WHERE FUEL MEETS FOOD

BRIDGING THE GAP BETWEEN ENERGY AND AGRICULTURE

TOWARDS GREATER IMPACT

> There have been calls in recent years for the revival of local agriculture and greater investment in food security. Despite having the resources to support food production for both internal markets and an export-oriented industry, the country today spends around **$5 Bn** annually to import over **80%** of its food.

A country's sovereignty and capacity for sustainable development are severely undercut if it cannot feed itself.

Agriculture has become a mere spectator in the development of Trinidad and Tobago with the advent and subsequent reliance on the oil and gas industry. Accordingly, there have been calls in recent years for the revival of local agriculture and greater investment in food security. Despite having the resources to support food production for both internal markets and an export-oriented industry, the country today spends around $5 billion annually to import over 80% of its food.[1]

[1] https://publications.iadb.org/publications/english/document/Analysis-of-Agricultural-Policies-in-Trinidad-and-Tobago.pdf
https://oxfordbusinessgroup.com/analysis/aiming-revival-targeting-reduction-costly-food-imports-and-bolstering-development-agricultural
https://sta.uwi.edu/uwitoday/archive/may_2020/article7.asp

As energy sector revenues decline due to a challenging global market, the expenditure of such a significant portion of foreign exchange on imported food has become an increasingly bitter pill to swallow. Concurrently, the need for alternative revenue streams has become more pronounced and urgent.

The COVID-19 pandemic also exposed the danger of dependence on international markets for food. At its current rate of food importation, Trinidad and Tobago could suffer tremendously if another extreme event were to force a complete border closure, cripple international trade, or disrupt global food production systems and supply chains.

It is with good reason that the United Nations has made food security a priority target under its Sustainable Development Goals (SDGs).

ENTER NGC

The industries of energy and agriculture seem an incongruous pairing - it is not immediately obvious where one can help the other, but NGC, together with its subsidiaries, believes it can add value to agriculture and food production. Why would this company take an interest in this sector, and how exactly could it contribute?

To the question of motivation, NGC and its group members have become vocal advocates for sustainability. To be a respected business in today's world, one must be attuned to the impact of operations on people and the planet. Sustainability means constantly focusing on current and future impact, and aligning business objectives with the targets of the UN SDGs. A focus on strengthening the domestic agricultural sector fits within the Company's sustainability agenda, by allowing the organisation to help move the country closer to several SDG targets (See next page).

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Add to these all the adjunct socioeconomic benefits that come with increased earning potential and purchasing power, and there is no denying the gains to be derived from building out the agricultural sector.

On another level, NGC and its subsidiaries have embarked on several initiatives aimed at managing climate change, from emissions reduction programmes to renewable energy exploration to energy education. NGC, however, appreciates that this battle cannot be fought in isolation, as there are many sectors with a role to play. Agriculture is one of them.

Although agriculture might be perceived as a green enterprise, the sector does have a hand in climate change. According to the Organisation for Economic Co-operation and Development (OECD), agriculture contributes a major share of greenhouse gas (GHG) emissions – 17% directly through agricultural activities and an additional 7-14% through land use changes.[2]

Incidentally, the sector also accounts for 70% of all freshwater withdrawals globally[3] - an unsustainable consumption rate given increasing demands on water resources from growing industry and populations. If agricultural expansion is to happen, whether organically or by government decree, it has to be done sustainably, to ensure a low carbon footprint and efficient use of resources. Existing farmers and agribusinesses should also be educated and encouraged to make their operations greener. By bringing its own emissions reduction strategies and other relevant research and technology out into the fields, NGC, together with its member companies, could help ensure local agriculture develops sustainably and produces efficiently.

In summary, then, the reasons for NGC's involvement with agriculture are twofold – to help effect positive socioeconomic change through the development of the sector, while helping to reduce the negative externalities and inefficiencies of the industry.

So how exactly does the Company propose to help?

RESOLVING THE CHALLENGES

In 2020, a team from across NGC and its subsidiary companies sat together to figure out what stands in the way of agricultural expansion, food and water security, and what internal resources could be leveraged to remove those obstacles and facilitate sustainable growth in the sector. The outcome of that internal process was a technical paper entitled 'Energy and agriculture - bridging the gap', which was presented to the Ministry of Agriculture, Land and Fisheries for consideration. In that paper, several possibilities for collaboration and support were explored.

Putting technology and data to work

There are many challenges facing farmers which could be overcome or at least alleviated using technology.

Changing weather patterns due to global warming are causing more unpredictable and severe dry and rainy spells. In flood-prone areas, farmers run higher risk of losing crops after heavy rainfall, and this

[2] https://www.oecd.org/agriculture/ministerial/background/notes/4_background_note.pdf

[3] https://www.worldbank.org/en/topic/water-in-agriculture

is a deterrent to planting. Floods also bring pests and diseases, which can equally ravage crops. The giant African snail, which feeds on over 500 types of plants, is one destructive agricultural pest that is spread by floodwaters.[4]

On the opposite end of the spectrum, droughts also lead to crop failure, particularly in areas with little or no artificial irrigation. Even when there are irrigation systems in place connected to the national grid, water supply can be unpredictable due to rationing when reservoir levels are low. Leaks along water pipelines are also notoriously common and interfere with regular supply.

Technology and specialist skill sets that are already used in Group operations could be adapted to help address some of these concerns.

Although weather patterns are changing, data captured by satellites, drones and airborne sensors could potentially be used in computer modelling and predictive analysis to help mobilise action ahead of significant weather events. It is possible to send alerts to farmers through integration with telecommunications providers. With enough input data, major instances of flooding, drought and even pests or diseases can be mapped and tracked year-on-year to create vulnerability models and better guide planting. Software and partnerships managed by NGC's Geospatial Information Services (GIS) Department could help make such resources available to agricultural communities and stakeholders.

NGC uses drones to survey and monitor its pipeline corridors and associated infrastructure for encroachment, landslips and other terrestrial changes that could expose or damage its assets. In similar fashion, NGC could use its expertise

TECHNOLOGY CAN HELP ADDRESS FLOODING ISSUES, WHICH CAUSE SIGNIFICANT LOSSES FOR FARMERS.

and equipment to help farmers monitor large tracts of land for changes that could affect crop yield or soil stability. With the attachment of special sensors, drones could even monitor plant growth or assess irrigation needs. The latter function would be particularly important in helping ensure the country's limited water supply is used efficiently. Aerial surveillance could also be useful in curbing the threat of praedial larceny, which often accounts for a significant share of losses faced by many farmers and agribusinesses when crops reach maturity.

With regard to the challenge of water loss due to leaking pipelines, there is considerable opportunity for NGC to collaborate with the Water and Sewerage Authority (WASA) to manage its infrastructure, given that both NGC and WASA oversee extensive pipeline networks. WASA's network is reportedly in great need of repair – the Minister of Public Utilities shared that approximately 50% of water that enters the network does not make it to consumers.[5] NGC has a robust Asset Integrity Management (AIM) framework in place, as well as a world-class SCADA system to monitor pipelines in real time for integrity issues. Sharing technology and best practice with the state utility will allow for much-needed improvement in the national water grid. This will not only benefit agriculture but build water security for the wider public as well.

Of course, technology is only able to help prepare and protect the industry up to a certain point. However, if and when severe weather events do happen, the same technology is capable of expediting recovery. Drone and satellite resources can be deployed to take early stock of damages due to flooding - an exercise that would be dangerous if not impossible for farmers to physically conduct. Aerial imagery may also be used to help support and expedite insurance claims for agribusinesses.

[4] https://agriculture.gov.tt/wp-content/uploads/2017/11/51_Giant-African-snail-factsheet-general-Flyer.pdf

[5] https://newsday.co.tt/2017/10/17/minister-50-per-centof-water-lost-via-leaks/

Reducing environmental impact
Although the connection is not readily made, energy is an important input factor in agricultural production. Petroleum-based fuels and electricity are used to operate machinery and equipment for preparing fields, planting, harvesting and transportation. Natural gas, liquid propane and electricity have also been used to power crop dryers and irrigation equipment. In addition, natural gas is a key component in the manufacture of fertilisers and pesticides.

Given that fossil fuels contribute to GHG emissions, there is room for reducing the carbon impact of the agricultural sector by integrating cleaner fuels. Through its subsidiary, NGC currently markets Compressed Natural Gas (CNG) as a cleaner and cheaper alternative to diesel and gasoline. Farmers should make use of incentives offered by NGC CNG to convert their vehicles to run on CNG, thereby reducing their GHG output and saving on costs. The same gains would be accrued further down the value chain, if vans and refrigerated trucks that are used to transport goods to market are also converted.

Subsidiary National Energy is also exploring applications for renewable sources of energy, including solar and wind, which could replace conventional fuel in powering certain farm equipment, generators, buildings or even irrigation systems.

Of course, power generation and transportation are not the only sources of GHGs in agriculture. The sector is a major contributor of methane, which has a much higher warming potential than carbon dioxide. The Company has embarked on a campaign to address methane emissions,[6] which involves knowledge sharing across sectors to raise awareness about and action against this potent GHG. As part of its education drive, the NGC team will look to engage with agricultural stakeholders to bring attention to practices that help decrease methane output, such as better management of manure or the use of quality feeds.

Innovation
Trinidad and Tobago's agricultural productivity, or value-added per worker per hectare, is among the lowest in the Caribbean, according to the Inter-American Development Bank (IDB).[7] Many factors contribute to this, such as small farm sizes that prevent economies of scale, a shrinking agricultural labour force and issues related to changing climate.

Growing agriculture as an industry today requires research and innovation to help address these issues and raise productivity and competitiveness.

Educational institutes such as The University of the West Indies (The UWI), University of Trinidad and Tobago (UTT) and The Caribbean Agricultural Research and Development Institute (CARDI) are leading research in agronomy to help accelerate local food production by: developing high-yielding and climate- and pest-resistant crop varieties; building gene and tissue banks; and exploring technology options to make food production less labour and land intensive. NGC has been partnering with academia for many years and intends to work closely with these research institutions to uncover modern and sustainable ways to enrich the sector and boost its revenue potential.

The Company also proposes to establish a Research and Development work centre in collaboration with the Ministry of Agriculture, Land and Fisheries to focus on energy innovation within the agricultural sector, to improve on core capabilities and explore new, disruptive solutions for the advancement of the sector. The objective would be to facilitate idea generation and the realisation of concrete projects with measurable outcomes.

A third initiative being considered is creation of an ideation platform to bring students and young inventors into the conversation, where early stage ideas can be developed, pilot tested and brought to fruition. This initiative would be particularly important to stimulate interest in agriculture among youth.

Global statistics show an ageing crisis threatening the future of the agriculture industry, as the average age of farmers in many countries has climbed over 50.[8] The occupation of farming is not seen as an attractive career choice for most young people today, due to associations with 'backward' living, low income and tedious manual labour. However, if more young people do not take up the mantle, food production in years to come would be at risk.

[6] See p 4 for more information

[7] https://publications.iadb.org/publications/english/document/Analysis-of-Agricultural-Policies-in-Trinidad-and-Tobago.pdf

[8] https://www.bbc.com/future/bespoke/follow-the-food/the-ageing-crisis-threatening-farming/

TOWARDS GREATER IMPACT

Young people must be made to see agriculture as a lucrative business sector ripe with opportunities for modern technology. This sector will be tasked with solving one of the most pressing challenges of the decades ahead – feeding a rapidly growing population with healthful and sustainably farmed foods. Accordingly, bright and innovative minds will need to be engaged in the development of the industry.

The intent is that NGC's ideation platform, and other R&D initiatives, will show the potential to modernise local agriculture and attract a new generation to the sector.

Investment facilitation

One of the prerequisites for expansion of any industry is a downstream market. Local produce markets can only absorb so much, given the perishable nature of many fruits and vegetables. The existence of agro-processing industries in Trinidad and Tobago to serve as off-takers for produce would provide much needed incentive for investment in agricultural development, especially for farmers of highly perishable goods like peppers, and specialist goods like cocoa.

In July 2020, the Government of Trinidad and Tobago officially opened the country's first Agro-Processing and Light-Industrial Park at Moruga.

The park offers leasable factory shells and lots for processing of pepper, fish, cocoa, root crops and fruit.

Investors must be wooed to set up shop at the park, and other estates, but Trinidad and Tobago has a poor ease-of-doing-business rating, which often deters investment. In 2019, the country was ranked 105 out of 190 economies, down from 86 in 2015.[9] Attracting investors to take up residence at the park is an undertaking that will be supported through National Energy's TTEngage platform. This platform brings all major regulatory agencies involved in the approval process for new investments into a single portal, making the end-to-end process faster and more efficient.

With this company's support, more agro-processors could launch new businesses, opening fresh market demand for local production.

[9]https://publications.iadb.org/publications/english/document/Analysis-of-Agricultural-Policies-in-Trinidad-and-Tobago.pdf https://tcpd.gov.tt/2020/01/30/trinidad-and-tobago-ready-to-raise-ease-of-doing-business-index-caribbean-news-global/#:~:text=Trinidad%20and%20Tobago%20has%20placed,2018%20and%-202019's%20annual%20ratings.

Bringing stakeholders together

It is clear that NGC and its subsidiaries have a strong value proposition in terms of helping to develop the agriculture sector in Trinidad and Tobago.

However, there are other entities with just as much to contribute to the sector, which need to be brought into the conversation.

One of the Company's most important roles going forward may be to facilitate collaboration among key stakeholders, by leveraging its position in the energy value chain and its partnerships with state entities and academia.

NGC provides input for some of the foremost fertiliser companies in the world, including Nutrien, CF Industries and the Proman Group. These companies are themselves making waves in agriculture by pioneering technologies and products that can help ramp up the productivity, yield and profitability of farming enterprises. Bringing their insight and expertise to bear on discussions around expansion of local agriculture will be of tremendous value.

Also critical to the conversation are insights from both government and academia. Through its relationships with The UWI, UTT, CARDI, the Ministry of Energy and Energy Industries, the Ministry of Agriculture, Land and Fisheries and other key stakeholders within the energy and agriculture value chains, NGC sees itself as an axis around which collaboration can take shape.

The Company intends to push forward with this cross-sectoral and interdisciplinary collaboration, and has already proposed the formulation of a Steering Committee to oversee the process.

FUELLING THE FUTURE

The future of agriculture and food production in Trinidad and Tobago should be the concern of every citizen. This industry will not only fuel bodies but has the potential to fuel careers and the economy. Recognising this, and as an invested corporate citizen, NGC, together with its subsidiary companies, will continue to advocate and work closely with all players to help build the sector, and national food and water security.