Muhammad. N. Idris

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idrismn@hotmail.com

Process Refining Technology and Sustainable Energy Development Group, Department of Chemical Engineering, University of Maiduguri, Nigeria

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Repositioning the Nations' Agricultural Potentials Towards Diversifying the Economy for Sustainable Development – the Engineering Perspectives and Netherlands Examples

Muhammad. N. Idris[1]* and Ibrahim. Abdul[2]

[1]Process Refining Technology and Sustainable Energy Development Group, Department of Chemical Engineering, University of Maiduguri, Nigeria.

[2]College of Agricultural Economics and Extension, Joseph Sarwaun Tarkaa University, Markudi, Nigeria.

***Corresponding authors:** idrismn@hotmail.com

ABSTRACT

Agricultural production was the main financial revenues, that is, the front-line gross domestic product GDP, for the country before the advent of black gold (fossil fuel). Unfortunately, since the beginning of petroleum exploration and production in Nigeria, the country has lost it numerous agricultural potentials, due to the immediate monetary benefits from exporting crude oil to the Europe and America. Since 2017, the Netherlands has repositioned herself as the second-largest exporter of agriculture in the world with a net value of $111 billion US. These include $10 billion of flowers and $7.4 billion of vegetables. The Netherlands is the world's second-largest agricultural exporter, after the United States. In 2021, the net value of the agricultural export was more than $118 billion US. Nigeria must take a leave from Netherlands by setting a robust and sustainable policies, the Netherlands model, to salvage her agricultural developments that will catapult the country to be in the fore-front of the world agricultural products for both domestic and foreign export gains, which in-turn increases the nations' gross domestic product, GDP. The interest of this paper is to provide some valuable insights to the Nigerian government and policy makers on the guides to achieving these objectives within a short span.

Keywords: Potentials, reposition, and sustainable development

1.0 INTRODUCTION

Agriculture is the foundational stone of national economy and this is an objective socio-economic applicability of universal law. The living mankind can never survive or exist without food derived from agriculture and non-agricultural sectors could not be developed without agriculture. It is absolutely certain that a modern economy and society cannot be based on a backward agricultural development. If agriculture is less developed in one country, it is impossible for an advanced society to be developed, even in some cases a relatively advanced industrial subsector cannot be developed. However, if there is an advanced agriculture in one country, it follows there must be an advanced national economy and society. More attention has to be placed on agriculture for greater economic development; agriculture should never be neglected at any rate in a country's development strategy and plan.

There are distinct variations in levels of agricultural development among countries of the world. These differences from countries may be classified based on the natural endowments, such as climate, location, soil types, technology and innovations, budgetary funding and

commitments etc., But the experience of world agricultural development has shown that it is the socio-economic institutional resources, such as land ownership and tenure, finance, marketing, education, research and extension systems, and government policy, namely the manmade resources, which has determined the differences in agricultural development level among countries, especially the differences between developed countries and the developing ones. The natural endowment is unmovable, even though the social resources can be transferred from one country to another and from one sector to another. This means that developing countries can overcome their agricultural differences by learning the techniques from developed countries. This term *'learning effect'* in development economics has already come into bloom in some developing countries. However, agricultural development in Nigeria is still very backward compared with developed countries like United States, the Netherlands etc. But the good news is that, since 2017 to date, the Federal Government policy implementation seriously helps to improve in local rice production. However, efforts to address backward challenges for greater benefits brought the need for this paper.

2.0 BACKGROUND LITERATURES

Agriculture, unlike other industries, relies much on natural resources. In agriculture, land is not only fulfills the role of a location factor as it does for manufacturing industry and other non-agricultural industries, but it is primarily an indispensable production factor. This is especially true for arable farming, horticultural field crops and stock farming. Only in the case of modern operations involved in intensive animal husbandry and greenhouse horticulture, which is similar to industrial operations, does land mainly, fulfill the function of location factor. Others include the Ricardian factors are the climate, soil fertility, supply channels (such as harbours) or distribution areas, also play an important role in agricultural production. A favourable natural background is an asset for a country's agricultural development. At a glance, the United States (U.S.) and the Netherlands seem as mismatched as ketchup topping on applesauce. Since the U.S. has vast land size; the Netherlands is tiny, with 1,300 inhabitants per square mile. The U.S. has huge swaths of farmland growing corn, soybeans, and wheat. The Netherlands has huge greenhouses – some covering up to 175 acres – growing a wide variety of fruits and vegetables. One commonality exists, through is that both nations are agricultural powerhouses. The Netherlands is the world's second-largest exporter of food as measured by value, second only to the U.S. That is amazing, considering the United States has 270 times the landmass of the Netherlands. Table 1 is the summary of reviewed investigations.

Table 1 Summarised version of reviewed investigations

Author(s)	Investigation(s)	Research Benefits	Remarks
MLNV, 2009	The agro-complex covers all the economic activities in production, processing and distribution of agricultural products (food and non-food), about 9.6% (or 47.6 billion Euro) in 2007	Offers employment to over 600,000 jobs (10% of national employment)	The innovation platform adopted by the Prime Minister Balkenende, improves the Dutch economy
Gil Gullickson, 2018	'If we want to double yields in the next 35 years, we need to crack this big question,' says Eric Schranz, a WUR professor of biosystematics.	'Global yields are going up – but not fast enough to provide the yield boost we need'.	He notes a photosynthesis project like this one has never been done by a large community of scientists.

	He notes there are only so many current techniques (like fertilizer application) that can be done when it comes to boosting yields.		
Frank Viviano, 2020	'Twice as much food using half as many resources.' Since 2000, van den Borne and many of his fellow farmers have reduced dependence on water for key crops by as much as 90 percent. They've almost completely eliminated the use of chemical pesticides on plants in greenhouses, and since 2009 Dutch poultry and livestock producers have cut their use of antibiotics by as much as 60 percent.	'Higher increases in global yields are going up – a need for further improvement on the research findings for better yield boost we need'.	A sea of greenhouses surrounds a farmer's home in the Westland region of the Netherlands. The Dutch have become world leaders in agricultural innovation, pioneering new paths to fight hunger.

Figure 1: Greenhouse in Netherlands

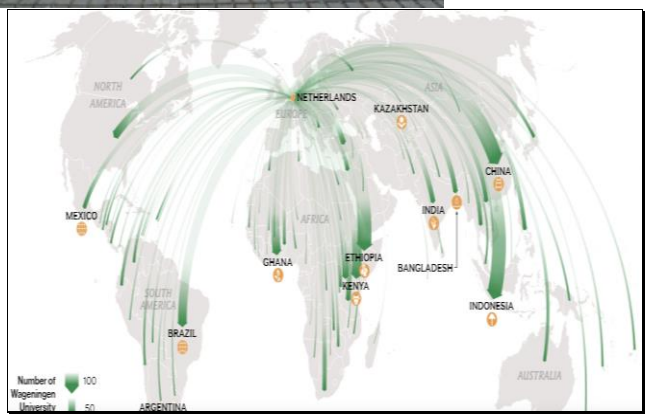

Figure 2: WUR feeding the world (Viviano, 2020)

Wageningen University & Research (WUR) is the brain trust behind these astounding numbers and is located 50 miles southeast of Amsterdam. Widely regarded as the world's top agricultural research institution, WUR is the nodal point of Food Valley, an expansive cluster of agricultural technology start-ups and experimental farms. The name is a deliberate allusion to California's Silicon Valley, with Wageningen emulating the role of Stanford University in its celebrated merger of academia and entrepreneurship. Figure 1 is an example of greenhouse

farm in the Netherlands, while Figure 2 is the WUR network exporter of innovative approach around the globe (Viviano, 2020). The network countries are: Latin America, Kenya, Kazakhstan, Ghana, Ethiopia, India, Bangladesh, China and Indonesia.

3.0 MATERIALS AND METHODS

3.1 Materials: Process data and reviews of literatures.

3.2 Methodology: Focus on the U.S. and Netherlands achievement in agricultural development as the hub of world's exporters.

Table 2: The U.S., Netherlands and some Northern Nigeria landmass

S/No	Countries		Landmass (km^2)	Data Comparison to the Netherlands	Remarks
1.	United States		**11,216,610**	270 times the landmass of the Netherlands	Top agricultural exporter of the world
2.	Netherlands		**41,543**	-	Total GDP of $111 billion US in 2017
3.	States of Northern Nigeria	Borno	75,481	over 10 times the landmass of the Netherlands (Nigeria has 36-states)	Need to apply the Netherland or U.S. model
		Bauchi	49,934		
		Kaduna	45,711		
		Niger	74,109		
		Taraba	60,291		
		Yobe	46,934		
	Total		**352,460**		
The six northern states of Nigeria having a landmass arable capacity of 352,460 km^2 (that is over 10 times the size of the Netherland) can be reposition to produce greater yields of agricultural products					

Sources: modified from StatiSense (2017)

Table 2 shows the landmasses of some northern states in Nigeria in comparison with the whole Netherlands. The 2017 fiscal year show that the Netherlands GDP was valued at $111 billion US and as the second-largest exporter of agriculture in the world. These total values include the generation of $10 billion of flowers and $7.4 billion of vegetables sectors. And Table 3 outlines the economic significance of the Dutch agro-complex, between the span of 1995 - 2007. In the span of the 12-years, the economic potential has sustainably increased. The continuous progression of the Netherland agricultural capacity has been sustainable to the present time. This sustainability was possible because of the Netherlands commitment to develop her agricultural sustainable model to become the hub of the world.

Table 3: Economic significance of the Dutch agro-complex

	Added value (x 1,000 million euros)			Employment (x 1,000 annual labour units)		
Years	1995	2001	2007	1995	2001	2007
* Agro-complex (total)	32.4	40.5	47.9	659	717	672
Share of national total (%)	12.0	10.2	9.6	11.6	10.8	9.9
* Agro-complex on basis of domestic agricultural raw materials	20.2	21.5	25.6	430	416	390
Primary production	8.4	7.6	8.0	189	184	169
Processing	3.0	3.2	4.4	54	50	42
Supply	6.5	8.1	9.9	135	137	130
Distribution	2.3	2.6	3.2	53	45	50
* Processing, supply and distribution of foreign agricultural raw materials	10.9	15.3	18.3	190	226	218
* Agricultural services, gardening businesses and forestry	1.3	3.7	4.0	39	75	64

Source: LEI Wageningen UR

Table 4: Agricultural holdings by five major types (1985-2008)

Years	**1985**	**1990**	**1995**	**2000**	**2005**	**2008**
Grassland base livestock	12.0	10.2	9.6	11.6	10.8	9.9
Horticulture	20.2	21.5	25.6	430	416	390
Arable crops	8.4	7.6	8.0	189	184	169
Pigs and poultry	3.0	3.2	4.4	54	50	42
Mixed	6.5	8.1	9.9	135	137	130

Source: LEI Statistics (see www.lei.wur.nl/UK/statistics/)

The Netherlands agricultural holdings by five major types between the periods of 1985 – 2008 are presented in Table 4. The fiscal year 2000 has the highest achievement within the span of the period. In the current fiscal year 2022, the Netherland has a better improvement with more than 5-holdings which now includes flowers, vegetable and spinaches, Heringa P.W (2009), Silvis and Leenstra (2009).

4.0 REPOSITIONING NIGERIA AGRICULTURAL REVOLUTION TO BECOME THE GLOBAL HUB OF EXPORT OF AGRICULTURAL PRODUCTS

Nigeria is gifted with versed arable land that is compared with the U.S. and more than 10 times the landmass of the Netherlands. If the Netherland has maintained world-class technologies and innovations in agricultural products over the years, and is the second-agricultural exporter of the world, there is absolutely no reason why Nigeria with a versed arable space cannot follow-suit.

4.1 The Netherlands Examples

The Netherlands was able to achieve the notable scale of being the second-agricultural exporter of the world because of it dedicated technology mechanisms, sustainable policies and quality implementation. The Government of the Netherlands has direct supervision mechanisms through the office of the Prime Minister.

In 2020, the Netherlands exported 9.6 billion euros worth of horticultural products; in 2019, 9.5 billion euros. The second most exported agricultural product is meat. In 2021, meat exports rose by 7 percent: from 8.5 billion euros in 2020 to 9.1 billion euros.

4.1.1 How did the Netherlands Succeed

WUR, located 50 miles southeast of Amsterdam, has helped to key the country's agricultural success. WUR has a huge footprint of about 12,000 students with a faculty and staff of approximately 6,000. It has 25 branch locations across the Netherlands, China, Africa, and the Middle East, with 458 projects in 90 countries.

Agricultural start-ups and global companies flock there, as evidenced by Unilever's building of a global foods innovation centre in Wageningen. The goal of WUR is to revolve around the following:

- More production per square meter of land
- Less inputs
- Bettering factors like health food and food safety
- Technology and sustainability links

Frank Viviano, (2020), Heringa (2009), van der Meulen (2009).

4.1.2 The WUR Projects

One project WUR scientists are leading is how to improve photosynthesis. 'If we want to double yields in the next 35 years, we need to crack this big question,' says Eric Schranz, a WUR professor of biosystematics. He notes there are only so many current techniques (like fertilizer application) that can be done when it comes to boosting yields. 'Global yields are going up – but not fast enough to provide the yield boost we need,' he added. He notes a photosynthesis project like this one has never been done by a large community of scientists. He's hoping it will be akin to the Manhattan Project during World War II, where scores of physicists cooperated on a large project (Gil Gullickson, 2018).

4.2 Sustainable Policies, Research and Development

For the coming years Nigeria agricultural policy should focus on providing the agricultural sector with a new perspective for the future and protecting the interests of nature and landscape. To realize these aims the Government should opted for policies which (i) offers more incentives to promote innovation in the sector, (ii) sticks to the objectives for nature and landscape but stresses people's own responsibility in the management of the natural heritage, and (iii) promotes cooperation between research, education and extension bodies

and encourages efforts in the areas of R&D and innovation. Heringa (2009), van der Meulen (2009).

4.3 Innovative Transfer and Industrial Collaborations

Nigeria must be ready to fully adopt the Netherlands model in repositioning her agricultural transformation to become the hub of the world exporter and high domestic capacities. These can be achieved through innovative transfer of technology and industrial collaborations. All patented researches that are in the shelves of the universities and research centres must be immediately put to use. The efforts of integrating all these findings and evaluate it capacities to improve on the current state of the affairs and good implementation. Currently, there are about six agricultural universities in Nigeria. There are need to harmonize, network and collaborative research work within them, with the outmost goal to arriving at quality research ideas. These universities should have a coordinating centre that executive monitor of the research activities and the dissemination of the findings to the appropriate units, industries and the relevant stakeholders.

4.4 Large Scale Implementations of Engineering/Technology Know-how

The modern technologies remain the valuable platform where continuous research and innovation takes place. Large scale implementation of the findings through industrial collaborations is very important. Its application will easily catapult the Nigerian agricultural transformation to a greater level Frank Viviano, (2020), (CBS, 2022).

4.5 Recent Achievements in the Netherlands Agriculture and Export

Exports of agricultural goods are estimated to have reached 104.7 billion euros in 2021, setting a new record. This is reported by Wageningen Economic Research (WUR) and Statistics Netherlands (CBS) on the basis of joint research commissioned by the Ministry of Agriculture, Nature and Food Quality. Total exports of agricultural goods were 9 billion euros (9.4 percent) higher in 2021 than in the previous year. The growth in agricultural export value is attributable to both increased prices and growth in export volume. Prices of exports increased slightly more than volume.

The estimated total of 104.7 billion euros in agricultural goods exports comprised 75.7 billion in domestically produced goods and 29.0 billion in re-exported agricultural goods which originated from other countries. Domestic exports thus reached 10.7 percent year-on-year growth while re-exports grew by 6.1 percent.

Last year, agricultural exports generated export earnings of an estimated 46.1 billion euros. Of this amount, 42.1 billion euros were domestic exports and 4.0 billion re-exports. Figure 1 represent the domestic exports and re-exports between the fiscal periods of 2016 – 2021. There were stable and noticeable progressions within the span of the 5-years (CBS, 2022).

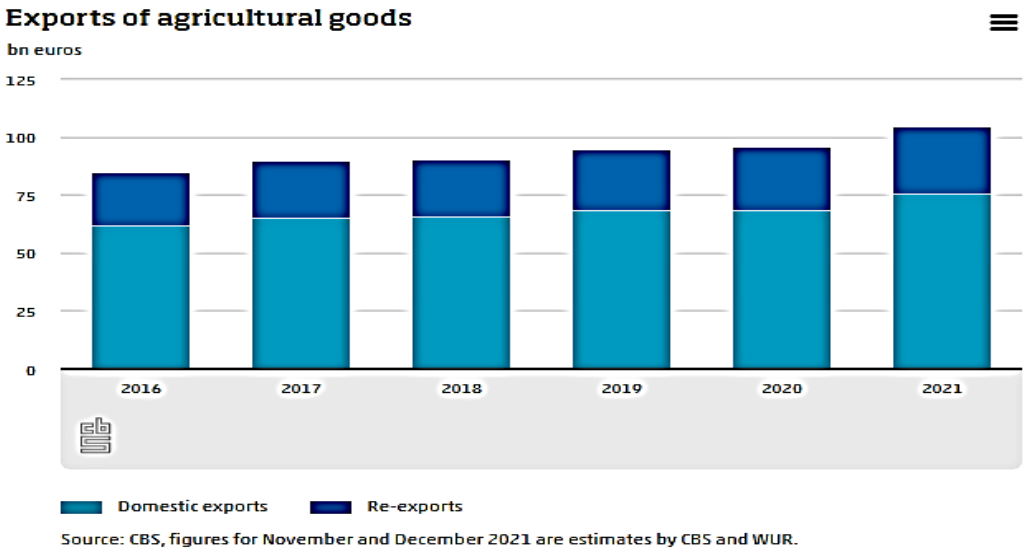

Figure 1: The domestic exports and re-exports between the fiscal periods of 2016 – 2021.

The Netherlands most agricultural exports went to neighbouring countries. In 2021, a quarter of total agricultural exports went to Germany (26.3 billion). The three next largest markets were Belgium (12 percent), France (8 percent) and the United Kingdom (8 percent). France has surpassed the United Kingdom as the third largest destination for Dutch agricultural exports. Whereas the value of these exports to France rose by 14 percent in 2021, exports to the UK hardly increased (0.4 percent). Re-exports to the United Kingdom down by 35 percent due to Brexit: Exports to the United Kingdom are stagnant in the fiscal year. This is due to the significant 35-percent decline in re-exports of agricultural goods to the UK. As of 1 January 2021, import duties have made shipping of goods from outside the European Union directly to the United Kingdom more favourable than via the Netherlands. On the other hand, domestic agricultural exports to the United Kingdom showed a significant increase last year at 14 percent. However, many of the UK's border checks on animal and plant products and various customs formalities have been postponed until 2022. These checks are expected to have an effect on Dutch agricultural exports to the United Kingdom as of this year. Figure 2 depicts the top-ten destination of Netherlands agricultural exports in 2021, (CBS, 2022).

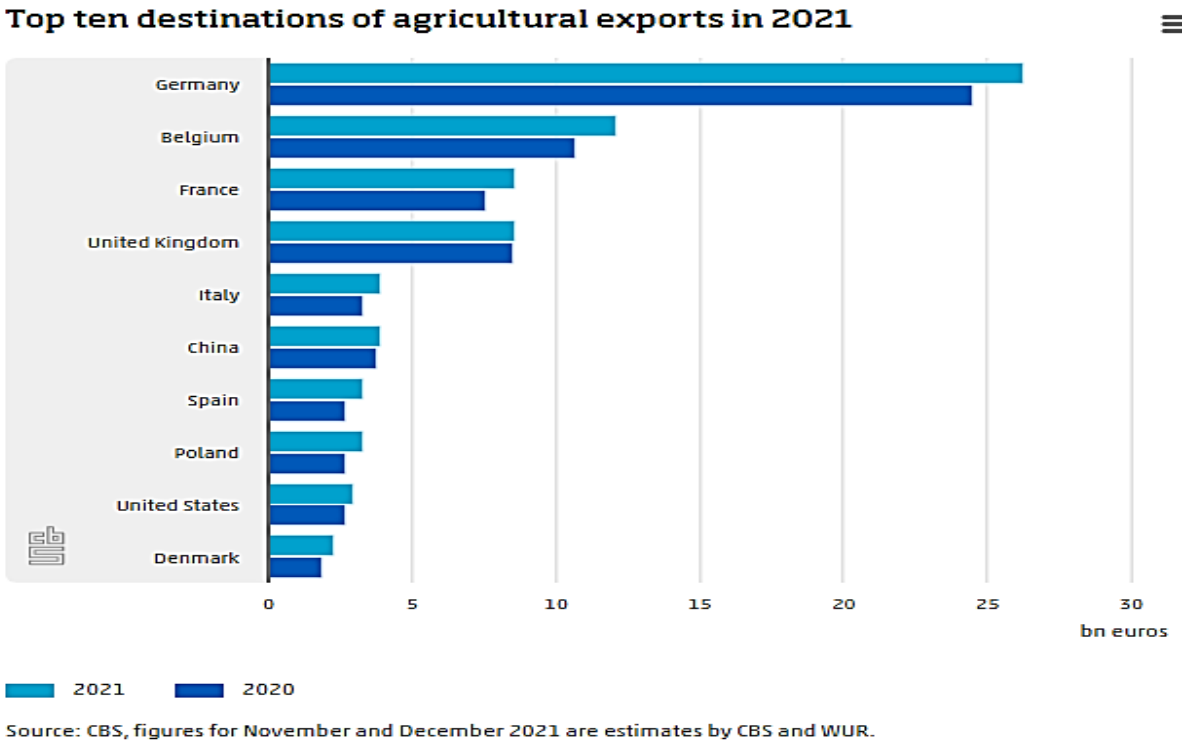

Figure 2: The top-ten destination of Netherlands agricultural exports in 2021

Over the years, Germany takes the lead in the exports of the Netherlands agricultural products with net values of 26.5 and 24.5 billion Euros respectively. While Denmark record the lowest net values of 3.0 and 2.5 billion Euros respectively, (CBS, 2022).

4.6 Nigeria Becoming the Agricultural Exporter to Sub-African Countries & Global World

The implementation of all the highlights stated in 4.1 – 4.5 can be used as an exemplary steps to reposition Nigeria at resolving her domestic needs in agricultural products and in turn establish higher capacity to exporting agricultural products to neighbouring countries, sub-Africa regions and the global world in large scale.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Food and agricultural products remain the most important parameters that sustain the living human being and other creature in the globe. Therefore, agriculture shall remain a good market for any country that can advance in the use of relevant technologies, good policies and sustainable implementation to achieve greater yields. The Netherlands model is a good example for Nigeria, which can easily catapult our agricultural capacity to be among the hub of the world. Agriculture was the main financial revenues, that is, the front-line gross domestic product GDP, for the country before the advent of black gold (fossil fuel). Unfortunately, since the beginning of petroleum exploration and production in Nigeria, the country has lost it numerous agricultural potentials, due to the immediate monetary benefits from exporting crude oil to the Europe and America. The Netherlands is the second-largest exporter of agriculture in the world with a net value above $111 billion US; these include $10 billion of flowers and $7.4 billion of vegetables since 2017 to date.

In summary, Nigeria must take a leave from Netherlands by setting a robust and sustainable policies, the 'Netherlands model', to salvage her agricultural developments that will catapult the country to be in the fore-front of the world agricultural products for both domestic and foreign export gains, which in-turn increases the nations' gross domestic product, GDP.

5.2 Recommendations

In this research study, the following were the recommendations:

a) Nigeria should adopt the Netherlands model to reposition her agricultural capacity.
b) The Federal Government should be the supervisory chairman to the implementation of the Netherlands model in Nigeria.
c) There must be a coordinating centre of agriculture that supervises the researches and collaborations of all the agricultural universities in Nigeria.
d) There must be a good network and collaborations between the agricultural industries, academics and the government.

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