Marketing of Palm Oil Wastes: Economic and Environmental Benefits in Nigeria

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Abstract: The palm oil industry provides means of livelihood to many people thus contributing substantially to the Nigerian economy. Wastes generated from the processing of palm oil often constitute environmental hazards. At present, there is strategic search for research, policy debates and agro-environmental schemes geared toward the conversion of waste to wealth in the industry. It is important that the wastes generated by palm oil processors be managed using technologically sound, economically viable and environmentally friendly techniques. The study investigated the financial and environmental benefits in the marketing of palm oil wastes. Data on waste disposal methods and revenue derivable from the marketing of palm oil wastes were collected from primary sources using structured questionnaire. Data obtained from these sources were analyzed with the use of descriptive statistical tools and correlation analysis.

The result showed that the major type of palm oil waste generated was palm press fibre (PPF) (40%) and palm kernel shell (32%). Recycling of waste (36%) dominated the waste management methods, followed by the sale (30%), while the least was dumping method. Disposal of palm oil waste through organic recycling had positive effect (54%) on the environment. The sale of palm oil mill effluent had significant ($p<0.05$) and positive relationship with revenue generated by palm oil processors. The marketing of palm oil waste studied enhanced the income of palm oil processors and improved environmental quality respectively. We recommended the development of the emerging market for palm oil wastes in Nigeria..

Keywords: financial, environmental benefits, palm oil, processing wastes

Palm (Hurma) Yağı Atıklarının Pazarlanması: Nijerya'daki Ekonomik ve Çevresel Faydaları

Öz: *Palm (Hurma) yağı endüstrisi, birçok insana geçim yolu sağlamaktadır ve böylece Nijerya ekonomisine büyük ölçüde katkıda bulunmaktadır. Palm yağının işlenmesi sonucu ortaya çıkan atıklar, genellikle çevresel tehlikelere yol açmaktadır. Günümüzde, sanayi atıklarının değerlendirilmesine yönelik araştırmalar, siyasi yaptırımlar ve tarımsal çevre düzenlemeleri için stratejik araştırmalar yapılmaktadır. Palm yağı işleyen işletmelerin ürettiği atıkların teknolojik ve ekonomik açıdan uygun, çevre dostu tekniklerle yönetilmesi önemlidir. Bu yüzden yapılan bu çalışmada, palm yağı atıklarının pazarlanmasında finansal ve çevresel faydalar araştırılmıştır. Birincil kaynaklardan toplanan atıkların değerlendirilmesine ilişkin veriler ve palm yağı atıklarının pazarlamasından elde edilen gelirler özel olarak hazırlanan anket kullanılarak belirlenmiştir. Anket çalışmasından elde edilen veriler, tanımlayıcı istatistiksel araçlar ve korelasyon analizi kullanılarak analiz edilmiştir.*

Çalışmanın sonuçları, palm yağı atıklarının büyük bir çoğunluğunu palm yağı posası (PPF) (%40) ve palm çekirdeği kabuğunun (% 32) oluşturduğunu göstermiştir. Atıkların değerlendirilmesinde geri dönüşüm (% 36) oldukça yaygındır, bunu satış (%30) yöntemleri izlemektedir. Palm yağı atıklarının organik geri dönüşümle atılması, çevre üzerinde (% 54) olumlu etkiye sahip olmuştur. Palm yağı işletmesi atık sularının satışı, işletme sahiplerine gelir getirdiği için, aralarındaki korelasyon istatistik açıdan önemli bulunmuştur ($p <0.05$). Bu çalışma göstermiştir ki, palm yağı atıklarının pazarlanması, palm yağı işletmelerinin gelirlerini arttırmış, ardından çevreyi olumlu yönde etkilemiştir. Nijerya'da palm yağı atıklarının pazarlanmasının geliştirilmesi tavsiye edilmiştir.

Anahtar Kelimeler: *finansal, çevresel faydalar, palm yağı, işleme atıkları*

INTRODUCTION

Palm oil originated in the tropical rain forest of West Africa. It is grown for the purposes of satisfying household and industrial demand for vegetable oil. Its production and processing into palm oil are economically profitable. In Nigeria, the crop is grown between latitude 40N and 110N of the equator, it is mostly found in the fresh water swamp and rain forest of the coast of the northern zone of the guinea savannah (Omoti, 2004). In Nigeria, palm oil is indigenous to the coastal plain, having migrated inland as a staple crop. While in the early (1960s), Nigerians palm oil production accounted for 43% of the world population, nowadays it only accounts for 7% of total global output (Omoti, 2004).

Kei et al., (1997) compared the characteristics of the palm oil sectors in Malaysia and Nigeria and found out that Malaysia's success is built on plantation management together with processing in large modern mill. The production and processing of palm oil production constitute important sources of employment to many rural dwellers

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that own wide grooves of less than 2 hectares (Usoro, 1974).

In order to overcome these problems and increase the productive capacity of farmers the Nigerian government instituted the oil palm rehabilitation program (OPRP) in the early 1980's under the ministry of agriculture and natural resources and specifically, under the small holder palm oil management unit (SMU) which is responsible for implementing the OPRP that was designed to encourage farmers to move away from traditional oil palm production and processing technologies to improved technologies that would increase yield and quality of product and at the same time alleviate poverty.

The palm oil industry generates large quantity wastes whose disposal is a challenging task. In the palm oil industry, the waste arises from palm fruits and seeds and it is a growing problem. Using them as fuel is not environmentally sound and alternative methods are to be sought. Recycling wastes for farm inputs is a viable option as evident from earlier reported work (Srindhar and Adeoluwa, 2004). Santoso (2018) evaluated the performance of palm oil mills in renewable energy production that is the most optimal in generating the largest profit margin. The results showed that each process of waste management, the percentage of the processed waste is about 19.8; 45.5 and 34.6% compost, biogas and pellet production respectively. Accordingly, the following financial benefits were reported US$6.1; US$31.3 and US$54.47 / ton respectively (Santoso, 2018). The economy has benefitted from palm oil mill waste processing in different ways such as:

(1) Raw materials for organic fertilizers can only reduce environmental issues, but also help government solve municipal problems. (2) High nutrients for plants growth, processed palm oil wastes has high organic which meets the needs of plants growth. (3) Improving soil structure, it enhances soil fertility & accelerates growth of oil palm roots so that promotes sustainable development of the oil palm industry. (4) Reducing environmental pollution (5) Basically used as feeds for animals (6) Serve as potential resources for use in several bioconversion processes for producing valuable products.

The wastes have been productively utilized as a resource in diverse industries but yet to reach its optimum. Large quantities of POME are still unreasonably discarded. Disposal options carried out these days comprises of land filling, dumping at the sea, soil application and incineration.

The palm oil waste/by products is used both in food industry and in the non-food industries (Armstrong 1998). In the food industry palm oil and kernel oil are the major extract from the fruit and seed. Palm oil which is one of the major extract from the outer parts of the fruit is used as margarine, nondairy creamer and ice cream amongst other uses food uses of palm oil.

Traditionally, the main nonfood uses of palm oil have been in the manufacture of soaps and detergent and in the production of greases, lubricants and candles. Palm oil wastes produced from small and medium scale industries pose a serious environmental problem in Nigeria. Despite the obvious benefits, of palm oil mill to the economy, it also significantly contributes to environmental degradation, both at the input and output sides of its activities. Strategic disposal of palm oil waste through recycling and sale could improve the revenue base of the small and medium scale palm oil processing firm in the study area.

The importance of palm oil waste which is now preferred to be referred to as the by-product of oil palm cannot be over emphasized, therefore this research work is designed to know the revenue generated from palm oil wastes, its environment benefits and the importance of these by-products and the effects it has on the society at large. It is important to examine the various economic and environmental benefits of palm oil waste disposal. Any oil processing industry striving for relevance must face and address the challenges of proper waste disposal in its operations to advert harm to the environment and health of the community hosting the Palm Oil Mill (POM). The palm oil industry produces two major products from the processing of Fresh Fruit Bunches (FFB) namely: Crude Palm Oil (CPO) and Crude Palm Kernel Oil (CPKO). CPO is obtained from the meso-carp of fresh fruit and the CPKO is obtained from the endosperm (kernel). The production of these primary products generates waste by products.

It is important to investigate the dual goals of oil palm waste disposal methods that maximize revenue generation and minimize negative environmental impact. Hence this study was designed to examine the conversion of palm oil waste to wealth and its environmental benefits.

The study provided answers to the following research questions: How do the palm oil producers dispose of waste? How does the disposing method of oil palm waste affect the environment? Do palm oil wastes contribute benefits to private companies and the community? What is the level of wealth derivable from palm oil waste disposal?

The major objective of the study was to ascertain the financial and environmental benefits of palm oil mill waste disposal Nigeria. The specific objectives of the study were to:

i. determine the types and magnitude of oil palm wastes generated in the study area.

ii. evaluate the methods of disposal of generated oil palm wastes.

iii. assess the effects of methods of oil palm waste disposal on the environment and the society at large

iv. determine the amount of wealth derivable from the marketing of oil palm waste disposal.

This study was planned on two hypotheses;

H01: There is no significant effect of palm oil waste disposal methods on the environment.

H02: Palm Oil waste disposal methods has no significant effect on revenue generated by palm oil processors.

MATERIALS AND METHODS

Area of Study

This study was conducted in Nigeria. The communities that were involved in the study were Adonte, Ashama, Egbudu-Akah, Ejeme-Unor, Ewulu, Isheagwu, Ogwashi Ukwu (comprising Olor, Igudu), Nsukwa, Ubulu-okiti,Ubulu Ukwu, Ubulu-Unor, Ukwu-Oba and Umute. It has an area of 868km2 and a population of 140604 at the 2006 census. The permanent crop grown in the area includes palm oil plantations in Nsukwa, Ubulu Ukwu and Ashama. Hence palm oil processing is one of their means of livelihood.

Sampling Techniques

The study area was made up of about 14 communities. 5 communities were selected namely Ashama, Ejeme Unor, Isheagwu, Nsukwa, and Ubulu Ukwu. Two samples were used for this study. First producers of palm oil and then buyers of oil palm waste. About 50 palm oil producers were randomly selected from the two communities using simple random techniques.

Method of Data Collection

Data for this study were collected from both primary and secondary sources. The primary data collection instrument was a structured questionnaire and interview schedule. Copies of the questionnaire were administered to literate oil palm producers while interview schedules were used for those who could not write but can express themselves orally. The secondary data were existing published materials relevant to the study such as textbooks, internet, journals etc data obtained from these sources were analyzed to achieve the objectives of this study.

Methods of Data Analysis

Data collected in the course of this study were analyzed with the use of descriptive statistical tools (mean, standard deviation, frequency distribution and percentage analysis). Correlation matrix was used to test hypotheses on cause and effect relationships.

The Pearson Correlation model is given as

$$r = \frac{n\Sigma xy - \Sigma x\Sigma y}{\Sigma x^2\_ - (\Sigma x)^2 .\Sigma y^2\_ - (\Sigma y)^2}$$

RESULTS AND DISCUSSION

Types and magnitude of oil Palm mill waste generated

Table 1 shows the types of oil palm waste produced, Palm Press Fiber (PPF) (40%), Palm Kernel Shell PKS (32%), Palm Oil Mill Effluent (POME) (16%), Empty Fruit Bunch (EFB) (12%). This clearly shows that PPF is highly produced amongst other waste, and the least produced is POME 12%. This result implies that an increase in the sale or recycling of palm press fibre will increase the wealth derived by the processor, and this can drastically reduce the overall quantity of oil palm waste as environmental pollutant in the society.

Table 1. Distribution of types and magnitude of palm oil waste generated

Types	Percentage % (Magnitude)
Empty fruit bunch (EFB)	16.0
Palm kernel shell (PKS)	32.0
Palm press fiber (PPF)	40.0
Palm oil mill effluent (POME)	12.0
Total	100.0

Methods of Disposal of Generated Palm Oil Wastes

The distribution of oil palm wastes disposal methods is presented in Table 2. The finding shows that 12% practiced dumping, 22% practiced burning, 36% adopted recycling method, while 30% sold oil palm wastes to generate revenue. The result indicates that recycling method is the dominant disposal method among the respondents, followed by sales method. Both methods are sources of wealth to the processors. This result further shows that about 34% of the oil palm wastes generated were actually lost to the environment. This finding supports the earlier report of Adeniyi et al. (2014) on the common methods of palm oil mill waste disposal in Ogun state, Nigeria.

Table 2. Distribution of oil Palm Wastes Disposal Methods

Methods	Frequency	Percentage (%)
Dumping	6	12
Burning	11	22
Recycling	18	36
Sales	15	30
Total	50	100

Effect of methods of Disposal of oil Palm Waste on the Environmental Quality

The above Table 3 shows that palm oil waste positively affects the environment by (54%) and it negatively affects the environment by 46%. This shows that the positive effect of oil palm waste is higher than its negative effect on the society.

Table 3. Effect of methods of Disposal of palm oil Waste on the Environmental Quality

Effect	Frequency	Percentage %
Positive	27	54.0
Negative	23	46.0
Total	50	100.0

Table 4 shows the distribution of economic benefits of oil palm waste to the society. The result shows that the percentage of income generation is higher (54%), followed by 32% from organic fertilizer 14% fuel wood substitute/mulching. The result indicates that the highest benefits is derived from income generation, followed by organic fertilizer (i.e. some of these oil palm wastes serves as fertilizer to the oil palm plantation making them benefit in that aspect and money is saved, which would have been used to purchase chemical fertilizer). About 14% of the oil palm waste is used as alternative energy to fuel wood and also used for mulching in the nursery. This result agrees with Ese (2018).

Table 4. Distribution of Economic Benefit of Palm oil Wastes to the Society

Benefits	Frequency	Percentage (%)
Income generation	27	54.0
Organic Fertilizer	16	32.0
Fuel Wood Substitute/Mulching	7	14.0
Total	50	100.0

The relationship between oil palm waste disposal methods and environmental quality (odour, smoke and physical damage) is presented in Table 5.

Table 5. Pearson Correlation Matrix Showing the Relationship between palm oil Waste Disposal Methods and Environmental Quality.

	Odour	Smoke	Damage
EFB disposal	0.14(0.32)	0 .15(0.29)	-0.06(0.70)
PKS disposal	0.03(0.81)	0.06(0.67)	0.09(0.52)
PPF disposal	0.06(0.69)	-0.03(0.82)	0.08(0.57)
POME disposal	-0.68(0.00)**	-0.65(0.00)	-0.05(0.74)

*** p<0.01 {2-tailed}*

The result shows that Palm oil Mill Effluent (POME) (-0.68) disposal has a negative and significant relationship ($p<0.05$) with environmental quality (odour). The result implies that better methods of disposing POME will reduce the offensive odour it emits to the environment, thus improving the quality of the environment. The result in Table 5 also shows a negative and significant relationship between Palm oil Mill Effluent (POME) disposal and smoke (-0.65) in the environment. This finding indicates the more the quantity of POME that is evacuated the less the smoke in the environment. Evacuation methods of Palm oil Mill Effluent is therefore an important determinant of environmental quality in areas where oil palm is processed. Although all the disposal methods of oil palm waste has relationship with physical damage of the environment, the relationship is not significant. This implies that although the crude disposal methods cause physical damage in the form of eye-sore, the physical damage is not a significant source of worry.

The relationship between oil palm disposal methods and revenue (wealth) creation is presented in Table 6, the result shows that there is a positive and significant relationship between EFB (0.44) and revenue. This finding indicates that the sale of Empty Fruit Bunch (EFB) generates good revenue to the processors. This result also showed that Palm oil Mill Effluent (POME) (0.68) has a positive and significant relationship with revenue of processors. This implies that the sale of Palm oil Mill Effluent (POME) would generate additional financial benefits to the processor when it is produced on a large scale. Crude palm oil (CPO) extracted from the mesocarp of palm oil fruit, accounts for 35.1% of the global vegetable oil output, Its economic importance has contributed greatly to the GDP of major world producers and exporters of the products such as Malaysia and Indonesia (MPOB, 2016). Also Abdullah and Sulaiman (2013) had earlier reported that utilization of oil palm waste as renewable resource is strategically viable as it can contribute to the country's economy and environmental sustainability. Santoso (2018), also reported significant financial benefits in palm oil processing mill waste management.

Table 6. Relationship between palm oil wastes disposal methods and Revenue (Wealth) creation

	EFB disposal	PKS disposal	PPF disposal	POME disposal
REVENUE	0.47(0.01)**	-.012(0.93)	-0.09(0.51)	-0.67(0.00)**

**p<0.01 {2-tailed}

CONCLUSION AND RECOMMENDATIONS

This various types of oil palm wastes and methods of disposal were investigated in relation to their effects on environmental quality and wealth derivable by the processors. The result showed that palm press fibre was the major wastes generated and the dominant waste disposal

method was the recycling techniques. Further analysis indicates that effective management of processing oil palm mill wastes has positive effects on the environment especially palm oil mill effluent. The sale of oil palm wastes particularly empty fruit bunch and palm oil mill effluent are additional sources of wealth to the processors. In addition, Empty fruit bunch and palm oil mill effluent could be used by oil palm producers as organic fertilizer, while palm press fibre and palm kernel shell could be used by processors as substitute for fuel wood and save cost of production.

Based on the findings this study, the following recommendations were made. Government in the three tiers should collaborate together in mounting a vigorous advocacy on the benefits of the palm oil processing mill wastes through seminars to broaden the understanding of processors. Effective information should be dispersed by the extension agents to educate processors on the additional income they can generate from the sales of these wastes.

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