Optimal Transportation and Spatial Integration of Regional Palm Oil Markets in Nigeria

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ABSTRACT

The poor quality of transportation infrastructure in Nigeria impacts negatively on the competitiveness of palm oil. This leads to increased inter-regional transportation cost, delayed time of arrival to the destination and lowered transaction efficiencies in the distribution chains. Primary and secondary data were used. Random sampling technique was used to collect data from 276 distributors in main palm oil markets. Data were analyzed using linear programming and Ravallion model at 0.05 α-level. Results of the data analyzes show that average cost of transporting palm oil from the production market to the consumption market was N5,831.9 per MT. Observed transportation cost was N60,724,830.5 while the optimal cost was N44,003,500.30 indicating a 38.0% reduction in total cost of transportation. Highest optimal allocations to the destination markets were Owerri-Jos (133,500 MT), Ondo-Lagos (107,200 MT) and Port Harcourt-Kano (82,000 MT) at minimum transportation cost of N5,750, N4000.7 and N6500.0 per MT respectively. Two lag periods were identified signifying that it takes about 1-2 months for price information to spread across the markets by the model. Six of the 27 market pairs exhibited high short-run market integration for both lag periods with Port Harcourt-Abuja market pair indicating the highest (0.1 and 0.004). The lowest short-run market integration was recorded in Ondo-Minna market pair indicated by 1.4 and 17.4 respectively. Policies that will enhance redistribution of palm oil supply between producing and consuming regions should be pursued.

KEYWORDS

Market Integration, Optimal Allocation, Palm Oil, Nigeria, and Transportation Cost

INTRODUCTION

Stable food markets are of importance for economic development, political stability and the welfare of Nigerian farmers and middlemen. These markets are also important to consumers who spend a high proportion of their income on staples. The efficient transportation of these staples is important to all. The ways in which the transportation system is organized play a very important role in determining the livelihoods opportunities available to the economic agents both directly and indirectly.

Transportation adds value by making products available in the right place and at the right time. This can affect the production decision of farmers as they are likely to produce commodities which have high demand and consequently higher returns. The existence of poor quality or inadequate infrastructure may impact negatively on the competitiveness of agricultural producers through...
increasing internal transport costs, reducing levels of value-added at origin and lowering transaction efficiencies in the marketing chains. Physical transportation cost accounts for as much as 12% in the US, but in Nigeria, the percentage varies between 30 and 65% of delivery cost (MTC, 2013; Olayide in Adekanye, 1988). Walker (2000) has stated that the high cost of transportation in Nigeria is explained by an inefficient and uncoordinated transport system coupled with poor roads, reckless driving and absence of effective vehicle inspection and control.

Efficient transportation of goods and services is one of the stimulants of the national economy. In Nigeria, this is adjudged to be traumatic (Makhura, 2001). This has led to inefficient and poorly integrated agricultural markets in African countries. Agricultural marketing efficiency in these countries and indeed Nigeria is dismally low (Onyuma, Icart & Owuor, 2006; Phillip, Nkonya, Pender & Oni, 2008). This in turn, results from poor information transmission channels, inefficient communication systems and absence of official (government) price communication/media (Okoh, 1999).

The study seeks to find the optimal transportation schedule that will minimize the total cost of transporting palm oil from three production regions (Port Harcourt, Owerri and Ondo) to the various key destinations geographically scattered in Nigeria. The destinations are the markets where distributors/marketers carry the palm oil to (i.e. Lagos, Ibadan, Abuja, Sokoto, Kano, Kaduna, Maiduguri, Minna and Jos). Essentially, the problem becomes that of determining how much of a region’s total palm oil output in a particular period, should go to a particular market. What is the “best” way to do this? That is, in an attempt to minimize total transportation cost of palm oil incurred by the distributors; what channels of physical distribution should each firm adopt, all acting within some binding constraints. These constraints are such that each firm cannot ship more than is available at the origin and the total shipment to the destination must at least be equal to the quantity required at the destination.

Another side of this problem is to maximize the nation’s net revenue from palm oil industry. In other words, what is the price that must be paid either for a unit of the product at a particular production point and/or what price must be paid for the delivery of a unit of the product at a particular destination to achieve maximum revenue? When we try to discover the competitive prices charged both at the production and consuming points, we must be trying to achieve maximum net revenue at the same time that we are trying to minimize transportation cost.

A fundamental question that is relevant to this study is ‘how effective is transportation in response to palm oil demand?’ Transportation of palm oil from one location to the other constitutes a serious problem in Nigeria (Nwauwa, 2011). This is because the commodity is bulky and infrastructural facilities in the country have not been properly developed to handle evacuation of bulk materials at least cost. Rail system of transportation is most ideal for this situation but it is regrettably in lack with road system widely in use today (Otitolaiye, 2009).

Thus, this study therefore contends that imbalance in demand and supply of palm oil exists primarily due to inefficiency in the distribution of this commodity across the regional markets. This further leads to problem of price differential in different parts of the country. From past studies on transportation with the general consensus that the level and quality of infrastructure is low, a fundamental question that needs an urgent answer is “how does the Nigerian palm oil market perform under this situation?” In general, this study aims to evaluate optimal pattern of palm oil shipment that minimizes total cost of transportation and assess the level market integration of regional palm oil markets in Nigeria.
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