

Developing a Sourcing and Distribution Strategy



ASHESI UNIVERSITY COLLEGE

Developing a Sourcing and Distribution Strategy for Tieme Ndo Social Enterprise

APPLIED PROJECT

BY

MOSES YANGNEMENGA

Applied Project Report submitted to the Department of Business Administration, Ashesi University College in partial fulfilment of the requirement for the award of Bachelor of Science degree in Business Administration.

April 2018

DECLARATION

I hereby declare that this Applied Project is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

CANDIDATE'S SIGNATURE:

CANDIDATE'S NAME: MOSES YANGNEMENGA

DATE:

I hereby declare that the preparation and presentation of the Applied Project Report were supervised in accordance with the guidelines on supervision of applied projects outlined by Ashesi University College.

SUPERVISOR'S SIGNATURE:

SUPERVISOR'S NAME: DR. GORDON ADOMDZA

DATE:

ACKNOWLEDGEMENT

I first of all want to thank the Almighty God for the strength throughout the course of this project.

This project was under the supervision of Dr. Gordon Adomdza and I want to express my sincere gratitude to him for stepping up to supervise this project. His expert knowledge and guidance cannot be underestimated.

I also want to say a special thank you to myself for taking up this challenge and for overcoming all the challenges to the end of this project. I also want to thank my family especially Aloysius Yangnemenga for your prayers, advise and encouragement since the start of this project.

For the extension officers at Tieme Ndo, the farmers in Nandom, I say thank you for resilience and lessons you have thought me while working with you.

Lastly, I want to thank my friends especially Mary Ewusi, Justice Nyamadi, Stephen Gyan and Joseph Wukpan – my roommate for their encouragement and assistance offered me in this project.

EXECUTIVE SUMMARY

Tieme Ndo is a social enterprise startup that supplies farm inputs such as fertilizer, improved seeds and weedicides to rural farmers at Nandom in the Upper West Region of Ghana. The startup is committed to boosting crop yields among rural farmers and empowering them to lift themselves out of poverty. Tieme Ndo started operation last year in May but was not able to supply the right kind of fertilizers, seeds and weedicides to farmers at the right time. Thus, leading to low crop yields among its portfolio of farmers. Hence the need for this project. The project seeks to identify the operational challenges Tieme Ndo faced in procuring and distributing farm inputs to farmers during its pilot and to orchestrate an efficient means for procuring and distributing the right kind of farm inputs to farmers at the right time. To do this, three workers of the organization were interviewed including one of the co-founders. Agriculture farm input dealers were also interviewed. Various sourcing and distribution strategies often used by organizations around the world were reviewed. Finally, the author proposed parallel sourcing as the sourcing strategy and distributor storage with customer pickup as the distribution strategy. Based on the factor-rating model, three farm input dealers were recommended: AMG, RMG and M&B Seeds and Agricultural Service Ltd to be the suppliers of fertilizer, seeds and weedicides to Tieme Ndo. The proposed solution will help Tieme Ndo save cost of renting an additional warehouse and will also help the organization hold enough stock – about 1000bags of fertilizer and seeds for cash sales.

TABLE OF CONTENTS

DECLARATION	ii
ACKNOWLEDGEMENT	iii
EXECUTIVE SUMMARY	iv
CHAPTER 1: INTRODUCTION TO PROJECT	1
Introduction.....	1
Rationale for Selecting Tieme Ndo for the Project.....	1
Company Profile – Tieme Ndo	2
Industry Analysis – Agriculture in Ghana	4
The Fertilizer Market in Ghana.....	5
<i>External analysis using the STEEPLE Framework</i>	10
SWOT Analysis on Tieme Ndo	15
CHAPTER 2: PROJECT NEEDS ANALYSIS.....	18
<i>Methodology</i>	18
<i>Needs Assessment based on Insights from the Interviews with the Co-founder and Extension Officers</i>	19
<i>Problem Statement</i>	22
<i>Research Purpose</i>	22
<i>Project Objectives</i>	22
CHAPTER 3: MASTERY OF SUBJECT MATTER.....	23
Sourcing Strategies	23
<i>Single Sourcing Strategy</i>	25
<i>Parallel Sourcing</i>	27
<i>Multi Sourcing</i>	28
<i>Delegated Sourcing</i>	29
Supplier Assessment and Selection Criteria	31
Methods of Evaluating Location Alternatives	33
Distribution Strategies	34
<i>Distributor Storage with Package Carrier Delivery</i>	35
<i>Distributor storage with last-mile delivery</i>	36
<i>Manufacturer/Distributor Storage with Customer Pickup</i>	37
<i>Retail storage with customer pickup.</i>	39
Case Study on One Acre Fund.....	40
Findings and Insights from Interview with Agro Input Dealers	42
CHAPTER 4: SOLUTION/TOOL AND IMPLEMENTATION PLAN.....	44

Review of the Structure and Components of the Tool.....	44
<i>The Proposed Sourcing Strategy</i>	44
<i>Benefits of Parallel Sourcing to Tieme Ndo</i>	45
<i>Supplier Evaluation Selection Criteria</i>	46
<i>Analysis of the Supplier Selection Criteria</i>	47
<i>The Factor Rating Model</i>	49
<i>Analysis of the Factor-Rating Model and the Recommended Suppliers</i>	50
The Distributor Storage with Customer Pickup Distribution Strategy	52
Putting it Together – The Complete Supply Chain for Tieme Ndo	55
Analysis and Benefits of the Sourcing and Distribution Strategy	56
Implementation Plan	58
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS	62
Conclusions	62
Recommendations	62
References	64
Appendix	67

CHAPTER 1: INTRODUCTION TO PROJECT

Introduction

At Ashesi University College, the purpose of an applied project is to allow students to engage with real life organizations. This means that, the applied project gives students the opportunity to apply their knowledge and skills learned over their four years at Ashesi to solve real-life challenges faced by existing organizations (Ashesi University, 2017).

Therefore, the objective of the project is to identify the operational challenges Tieme Ndo encountered in procuring and distributing farm inputs to farmers at Nandom. The project will also orchestrate a strategy to effectively source and distribute farm inputs to farmers at the right time. This is necessary because, rural farmers in Northern Ghana especially Nandom, needs timely access to farm inputs because, late access to basic farm inputs such as fertilizer and improved seeds leads to late crop yields. This makes farmers vulnerable to food insecurity, hunger, poverty and malnutrition. Hence, the need for this project to help Tieme Ndo achieve its goal of timely supply of fertilizer, seeds and weedicides.

Rationale for Selecting Tieme Ndo for the Project

Tieme Ndo is a startup with high growth potentials in the agriculture sector. The startup also have high impact in the lives of rural folks with services packages. This means that, if Tieme Ndo is given all the needed support for it to overcome its operational challenges, it will grow to impact millions of lives in Nandom and the whole of Ghana. Tieme Ndo will be contributing to reduce unemployment rate in Ghana. More important, Tieme Ndo is operating within the agriculture sector which is of great interest to me. Beyond this, it is my passion to support startups improve their operational efficiencies to facilitate their faster growth and

ability to attract investors. Hence, working with Tieme Ndo will give me such an opportunity to explore my interest in agriculture and passion for supporting startups.

Company Profile – Tieme Ndo

Tieme Ndo literally means “*push me up*” in Dagaare. It is a social enterprise startup based in Nandom in the Upper West Region of Ghana. Tieme Ndo seeks to be the “farm hub” of the North. With the aim of providing farmers with their farm needs and all the necessary assistance that will empower them to lift themselves out of poverty. Tieme Ndo was founded in May 2017 to mitigate a systematic failure of farmers’ inability to access improved fertilizer and seeds on time. Because, they do not have the needed capital to pay upfront for the basic farm inputs that will boost their crop yields. To solve this problem, Tieme Ndo has developed a special package – **Credit Extension Package (CEP)** to help farmers boost their crops yields every year. Under the CEP, each farmer registered is given a minimum of three bags of fertilizer, seeds and weedicides on credit to cultivate an acre of maize. In addition, farmers are given training and monthly field visits from experienced and technical personnel to assist them use the inputs appropriately. After harvest, farmers are assisted to sell the excess of their farm produce for income.

Furthermore, Tieme Ndo also provides **Small Agribusiness Development (SAD)** services to farmers. That is, farmers are given training on how to add value to their farm produce before they are consumed or sent to market for sales. Farmers are further trained on how to start small enterprises along the agriculture value chain. With a \$20,000 award from D-Prize Foundation, a San Francisco based NGO, Tieme Ndo has been able to distribute over 1000 bags of fertilizer, seeds and weedicides to more than 400 farmers from 30 communities in the Nandom District since its pilot last year. Averagely, farmers have increased their maize yields per acre by about 25% (Tieme Ndo Pilot Evaluation, 2018). This implies that, each

household will now have enough food to feed their children and possibly sell the excess for income. With a staff size of three: two extension officers and stock keeper, Tieme Ndo is looking forward to distributing fertilizer and seeds to more than 1500 farmers at Nandom in the coming season in May, 2018.

Tieme Ndo's Vision

Tieme Ndo envisions a future where every rural farmer in Ghana and Africa is able to identify business opportunities along the agriculture value chain. As such, Tieme Ndo seeks to train farmers to add value to their farm produce before they are consumed or sent to market for sales.

Tieme Ndo's Mission

Tieme Ndo's mission is to stay committed to boosting crop productivity, increase income, job creation, alleviate poverty and achieve food security by empowering rural farmers with timely supply of fertilizer, quality seeds and agricultural support services.

Tieme Ndo's Values

Tieme Ndo is established on the basis of mutual trust and respect between farmers and the organization. In that, Tieme Ndo trusts farmers by giving them farm inputs and other related services on credit. Trusting that, farmers will repay all monies due on time. On the other hand, farmers trust Tieme Ndo to provide them with quality and credible services that will enhance the returns on their farm investment. Another important value is self-accountability. Even though farmers are registered into groups, each farmer is responsible for his/herself in terms of credit repayment and compliance to recommended farm practices.

Industry Analysis – Agriculture in Ghana

Ghana is an agrarian country with agriculture being the main driver of economic development with a steady growth rate of 6% (MOFA, 2017). As at 2017, the agriculture sector contributed about 18.5% of national GDP and employs close to 50% of the working population (Ghana Statistical Service, 2017). Unfortunately, the agriculture sector in Ghana is rain fed and largely on small-scale basis, Industrial crops cultivated on large fields are: palm oil, pineapples, cotton, tomatoes, bananas, citrus fruits, coconuts, tobacco, cashew, fresh vegetables, rubber, Shea and soybeans (Ministry of Food and Agriculture, 2017). Cereals and vegetables are grown on small scale farms mostly less than 2 hectors of land (GSS, 2017). Ghana is the leading producer of cocoa in the world after Cote d'Ivoire, even though the production is mostly done by small holder farmers. The production of cotton is mostly done in the Northern regions of Ghana which serves as a source of income for smallholder farmers (Ghana Investment Promotion Centre, 2018).

The farming systems in Ghana is traditional where hoes and cutlasses are predominantly used as tools with little mechanization. Bullocks are still used in the Northern part of Ghana (MOFA, 2017). Over the years, the agriculture sector has been characterized by low yields for cereals such as maize, rice and sorghum. Cereal yields are estimated at 1.7 tons per hector compared to the regional average of 2.0 tons per hector although potential yields is in excess of 5.0 tons per hector (MOFA, 2017). Among other factors causing low cereal yields are low fertilizer usage and post-harvest losses. According to the International Fertilizer Development Centre (2012), Ghana has to increase its fertilizer imports from 0.2million metric tons to 0.37million metric tons in order to achieve high cereal yield targets. This will increase fertilizer application among rural farmers. Eventually increasing their crop yields. Although low productivity in the agricultural sector could be attributed to a broad

range of factors, low adoption of improved technologies including agro inputs, unfavorable weather, poor farm management skills and policies are major contributors to poor yields.

The Fertilizer Market in Ghana

Fertilizers and improved seeds are important farm inputs that farmers need in order to increase their crop yields. Unfortunately, farmers in Ghana especially rural farmers have challenges accessing improved farm inputs such as fertilizer and seeds. Mostly, fertilizer use is more expensive for smallholder farmers to afford (Tetteh, et al., 2017) . Thus, the adoption and use of fertilizer is very low among rural farmers in Ghana. According to the International Fertilizer Development Centre (IFDC), approximately 10 percent of smallholder farmers who cultivate less than 1.0 ha of land use fertilizer. Fertilizer use in Ghana is about 7.2 kilograms per hectare (kg/ha), similar to the average rate in Sub Saharan Africa (SSA), but significantly lower than other developing countries (IFDC, 2012). Generally in Africa, the high cost of chemical fertilizers and limited availability of enough quality organic inputs (manure, crop residues.) contribute significantly to the overall low use of nutrient inputs on the continent (IFDC, 2012). For seeds, most farmers save some of their produce to be used as seeds in the next cropping season, indicating both a lack of access to improved seeds and a lack of understanding of the benefits of the increased production associated with improved seed technology. According to the International Fertilizer Development Centre; IFDC, there is an important nexus between output and input markets, with price signals inducing farmers' decisions to invest in their soil, and thus their likelihood to purchase fertilizers (IFDC, 2012).

The fertilizer market in Ghana is the fourth largest in the West African Region after Nigeria, Burkina Faso and Code d'Ivoire. The fertilizer market in Ghana represents an average of about 10.6 percent of the total fertilizer consumed (in nutrients base) in the Economic Community of West African States (ECOWAS), (Fuentes, Bumb, & Johnson,

2012). Ghana imports 80% of its chemical fertilizer, whereas the remaining 20% is produced locally as organic fertilizer (IFDC, 2017). Fertilizer imports in 2016 amounted to 240,000 metric tons, decreasing by 17% in 2015 (290,000mt). This resulted in lower fertilizer consumption, which is 240,000mt in 2016 as compared to 290,000mt in 2015 (IFDC, 2017). Also, it is important to note not all the fertilizer imported into Ghana is consumed by farmers because, a proportion of the fertilizer imported is exported (Anonymous, 2014). Although Ghana is not a secondary producer of fertilizer, its imports are re-exported to neighboring countries such as Burkina Faso, Guinea Mali, Cote D'Ivoire and Niger (Anonymous, 2014). As at 2014, fertilizer re-exported amounted to 7,520 MT consisting of 72% of NPK and 28% Urea (IFDC, 2017).

The largest importers of fertilizer in Ghana are Yara, Chemico Limited and Louis and Dreyfus Commodities. All these importers are secondary fertilizer producers because, they import fertilizer supplements, blend and bag them into 50kg bags. The marketing and distribution of the fertilizer is carried out by the importer. Other players along the supply chain includes, fertilizer distributors/wholesalers, retailers and the final consumers – farmers. The figure below shows the various actors along the fertilizer supply chain in Ghana.

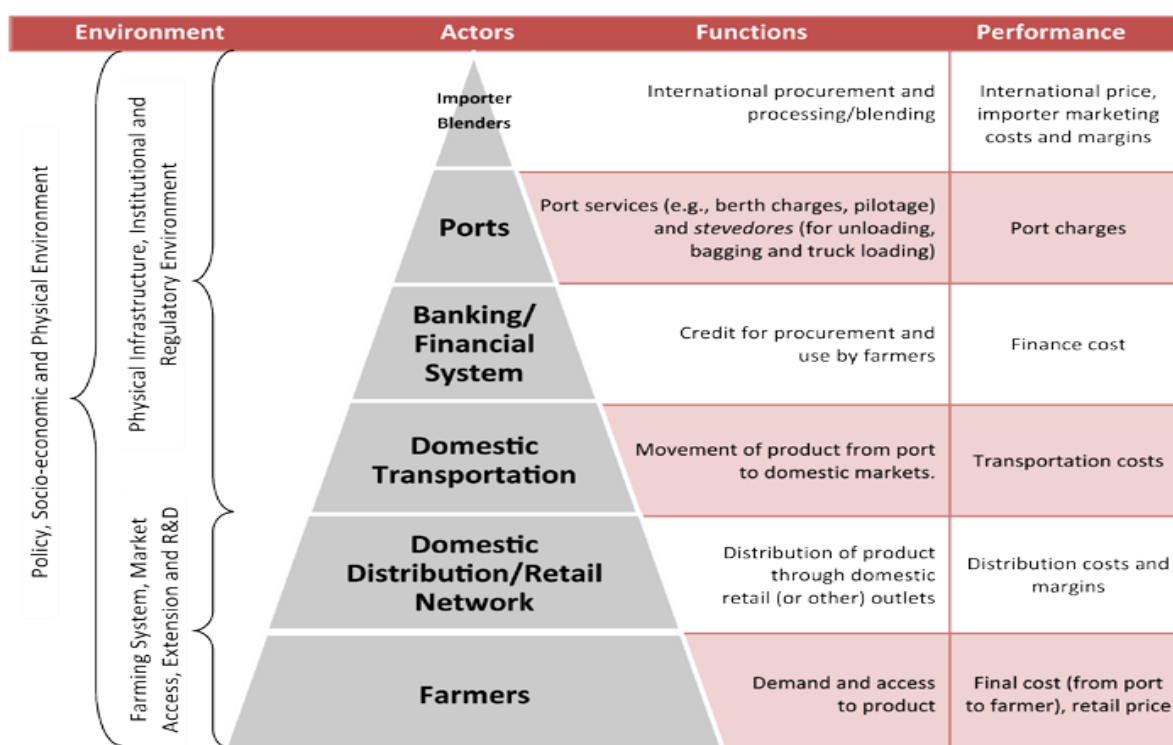


Figure 1 - Fertilizer Supply Chain in Ghana (IFDC, 2012)

As indicated from the diagram above, the fertilizer importers are represented at the apex of the diagram. These importers are involved in the importation of fertilizer supplements, blending different fertilizer formulations and bagging them. Other players identified are financial institutions, mostly banks who provide credit for importers to procure fertilizer. Financial institutions also provide finances to the farmers to purchase fertilizer. In addition to these factors, domestic transportation companies play a larger role in the fertilizer industry. Transport companies contribute largely to the movement of fertilizer from the importers at the port to distributors, retail outlets and to the farmers who are the final consumers. Distributors and retailers are closer to farmers than the importers. As such, the importers do not sell directly to the farmers but through the services of the distributors and retailers. Hence, it worth mentioning that all these players along the fertilizer supply chain contributes to the final cost of fertilizer paid by the farmer. For example, fertilizer importers usually do not have direct link to the farmers so distributors and retailers are engaged to market and sell fertilizer products to the farmer. By doing that, they make their margins

which is ultimately paid by the farmer thus, resulting in the high cost of fertilizer paid by rural farmers. This causes the low fertilizer usage among farmers.

In addition, it is important to note that, the four players at the upstream fertilizer market is attributed to low volume of trade and high transaction costs related to finance and logistics. Resulting in apparent low trading margin. The high cost is associated with the high cost of borrowing from banks which stood as high as 35.5% (Bank of Ghana, 2017). The cost/price structure along the fertilizer supply chain can be classified into two main components. First is the international cost, which composed of prices/cost of fertilizer in the international market (mostly with free on board [f.o.b.] price), plus insurance and freight or international shipping charges (Incoterm: cost, insurance and freight [c.i.f.]) (Fuentes, Bumb, & Johnson, 2012). The second cost component is domestic cost. Domestic cost consist of the additional inland costs incurred from the port to the point of final sale. It includes port charges, vessel unloading and bagging, government charges, finance cost, domestic transportation and marketing cost or distribution margins (Fuentes, Bumb, & Johnson, 2012).

Domestically, finance cost – the cost of borrowing from banks is the highest cost component along the domestic fertilizer supply chain, accounting for an average of 30 percent. Followed by marketing and distribution cost 27.2% on average. Domestic transportation cost averagely 21%, port charges 17.8% and government charges amounted to 3.7% (Fuentes, Bumb, & Johnson, 2012). Moreover, other challenges along the fertilizer supply chain includes, high marketing cost, high operational inefficiencies at the port, poor domestic infrastructure like roads and transport system. All these cost and challenges together amount to the high price of the fertilizer, which is often expensive and unfordable to the rural farmer. It is therefore not surprising if fertilizer usage in Ghana is low. According to the authors, operational efficiencies at the port will reduce cost of fertilizer and eventually, there will be no need for the government to subsidize fertilizer for farmers. Therefore, for Tieme

Ndo to supply low cost fertilizer to farmers, the organization must work towards eliminating the inefficiencies along the fertilizer supply chain. Also, reducing the number of players along the fertilizer supply chain could contribute to low cost fertilizer for farmers. As such, it is the goal of this project to find the efficient means of procuring fertilizer. This include identifying the stage along the supply chain where Tieme Ndo could play.

In Ghana, most importers do not own the distribution network down to the retail level, but prefer to associate with local businesses involved in fertilizer wholesaling and retailing. There are more than 2,700 fertilizer retail shops spread across the country, with the highest concentration in the central regions of Ashanti, Eastern and southwest area of Brong Ahafo region. In 2008, when the fertilizer subsidy was first introduced a study was carried out by Banful (2009). From the research, Banful discovered four types of fertilizer retailers (Banful, 2009). Figure 3 below describes the type of players along the value chain.

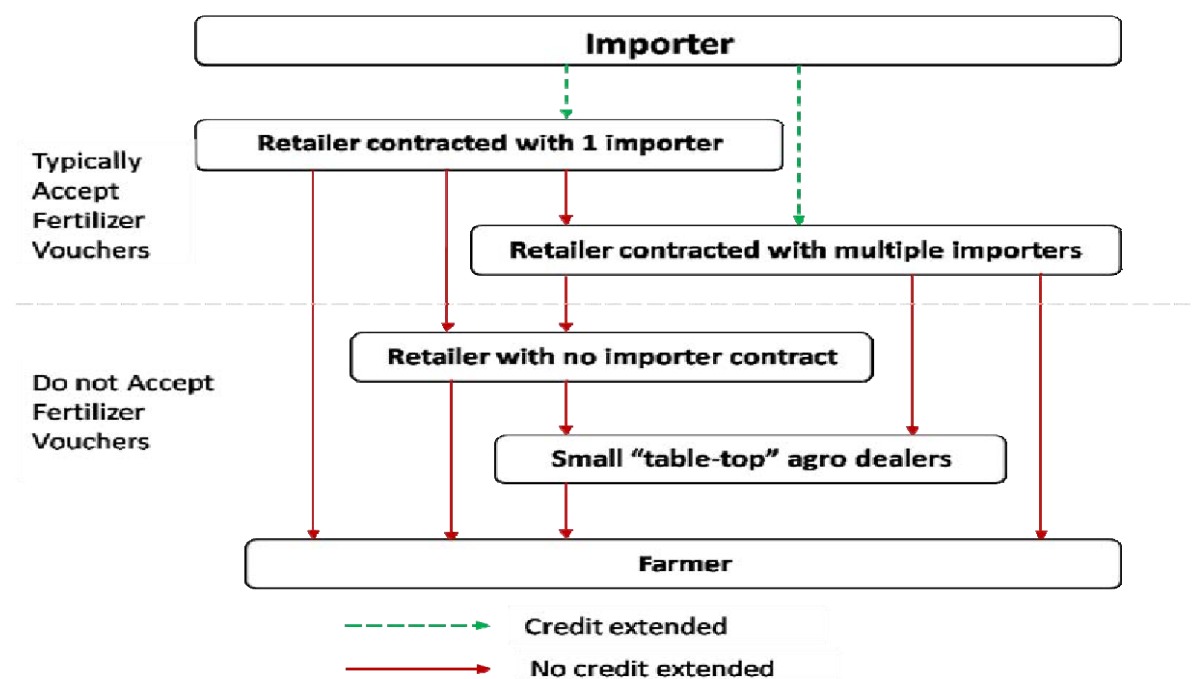


Figure 2. Different Types of Players along the Fertilize Supply Chain (Banful, 2009)

Figure 3 above represents a narrowed version of the fertilizer supply chain in Ghana. As indicated on the diagram, fertilizer importers distribute fertilizer directly to retailers who

in turn supply to farmers directly. Further, from figure 3, it is observed that, retailers do not purchase solely from importers but also from other retailers and sell directly to small agro dealers instead of the farmers. In this case, the agro dealer also sells the fertilizer to the farmer. Typically, retailers who are contracted by the importers are often given credit purchase for a period of 7 to 30 days (Banful, 2009). They may also get concessions such as bulk pricing and free transportation. On the other hand, retailers that source from other retailers as well as the small table top dealers are typically not extended credit and do not receive any pricing and transportation cost concessions (Banful, 2009). In essence, this paper is consistent with the International Fertilizer Development Centre's report. The relevance of the two papers is that, it helps the author to assess Tieme Ndo's current role along the fertilizer supply chain. It further helps the researcher to understand the fertilizer supply chain, which makes it easy for the author to think of the appropriate means for Tieme Ndo to procure and distribute its fertilizer without putting pressure on prices.

External analysis using the STEEPLE Framework

This section begins with an analysis of the general environment within which Tieme Ndo operates. The analysis is done using the STEEPLE framework. STEEPLE is a strategic planning tool. It is an acronym which means Social, Technological, Economic, Environmental, Political, Legal and Ethical factors that could influence a company's operations.

Social Factors

Ghana has a growing population of about 28 million people with more than 50% of the population dependent on agriculture for livelihood (Ghana Statistical Service, 2017). Hence, the need to increase food production to feed the growing population. More than 50% of the total population is made of women who contribute the largest labor force, about 70% to

the agriculture sector (GSS, 2017). In a recent MasterCard report, Ghana was ranked the highest (46.4%) in terms of the number of businesses owned by women (MasterCard Foundation, 2018). The report says that, majority of these businesses are in the agricultural sector. This indicates the enormous role women play in the economy despite the challenges women face accessing agricultural lands for cultivation. Although Ghana achieved a middle income status in 2010, 24.2% of its population are still in poverty (Cooke, Hague, & McKay, 2016). Majority of the people still living in poverty are living in rural areas with agriculture being their only source of livelihoods (Cooke, Hague, & McKay, 2016). That means, there is the need for massive investment in rural agriculture in order to end poverty in rural areas. More importantly, 76.6% of the population aged 15 and above can read and write (World Fact Book, 2017). Indicating that, majority of Ghanaians could be communicated to in English.

Technological Factors

There is a continuous surge in mobile subscription in Ghana. As at July 2017, there was a total of 22,103,467 mobile subscription with a 77.58% penetration rate (National Communication Authority, 2017). Indicating that, a large number of Ghanaians are using mobile phones thus making communication among individuals and businesses easy. Also, as a result of increase in mobile subscription, there has also been increase in mobile money usage in the country especially among rural dwellers (Bank of Ghana, 2017). Mobile money has become the alternative payment system to majority of people who do not have bank accounts. According to the Bank of Ghana, there are 20 million mobile money users as compared to 10 million bank account holders in Ghana (Bank of Ghana, 2017). This therefore shows that, mobile money could be the preferred savings and payment systems for most Ghanaians. Considering the fact that mobile phone users are increasing, tech companies like

Farmerline, CowTribe and Esoko are leveraging on mobile technology to link farmers to agricultural information.

Environmental Factors

Environmental factors is regulated by the Environmental Protection Agency, EPA. The EPA regulates all environmental issues in Ghana to ensure that the air, water and the land is not polluted through business activities. As such, Tieme Ndo needs to register with the EPA to ensure that, its fertilizer and chemicals are not harmful to the environment. It will also be important for Tieme Ndo to implement the 4R Nutrients principles. The 4R nutrient principle or stewardship is a movement to teach farmers to use the right type of fertilizer, at the right time, at the right place and from the right source (4R Nutrient Stewardship, 2018). Another environmental issue is the outbreak of the fall armyworms in 2017 that has resulted crop loss of about 13 billion dollars. The United State of America USA Fall Armyworms Task Force has warned that, the fall armyworms have come to stay. Hence, African countries must prepare ahead for the worms' infestation (Eduku, 2018). This means that, Tieme Ndo will also need to prepare to help its farmer groups overcome the fall armyworms incase their crops are affected.

Economic Factors

The Ghanaian economy is soaring with a Gross Domestic Product, GDP growth of 7.6%. The agricultural sector which is the largest part of the economy is growing at 4.3% (Ministry of Finance, 2017). Economic factors that influence businesses includes the GDP growth of the Ghanaian economy, which is growing at the rate of 7.6% and the agriculture sector is growing at 4.3%. Inflation has also dropped from 15.4% to 11.8% indicating positive influence on consumer spending (Ghana Statistical Service, 2018). The Ghana cedi

continuous to depreciate as the cedi is trading at GHS 4.4203 against a dollar (Bank of Ghana, 2018). Also, the central bank lending rate stood at 20% (Bank of Ghana, 2018). The finance ministry announced a number of tax exemptions and holidays for startup companies (Ministry of Finance, 2018). These tax policies and exemptions for startups like Tieme Ndo will enhance its financial sustainability and growth.

Political Factors

Ghana is political stable with a successful transition of government after the 2016 general election. Government has implemented the fertilizer subsidy program by paying 50% of fertilizer and seeds cost (MOFA, 2018). The planting for food and jobs program has also been implemented since 2017 and will continue this year as well (Ministry of Finance, 2017). This initiative is also an opportunity that Tieme Ndo could leverage to on by partnering with the government at the district level to help distribute subsidize fertilizers to farmers.

Legal Factors

In Ghana, it is a legal requirement to register all businesses with the Registrar General Department to obtain a certificate of incorporation and commencement. More important, Tieme Ndo also have to register with the Ministry of Food and Agriculture (MOFA) under the Plant Protection and Regulatory Service Directorate as a fertilizer dealer. The sector is being regulated by the Plant Protection Act, 2010 (Act 803). By registering and obtaining the right certifications, it will be much easy for Tieme Ndo to transact business with its customers and also attract investors.

Ethical Factors

Lastly, ethical factors includes not smuggling farm inputs out of the country.

Supplying the right kind of fertilizer and seeds to farmers. It will also be ethical to join associations such as the Ghana Agricultural Inputs Dealers Association, GAIDA and the Peasant Farmers Association of Ghana, PFAG.

The STEEPLE analysis contribute to understand important factors that influences Tieme Ndo's operations and its customers. This analysis has helped identify the opportunities within the Ghanaian economy such as the tax policies and exemptions. The table below is a summary of the STEEPLE Analysis.

Table 2 – STEEPLE Analysis

SOCIAL	TECHNO-LOGICAL	ENVIRON-MENTAL	ECONOMIC	POLITICAL	LEGAL	ETHICAL
<ul style="list-style-type: none"> 28 million people 50% of population depends on 	<ul style="list-style-type: none"> Use of mobile technology to link farmers to market 	<ul style="list-style-type: none"> Unpredictable rainfall pattern 4R nutrients stewardship 	<ul style="list-style-type: none"> GDP growth of 7.6% Agriculture growing at 4.3% 	Government subsidized fertilizer by 50%	<ul style="list-style-type: none"> Register with Plant Protection and Regulatory Services as fertilizer dealer 	Ghana Agricultural Input Dealers Association, GAIDA
<ul style="list-style-type: none"> Women contributes over 70% of the agriculture labour force 24.3% still living in poverty 	<ul style="list-style-type: none"> Increasing number of mobile phone users in Ghana – 77.58% mobile subscription 	<ul style="list-style-type: none"> Inappropriate use of farm inputs Fall armyworms infestation 	<ul style="list-style-type: none"> Decrease inflation rate from 15.4 to 11.6% Favourable tax policies and exemptions for startups 	Government Planting for food and job program	<ul style="list-style-type: none"> Established Plants and Fertilizer Act, 2010 (Act 803) Avoid smuggling of farm inputs Ensure appropriate use of the farm inputs 	Peasant Farmers Association of Ghana, PFAG

SWOT Analysis on Tieme Ndo

This section focuses on the internal capabilities of Tieme Ndo using the SWOT analysis. SWOT is an acronym where the S stands for strengths, W for weaknesses, O for opportunities and T for threats (MindTools, 2018).

Strengths

Tieme Ndo's main strengths is its ability to organize farmers at the community level, sensitize them and eventually recruit them into its program. During the pilot, Tieme Ndo convinced 162 farmers to participate in its pilot. The number of farmers recruited was more than its initial target of 130 farmers. Monthly meetings are held with all these farmers in their various communities. The interest of farmers in Tieme Ndo's program is an indication that, the organization's CEP is a good package for farmers in the district. This was evident during Tieme Ndo's annual meeting last year where farmers expressed their appreciation towards the organization and its programs. In addition, one of Tieme Ndo's strength is in distribution. Tieme Ndo joined the agriculture inputs supply industry for the first time but has trampled all odds to distribute over 1000bags of fertilizer and seeds to farmers within three months.

Weaknesses

Just like any other startup, Tieme Ndo is bound to face a number of challenges that Tieme Ndo would not be able to overcome easily. One of such weak points is that, Tieme Ndo could not supply the needed farm inputs to farmers in the right quantity, quality and time. During pilot, Tieme Ndo was unable to deliver the fertilizer, seeds and insecticides to farmers on time as promised. The inputs were supposed to be delivered a month before the season starts, which was supposed to be in April. Unfortunately, the inputs were delivered in June when cultivation had already commenced. The worst part of it was that, the correct type of inputs were not provided to farmers. For example, farmers requested for yellow corn and

insecticides but white maize and weedicides were supplied to them. Another weakness is Tieme Ndo's inability to collect farmers' loan repayment at a faster rate. Farmers are supposed to complete their repayment in April but currently, Tieme Ndo has been able to collect monies from 50% of the farmers registered. In addition, Tieme Ndo lacks the organizational strategies and processes to guide its daily operations. This makes it difficult to identify loopholes in the firm for improvement. The management of the startup are undergraduate students who lack much experience to develop the internal structures to push the vision of the firm forward and to attract the necessary resources: expert's personnel and funds.

Threats

Possible threats to the smooth running of Tieme Ndo is the low credit repayment rate which stood as low as 50% thus affecting the cash flow of the firm. This is as a result of the low income level of the farmers and their over reliance on agriculture as the only source of income for survival. The low income level of farmers post a threat of high default payment. In addition, the low literacy rate among farmers has made it challenging and difficult in disseminating important information. In that, the startup cannot engage any external resource personnel who do not understand the local language. The other threat is climate change. The rains are highly unpredictable. Leading to late cultivation that affects crop yields adversely. There is high threats of new entrant. Tieme Ndo envisions new companies that could emerge in Nandom to compete with Tieme Ndo for farmers customers.

Opportunities

One of the opportunities available to Tieme Ndo is the government subsidy program. The fertilizer subsidy program is Ghana's government initiative to subsidize the cost of fertilizer by 50% (MOFA, 2018). This therefore allows farmers to purchase fertilizer at affordable prices. Another opportunity is the increasing number of youth who are becoming

interested in agriculture. This could help Tieme Ndo to develop new products and services targeting the youth especially women. In addition, the increasing technological advancement and rate of adoption in Ghana is another opportunity for Tieme Ndo on. In that, mobile subscription is on a growth and that includes farmers who use mobile technology like mobile money to make their monthly repayment. With the use of mobile technology, Tieme Ndo could be able in the near future to communicate directly with its farmers using text message, voice, and visuals to disseminate information to farmers located in villages. Another opportunity is that, Tieme Ndo is the first social enterprise in Nandom to support farmers with fertilizer and seeds on credit. Hence, the startup has great opportunity to grow fast in Nandom and scale to other districts. The table below is a summary of the SWOT analysis on Tieme Ndo.

Table 1 – SWOT Analysis of Tieme Ndo

Strengths	Weaknesses
Recruiting farmers	Lack of strategies, process and personnel
Organizing farmers	Untimely delivery of inputs
Distribution of inputs	Low debt collection rate
CEP is very good for farmers	Insufficient funds
Threats	Opportunities
Low income and literacy level of farmer customers	Government fertilizer subsidy program
Low credit repayment	Increasing number of youth interested in agriculture
Climate Change	The first social enterprise in Nandom supplying fertilizer and seeds on credit.

CHAPTER 2: PROJECT NEEDS ANALYSIS

This chapter assesses the needs of Tieme Ndo to understand whether the project fills a gap within the organization or whether the project will contribute to improve the operational efficiency of Tieme Ndo. The chapter also looks at the methodology used to do the needs assessment.

Methodology

The methodology in this paper refers to the various steps the researcher took to understand the needs of Tieme Ndo. The methodology adopted has contributed to the project's needs assessment. The methodology begins with a qualitative research where one of the co-founders of the organization was engaged in an interview using semi-structured interview questions. This allowed the researcher to probe further for insights on issues raised during the interview. At the time of the interview, the other co-founder was not in the country and could not be involved in the study. A focus group discussion was held with two extension officers. Two of the extension officers who worked with the farmers during the pilot were also interviewed. This helped the researcher to better understand how farmers were affected due to the challenges Tieme Ndo faced. Further, an observational study was carried out on the beneficiaries of Tieme Ndo. In this case, over 80 farmers were observed during their Tieme Ndo annual meeting held in Nandom. The observational study was a strategy to listen to farmers' frustrations and excitement towards Tieme Ndo. In this case, farmers were not made to be aware that they were under study during the meeting. This is because, the researcher did not want his presence to influence farmers' thoughts and feedback towards Tieme Ndo. In addition, four agro input dealers were interviewed using semi-structured interviews. Involved in the interview were: Agricultural Manufacturing Group (AMG), Naasons Agro; Yara Ghana, M&B Seeds Agricultural Services and RMG Ghana. The interview with these

companies was to identify partnership opportunities in order to know if they will be good suppliers of the farm inputs.

Table 3 – Summary of Methodology and Findings/Insights

Data Collection Method	Number of Participants	Findings and Insights
Observation at Tieme Ndo annual meeting with farmers	80 Farmers including chiefs	<ul style="list-style-type: none"> • Complained of late access to fertilizer and seeds • Unhappy with seeds and chemicals received • Prefer many crop variety • Low yields • Limited tractor services • Complain of access to markets to sell produce
Interview	2 extension officers	<ul style="list-style-type: none"> • Late delivery of farm inputs • Wrong seeds and chemicals delivered • Did not think tractor was a problem
Interview	Co-founder	<ul style="list-style-type: none"> • Currently buy fertilizer and seeds from distributor • Trucks carrying inputs broke-down on the way • Cost over GHC1500 to transport fertilizer
Phone Interview	5 input dealers	<ul style="list-style-type: none"> • Do not supply inputs on credit • No transport service provided • Supply fertilizer only

Needs Assessment based on Insights from the Interviews with the Co-founder and Extension Officers

The needs assessment is to identify the gaps and challenges within Tieme Ndo that necessitated this project. Thus, the need assessment is based on Tieme Ndo's recent pilot activities which started last May, 2017. The pilot went successfully as the startup was able to supply all its registered farmers with fertilizer, seeds and chemicals. More importantly, on the 28th of December, 2017, management of Tieme Ndo held a general meeting with all its farmer groups in Nandom. In attendance were 80 farmers and chiefs from all four communities. The purpose of the meeting was to allow farmers to provide feedback and suggestions on Tieme Ndo's pilot activities.

Listening to the farmers during the feedback session, a number of issues stood out. First, farmers complained of late delivery of inputs. In that, Tieme Ndo delivered the farm inputs to farmers in June instead of April. In an interview, one of the founders of the startup mentioned that, the inputs were delivered late because, the supplier of the fertilizer and seeds default on its part to dispatch the inputs on time. Also, the trucks transporting the inputs from Tema to Nandom broke down many times before reaching Nandom. The breakdown of the trucks led Tieme Ndo to incur an extra cost of transportation, over GHS1500 to transport the remaining bags of fertilizer to Tieme Ndo warehouse in Nandom.

Also, another issue discovered was the supply of the wrong type of seeds and chemicals by the supplier. For example, during the interview, it was discovered that, Tieme Ndo ordered for yellow corn and insecticides but the supplier supplied white maize and weedicides. The co-founder interviewed described this issue as the worst part of the pilot program. This is because, farmers were unhappy with the seeds since it is very difficult to find favorable market for white maize. The two extension officers interviewed, held similar views as the co-founder. They both described the situation as unfortunate and somehow unprofessional. The results of this issue is felt by the farmers as they had very low crop yields. The average yield per farmer per acre stood at about 25% far below Tieme Ndo's initial target of 200% increase in yields. (Tieme Ndo pilot evaluation, 2018).

Surprisingly, even though maize yield was low, farmers raised concerns about access to market to sell their farm produce at favorable prices. As at December last year, market price for maize in Nandom was GHS80 to GHS100 per 100kg bag (Market Observation, 2018). This therefore made it impossible for most of the farmers to repay their credit since they are not willing to sell their produce at a lower price. Thus putting farmers credit repayment rate at 30%. Eventually affecting Tieme Ndo's plan for the next farming season. Another issue raised was limited tractor services; farmers complained of spending a

significant amount of time queuing for tractors. Some even spent up to three days on the farm looking for tractors but often got deceived by tractor operators. Farmers attributed their low yields partly to the untimely access to tractor services. According to an extension officer in Nandom, there are about six tractor owners in town serving over thousands of farmers in the whole district. According to management at Tieme Ndo, tractor services was something they overlooked while planning the pilot.

Table 4 – Summary of Challenges and Impact on Farmers

Issues	Why?	Impact
Delivered inputs in June instead of April	Supplier Delayed Trucks broke-down on the way	<ul style="list-style-type: none"> • Late delivery of inputs to farmers by Tieme Ndo • Late planting by farmers • Low maize yields • Unable to win the trust of farmers
Delivered white maize and weedicides to farmers rather than yellow corn and insecticides	Supplier mistakenly supplied the wrong seeds and chemicals	<ul style="list-style-type: none"> • Low yields – 25% average increase • Fall army worms infections • Difficult to find market for the produce
Stock out	Limited space to store for storage	<ul style="list-style-type: none"> • loss customers and money over GHC7000
Tieme Ndo did not consider access to tractor service as a challenge prior to the pilot	Limited tractor services in Nandom – less than 10 tractor operators Untimely access to tractor services – long queues Difficult to prepare farm lands for cultivation land	<ul style="list-style-type: none"> • Late planting • Low yields • Tieme Ndo could not achieve its target
Tieme Ndo could not find market for farmers to sell their produce	Low prices of maize in Nandom Seeds aggregators unwilling to buy farm produce	<ul style="list-style-type: none"> • Low loan repayment to Tieme Ndo by farmers • Farmers unhappy that Tieme Ndo cannot help them sell produce

Problem Statement

Rural farmers in Northern Ghana want to increase their crop yields every year for both consumption and sales because hunger, food insecurity and poverty is increasingly becoming high among rural households in the North. With over 510,000 farmers being vulnerable to food insecurity in the three northern regions and an additional 1million people being vulnerable to food insecurity in the other seven regions in Ghana. Therefore, Tieme Ndo as a social enterprise based in Northern Ghana needs to find an efficient approach to procuring and distributing the right type of fertilizers and seeds to rural farmers at the right time because, late delivery of fertilizers and seeds results in low crop yields among rural farmers.

Research Purpose

The essence of this study is to explore the challenges Tieme Ndo faces in assisting rural farmers to boost their crop yields and to orchestrate an efficient approach to sourcing and distributing farm inputs to farmers.

Project Objectives

- To identify the operational challenges Tieme Ndo face during its pilot
- To identify the challenges Tieme Ndo face in procuring and distributing the farm inputs to farmers.
- To develop a sourcing/procurement and distribution strategy for Tieme Ndo

CHAPTER 3: MASTERY OF SUBJECT MATTER

This chapter consist of a review of relevant articles with regards to finding the appropriate ways of sourcing and distributing farm inputs to rural farmers. As such, important tools relevant in designing a sourcing and distribution strategy for Tieme Ndo are unraveled in this chapter.

Sourcing Strategies

According to Chopra, Dharam and Meindl (2016), Supply Chain Management is an integrated set of activities required to source (procure) materials, change them into semi-finished products or final products and deliver them to customers. Supply Chain Management could also be described as all the links between the raw materials, final products design and delivery (Ali, et al., 2015). Therefore, it is possible to conclude that, sourcing and distribution are integral aspects of supply chain management. Sourcing is the set of business processes needed to purchase goods and services. Purchasing, also called procurement is the processes by which companies acquire raw materials, parts or products and services (Chopra, Dharam, & Meindl, 2016). Hence, purchasing or procurement is a part of the sourcing process. The sourcing strategy requires an organization to plan, design and develop a reliable and a competitive buying sources for its raw materials (Juneja, 2018).

In every organization, one of the decisions managers are often confronted with is to decide whether to insource or outsource a task or a business function. Insourcing also called make in-house (Chopra & Meindl, 2010) is an organization internal labor and personnel in combination with other resources to provide the operational needs of the enterprise (Sikula, Kim, & Braun, 2010). Insourcing also means giving out work yet keeping it within national boundaries instead of subcontracting to suppliers overseas. This implies that, insourcing could be described as when raw products of a company are produced internally by the

company without engaging any third party in the procurement process. According to Slobodan Achimovic, Veljko M. Mijuskovic and Lazar Colic (2016), the option of insourcing or the decision to perform a task by an organization itself was more prevalent within large organizations. Eventually, leading to the concept of forward/backward vertical integration (Acimovic, Mijuskovic, & Colic, 2016). This means that, insourcing could be a thing for companies that have significant internal resources and personnel to spearhead production. Insourcing allows for the company to oversee the entire supply chain process thus giving it a greater degree of control and the ability to leverage on its economies of scale and scope (Acimovic, Mijuskovic, & Colic, 2016). One of its key disadvantages is that it requires high investment and potential suppliers may offer superior products and services than a company that produces its own raw materials or products.

On the other hand, outsourcing is the opposite of insourcing. Outsourcing is when a company engages a third party in the process of providing goods and services that were previously provided internally. Outsourcing involves substitution — the replacement of internal capacity and production by that of the supplier (North Carolina State University, 2011). Common reasons why companies outsource their activities are: lack of production capacities, lack managerial and technical expertise, reduce risk and the availability of a supplier of good quality nearby (Acimovic, Mijuskovic, & Colic, 2016). The decision by a firm to outsource largely depends on the increase in supply chain surplus provided by the third party as well as the increase in risk incurred for involving the third party. Supply chain surplus is the difference between the value of a product for the customer and the total cost of all supply chain activities involved in bringing the product to the customer. The third party can increase the supply chain surplus through capacity aggregation, inventory aggregation, transportation aggregation (Chopra, Dharam, & Meindl, 2016). For Tieme Ndo, the decision of whether to insource or outsource implies, whether the farm inputs particularly fertilizer

should be bought in Ghana or imported from another country. This decision will be based on the capabilities of Tieme Ndo and the potential risk involved in each case. Whether to buy in Ghana or import should yield higher supply chain surplus for both Tieme Ndo and the farmers. Therefore, it is the goal of this project to identify and recommend the appropriate strategy for procuring farm inputs.

Nonetheless, whether Tieme Ndo decides to buy in Ghana or import, the startup still needs to develop its strategic approach to sourcing so as to know the number of suppliers to engage to achieve its strategic objectives. Managers across various companies and industries deploy different approaches to purchasing their raw materials, products and services. Below are various sourcing strategies companies around the world often use in procuring their raw materials, which Tieme Ndo could consider in procuring its farm inputs.

Single Sourcing Strategy

In single sourcing strategy, the buying company purchases all its products, services or raw materials from one supplier regardless of the number of alternative suppliers available in the market. However, single sourcing is different from sole sourcing, whereby a firm buys its products from just one supplier because, there is only one supplier existing in the market. The difference therefore is that, in sole sourcing, only one supplier exist whereas in single sourcing, there are many alternative suppliers but the buyer chooses to buy from only one supplier (Blome & Henke, 2009). The figure below is an illustration of the single sourcing strategy.

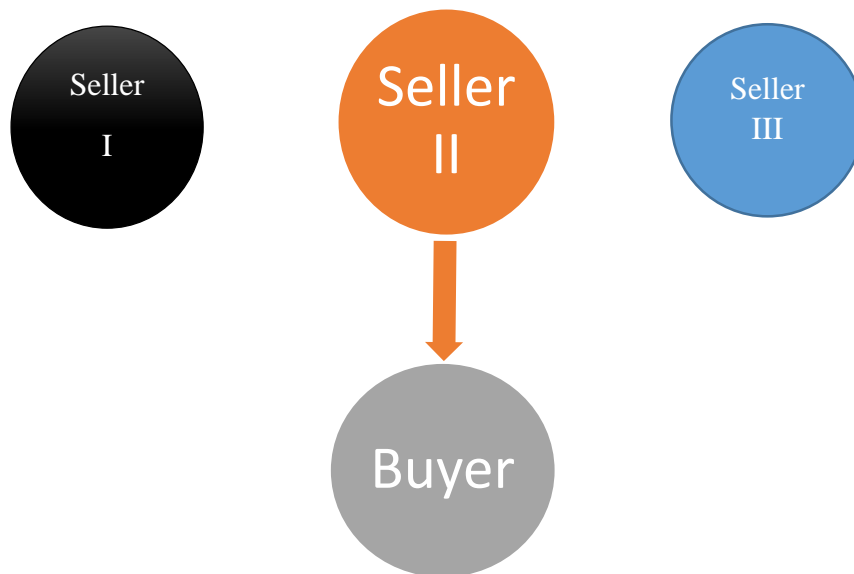


Figure 3 – Single Sourcing Strategy (Najafi, Lind, & Pedersen, 2014)

Arguments for single sourcing is that, in an event of shortages, the supplier will give priority to the needs of a special customer, lower costs are incurred to source, process, expedite, and inspect the materials (Starling, Burt, & Dobler, 2003). In the end, the buyer somewhat is able to control and coordinate the quality of the goods (Starling, Burt, & Dobler, 2003). This fosters high quality relationships, mutual interdependence, reliability, short lead times, and cooperative action (Najafi, Lind, & Pedersen, 2014). The findings of Najafi, Lind and Pedersen is consistent with a study by North Carolina State University, which found that, just-in-time manufacturers often use single sourcing strategy to build a close relationship with few suppliers to foster high product quality, cooperation and reliability (NC State University, 2018). On the contrary, Faes and Matthyssens (2007) maintains that, single sourcing leads to over-dependency on supplier, less competitive pressure on the supplier and less competitive price structures (Matthyssens & Faes, 2007). This could therefore increase the overall supplier chain risk.

Parallel Sourcing

In an attempt to reduce the risks and dangers associated with single sourcing, industrial companies introduce competition to procure a group of related products. This approach is called parallel sourcing (Matthyssens & Faes, 2007). Parallel sourcing is a combination of both single sourcing and multiple sourcing strategies (Jahanfar, 2016). In parallel sourcing, buying companies choose single sourcing approach for one component of their products and at the same time introduce competition on a family of related components for other parts of the products (Matthyssens & Faes, 2007). According to James Richardson (1993), the Japanese automobile manufacturers have used parallel sourcing as a hybrid model of sourcing to provide incentives for supplier performance (Richardson, 1993). One advantage of parallel sourcing is that, it allows for performance comparisons and competitive bidders among suppliers (Jahanfar, 2016). Also, parallel sourcing enjoys most of the advantages that single sourcing provides since it is a hybrid model. Unlike single sourcing, in parallel sourcing, one part or component of a company's product is bought from company A and another component bought from company B. With parallel sourcing, it is possible to infer that, products or components supplied by suppliers may not correspond with each. This could disrupt production and eventually cause losses to the company. Parallel sourcing could present a challenge of managing different suppliers of the products. In instance where product components do not depend on each other, parallel sourcing will be perfect because, regardless of the nature of the component it could still achieve its purpose. In this case, parallel sourcing could be used in procuring fertilizer from one supplier, while buying seeds and weedicides from another set of suppliers.

Multi Sourcing

Unlike single sourcing, multiple sourcing is when the firm buys its raw materials, products and services from many suppliers. Multiple sourcing strategy is used when there exists more than one independent supplier (Blome & Henke, 2009). The figure below is a representation of multiple sourcing strategy.

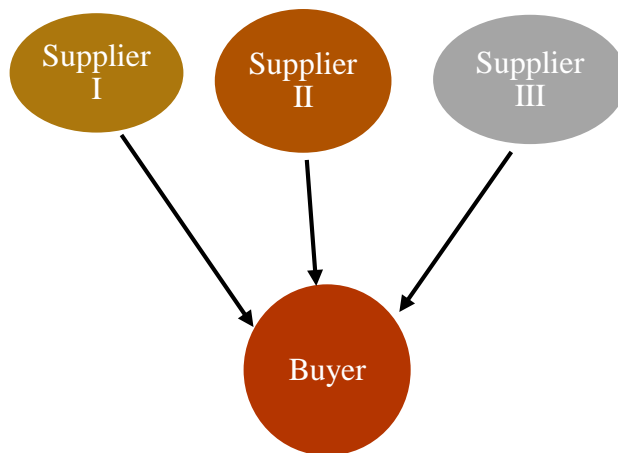


Figure 4 – Multiple Sourcing Strategy (Najafi, Lind, & Pedersen, 2014)

Companies often introduce multiple sourcing strategy to induce healthy competition between the suppliers based on parameters such as product quality, price and delivery time (Najafi, Lind, & Pedersen, 2014). Multiple sourcing is a good choice for buying companies that are price sensitive and wants to maximize gains through price margins and at the same time reduce the risk of supplier default or disruption. Also, multiple sourcing is helpful when the exact lead time – delivery time of one company to the other is uncertain. However, this strategy could result in inconsistency of product quality and performance. In a study by Kostas Bimpikis, Douglas Fearing and Alireza Tahbaz-Salehi (2014) found that, the use of multi-sourcing strategies by big companies aggravate the amount of risk smaller firms face even though the strategy could be optimal to the big firms. The reason is that, such decisions could result in a more intertwined supply chain that could cause more supply distribution.

They added that, multi-sourcing could increase the likelihood of simultaneous disruptions in all procurement channels available to the downstream firms (Bimpikis, Fearing, & Tahbaz-Salehi, 2014). This suggest that, multiple sourcing by big companies posts a threat of supplier disruption for smaller firms in the same industry. Or, it is possible to say that, big companies using multi-sourcing is practicing at the expense of the smaller firms.

Delegated Sourcing

Delegated sourcing is when one supplier is responsible for the coordination and delivery of all the different components of the product to the buying firm instead of delivering an individual component (Najafi, Lind, & Pedersen, 2014). Delegated and network sourcing is often used interchangeably where the buying firm assigns a supplier with the role as partners or adults, and task them to manage the remaining children as commodity suppliers (Wong, 2011). The buying firm gives more responsibility to one key supplier who coordinates the rest of the component suppliers. One advantage of delegated sourcing is that, it allows the buying firm to focus on few suppliers and work closely with them to build strong relationship and eventually reduce the day-to-day transaction costs. Also, the exchange of information is much easier because of the parties' interdependence. Figure 5 is an illustration of delegated sourcing strategy.

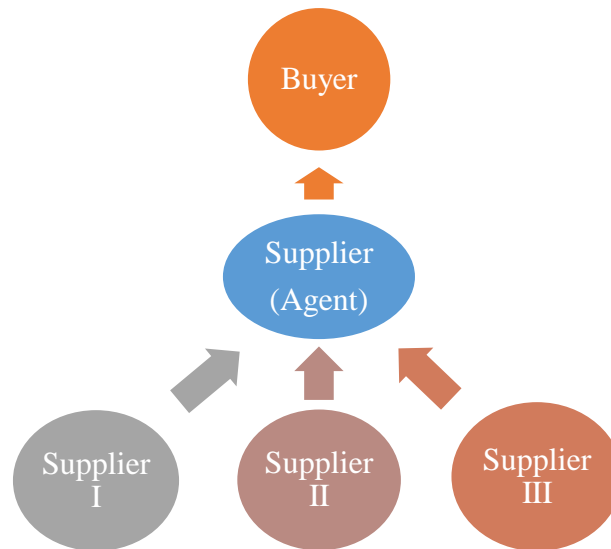


Figure 5 – Delegated Sourcing Strategy (Wong, 2011)

This means that, the supplier is acting as an agent to mobilize and supply products. It is also possible to believe that, the supplier does not produce the products it supplies but only serves as a link between the buyer and a third party. One disadvantage with this sourcing strategy is that the first tier (or system) supplier can become very large, and thereby get more power than the buying firm. This can alter the balance in the buyer-supplier relationship (Najafi, Lind, & Pedersen, 2014). This sourcing strategy is similar to Tieme Ndo's current sourcing strategy. According to management of the organization, they engaged Naasons Agro to supply fertilizer, seeds and weedicides. However, even though Naasons Agro does not supply seeds and weedicides, but it coordinated the supply of the seeds and weedicides. As the Najafi, Lind, & Pedersen indicated, the supplier is given more responsibility and could therefore become more powerful to the extent of inflating prices for the buyer. Hence, it will be important in this project to determine whether it is prudent for Tieme Ndo to still run this model or to change its strategy.

Table 5 – Summary of Various Sourcing Strategies

Strategies	Summary	Advantages	Disadvantages
Single Sourcing	Buying community purchases products from a single supplier regardless of alternative suppliers	<ul style="list-style-type: none"> • Lower sourcing and processing cost • Long term relationships • Better pricing through higher volumes • Better quality through continuous improvement 	<ul style="list-style-type: none"> • Vulnerable to disruption when fail to supplier • Over dependence on supplier • Less competitive price pressures
Multiple Sourcing	Buying company purchases products from many suppliers	<ul style="list-style-type: none"> • Ability to switch suppliers in case of failures • Lower cost through competitive tendering 	<ul style="list-style-type: none"> • Difficult to obtain economies of scales • Less commitment from supplier • Inconsistency in product quality
Parallel Sourcing	Buying company source different components of its products from different suppliers	<ul style="list-style-type: none"> • It is a hybrid of single and multiple sourcing strategy • Reduces over dependency 	<ul style="list-style-type: none"> • Possibility of incompatible components • Difficult in coordinating suppliers
Delegated Sourcing	One supplier is responsible for the coordination and distribution of the different components to the buying firm	<ul style="list-style-type: none"> • Reduce transaction cost 	<ul style="list-style-type: none"> • The supplier could get power over the buying company • Supplier could become more powerful than buyer

Supplier Assessment and Selection Criteria

Developing a sourcing strategy is not enough to achieve supply chain objective without taking into consideration the approaches to selecting suppliers. Companies often deploy various criteria and processes to selecting their suppliers who will help them achieve their supply chain objectives such as low cost and responsiveness. Selecting the right suppliers that fit the company's strategic needs, leads to enormous savings (Ali, et al., 2015)

for the company and that eventually benefits the final consumer. Choosing an inappropriate or unsatisfactory supplier could destabilize a company's financial position - high cost and upset its operational infrastructure which could lead to low product quality (Ali, et al., 2015). According to Lammi (2016), there are two types of supplier evaluations: the process-based evaluations and performance-based evaluations. The process-based evaluations assesses the supplier's actual production or service process by auditing the supplier's site or office. On the other hand, the performance-based evaluation assesses the supplier's performance on various criteria such as delivery, reliability and cost. These could be viewed as key performance indicators (KPIs) for suppliers.

Further, in 2014, a study was conducted by Arpan Kumar Kar and Ashis Kumar Pani to identify the important critical supplier selection criteria among manufacturing companies in India. The authors found seven supplier selection criteria that were important to companies in India in selecting suppliers. They are, product quality, delivery compliance, price, production capability, technological capability, financial position and e-transaction capability. However, the most important criteria for supplier evaluation and selection among Indian companies are product quality and delivery compliance. More importantly, the authors found that, e-transaction capability is gaining enormous strength among manufacturing companies in India in evaluating suppliers in the pre-selection stage. Indicating the importance of technology in the field of procurement (Pani & Kar, 2014). The criteria deployed by the Indian companies could be described as performance-based evaluation, which Lammi (2016) identified in his paper. This study is really important in deciding on factors to consider in selecting farm inputs companies suitable for Tieme Ndo. In this project, it is important to determine the most important criteria in selecting farm inputs suppliers that will meet Tieme Ndo sourcing objectives. Beyond this, it is imperative to assess the relative importance of the criteria identified in the context of Tieme Ndo.

Methods of Evaluating Location Alternatives

According to Jay Heizer and Barry Render (2011), there are four main methods of solving location problems. They are factor-rating method, locational break-even analysis, center-of-gravity method and transportation model (Heizer & Render, 2011). For the purpose of this project, the focus will be on the factor-rating model and the transportation model. This is because, these two models especially the factor-rating model is used across a wide range of fields including education and recreation. The Factor-Rating model is the most popular method use in selecting and making location decisions. This model instills objectivity into the process of identifying hard-to-evaluate costs. It is popular because, a wide range of factors from education to recreation can be objectively measured. The factor-rating method has six main steps: 1. Develop a list of relevant factors called key success factors. 2. Assign a weight to each factor to reflect its relative importance in the company's objectives. 3. Develop a scale for each factor for example, 1 to 10 or 1 to 100 points. 4. Have management score each location factor using the scale in step 3. 5. Multiply the score by the weights for each factor and total the score for each location. 6. Make a recommendation based on the maximum point score, considering the results of the other quantitative approaches as well (Chopra & Meindl, 2010). The other method of evaluation is transportation model. The focus of this model is to determine the best pattern of shipments from several points of supply – source to several points of demand – destinations to reduce transportation costs. Although these approaches used in evaluating and selecting location sites for companies, they are worth exploring in evaluating the criteria in selecting suppliers. For example, it is important to assess whether AMG or Yara Ghana performs better in terms of delivery time or product price and quality over company Naasons Agro or M&B Seeds Agricultural Services.

Distribution Strategies

Distribution involves the steps taken to move and store a product from the supplier stage to the customer in the supply chain (Chopra & Meindl, 2010). Raw materials, semi-finished goods are moved from suppliers to manufacturers and finished goods are also moved from manufacturers to customers. In this case, moving fertilizer, seeds and weedicides from either importers or distributors to farmers. Distribution affects cost and the customer experience and eventually affects firm's profitability. In India, the distribution cost of cement is 30 percent of the cost of producing and selling cement (Chopra & Meindl, 2010). It is therefore not a surprise that, Wal-Mart and Seven-Eleven Japan have built successful business arising from good distribution design and operation (Chopra & Meindl, 2010). For example, Wal-Mart distribution strategy allows the company to make its products readily available to customers at a relatively lower cost. On the other hand, the distribution strategy of Seven-Eleven Japan is very responsive to customers at a reasonable cost. This suggests that, the products of Wal-Mart and Seven-Eleven Japan are accessible to customers anytime they are in need. For the purpose of this project, it will be incumbent to find a distribution strategy that will make farm inputs available to farmers in time. Some of the distribution strategies companies like Wal-Mart and Seven-Eleven often deploy in their operation 1) Manufacturer storage with direct shipping, 2) Manufacturer storage with direct shipping and in-transit merge, 3) Distributor storage with package carrier delivery, 4) Distributor storage with last-mile delivery, 5) Manufacturer/distributor storage with customer pickup and 6) Retail storage with customer pickup (Chopra & Meindl, 2010). Since Tieme Ndo is not a manufacturer/importer of its farm inputs, the focus will be the last 4 distribution strategies as described below.

Distributor Storage with Package Carrier Delivery

Distributor Storage with Package Carrier Delivery is when manufacturer do not hold inventory at its warehouse. Instead, inventory is held at distributors or retailers' warehouse where package carriers are used to transport the products to customers (Krishnan, 2012). The figure below is an illustration of this strategy, indicating the flow of the products and information.

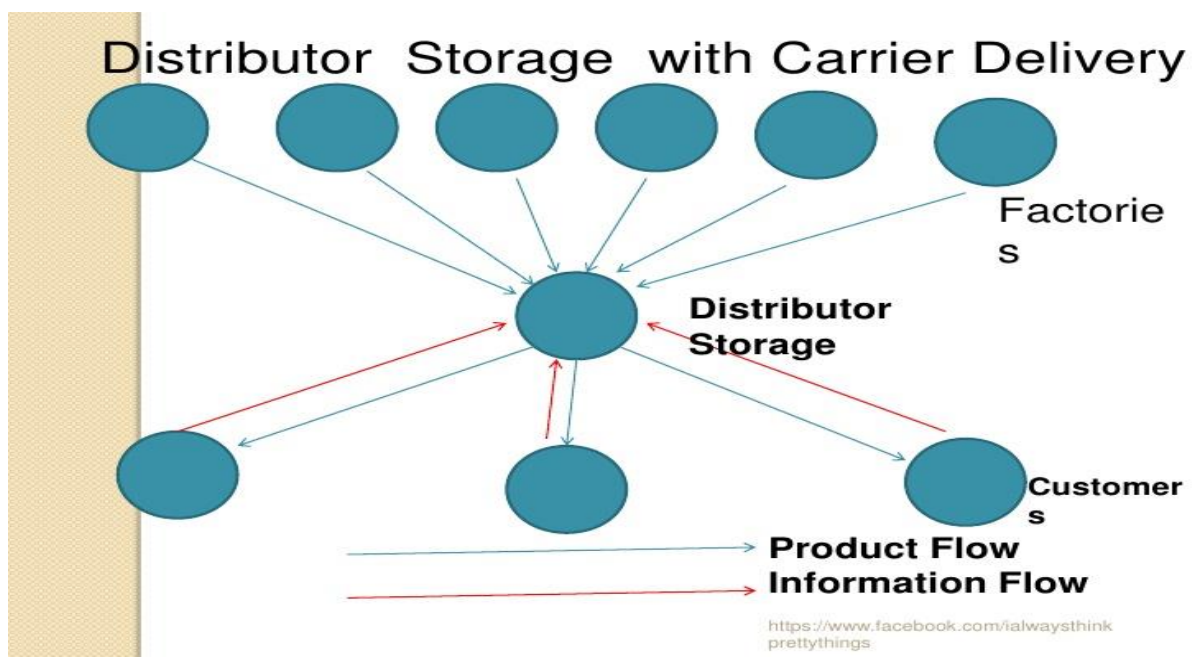


Figure 6 – Distributor Storage with Package Carrier Delivery (Chopra & Meindl, 2010)

As shown on the figure above, the manufacturer produces and shipped the products straight to distributors warehouse for storage. The products are then transported from the distributor's warehouse to the final customer. However, customers have to preorder the products from the distribtor. The distributor will then aggregate the products and deliver to the customer. The flow of the products from the manufacturer to the distributor's warehouse indicated by the blue arrow where as the flow of information from the customer to the distributor as orders is illustrated by the red arrow. Distributor Storage with Package Carrier Delivery is used for

products of higher demand (Chopra & Meindl, 2010). Hence, higher level of inventory is required. Under this strategy, transportation cost is somehow lower as the distributor could leverage on economies of scale by using truckloads to transport the goods from manufacturer to the warehouse which is closer to the customers. However, there is high facility cost – warehouse cost. This is because, big warehouses could be needed to store the products before shipping. Otherwise, the distributor has to ship from the manufacturer directly to the customers, which will also increase processing cost (Chopra & Meindl, 2010). Interestingly, this strategy is highly responsive to customers since it is close to them. Examples of companies that have used this strategy are Amazon and W.W. Grainger (Chopra & Meindl, 2010). Even though these two companies e-businesses, it worth exploring their model in the case of Tieme Ndo.

Distributor storage with last-mile delivery

Under last-mile delivery, distributors/retailers deliver the products to the customer's home instead of using a package carrier (Krishnan, 2012). Companies using this strategy are Webvan, Peapod, and Albertsons. The figure below is an illustration of last-mile delivery.

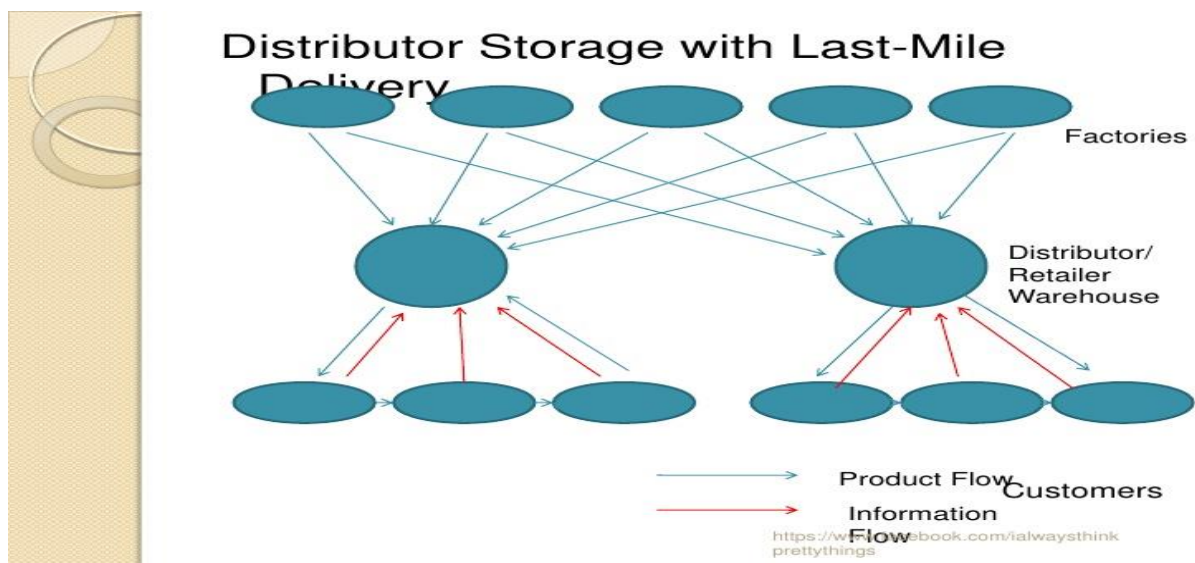


Figure 7 – Distributor storage with last-mile delivery (Chopra & Meindl, 2010)

Unlike distributor storage with package carrier which involves a third party for delivery, in last mile strategy, the distributor does not use package carriers but distribute the products to individual customers at their homes as shown in the diagram above by the green arrows. Last mile delivery requires the distributor to have its warehouse(s) close to its customers (Chopra & Meindl, 2010). Higher inventory level is also required in last-mile delivery model. There is high transportation cost in last-mile delivery since products are delivered at the customer's house. Last-mile delivery involves high facility cost and high cost of processing customer's orders because, many warehouses needs to be established closed to the customer. Processing cost is high because, customers are less engaged in the delivery of the goods because, all they need to do is to order and sit at home and wait for the product. Last mile delivery is however responsive to customers' orders as compared to other strategies (Chopra & Meindl, 2010).

Manufacturer/Distributor Storage with Customer Pickup

In this approach, products are stored at the distributor's warehouse. Customers will then place their orders online or through phone call and move to a designated pickup point to collect their orders (Chopra & Meindl, 2010; Krishnan, 2012). This means, customers' orders are shipped from the distributor's warehouse to the collection point. Example of companies practicing this approach is 7dream.com. 7dream.com allows its customers to pick up orders at designated store after they ordered their products (Chopra & Meindl, 2010). Even though customers place their orders online, it is very possible that, sales agents could collect customers' orders, process the orders and deliver them at the collection points. The figure below shows the product and information flow in this strategy.

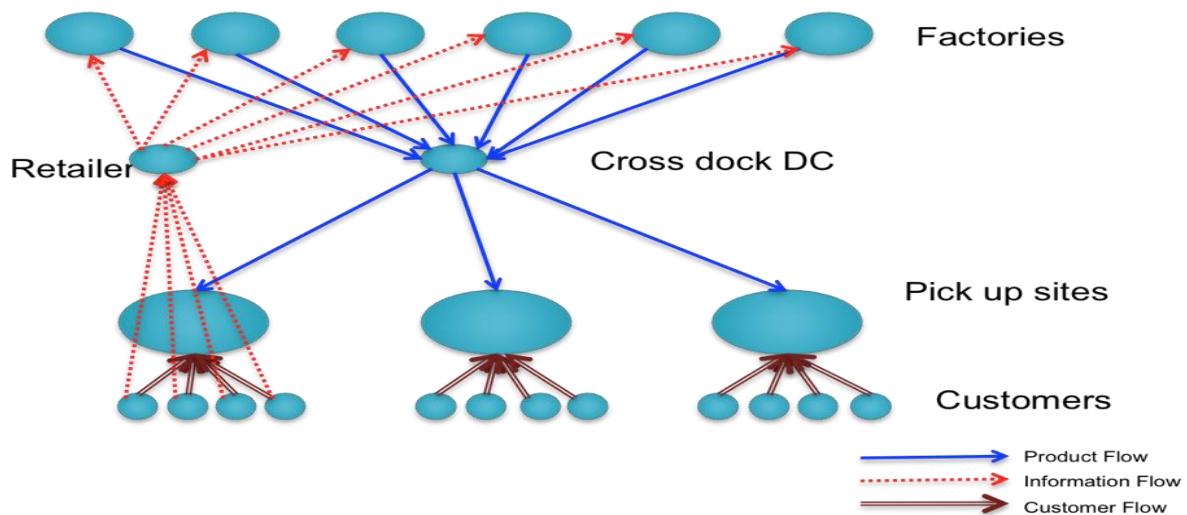


Figure 8 – Manufacturer Distributor Storage with Customer Pickup (Chopra & Meindl, 2010)

From the diagram above, as indicated by the red dotted lines, customers place their order online or with phone with the retailer or distributor. Products are then shipped to the collection points where customer can pick their orders. The movement of customers to the collection point is shown by the brown arrows whereas the flow of the products to the collection points is shown by the blue arrows. Inventory cost in this model could be kept lower at the distributor warehouse since the products could be crossed docked and sent straight to the collection point. Facility cost could therefore be higher if new warehouse has to be constructed but could be lower if already existing facilities could be used. In the case of Tieme Ndo, new warehouses may not be needed since it could leverage on already existing structures such as school compounds, community halls and community centers where farmers could meet to collect their farm inputs. Processing cost are high at the collection point because, orders have to be matched with the right customers. Thus, much attention needs to be given to information infrastructure to ensure accurate recording and tracking of orders. Customers must also be informed when the orders will arrive at the collection point.

Retail storage with customer pickup.

Retailer storage with customer pickup is regarded as the traditional kind of distribution strategy. Under this strategy, products are stored at a retail shop where customers could walk in anytime to purchase their products (Chopra & Meindl, 2010). Customers could place their order online or via phone and pick-up the orders at the retail shops. There is high inventory cost associated with this strategy since the retailer has to ensure that products are available all times for customer pickups. Nonetheless, transportation cost is at its lower because, inexpensive transport system could be used to replenish stock. However, there is high facility cost since more retail outlets need to be established. Response time to customer orders is high since goods are already available at the storage (Krishnan, 2012). Thus, increasing customers' experience.

Table 6 – Summary of Various Distribution Strategies with their Pros and Cons

Strategies	Description	Advantages	Disadvantages
Distributor Storage with Carrier Delivery	Inventory is held by distributor and package carrier is used to deliver orders to customers	<ul style="list-style-type: none"> • Warehouses are close to customers • Faster response time • Lower transportation cost 	<ul style="list-style-type: none"> • Higher inventory costs • Facility costs are higher • Less information to track
Distributor Storage with Last-mile Delivery	Distributor delivers the goods to customers home instead of using package carrier – third party	<ul style="list-style-type: none"> • Warehouses are close to customers • High response time • Enhance Customer experience 	<ul style="list-style-type: none"> • High transportation cost than any distribution network • High inventory and facility cost • Processing cost are high
Manufacturer/Distributor Storage with Customer Pickup	Inventory is stored at distributor's warehouse, customer then	<ul style="list-style-type: none"> • Transportation cost is lower than package carrier • Inventory cost is lower through 	<ul style="list-style-type: none"> • High facility cost if new pickup sites has to be constructed

	place order online and move to a designated location to pick their orders	aggregation and economies of scale	<ul style="list-style-type: none"> • Processing cost is high at the pickup sites • High investment in communication
Retail Storage With Customer Pickup	Customers pick up product from retail shops	<ul style="list-style-type: none"> • Low transportation cost • High response time • Easy for customers to return the product 	<ul style="list-style-type: none"> • High facility cost • Increased inventory cost

Case Study on One Acre Fund

One Acre Fund offers a complete bundle of services to its farmer clients through a market-based model. The model enables the organization to remain financially sustainable while expanding its services. One Acre Fund uses an end-to-end asset-based financing model as shown in the figure below.

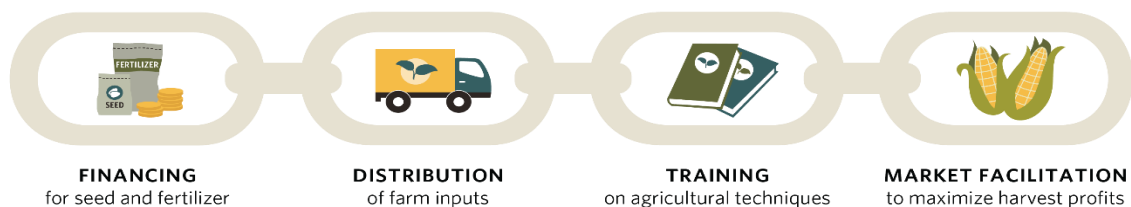


Figure 9 – One Acre Fund's Model (One Acre Fund, 2017)

The main features of One Acre Fund's model are; first, Asset-Based Loans where farmers are given high quality seeds and fertilizer on credit. Farmers repay their loans through a flexible repayment schedule. Farmers are required to pay 10% of total input cost before delivery and pay the remaining cost anytime within a given period. The second feature is the in time delivery of the farm inputs to farmers. Farm inputs are delivered at the village level within a walking distance a week to starting the farming season. Sometimes, a drop distribution

method is used where trucks deliver the inputs at particular date and time for farmers to collect. Thirdly, training sessions are organized by the field officers to train farmers on the efficient use of the inputs to maximize crop yields. Field officers organize weekly meetings with farmers to teach them new farm practices and also collect debt repayment from farmers. Lastly, market facilitation is provided in which storage facilities are provided to farmers to store their produce for some time (One Acre Fund, 2017). Farmers are also thought about price fluctuations in the market.

Lessons from One Acre Funds Model

Operating this asset-based financing model for more than 10 years now, One Acre Fund believed that, firms that intend to provide asset-based financing should consider two areas: **product development and organizations capacity. Product Development:** One Acre Fund believes that, new firms should deliver on higher return to investment (ROI) with regards to the benefits the farmer will get from the investment. Create simple products; One Acre Fund beliefs that, assets that promise higher returns are not always successful. Hence, products should be simple for farmers to easily adopt and use. Also, the product should minimize operational complexity such that, officers could rely on existing channels to deliver goods and also scale to serve new farmer clients (One Acre Fund, 2017).

Organizations Capacity: Build IT, procurement and logistics capacities to manage the purchase, storage, and movement of goods. Firms should understand farming just as finance by understanding the farming processes. Hiring agricultural experts to develop simple products and train farmers appropriately. This will ensure that, good knowledge is transferred to clients to maximize the income from their assets. Monitor, evaluate and innovate. Organizations have to closely monitor farmers' compliance with trained techniques, evaluates the impact on yield and develops improvements where necessary. This hedges credit risk by

reducing the possibility of unproductive loan (One Acre Fund, 2017). The key take away from One Acre Fund's model is that, for Tieme Ndo to operate such a model, it needs investment in its logistics to effectively procure and distribute farm inputs to farmers, which is the focus of this project.

Findings and Insights from Interview with Agro Input Dealers

A total of four agro input dealers were interviewed. These are: Agriculture Manufacturing Group (AMG), RMG Ghana, Yara Ghana and M&B Seeds Agricultural Services Ltd. All the input dealers interviewed have been contracted by the government of Ghana to distribute subsidized farm inputs such as fertilizer and seeds except M&B Seeds. AMG and Yara Ghana are both fertilizer importers. They import, blend and distribute various types of fertilizers: both compound and direct/single fertilizers. They also have distributors or retailers as their customers. Unlike Yara Ghana, AMG also distributes seeds and chemicals besides the importation of fertilizers. On the other hand, RMG Ghana and M&B Seeds also produce or process and distribute improved seeds. RMG also sells chemicals such as sunphosate and other pesticides (Interviews, 2018).

Under the government subsidy program, input dealers like AMG and Yara are required to distribute both seeds and fertilizers at the subsidized price – 50% lower. Fertilizer under the subsidy program are compound fertilizers (Nitrogen, Potassium and Phosphorus), urea fertilizers and organic fertilizers. Sulphate of Ammonium fertilizer is however not covered by the subsidy program. On the other hand, seeds under the subsidy program are maize, sorghum, groundnuts, soybeans, rice, cassava, tomatoes and vegetables. No weedicides or pesticides is being covered in the subsidy program. Due to the government subsidy program, all input dealers contracted are supposed to sell their farm inputs at the subsidized price. According to the dealers, average price of the fertilizer is from GHS100 to

GHS120 per 50kg bag, maize seeds is GHS16 per 1kg. However, with the 50% reduction, farmers will pay GHS68 for fertilizer and GHS8 for maize seeds. This means that, companies that buys from these dealers stand a chance of buying the inputs at a lower price and can also sell at the subsidized price. From the interview, it was observed that, averagely each of these suppliers could receive, process and deliver orders to Nandom within three working days (Interviews, 2018).

However, from previous experienced with Naason's Agro, one could say that, the company cannot deliver within three days unless it improves on its performance. This is because, last year, when Tieme Ndo engage Naason's Agro to supply the inputs, the firm took more than a week to process and deliver the order to Nandom. From the interview, management could not tell exactly what their sourcing strategy was. However, upon interaction with the co-founder, it is possible to conclude that, Tieme Ndo's engagement with Naason Agro is consistent with the concept of delegated sourcing. This is because, Naasons' Agro was engaged by Tieme Ndo to purchase fertilizer, seeds and weedicides from different suppliers and then deliver them to Tieme Ndo. This is means that, Naason's Agro is acting as an agent on behalf of Tieme Ndo did and therefore do not have direct contact with the main suppliers of its farm inputs.

CHAPTER 4: SOLUTION/TOOL AND IMPLEMENTATION PLAN

This chapter presents the proposed solution for the problem identified through the needs assessment. An implementation plan for the proposed solution has also being developed to provide the client information on how to use the tool to solve the problem.

Review of the Structure and Components of the Tool

The Proposed Sourcing Strategy

Last year, Tieme Ndo was practicing delegated sourcing where the firm engaged a distributor to source all the farm inputs: fertilizer, seeds and weedicides from other suppliers/third parties and then supplied them to Tieme Ndo. However, to avoid some of the mistakes made by the agent supplier, a parallel sourcing strategy is recommended for Tieme Ndo. Parallel sourcing combines both single sourcing and multi sourcing strategies. In that, different components of the products are sourced from more than one individual supplier. In this case, the different components will be fertilizer, seeds and weedicides. Figure 9 below is an illustration of the proposed multiple sourcing strategy.

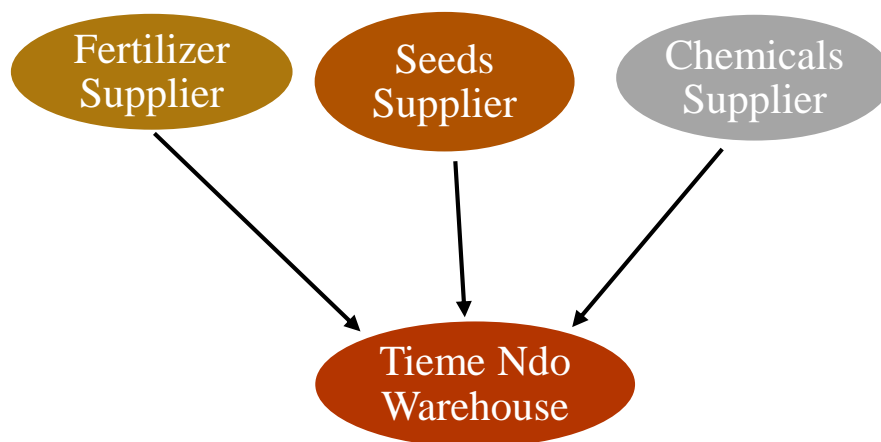


Figure 10 – Parallel Sourcing Strategy Proposed

Therefore, fertilizer will be supplied by one supplier, seeds will also be delivered by another supplier as well as the weedicides. Each supplier deliver its order to Tieme Ndo's warehouse located in Nandom for both cash and credit sales.

Benefits of Parallel Sourcing to Tieme Ndo

Parallel sourcing is a combination of both single sourcing strategy and multiple sourcing strategy. This means that, parallel sourcing assumes all the advantages and disadvantages of single and multiple sourcing. One of the benefits of this sourcing strategy is that, there is no tradeoff between supplier relationships and the number of suppliers to engage. Unlike single sourcing, the buying company cannot develop close relationship with many suppliers since all its products are sourced from one supplier. On the other hand, multiple sourcing allows the buyer to engage with many suppliers and is therefore unable to develop close relationship with these suppliers. However, for parallel sourcing, Tieme Ndo will be able to build strong relationships with many suppliers. As a result, Tieme Ndo could benefit from quantity discounts and other price concessions including credit extensions. In addition, there will be less supply disruption or mistakes since each supplier will be responsible for supplying one type farm inputs instead of all. This therefore eliminates all possible mistakes that the supplier could make in the processing the orders. Thus, enhancing quality of farm inputs supplied. Nonetheless, one of the disadvantage of this strategy is that, it is quite complex as it involves many suppliers. Hence, managing many supplies could be difficult for a startup like Tieme. Although this is a challenge, it will not be difficult if Tieme Ndo is able to build close relationships with these suppliers. Also, another possible challenge is that, farm inputs supplied by each of these suppliers could incompatible. That is, high quality seeds will not produce high yields without high quality fertilizers. Again, by establishing close relationship with suppliers will eliminate these discrepancies in inputs quality. The table below is a summary of the benefits and drawbacks of the proposed strategy – parallel sourcing.

Figure 7 – Summary of Benefits and Drawbacks of Sourcing Strategy

Benefits of Parallel Sourcing	Drawbacks
Reduced disruption in farm inputs supply	Difficult managing many suppliers
Enhance competition among suppliers	Products may incompatible with each other
Achieving timely delivery is high	
Enhanced buyer-supplier relationship	
Improved product quality	

Supplier Evaluation Selection Criteria

After establishing the sourcing strategy suitable for Tieme Ndo, it is important to identify, evaluate and choose the supplier that is best fit for the organization and can help the startup achieve its objective of timely delivery of farm inputs. In particular, the best approach to assess suppliers is to use the performance-based evaluation as proposed by Lammi (2014). The performance-based evaluation allows the buyer to assess suppliers based on their performance in terms of delivery, product quality, price and compliances. This method is somewhat consistent with the various selection criteria deployed by Indian manufacturing companies as described in the study by Kar and Pani in 2014. The table below describes important supplier selection criteria that Tieme Ndo could use in choosing its farm inputs suppliers.

Table 8 – Supplier Selection Criteria

Supplier Selection Criteria and Questions to Answer with Regards to each Factor	
Criteria/Key Success Factors	Decision Questions for Tieme Ndo
Cost/price of farm inputs	<ul style="list-style-type: none"> • Does the supplier sells the government subsidized farm inputs? • If not, how much is the supplier selling the inputs per kg or liter • Will you be able to resell the inputs to farmers with at a good margin? • Does the supplier give quantity discounts? • What is the quantity discount currently offered?
Delivery Time and Transportation	<ul style="list-style-type: none"> • How many days will it take a supplier to process and deliver inputs ordered to Nandom • Does the supplier provides transportation service? • How much does the supplier charge for transportation?
Credit Extension	<ul style="list-style-type: none"> • Does the supplier supply inputs on credit? • How many days or months is the credit period
Product Variety	<ul style="list-style-type: none"> • Does the supplier sells more than two types of inputs: fertilizer, seeds and weedicides
Off – Taker	<ul style="list-style-type: none"> • Does the supplier buys farm produce • Can the supplier assist Tieme Ndo find market to sell the farm produce after harvest? • Make sure to discuss price of the produce per kg.
Support for Startups	<ul style="list-style-type: none"> • Does the supplier provide any sort of support for startups such as training and funding

Analysis of the Supplier Selection Criteria

The first column to the left of the table describes the important key success factors or performance metrics upon which potential suppliers will be assessed by Tieme Ndo. The second column of the table listed relevant questions to guide Tieme Ndo in assessing potential suppliers on the various criteria. The performance factors to be considered are:

Delivery time/transportation – the number of days or hours the supplier will take to process and deliver the order to Tieme Ndo warehouse at Nandom. The factor also consider transportation, which takes into consideration whether the supplier will use its own transportation system or Tieme Ndo will have to provide the transportation system. This factor is necessary to assess the ability of potential suppliers to deliver inputs to Nandom on time. Otherwise, when inputs are not delivered to Tieme Ndo by the suppliers on time, it is obvious that, farmers will also receive their inputs late, which could affect their crop yields negatively.

Credit Extension – another criteria to consider is whether the supplier is willing to supply the farm inputs on credit or not. It also looks at the number of months or days the supplier is willing to supply its inputs for credit. This is important because, it releases the organization of having to raise funds all the time to purchase inputs. It also allows the firm to embark on investment opportunities without worry of not having enough cash to finance cost of farm inputs.

Cost/price of inputs – this criteria assesses the price offerings of the supplier for its products. Suppliers will be assessed based on their price offerings as well as the margin Tieme Ndo could make when it retail the farm inputs. The factor also consider whether the supplier is being contracted by the government of Ghana to distribute subsidized inputs or not. The price at which suppliers sell their products is really imperative to determining how much margin Tieme Ndo could make on every product it buys. It is also important because, when Tieme Ndo buys inputs at higher price, farmers will have to pay a little bit higher above the purchase. Thus putting a burden on the farmers.

Product variety – this metrics assesses the supplier based on the number of product offerings. Products in consideration are fertilizer, seeds and weedicides. The metric looks at

whether the supplier supplies either two of the aforementioned farm inputs. This selection metrics is relevant because, companies with many product offerings will be given much priority over suppliers of single products. This is because, suppliers with many offerings will be reliable or will serve as backup suppliers incase other suppliers default or are unable to deliver on time.

Off-Taker – under this criteria, suppliers are evaluated based on their ability to buy-back the farm produce from Tieme Ndo's farmers after they have harvested. It also allows suppliers to justify whether they could assist Tieme Ndo find market for its farmers to sell their produce if the supplier cannot off-take the produce. This factor is important because, it reduces the stress management at Tieme Ndo will go through to finding buyers to purchase the farm produce. Somehow, this criteria could result in contract farming where Tieme Ndo group of farmers could be contracted by another organization to produce for them at an agreed market price. This will give farmers a guaranteed market to their farm produce after harvest. Thus, motivating them to invest in their farm activities.

The last criteria is **support for startups** – this is one of the interesting criteria. The criteria looks at whether the supplier could provide startup support to Tieme Ndo in the form of training and funding. This is important because, it minimizes the number of stakeholders Tieme Ndo need to engage to achieve its objectives.

The Factor Rating Model

After establishing the various metrics to selecting suppliers, it is important to evaluate some potential suppliers of different farm inputs based on the above key success factors. This is done using the factor-rating model. Although the factor rating model is used in selecting locations for companies, it could also be used to select suppliers. This is because, as maintained by Heizer and Render, the factor-rating model instill objectivity in evaluating a

wide range of factors from education to recreation. As such, using the factor-rating model to evaluate suppliers of farm inputs could yield similar results as it is in selecting locations. The table below shows the factor rating model used in evaluating five inputs suppliers in Ghana.

Table 9 – The factor-rating model

			Scores for Suppliers (0 to 100 points)				
Factors		Weight (0 to 1)	AMG	Yara	Naasons Agro	RMG	M&B Seeds
Delivery Time		0.5	60	60	10	60	60
Price/Govt. Subsidy		0.2	76	76	76	76	90
Credit Extension		0.05	0	0	30	0	0
Product Variety		0.1	100	33	100	60	33
Off - Taker		0.14	10	10	10	10	10
Support for Start-ups		0.01	0	0	0	0	0
Total		1	56.6	49.9	33.1	52.6	52.7
*Ranking between 0 to 100, where 0 is least and 100 is highest *Ranking weight between 0 to 1, where 0 is least important and 1 is most important							

Analysis of the Factor-Rating Model and the Recommended Suppliers

The above table indicate the factor ratings on different potential input suppliers based on their performance with regards to the selection criteria described in the previous section (4.1.2.). The factor-rating model is developed by following the six steps provided by Heizer and Render: The first step is to develop a list of relevant factors, which has been developed as seen in the diagram in section 4.1.2. Secondly, a weight between 0 and 1 is assigned to each factor in order of importance to Tieme Ndo. Factors with the highest weight are of most important to achieving Tieme Ndo objectives. These factors are: delivery time (0.5ratings), price/government subsidy (0.2ratings) and Off-taker (0.14ratings). Factors with the least

weight were product variety (0.1), credit extension (0.05) and startup support (0.01). After assigning the weight to each factor, each supplier is given a score from 0 to 100 with regards to their performance on the factors. As shown on the table, almost all the suppliers said they will be able to process and deliver order within two to three days. Thus, the score of 60 points (five days are considered, so each day has 20points) to all suppliers except Naasons Agro which scored 10points because last year the company could not deliver within 3days. For pricing, it is seen that, all the suppliers are relatively good because all of them have been contracted by the government to distribute these inputs at the subsidized price and that is why they all scored 76points except M&B Seeds. M&B Seeds was given 80points because, even though the company does not supply subsidized seeds, its prices are relatively cheaper as compared to the other suppliers who have been contracted by government to distribute subsidize seeds. This means that, their seeds would have been more costly if they were not in the government subsidy program.

In addition, all the suppliers under consideration do not supply inputs on credit. Hence, all of them were scored zero points. According the personnel from these suppliers, they do not give inputs on credit due to lack of trust and default payment by distributors. They only give credit to their long serving customers. For product variety, AMG and Naasons Agro scored 100points. This because, both companies sell all the three type of farm inputs Tieme Ndo needs: fertilizer, seeds and weedicides. Another metric worth discussing is as to whether the supplier will buy-back the farm produce from Tieme Ndo's farmers or it will assist Tieme Ndo find buyers for the produce. From the diagram, it shows that, all the suppliers do not buy-back the farm produce but either plan to purchase the produce themselves or link another company to buy the produce. For example, RMG does not buy produce but could link Wienco Ghana to buy the produce. Surprisingly, none of the suppliers currently provide any sort of support for social enterprise startups or startups in general even

though they have plans to doing that. The fifth step is to multiply the scores by the corresponding weight assigned to each performance criteria and add them together. The final step to complete the factor-rating model is to make recommendations for the qualified suppliers based on the total points calculated.

Hence, from the table above, the top three suppliers suitable for Tieme Ndo could be Agricultural Manufacturing Group (AMG), RMG and M&B Seeds. AMG with the highest total ratings of 56.6, imports fertilizer, seeds and weedicides including farm implements. Hence, in terms of product variety, AMG scored 100points more than any company because, it has all the product needs of Tieme Ndo. In terms of delivery time, AMG could process and deliver fertilizer to Nandom in three days. The company has also being contracted by the government of Ghana to distribute subsidized farm inputs such as fertilizer and seeds. Due to the government subsidy, AMG fertilizer and seeds are relatively low. RMG also supply chemicals and seeds and has also been contracted by government to distribute subsidized fertilizer. The above recommendation informed by the proposed sourcing strategy – parallel sourcing, which combines both single and multiple sourcing strategies. On the other hand, M&Seeds is a seeds processing company located in Volta Region. The company have spearheaded the development of high yielding maize variety. M&B could process and deliver seeds to Nandom within three days or less and it is willing to cover 50% of the transportation. It does not give credit for its seeds but its prices are relatively cheap as compared to the other companies.

The Distributor Storage with Customer Pickup Distribution Strategy

As mentioned in the previous chapter, distribution involves the process of moving products from their original source to the final consumer. Distribution is an important component in achieving supply chain objectives. In this case, it is imperative to think about

how to move fertilizer, seeds and weedicides from suppliers: AMG, RMG and M&B Seeds to farmers in rural communities at Nandom in time. Based on the needs assessment, the recommended distribution strategy suitable for Tieme Ndo is **Distributor Storage with Customer Pickup**. The diagram below described this strategy.

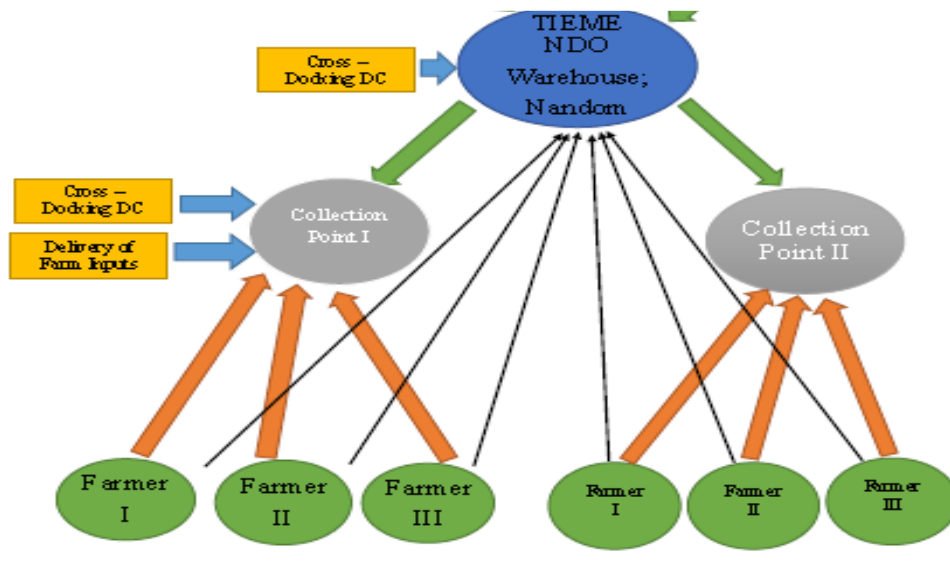


Figure 11 – Proposed Distribution Strategy - Distributor Storage with Customer Pickup

From the diagram, when fertilizer, seeds and weedicides are supplied to Tieme Ndo by suppliers, a percentage of the inputs will be stored in Tieme Ndo's warehouse at Nandom for cash sales. The remaining inputs will be offloaded from the inbound truck (the truck bringing the inputs from the supplier) unto an outbound truck (the truck that will transport the inputs to the collection points) who will then transport the inputs to local collection points like school compounds and community centers for farmers to pick up their orders. Alternatively, Tieme Ndo could arrange with the inbound truck driver to offload a certain percent of the inputs needed for cash sales into Tieme Ndo's warehouse and proceed to offload the remaining inputs at the local collection points. The interaction between the incoming truck and the outgoing truck is indicated as the point of Cross-Docking, where the

incoming truck either offload some of the fertilizer into the warehouse and proceed to local collection points or incoming truck offloads a percentage of the inputs unto an outgoing truck who will then transport the inputs to local collection points. At the local collection points, there are no warehouses to store the inputs hence, extension officers will be at the collection points to distribute the inputs to the registered farmers. This means, farmers will need to meet at the collection point as indicated by the grey circles on the diagram on the day of delivery. At this point, the extension officers must ensure that, the inputs distributed corresponds with the farmer who ordered such inputs. Again, the distribution of the inputs to farmers straight from the delivery van at the collection point is considered as cross-docking as shown on the diagram.

From the diagram, the black arrows indicates the flow of information from farmers in the form of registering of farmers. This helps Tieme Ndo to aggregate the type of inputs needed and the quantity demanded prior to delivery. The information includes, communicating the dates and time in which the inputs will be delivered at the collection points. By extension, the information could also include the dates on which farmers will be trained as well as the dates for the monthly meetings. Also, the blue arrows indicate the flow of farm inputs from Tieme Ndo's warehouse to the local collection points. Beyond the flow of the products, the blue arrows also indicate the movement of Tieme Ndo's extension officers and personnel moving these collections points to hold meetings with farmers and to train them. The light red arrows indicates the movement of farmers from their homes to the local collection points: school compounds and community centers to receive their orders. This could also include farmers attending their monthly meetings and training sessions organized by Tieme Ndo.

Putting it Together – The Complete Supply Chain for Tieme Ndo

Putting the sourcing strategy and distribution strategy together presents a snapshot of Tieme Ndo's supply chain. Supply chain is all activities involve to source, make, deliver and sell. In this case, the make stage is represented by the storage of the farm inputs since Tieme Ndo is not a manufacturer of any of the farm inputs. The diagram below illustrate the supply chain system.

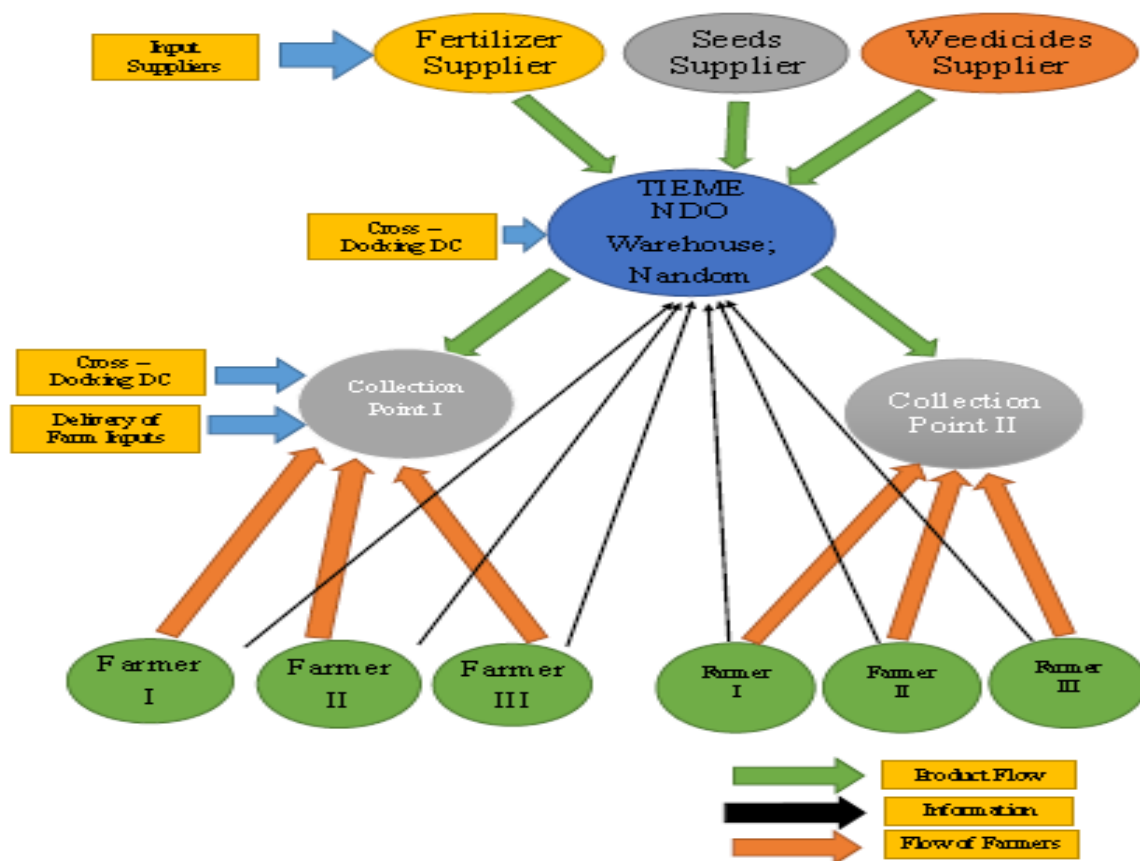


Figure 12. Complete Supply Chain for Tieme Ndo

Again, from the diagram, it shows the three suppliers of the various farm inputs: fertilizer suppliers, seed suppliers and weedicides. From the factor-rating analysis, the three

suppliers will be AMG, RMG and M&B Seeds since they scored the highest ratings among the suppliers engaged. The blue circle indicates Tieme Ndo's warehouse at Nandom where the three suppliers will send their inputs to. At the warehouse in Nandom, some of the farm inputs will be offloaded into the warehouse while others will be sent straight to the farmers at the local collection points as shown on the diagram by the grey circles (see section 4.12. for details). The date and time for which the inputs will be sent to these collection points will be communicated to farmers beforehand. Farmers will then move from their homes to the local collection point to receive their inputs. This movement is shown by the right arrows.

Analysis and Benefits of the Sourcing and Distribution Strategy

The diagram above presents not just Tieme Ndo supply chain but also a snapshot of its operational plan. First, the strategy depicts how Tieme Ndo will procure, store and distribute its farm inputs to farmers at the right time. The factor rating model will help Tieme Ndo to identify, evaluate and select suppliers who can perform better to help the organization achieve its objectives of timely distribution of inputs. Beyond this, the strategy has highlighted on other key operational activities of the organization. One of such activities is holding monthly meetings and training sessions for farmers. The strategy has shown the movement of Tieme Ndo personnel to community centers or meeting grounds to offer training sessions. This also makes it easy for farmers to know the venue for their monthly meetings thus will not need regular reminders from extension officers, which could be costly. Hence the dissemination of information to farmer groups is made easy as a result.

Further, this approach will save cost for both the farmer and the organization itself. For the farmer, it will save them a transportation cost of about GHC2 to GHC5 to transport one bag of fertilizer to their homes or farms. It also reduce the stress of travelling long distance to town to purchase farm inputs. Traveling from a typical community to the Nandom

town takes a more than 1 hour. However, with this strategy, farm inputs will be available in within the community. This also reduces the amount of time farmers spend planning their travel to buy fertilizer.

On the other hand, this approach helps Tieme Ndo to reduce its warehouse cost by about GHC4000. Tieme Ndo intends to distribute more than 2000bags of fertilizer this year, including seeds and weedicides. However, its current warehouse could store less than 1000kg bags of fertilizer. This means, Tieme Ndo will need to rent an additional warehouse to store the farm inputs, which will cost about GHC4000. However, with this strategy, Tieme Ndo could store about 1000bags of fertilizer in its current store for cash purchase while the remaining inputs are delivered directly to farmers in their communities. In the end, Tieme Ndo will not have incur cost on maintenance and electricity cost.

In addition, this strategy reduces early stock out. Tieme Ndo has lost over 10 customers worth GHC6000 who could have bought 100bags of fertilizer. Fortunately, this strategy will also Tieme Ndo store about 1000bags of fertilizer, seeds and weedicides in its warehouse for only cash sales. This means, farmers who are not registered into the program will also benefit from the quality farm inputs supplied by the firm.

Implementation Plan

To implement this model involves a two stage approach. Each stage has steps to follow.

Stage 1: The Sourcing and Evaluating Process.

Step 1: Assess Sourcing Needs. The first step is to for Tieme Ndo to assess its sourcing or purchasing needs for that particular farming season. Taking into consideration the number of farmers targeted, the type and quantity of farm inputs required by each farmer for the season. In this case, timely registration of farmers as early as March will be important at this stage. Both credit and cash sales project will be important things to do.

Step 2: Develop the Sourcing/procurement Strategy. Developing the sourcing strategy involves the decision of whether to insource or outsource. In this case, insourcing and outsourcing would be whether to buy farm inputs in Ghana or overseas. In either case, management still have to determine the number of suppliers to engage in the supply of the inputs. The number of suppliers to engage will determine the kind of sourcing strategy management are considering. In this case, the proposed sourcing strategy is parallel sourcing which involves engaging many suppliers who will supply fertilizer, seeds and weedicides. Other strategies management could consider in the future are: single sourcing, multiple sourcing, parallel sourcing and delegated sourcing (see details in section 3.1).

Step 3: Performance-Based Evaluation of Potential Suppliers. After deciding on the number of suppliers to engage in the supplier of the farm inputs, management need to assess potential suppliers to match their capabilities against that of company's objectives. In this case, the performance-based evaluation method should be used to assess shortlisted suppliers' against the following performance metrics: delivery time/transportation, price of

farm inputs or suppliers involvement in the distribution of subsidized farm inputs, credit extension, product variety, ability to buy-back (off-take) the farm produce after harvest and support services currently offered by the supplier to startups.

Step 4. Establish the Factor Rating Model. The next thing to do after the first three steps is to establish the factor-rating model to evaluate potential suppliers with respect to their performance on important performance metrics. The following steps below should be followed in setting up the facto-rating model:

- a. Develop a list of relevant factors called key success factors.
- b. Assign a weight to each factor to reflect its relative importance in the company's objectives.
- c. Develop a scale for each factor for example, 1 to 10 or 1 to 100 points.
- d. Have management score each location factor using the scale in step
- e. Multiply the score by the weights for each factor and total the score for each supplier.
- f. Make a recommendation based on the maximum point score. The company with the highest score should be selected. See section 4.1.3 for an illustration.

Note: Management will now go into negotiations with the recommended companies and eventually sign contracts for them to supply farm inputs to Tieme Ndo.

Stage 2: The Distribution Process

The distribution strategy is a strategic decision to be decided by top management. In this project, the proposed strategy is distributor storage with customer pickup. The following steps should be followed in implementing this strategy:

Step 1: Build the Logistics Team – the first step is to build the logistics team who will be responsible for receiving, storing and delivery the farm inputs. Training of the

logistics team is essential in this case to help them understand the distribution strategy. This stage is necessary because, according to One Acre Fund who has been operating a similar model, building the capacity of the logistics team helps achieve the distribution strategy.

Step 2: Establish a Communication System – It is important to keep all the stakeholders: farmers, extension agents, suppliers and logistics team in the loop. This will enhance easy flow of information and task to ensure everyone is delivery on time and within budget.

Step 3: Identify and Secure a Local Collection Point – A background checks should be conducted on every community to identify the possible collection points such as school compounds and community centers. Engage community leaders to solicit their support to use these existing facilities or centers as your collection points.

Table 10 – Summary of the Implementation Plan

Implementation Plan			
Steps or Tasks	Objectives	Resources or Things Needed	Personnel Responsible
Stage 1: The Sourcing and Evaluation Process			
Assess Sourcing Needs	To identify the type and quantity of farm inputs needed for the season.	Information type of farm inputs needed by each farmer, sales projection	Procurement team and Extension Officer/Agronomist
Develop the Sourcing/procurement Strategy	To identify the number of suppliers needed	Information on different sourcing strategies	Management
Performance-Based Evaluation of Potential Suppliers	To identify and evaluate potential suppliers of farm inputs	Information/database of all farm inputs suppliers, sticky notes, white board and markers List performance metrics to assess suppliers	Procurement Team and Agronomist
Establish the Factor Rating Model	To select the 3 top performing suppliers		Procurement team

Stage 2: The Distribution Process			
Build the Logistics Team	To receive, store and deliver farm inputs on time	Training manuals	Procurement Manager
Establish a Communication System	To keep all stakeholders in the loop to avoid disruption	Mobile phones, Internet, registration forms	Logistics team
Identify and Secure a Local Collection Point	To secure a collection point in every community	Motorbike, note books	Extension Officer
Others Specific Task			
Registration of Farmers	To convince and recruit the target number of farmers	Registration forms, pens, motorbikes, mobile phones and recharge cards	Extension Officers
Receiving, Inspection, Accepting and Storing of inputs	To receive the requested farm inputs at the right time and in the right quality and quantity	Invoice, Waybills	Warehouse Manager and Agronomist
Communicate to farmers date and time of inputs collection	To inform farmers the date and time to meet at the collection point to collect their inputs	Phone, recharge cards, farmers phone numbers	Agronomist and Extension officers
Distribution of Inputs to collection points	To distribute the right quality and quantity of fertilizer, seeds and weedicides to various collection centers at the right time	Trucks, Extension officers, phones, inputs collection and payment booklets, farmers repayment booklet	Extension Officers
Training of farmers	To effectively train farmers on the appropriate use of farm inputs	Farm equipment Sample fertilizers and seeds, demonstration farm	Agronomist and Extension Officers Group leaders
Monthly Meetings with Farmer Groups	To discuss and address challenges encountered on the farms To gather feedback on the model and to assessed and improve the model with farmers	Group register Camera	Extension Offers and Management
Field Extension and M&E	To ensure farmers uses the inputs appropriately To measure the impact of model	Motor Vehicles Computers M&E forms Mobile Devices Camera	Extension Officers and Management

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This project sets out to help Tieme Ndo Social Enterprise identify the most efficient ways of sourcing and distributing the right kind of farm inputs: fertilizer, seeds and weedicides to rural farmers at the right time. There was necessary because, Tieme Ndo could not supply rural farmers with the right kind of farm inputs on time during its pilot last year. Thus leading to low crop yields among rural farmers. Fortunately, this project has orchestrated sourcing and distribution strategy to help the organisation procure and distribute quality farm inputs on time. The proposed sourcing strategy is parallel sourcing, which allows the organisation to source its different types of farm inputs from different suppliers. The performance-based evaluation supplier evaluation criteria was used, coupled with the factor-based rating model to evaluate and recommend potential suppliers for Tieme Ndo. The recommended suppliers were AMG, RMG and M&B Seeds. As part of the implementation plan, a two stage approach has been developed to guide management to implement the propose solution.

Recommendations

Invest in Logistics and Communication – Tieme Ndo needs to invest significantly developing its capacity in terms of logistics management and communication to effectively implement this model. This means, intensive training should be given to the logistics team and they should be equipment with the necessary communication tools. Logistics could include: motorbikes, pens, registration forms, and order tracking systems, inventory tracking systems, mobile phones and airtime.

Supplier Relationship Management – Since Tieme Ndo will be sourcing its inputs from many suppliers, the firm needs to find a way of managing all these suppliers. This will help management understand which supplier to engage and when to engage them. Effective stakeholder management could suffice. To use this model effectively, Tieme Ndo needs to establish a good communication system. Tieme Ndo needs to invest in its information technology to ensure effective communication between the firm and its major stakeholders: suppliers and the farmers. Tieme Ndo will have to train its extension officers on logistics and inventory management at the collection sites where farmers will be receiving their orders. This will help them match customers with the correct orders.

Management should not rely solely on the results of the factor-ratings model in deciding who the suppliers should be. The factor-rating model should be used in connection with management's past experience and facts on the ground relating to each potential supplier.

References

- Acimovic, S., Mijuskovic, V. M., & Colic, L. (2016). Procurement Insourcing Vs. Procurement Outsourcing: Evident from Serbia. *Eurasian Journal of Business and Management*, 34-45.
- Ali, T., Imeri, S., Liu, Y., Shahzad, K., Sillanpää, I., & Takala, J. (2015). Evaluation and Selection Process of Suppliers Through Analytical Framework: An Empirical Evidence of Evaluation Tool. *Management and Production Engineering Review*, 10 - 20.
- Ashesi University. (2016). *Applied Project Capstone Project Guidelines*. Accra: Ashesi.
- Authority, N. C. (2017). *Telecom Data Subscription*. Accra: National Communication Authority.
- Bank of Ghana, (2017). *Impact of Mobile Money on the Payment System in Ghana: An Economic Analysis*. Accra: Bank of Ghana.
- Bank of Ghana, (2018, January 18). *Home Page*. Retrieved from Bank of Ghana: <https://www.bog.gov.gh/>
- Banful, A. B. (2009). *Operational Details of the 2008 Fertilizer Subsidy in Ghana—Preliminary Report*. Accra: IFPRI.
- Bimpikis, K., Fearing, D., & Tahbaz-Salehi, A. (2014). Multi-Sourcing and Miscoordination in Supply Chain Networks. *Faculty and Research Working Paper*.
- Blome, C., & Henke, M. (2009). Single Versus Multiple Sourcing: A Supply Risk Management Perspective. In R. Bob, & G. A. Zsidisin, *Supply Chain Risk. International Series in Operations Research & Management Science*. Boston: Springer Boston.
- Central Intelligence Agency, (2017). *World Fact Book*. Washington DC: Central Intelligence Agency.
- Chopra, S., & Meindl, P. (2010). *Supply Chain Management*. New Jersey: Pearson.
- Cooke, E., Hague, S., & McKay, A. (2016). *The Ghana Poverty and Inequality Report*. Unicef.
- Eduku, P. A. (2018, April Wednesday). 'Fall armyworm has come to stay' – US Taskforce. Retrieved from Citi Business News: <http://citibusinessnews.com/index.php/2018/04/11/fall-armyworm-has-come-to-stay-us-taskforce/>
- Ministry of Finance, (2017). *The 2018 Budget Statement and Economic Policy of the Government of Ghana*. Accra: Ministry of Finance.
- Fuentes, P. A., Bumb, B., & Johnson, M. (2012). *Improving Fertilizer Markets in West Africa: The Fertilizer Supply Chain in Ghana*. Accra: IFDC and IFPRI.

- One Acre Fund, (2017, November Monday). *Our Model: Market Based Strategies to Fight Rural Poverty*. Retrieved from One Acre Fund: <https://oneacrefund.org/what-we-do/our-model/>
- Ghana Investment Promotion Centre (2018, April Monday). *Investing in Ghana's Cash Crops*. Retrieved from Ghana Investment Promotion Centre: <http://gipcghana.com/17-investment-projects/agriculture-and-agribusiness/cash-crops/287-investing-in-ghana-s-cash-crops.html>
- Gündel, S., Hancock, J., & Anderson, S. (2001). Scaling-up strategies for research in natural resources management A comparative review. *Natural Resources Institute* , 65.
- Heizer, J., & Render, B. (2011). *Operations Management*. New York: Pearson Education Inc
- international Fertilizer Development Centre, (2012). *Ghana Fertilizer Assessment* . Alabama
- International Fertilizer Development Centre, (2014). *Challenges in Assessing Fertilizer Consumption and Fertilizer Use by Crop in Ghana*. Accra: North and West Africa Division of the International Fertilizer Development Cente.
- International Fertilizer Development Centre (2017). *Fertilizer, Technical Working Group Validation Workshop; Ghana, Nigeria and Sierra Leone*. Accra: IFDC.
- Jahanfar, S. (2016). *Identifying the Risks and Opportunities for Development Projects with Suppliers*. Sweden: Göteborg.
- Juneja, P. (2018, April Sunday). *Sourcing Strategies & Procurement Processes*. Retrieved from Management Study Guide: <https://www.managementstudyguide.com/sourcing-strategies-and-procurement-processes.htm>
- Krishnan, R. A. (2012, April Saturday). *Supply Chain Management, Designing the Supply Chain Network*. Retrieved from SlidesShare: <https://www.slideshare.net/ialwaysthinkprettythings/scm-module-2-13536305>
- Lammi, H. (2016). *Supplier Evaluation and Selection Process*. Helsinki Metropolia University of Applied Sciences.
- Marketa, J., & Sanjiva, C. (2012). *Thinking Systematically About Scale Up: The Case of Competitive Grant Schemes for Agricultural Research and Extension*. Washington DC: World Bank.
- MasterCard Foundation, (2018). *Mastercard Index of Women Entrepreneurs (MIWE) 2018*. US: MasterCard.
- Matthyssens, P., & Faes, W. (2007). The effectiveness of parallel and single sourcing: purchasing and marketing implications. 10.
- MindTools. (2018, January Saturday). *SWOT Analysis: Discover New Opportunities, Manage and Eliminate Threats*. Retrieved from MindTool: https://www.mindtools.com/pages/article/newTMC_05.htm
- Ministry of Food and Agriculture, (2013). *Agriculture in Ghana: Facts and Figures*. Accra.

- Ministry of Food and Agriculture, (2013). *Agriculture in Ghana: Facts and Figures*. Accra: SRID.
- Ministry of Food and Agriculture, (2016). *Agriculture in Ghana: Facts and Figures (2015)*. Accra: MOFA.
- Ministry of Food and Agriculture, (2017). *Agricultural Sector Progress Report 2016*. Accra: Ministry of Food and Agriculture, Ghana.
- Ministry of Food and Agriculture, (2018, January Saturday). *Government to Spend GH 207m on Fertilizer Subsidy*. Retrieved from MOFA: <http://mofa.gov.gh/site/?p=15019>
- Najafi, N., Lind, F., & Pedersen, A.-C. (2014). Changing sourcing strategies to make the most of them . *IMP Conference 2014* (p. 27). Manchester: IMP Group.
- Obisesan, A., Akinlade, R., & Fajimi, F. (2013). Determinants of Fertilizer Use Among Smallholder Food Crop Farmers in Ondo State, Nigeria. *American Journal of Research Communication*, 260.
- Oppong-Anane, K. (2001). *Ghana Pastures/Forage Resource Profile*. Accra: FAO.
- Pani, A. K., & Kar, A. K. (2014, January). Exploring the importance of different supplier selection criteria. *Management Research Review*.
- Richardson, J. (1993). Parallel Sourcing and Supplier Performance in the Japanese Automobile Industry. *Strategic Management Journal*, 339-350.
- Service, G. S. (2017). *Consumer Price Index CPI*. Accra: Ghana Statistical Service .
- Sikula, A. S., Kim, C. W., & Braun, C. K. (2010). Insourcing: Reversing American Outsourcing in the New World Economy. *Management Faculty Research*, 3 -9.
- Starling, S., Burt, D. N., & Dobler, D. W. (2003). *World Class Supply Chain Management*. United States: McGraw-Hill Higher Education.
- Tetteh, F. M., Quansah, G. W., Frempong, S. O., Abdul Rahman, N., Atakora, W. K., & Opoku, G. (2017). Optimizing Fertilizer Use within the Context of Integrated Soil Fertility Management in Ghana. In C. J. Senkoro, *Fertilizer use optimization in sub-Saharan Africa*. (pp. 176-192). CABI Publishing; CAB International.
- University, N. C. (2018, April Sunday). *Supply Chain Resource Cooperative - Sourcing Strategy*. Retrieved from North Carolina State University: <https://scm.ncsu.edu/scm-articles/article/sourcing-strategy>
- VOTO. (2015). *A Complete Curriculum and Guide to Maize Production in Ghana*. Accra: VOTO.
- What are the 4Rs*. (2018, April Wednesday). Retrieved from 4R Nutrient Stewardship : <http://www.nutrientstewardship.com/4rs/>
- Wong, W. (2011). *Sourcing strategies: A case study in the construction industry*. Norwegian: Norwegian University of Science and Technology.

Figure 11 – Proposed Distribution Strategy

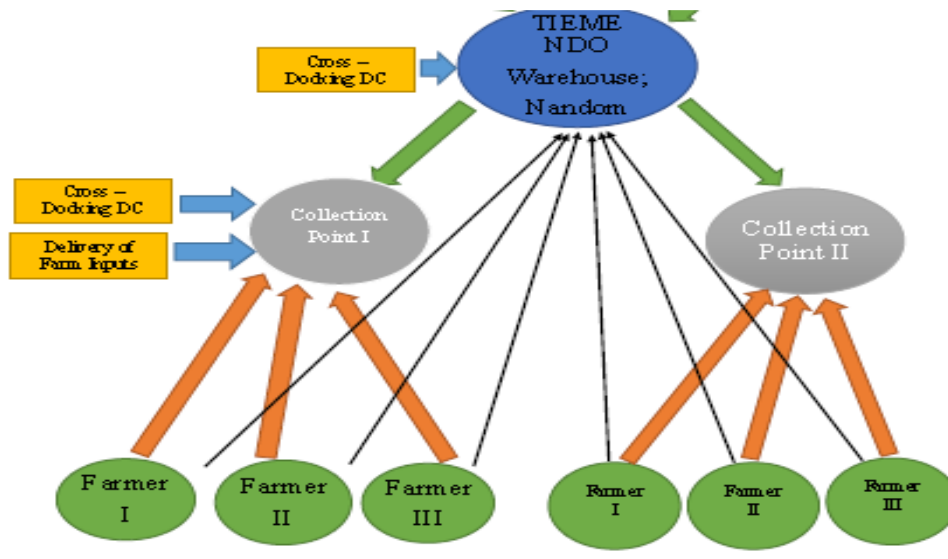


Figure 12 – Complete Supply Chain for Tieme Ndo

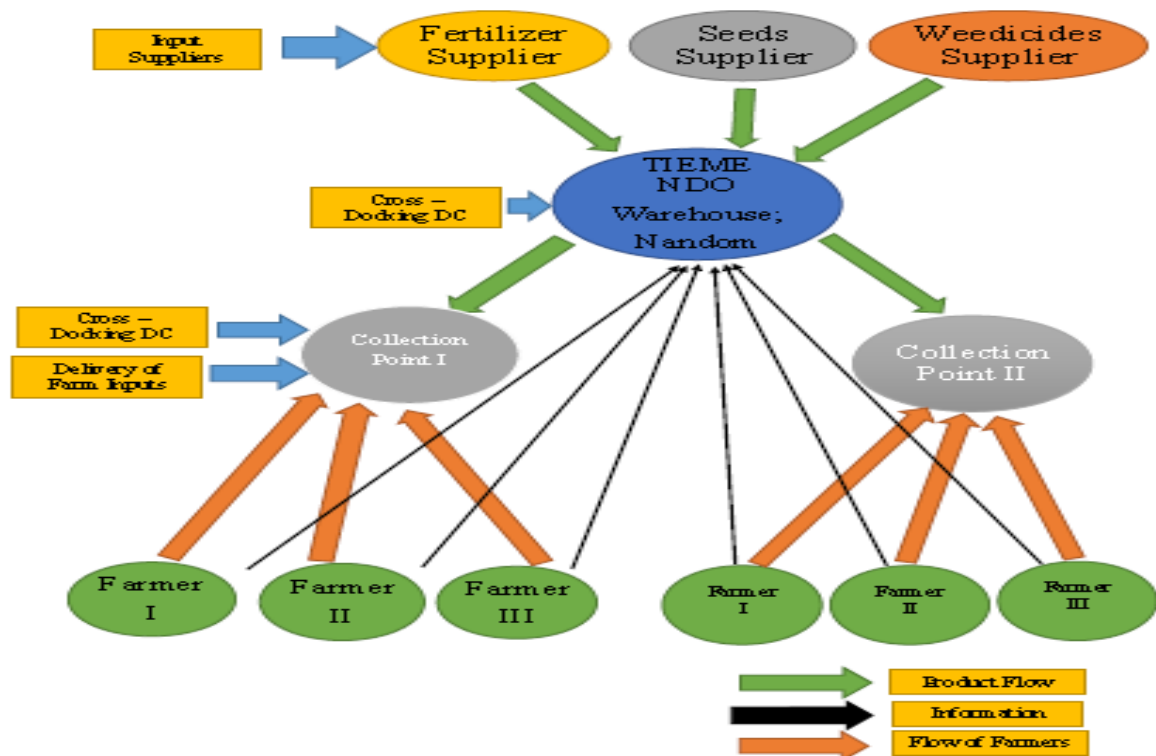


Table 13 – Interview Questions Guide

Interview Questions and Guide

My name is Moses Yangnemenga a final year business administration student at Ashesi University College. I am working on my applied project as part of my graduation requirement to develop a sourcing and distribution strategy for Tieme Ndo. The objective of the project is to identify the operational challenges Tieme Ndo encountered during its pilot and to orchestrate an efficient approach to procure and distribute farm inputs on time. This is why I will be glad if you could participate in this interview. Your participation is highly valued in understanding the needs of Tieme Ndo. This research has been approved by the Internal Research Board of Ashesi University College (irb@ashesi.edu.gh) and any information collected is highly confidential and will not be used for any other purpose either than this project. There is however no benefits for participating in this interview. Therefore, if you wish to be part of this interview, please proceed to answer the questions in the sections below. You are also free to opt out at any point during the process.

Questions for Agro Input Dealers

1. What kind of farm inputs do you sell?
2. How much do you sell for each product?
3. Has the government of Ghana contracted you to distribute subsidized farm inputs?
4. What are your discount policies?
5. Do you supply inputs on credit and who qualifies for a credit extension?
6. How long in days or hours will it take you to process and deliver orders to Nandom?

7. Do you provide transport service yourself or do you assist your customers in any way to transport their farm inputs to their warehouses?
8. How do you help your customers sell their farm produce after harvest?
9. What support services do you give to startups?
- 10.

Interview Questions for Co-founders and Extension Officers

1. What is Tieme Ndo about?
2. Give me an overview of your pilot activities
3. How many farmers and communities benefitted from the program?
4. What is the average yields per farmer after harvest?
5. What is the repayment rate of farmers?
6. Who did you buy your farm inputs from?
7. What was the price for each products?
8. How many bags of fertilizer, seeds and weedicides did you distribute to farmers?
9. What were some of the challenges in purchasing these farm inputs?
10. What were some of the challenges in distributing these farm inputs?
11. What is your current strategy to procure farm inputs?
12. What is your current strategy to distributing these farm inputs?
13. How many staff are in Tieme Ndo?
14. How did farmers feel when they received the farm inputs late?
15. What are the strengths, weaknesses, threats and opportunities for Tieme Ndo?

Interview Questions for Extension Officers

1. How did farmers feel when they received the farm inputs?

- 2. What will you say are the strengths, weaknesses, threats and opportunities for Tieme Ndo?**
 - 3. What will you say were the main challenges in distributing the farm inputs to farmers?**
 - 4. How has late delivery of farm inputs affect farmers?**
 - 5. Generally, what are some of the challenges farmers faced in agriculture?**
- 