per hectare.

In the study area, of the two physical inputs (labour and agrochemical) considered for the variable cost, labour cost was the highest responsible for about 40.0 per cent while cost of agrochemicals accounted for about 36.0 per cent of the total variable costs of producing cocoa beans production in the study area as estimated from Table 17.

4.3.2 Income expenditure ratio

Another profitability index was applied which was estimated from Table 17 is the income expenditure ratio. The income-expenditure ratio for cocoa beans farmers in Ondo State ranged from 1.22 in Ile Oluji/Oke Igbo to 1.42 in Ondo East. The ratio explains that for every one naira invested into cocoa beans production in Ondo East, ₦0.42 would be realized. Similarly, every one naira invested in cocoa beans production in Ile Oluji/Oke Igbo yields ₦0.22. This further confirms that cocoa beans production in Ondo State is profitable.

4.4 Estimation of labour–use efficiency on cocoa farmers in Ondo State

The following sections present the empirical results from the inverted factor requirement (cost) frontier model. The empirical maximum likelihood estimates (MLE) of the stochastic labour requirement (cost) frontier function is thus discussed. The analyses were based on the efficiency of labour allocation of 200 raw cocoa farmers in the producing zone. Section 4.4.1 presents the results from the stochastic labour-use frontier model for the farmers. Section 4.4.2 gives the analysis of the labour-use efficiency indices for the sampled cocoa farmers to determine the percentage of those who are efficient in allocating labour, given the prevailing farm labour wage and farmers who over use labour above the labour requirement (cost) frontier while the last section discussed the empirical relationship between the labour use efficiency indices and some determinants of labour-use inefficiency.

4.4.1 Labour requirement frontier: estimates from input requirement function

Labour-use requirement (cost) frontier is defined as the amount of labour that is technically necessary to produce a given level of output at the minimum cost, given input prices. The maximum likelihood estimates of the labour demand model are presented in Table 18.

Table 18. Parameter estimates of stochastic labour-use cost frontier model

Variable	Parameters	Full model	Restricted Model
General labour-use model			
Constant	α_0	-11.686 (-14.782)	-11.662 (-13.684)
Real value added of raw cocoa produced (₦)	α_1	0.654* (21.214)	0.640* (20.117)
Expenses on labour use (₦)	α_2	0.656* (14.961)	0.651* (14.322)
Cost of agrochemical sprayed (₦)	α_3	0.104 (1.419)	0.128* (1.842)
Labour-use inefficiency model			
Constant	δ_0	0.285 (1.702)	0
Age of the farmer	δ_1	0.074 (2.022)	0
Farming experience	δ_2	-0.131 (-0.908)	0
Level of education	δ_3	-0.160 (-1.023)	0
Family size	δ_4	-0.105 (-0.837)	0
Farm distance traveled	δ_5	0.140 (1.037)	0
Variance			
Sigma square	σ^2	0.077 (9.449)	0.077 (10.207)
Gamma	γ	0.037 (0.230)	0.000 (0.002)
Log likelihood function	λ	-24.403	-28.245
LR test of the one sided error		7.682	-
Lbr A.E (mean)		1.049	

Computed from field data, 2005

**Estimate significant at 0.05 level.*

Figures in parenthesis are t-ratios

The labour demand requirement (cost) frontier for the sampled cocoa farmers describes the ability of a producer to use minimum cost in producing a given level of output, given an appropriate technology. The estimated coefficients of the parameters of the cost function conform with *a priori* expectations with the expected positive signs implying that the overall cost of allocating more labour in an enterprise tends to increase when the budget ceiling of various inputs unit prices that make up the firm increases. The Cobb-Douglas labour-use (cost) frontier estimate obtained indicated that farmers are employing labour above the minimal cost frontier, and thus considered inefficient in their labour use, precisely in allocating labour.

The mean efficiency index of 1.049 for labour allocation revealed that there is over utilisation of labour above the cost frontier by the cocoa farmers in the producing zone. The degree of overuse of labour is measured at 4.9 % which indicate by how much do the farmers exceeds the percentage of labour efficiency in the cost frontier.

A striking result from the table above indicates that the estimate of the overall model variance, σ^2 (0.077) is significantly different from zero at 5 per cent, which implies a good fit and the correctness of the specified distribution assumption

4.4.2 Real value added of raw cocoa produced

The coefficient of real value added of raw cocoa produced (0.654) is statistically significant at 5 per cent level and has expected positive sign showing that increase in the value addition of cocoa produced would consistently lead to increase in the minimum cost associated with additional labour-use (mandays) that will be cost efficiently required and vice versa. The estimated coefficient shows that minimum cost of labour-use is relatively elastic to changes in the value added of raw cocoa produced. A unit change in value addition of cocoa will result in a more than proportionate change in the minimum amount of expenditure on additional labour that will be required. A 1.0 per cent

increase in the value added of cocoa (₦) will result to 65.4 per cent increase in the minimum cost of labour that would be required to care for the labour demand. This suggests that increase in the real value added of raw cocoa produced is significantly associated with changes (increase) in the cost of mandays of labour utilized, and vice-versa.

4.4.3 Expenses on labour use

The coefficient of expenditure on labour use (0.656) is statistically significant at 5 per cent level with the expected positive sign which conforms to *a priori* expectation that increase in the unit labour cost will raised the minimum expenses that would be cost efficient in meeting the changing labour demands. The estimated coefficient shows that the minimum cost of labour-use is relatively elastic to changes in the expenses on labour utilization. A 1.0 per cent increase in the labour expenses would lead to 65.6 percent increase in the minimum cost of labour that would be cost efficiently required for labour-use.

The results of labour allocation indices further revealed that the estimated labour-use efficiency indices vary substantially within the producing regions and across the study area, ranging from 1.00 and 1.32. The study indicated that only 5.5 percent of the sampled farmers are utilizing labour exactly on the labour factor requirement (cost) frontier, while 94.5 percent are cost inefficient in their labour allocations because they overused labour above the minimum cost frontier.

This study observed that cocoa farmers overutilised labour by 4.9 %, which specifies the degree of over allocation of labour into various traditional farm operations in the study area.

The result of the distribution of allocative labour-use efficiency indices has shown a wide variations which indicates that a great number of the farmers will have to reduce their current level of observed labour-use, hence reductions back to the minimum expenses on labour use that is cost efficiently necessary to produced appreciable value addition of raw cocoa in the study area.

4.5 Empirical relationship between cost efficiency indices and determinants of allocative labour-use efficiency

Farmer-specific variables, environment factors, farm-specific characteristics and non-physical factors are likely to affect the efficiency (Kumbhakar and Bhattacharya, 1992). Using the specification of equation (4) the study attempts to capture the determinants of the efficiency indices (allocative efficiency level ranges between 0 and 1). The results of analysis of the determinants of allocative labour-use efficiency are presented in Table 18.

The result observes that the coefficients of age of the farmers and farm distanced traveled both have positive signs indicating direct relationship with labour allocative inefficiency. It means that increase in any of these variables would increase inefficient labour-use allocation in farmers farm operations, nevertheless, age of the farmers is significant at 5.0 per cent.

Age

The positive coefficient (0.074) for the age variable implies same directional co-varied relationship with the minimum cost labour-use that would be sufficiently required to meet a certain labour demand. It connotes that young farmers are more efficient in labour allocation than their older contemporaries. Thus, increasing age would significantly lead to increase in the minimum cost of labour-use in terms of efficient allocating labour. As farmers advanced in age, the ability to take risk-bound decisions which are associated with low cost labour-saving technologies is low, thus increases labour allocation inefficiencies. Coefficient of age variable is found to be statistically significant at 5 per cent level, hence, shown by the estimates, it is a policy variable to the cost structure of labour use in cocoa production in the study. It the only significant determinant of labour use inefficiency in the study.

The negative coefficient of farmers' farming experience (-0.131), level of education (-0.160) and family size (-0.105) showed inverse relationship with the inefficient level of allocating labour, which implies declining labour-use inefficiencies. Given that any of these variables is increasing, there would be a decrease in the minimum expenditure of labour that would be allocated to meet the cost efficient labour demand frontier in cocoa production in the study. These are efficiency parameters that would improve labour allocation by the farmers at the minimum labour use cost in the study area.

The most striking conclusion that can be gleaned from the inefficiency labour allocation model shown in Table 18 is the absence of association between efficiency and some farmer-specific characteristics in the study area. Such lack of association has been reported by Kalirajan and Flinn (1983).

4.6 Hypotheses testing

The hypothesis that the allocative labour-use efficiency indices of the farmers are not affected by their socioeconomic characteristics was tested using the generalized likelihood ratio test statistics. The summary result of the generalized likelihood ratio (LR) test indicated. The computed LR (λ value) was 7.682 was greater than the tabulated chi-square (χ_t^2) value of 11.07 at 5.0 percent level of significance and 5 degree of freedom. Thus, the null hypothesis was rejected implying that there is influence of socioeconomic characteristics of the farmers on their cost efficient allocation of labour use in the study area. Table 19 presented below indicates the result of the generalized likelihood ratio (LR) test on cocoa farmers in the study area

Table 19. Generalised likelihood ratio test of influence of farmer-specific characteristics on labour-use efficiency in the frontier function

Null hypothesis	$L(H_0)$*1	$L(H_1)$ *2	$\chi^2_{5,0.05}$	D.f (v) *3	λ value	Decision
$\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$	-28.245	-24.403	1.150	5	7.682	Reject H_0

Computed from field data, 2005

*1= Log likelihood function specified by the null hypothesis

*2= Log likelihood function specified by the alternate hypothesis

*3= Degree of freedom equals the number of parameters excluded in the restricted model

The estimated gamma (γ) value implies that about 3.70 percent variations in the minimum cost of labour use by the farmers resulted from their labour-use allocation inefficiencies as observed in cocoa production in the study area as shown in Table 18. This conformed with the result of hypothesis tested by Ajibefun and Abdulkadri (1999); Ajibefun, Battese and Daramola (2002) that farmers were not fully efficient in their farm activities but their socioeconomic characteristics do exert influence on their productivity, thus the notion of cost efficiency by the cocoa farmers is rejected.

The hypothesis that there is no efficiency differential between households heavily dependent on hired labour and those that are heavily dependent on family labour is accepted. The comparisons of computed t_{com} value of 1.32, which is less than the tabulated t_{tab} value of 1.96 indicates the acceptance of the hypothesis. Table 20 below shows the summary of the result of the t-test comparing efficiency indices of households dependent on hired labour and those dependent on family labour.

Table 20. T-test result of efficiency differential of households dependent on hired and family labour

Parameters	Households dependency		t_{com} value	$t_{(0.025,\ 198\ d.f)}$	Decision
	Hired labour	Family labour			
n_i	174	26			
Mean X_i	0.764	0.728	1.32	1.96	Accept H_0
Sample std. of X_i	0.125	0.139			

Computed from field data, 2005

The similarity in the efficiency of the households that heavily depend on hired labour and those heavily dependent on family labour is attributed to the reason that members of the family view what belongs to them as important since cocoa beans production is the major means of livelihood to the people of the study area. Thus, households that are heavily dependent on family labour tend to be more efficient in dispensing more mandays of labour to carry out labour tasks on farm operations than hired labour who simply work to get payments. Family labour also work with higher commitments on farms than the hired labour who in most times do quick shoddy work that would enable them to go for other labour engagements elsewhere to make money irregardless of their performance in such labour tasks.

CHAPTER FIVE

5.0 SUMMARY AND CONCLUSION

This chapter presents the summary of major findings from the study, the conclusions, and the policy implications with recommendations aimed at improving of labour-use efficiency of the cocoa beans farmers in Ondo State and other cocoa beans producing regions in Nigeria.

5.1 Summary of major findings

The results presented in this study focused broadly on the analysis of labour utilization and productivity of farmers in smallholder cocoa production in Ondo State. The highlights of the major findings obtained in this study are thus given.

The mean age of cocoa farmers in the study area was 56 years implying that an average farmers was physically active, energetic enough to utilize labour efficiently. Given the gender disparity, there was a little female participation in producing cocoa in the study area, while 73.0 percent of the farmers were males. They are those mainly responsible for the bulk of farm labour supply in the study area.

The literacy status of the farmers was fair. About 38.0 percent had 7 to 12 years of formal education while 65.5 percent of the farmers had at least one year of formal education. This is a reflection that there wouldn't be delay in taking valuable decisions on diverse labour activities that depends on time and respond quickly to seasonal labour fluctuations.

The mean farming years of experience in cocoa production was 26 years which gives explanation that farmers have a long standing knowledge of labour allocation and optimal labour use in the study area. Among the sampled farmers 27.0 percent have been producing cocoa beans for more than 30 years.

The farmers are also capable of adjusting to sudden fluctuations in farm labour supply even at peak periods of labour demand. It was found that 55.0 percent of the farmers have large family size of 5 to 8 members. They are capable of meeting their immediate labour requirements.

Given the farm-specific characteristics, the study revealed the average age of most cocoa farms were about 24 years. It was an indication of marginal diminishing returns to labour which could spell down for cocoa beans production shortly into the future. The distribution of farm hectarage also shown an average cocoa farm of 5.57 hectare in Ondo State which is higher than the national average of 4.7 hectare in Nigeria. This confirms the status of the State as one of the leading cocoa producing States in the country. There is no close proximity of cocoa farms from the farmers' settlements on the average. This hinders efficient and quality time spent on actual labour-use on farms. An average of 11.3 kilometres would be traveled by a farmer in the study area.

Analysis based on the labour-use pattern showed that to augment the traditional source of farm labour (family labour) in the study area, six different categories of hired labour were utilized in cocoa production in the study area. Sharecropper labour-type was the main labour-type used (67.0 percent) in the study area while others are annual workers and children labour in order of magnitude of utilization. Adult male labour was also responsible for the largest proportion of the labour-use averaging about 69.0 percent across the study area in terms of gender decomposition of labour utilized.

Labour use distribution by farm-specific labour activities revealed that such labour tasks as spraying of agrochemicals (33.39 percent) and cocoa harvesting (29.26 percent) were the major farm activities that demanded the highest labour-use in the study. Cocoa farm understorey clearing (25.29 percent) and the application of fertilizer was the next labour tasking farm activities observed in cocoa production in the study area. Among the impediments studied, it was observed that given the period of labour activities at which labour shortage was experienced, harvesting period was the most

significant farm period in which labour was found to be very scarce, then followed by agrochemical spraying and harvested cocoa pods transportation in order of importance.

Analysis on the structure of farm labour employment wages shown by gender inequality confirmed a very low farm labour wages. Average wage rate for adult male labour was ₦400.00 while a value of about ₦300.00 was paid to the adult female labour and the children labour were paid at same rate with the adult female labour in the study area.

The profitability of cocoa production was estimated based on the gross margin analysis. The cost and returns analysis revealed that cocoa beans production is profitable. The gross margin of ₦15092.00 per hectare was recorded in the study area. Further analysis observed that within the producing regions, Ondo East region had the highest gross margin per hectare while Ile Oluji/Oke Igbo recorded the least.

The income expenditure ratio computed for the farmers in Ondo State ranges from 1.42 in Ondo East to 1.22 in Ile Oluji/Oke Igbo. It thus implies that every one Naira invested in cocoa beans production would yield profit to the producers in the study area. It confirms that cocoa beans production in Ondo State is profitable.

The results of the maximum likelihood estimates for the labour-use requirement (cost) model parameters indicated that the mean labour input requirement cost frontier recorded was 1.05. The study indicated that only 5.5 percent of the sampled farmers are utilizing labour exactly on the labour factor requirement (cost) frontier, while 94.5 percent are cost inefficient in their labour allocations because they overused labour above the minimum cost frontier. It was noted that none of the farmers allocated farm labour below the minimum cost efficiency frontier since no farmer has labour-use allocative efficiency index of less than unity.

The coefficients of the parameters estimated from the input requirement (cost) function using stochastic labour use frontier shows that all the variables estimated namely real value added of raw cocoa produced (₦), expenses on labour use (₦) and cost of agrochemicals sprayed (₦) have positive

signs. The coefficients of all the variables are statistically significant at 5 per cent level. The positive signs are indication that as unit price of raw cocoa and input prices are being increased, there would be increase in (cost) labour demand to meet the labour requirement resulted thereof.

The coefficient of determinant of efficient labour allocation is positive for age of farmers and highly significant at the 5.0 % level. This is the most important determinant of efficient labour (cost) allocation among the cocoa farmers in the study area. Hence, any policy that would increase the values of indicators of life expectancy would lead to an increase in terms of labour use cost in the study area. It can be concluded that older producers are less allocatively cost efficient than younger farmers.

5.2 Policy implications and recommendations

A number of policy implications could be drawn from this study. The most substantive are:

1. Given that cocoa producers are not presently operating on the labour-use requirement (cost) frontier. Productivity improvements can be achieved by implementing policies such that would improve life expectancy at the farm level.
2. Farmers should be exposed to technical assistance involving labour-saving technologies that save time and costs. This would make farmers to be on the optimal cost frontier.
3. As a proactive step, government should encouraged private investment in agrochemical production and other technical production inputs. This is particularly important in view of the high cost recorded in the overall cost profile.
4. The study revealed that the study area is fairly inefficient in cocoa beans production. Policy interventions are therefore required to encourage the youths staying back to ease adequate supply of labour (manpower), developing the rural level and generating improved farm income. This is in view of the competitive advantage that the State has in cocoa beans production.

5.3 Conclusions

The results of this study have observed that farmers are capable of adjusting to the sudden fluctuations in labour supply even at the peak periods of labour demand in cocoa productions judging from their large family size. Their labour-use pattern revealed that the traditional family labour was not sufficient to meet their labour demand requirements given their medium scale of operations. Hence, sharecropper labour remains the dominant labour type being used in cocoa production in Ondo State. The profitability analysis of the sampled farmers based on cost and returns estimated confirmed that cocoa beans production is profitable. An average margin of ₦15,092.00 per hectare was obtained in the study area. The least income expenditure ratio of 1.29 further confirmed that for every one naira invested, ₦0.29 would be recoup as profit, implying that cocoa beans production is profitable in Ondo State.

The analysis of the labour-use pattern shows that the farmers are not operating on the optimal labour-use level. Given the labour-use requirement (cost) frontier, the study revealed that 94.5 per cent of the cocoa farmers were not cost efficient in their labour allocations into various farm operations, since they overutilised labour beyond what is cost efficiently required to produce. About 5.5 per cent however are operating on the minimum cost efficiency frontier.

Although they are medium scale, the farmers in the study area were fairly efficient in their labour-use pattern but with open opportunities to improve their labour productivity given the input prices and level of technology in use. Gains in output from such improvements would contribute favourably to the farmers' livelihood and Ondo State's share of cocoa export earnings in the largest sector of employer of labour in Nigerian economy.

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APPENDIX

QUESTIONNAIRE

	Question	Responses	Tick
1.0	Name of Village:		
1.1	Gender of Respondent:	Male Female	
1.2	Age of Respondent:	Years:-	
1.3	Marital Status:	Married only one spouse Married more than a spouse Widowed Divorce/separated Married but lives away from spouse Single	
1.4	Years of Education Completed	Years:-	
1.5	Social Status:	Family Head Village Head Traditional Chief Member of Community Immigrant Others (specify)	
1.6	Occupation of Spouse: (if Applicable)	Trading Farming Civil Service Full housewife Others (specify)	
1.7	Household Size:	**Male Children** Less than 14 years 14 – 17 years 18yrs and above **Female Children** Less than 14 years 14 – 17 years 18yrs and above **Total Number of Children**	

2.0 Cocoa Farm Characteristics

	Question	Response	Tick
2.1	How long have you been in cocoa production?	Years:	
2.2	How many Cocoa farms do you have?	Size of Cocoa Farm (km) Age of Cocoa Farm (Yrs) Dist. from Home (km) 1. 2. 3. 4.	
2.3	Cocoa Farmland Acquisition: (If 5 and 6, how much payments do you made annually? ₦:)	Inherited the land and established cocoa farm Inherited already established cocoa farm Purchased land & established cocoa farm Purchased already established cocoa farm Rented and established cocoa farm Rented already established cocoa farm	
2.4	How do you get to your farm(s)?	Trekking Personal vehicle Hired vehicle Motorcycle Bicycle Others (specify)	

3.0 Labour Utilization and Production Expenses

3.1	What **type of hired labour** do you employ on your farm; in addition to household labour?	Daily paid casual labour Contract casual workers Annual workers Share croppers Other (specify)	

3.2 Labour use by Operation: Household Labour

	Amount of Mandays Supplied Per Week			Wages for Operations
	Adult Male	Adult Female	Children	(₦)
Clearing/Weeding				
Spraying of Agrochemicals				
Harvesting				
Pods Transportation				
Drying of Cocoa				
Others (specify)				

3.3 Labour Use by Operation: Hired Labour

Type of Operation	Daily Paid casual labour			Contact Casual Labour		
Clearing/Weeding	Adult Male	Adult Female	Children	Adult Male	Adult Female	Children
Spraying of agrochemicals	Days/ week	Days/ week	Days/ week	Days/ week	Days/ week	Days/ week
Harvesting						
Pods Transportation						
Drying of Cocoa						
Others (specify)						

Type of Operation	Annual Workers			Sharecroppers		
Clearing/Weeding	Adult Male	Adult Female	Children	Adult Male	Adult Female	Children
Spraying of agrochemicals	Days/ week	Days/ week	Days/ week	Days/ week	Days/ week	Days/ week
Harvesting						
Pods Transportation						
Drying of Cocoa						
Others (specify)						

3.4 Cost of Hired Labour by Operations:

Farm Operations	Labour Payments / day (₦)
Clearing / Weeding	
Spraying	
Harvesting	
Pods Transportation	
Drying of Cocoa	
Others (specify)	

3.5 How much do you spend on agrochemicals in the last season? (₦)

3.6 Farm Implements

3.6	How much do you spend on the following implements:	**Implement**	**Quantity**	**Cost (₦)**
		Cutlasses Buckets Long sickles Pump sprayer Knapsack sprayer Other (specify)		
3.7	What other crops do you grown in addition to cocoa:	**Crops Grown** 1._____ 2._____ 3._____	**Size (ha)**	**Yield Qty (kg)**
3.8	Give reasons for cultivating other crops: Economic Social Traditional Feeding Household food security			

4.0 Revenue From Cocoa Production

4.1	How many bags of cocoa did you produced last season?			
	Cocoa Farm	**No of bags**	**Amount (₦)**	**Weight of bag (tick)**
	Farm1 Farm2 Farm3 Farm4 Farm5			25kg 50kg 64.5kg 75kg 100kg
4.2	How much do you spend on transportation of bags of cocoa monthly (₦ .00)			
4.3	Do you have buying agents?	Yes No		
4.4	Do you have trade associations	Yes No		
4.5	Are you **satisfied with price** they pay for your cocoa beans? If no, give reasons:	Yes No		

5.0	**Labour Availability**			
5.1	Do you experience **shortage of labour?**	Yes No		
5.2	If yes, at what period of production	1.Clearing/weeding 2.Spraying of chemicals 3.Harvesting 4.Pods transportation 5.Drying of cocoa Others (specify		
5.3	What do you feel are responsible for labour shortages at such period of operations:	1. Fewer men to work 2. Low cost of labour 3. Migration to cities 4. Schooling of children 5. Improved non-farm income 6. Other (specify)		
5.4	What do you normally do to solve labour shortage problems:	1. 2. 3. 4. 5.		
5.5	Do you pay some wages of labour supplied to both male and female hired labour:	Yes No		
5.6	How much do you pay?	Male hired labour Female hired labour	**Daily paymt**	**Duration of work (hrs)**
5.7	Which of the following affect the productivity of labour employed in your area?	1.The of farm implement used 2.The cost of labour 3.The health condition 4.The nutritional status 5.Type of farm operations 6.Age of the labour 7.Climatic factors on farm 8.Other (specify)		

6.0 Children Characteristics

	Question	Response	Please Tick
6.1	Are you from this village?	Yes No	
6.2	If no, where are you from?		
6.3	What brought you to this village?	1.My parent lives here 2.To work and earn wages 3.To farm 4.An agent brought me 5.A relation brought	
6.4	How long have you been in this village?	5 years 7 years 10 years Above 10 years	
6.5	When do you plan to leave this village?	1.When am old enough 2.Very soon 3.'ve come to stay	
6.6	How old are you?	Years:	
6.7	Gender	Male Female	
6.8	Are you registered in school?	Yes No	
6.9	If yes, what is your educational level?	1.Never attended school 2.Some primary 3.Completed primary 4.Some secondary 5.Completed secondary 6.Other (specify) ----------	
7.0	Do you work on the farm	Yes No	
7.1	If yes, whose farm?	1.My parent's farm 2.A relation's farm 3.An agent's farm 4.Other (specify)	
7.2	Do you work on the farm **full time** or **part time**?	Full time Part time	
7.3	If part time, when?	1.After school hours 2.During the weekends 3.During the holidays 4.Sometimes during school hours 5.Other (specify)	
7.4	If sometimes during school, what period/season is it common?	Clearing period Planting season Harvesting season	
7.5	What activities do you perform during that period that keeps you out	1.Land preparation 2.Planting	

	of school?	3.Nursery 4.Weeding 5.Spraying of pesticides 6.Harvesting 7.Pod breaking 8.Sun drying 9.Transportation of harvest	
7.6	Is your parent a farm owner or a hired labour?	Farm owner Hired labour	
7.7	Why do you help your parents to perform these activities?	1.To fulfill parental obligations 2.To get compensated 3.To work for my school fees 4.To earn a wage	
7.8	How long do you work on the farm?	Less than 2 hours 2 to 4 hours 5 to 7 hours More than 7 hours	
7.9	What is your working nature?	Helping parents Daily period Contract casual worker Annual worker	
8.0	Do you get paid for work?	Yes No	
8.1	**How much** do you get paid for daily work?	₦	