

Optimising oil palm breeding with PBS International products

Palm oil is derived from the fruit of its namesake, the oil palm tree (*Elaeis guineensis*). Oil palm trees are native to western Africa where they grow wild, but the crop is now cultivated commercially across the globe. 40% of global vegetable oil supply is comprised of palm oil, more than any other type, despite occupying less than 6% of the land used to produce all vegetable oils.¹

Ghana has seen significant government investment in oil palm breeding since 1960, underlining its importance to the Ghanaian economy, with a Presidential initiative launched in 2003 to expand oil palm plantations in the country.² Oil palm and coconut are two of six crops selected for the Planting for Export and Rural Development (PERD) program in Ghana. In 2019, former president William Nana Addo Dankwa Akufo-Addo visited the two organisations involved in research and development of oil palm – the Council for Scientific and Industrial Research’s Oil Palm Research Institute (CSIR-OPRI) and Ghana Sumatra Ltd.

Ghana Sumatra was founded in 2008 as the result of a joint venture agreement between PT PP London Sumatra Indonesia Tbk’s subsidiary Sumatra Bioscience (LONSUM) and CSIR-OPRI, and is the only commercial oil palm seed production company based in Ghana. This means that the operational success of Ghana Sumatra has an effect on the Ghanaian palm oil market, and even the country’s economic development as a whole. Today, the company is headquartered in Kusi, near Kade, a town in Ghana’s eastern oil palm belt, and owns over 200 hectares of oil palm seed gardens. This is where it produces high-quality germinated oil palm seeds strictly under SOP to supply to both domestic and international customers.



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Through close work with the CSIR-OPRI, Ghana Sumatra has joint access to the most expansive gene pool in Africa, giving it access to a wide range of cultivars and aiding in the creation of new seed varieties with traits that optimise yield, deliver high oil-to-bunch ratios, and tolerance to drought and diseases. The company is committed to strict quality control, adhering to industry best practices and a quality management system certified to ISO9001:2015 standard that ensures full traceability to the parents of each bag of 100 seeds sold.

Thomas Dakogre is the General Manager of Ghana Sumatra and has worked for the company for 15 years in multiple roles. Since Thomas' original arrival at the company as a Technical Service Officer, Ghana Sumatra has selected PBS International pollination control bags to prevent pollen contamination and protect fruit inflorescences from hazards.

Prior to using the PBS International bags, Ghana Sumatra used alternative materials for its pollination control, but these were not without their challenges. Mr. Dakogre explains:

"We used to use tarpaulins or bags made with calico fabric for pollination control, but there was a lot of humidity build-up, and when it rains, the material becomes very wet and heavy, sometimes breaking the bunch. When I was fortunate enough to receive training in Indonesia during 2011, I saw that they were using modern pollination bags made with modern materials. When I asked about them, PBS International's bags were recommended for their superior protection, control and breathability. We no longer use the calico bags and tarpaulin for pollination control, and instead use them only for harvesting bunches."

Exploring oil palm seed types

The primary challenge in oil palm production is seed purity, which affects everything from how much oil yield the fruits are capable of producing, to the efficacy of plant breeding programmes. Three phenotypes of oil palm seed are important in breeding: dura, pisifera, and tenera. Each produces a different fruit with specific characteristics, all of which serve a function in a successful cultivation.

Ultimately, the useful element of an oil palm is its fruit, and the palm oil it can produce. The fruit of each oil palm breed has an exocarp (exterior layer) that ranges in colour from reddish-orange to black, but the composition of its internal structure is what really

affects its usage. Under the exocarp is the fruit's flesh, or mesocarp, from which Crude Palm Oil (CPO) is extracted. Next is the shell, a hard, dark, woody ring which contains no oil. Finally, inside the shell, is the white kernel from which Palm Kernel Oil (PKO) can be derived.³

Dura palms produce fruits that have thick shells, making them less efficient for producing CPO and PKO. As a result, dura palms are less desirable to growers and millers. They are, however, typically used in seed production as mother palms, crossed with pollen from pisifera palms as the father. The pisifera phenotype often serves this role for breeding purposes because its' fruits lack any shell. This apparent benefit comes with a major drawback – these palms are sterile, which means they produce far less fruit (if any), resulting in vastly less CPO and PKO per hectare. By far the most desired palm for cultivation is known as tenera, a hybrid of both the dura and pisifera that, by minimising shell size in its fruit, significantly increases oil yield. This increases CPO and PKO making tenera the most profitable palm type for breeders, growers and millers.

However, pure tenera palms can only be created by hybridising dura and pisifera (DxP) palms to produce a tenera offspring (as tenera palms cannot reliably produce more tenera seed).

Meeting demand for tenera palms

The intense interest in tenera seeds, and their inability to self-propagate reliably, makes Ghana Sumatra's role in the oil palm industry clear: provide highly reliable, pure tenera seeds to growers, consistently. From that need for dependability emerges an imperative to keep dura contamination low through precise control of each inflorescence's environment.

High-quality pollination control solutions are therefore essential to successful production of tenera seeds. Mr. Dakogre states:

"Our pollinators are well-trained – however, you cannot be a good pollinator without quality pollination control, as you will still have challenges with dura contamination. Ghana Sumatra ensures its pollinators are well-trained and that they use PBS International bags as part of our mission to provide high-quality seeds. The reliability of our seeds is something we are wholly committed to and is a huge focus for us."

Ghana Sumatra supplies seeds as part of the wider palm oil production industry, and the production and protection of tenera fruit remains crucial to all parts of that chain. Mr. Dakogre explains:

“Whether our customer is conducting genetic research into oil palm, or farming the fruit to be supplied to millers, the oil yield of a dura fruit is 50% lower than the yield of a tenera fruit. It is important to us that our customers can trust the quality of our seed so that their organisations can generate profits and thrive. That is why we guarantee 99.9% purity in our seeds – less than one in one thousand will become a dura palm.”

Mr. Dakogre describes in more depth how Ghana Sumatra’s approach to pollination control has evolved since acquiring PBS International bags, and how its innovative approach protects the inflorescence and ensures maximum defence for seed purity:

“The pollination control bags we use are made from a breathable material, so we have found a new way to use them that allows us to double-protect around the inflorescences. When we have used a pollination bag once, we re-apply it as an “outer” bag over the top of another one. We still use a pristine, new bag to cover the inflorescence itself, but around it we will place one that’s already been used, which helps us double guard against contamination.”



Tenera palms are the most desirable variety of oil palm, as the smaller shell within the fruits results in greater CPO and KPO outputs.

How PBS International bags support oil palm cultivation

Reducing contamination by creating a controlled and protective environment is the chief concern of oil palm breeders across the world; the genetic integrity of produced seeds is paramount in any breeding program. Our proprietary duraweb® material was developed to deliver key benefits to oil palm breeders.

- Enhanced genetic integrity
- Reduced risk of contamination
- Strong resistance against tearing
- Breathability
- Maintains structure and does not collapse onto the inflorescence when wet
- Increased seed yield.

PBS International’s 2D.3 and 2D.4 pollination bags, alongside all other bags in our range, have been developed to address challenges in oil palm cultivation. The superior breathability of our patented duraweb® material reduces humidity compared to other materials used in the cultivation of oil palm. With duraweb®, the fruits of the tree are able to grow without being subjected to extreme temperatures inside the bag, and there is decreased risk of mould incidence as moisture cannot accumulate as easily, reducing Fusarium wilt.

The durability of the material is equally as important, given the various environmental challenges present in the tropical climates where oil palm is typically grown. Our pollination bags are designed to resist extreme wind and rain, defend plants from pests, and even from the plant itself; duraweb® is durable against plant spikes and spines, such as those found on oil palms.

Next Steps

The global palm oil market is expected to grow in the next 10 years at a compound annual growth rate of 4.2%, from USD \$74.5bn in 2024 to USD \$113.9bn by 2035, primarily driven by demand in the edible oils sector.⁴ Palm oil is well-poised to meet this demand, given the relatively small footprint that seed gardens occupy compared to other oil crops.⁵ Furthermore, in Ghana and West Africa, hybrids between “compact” oil palms and standard *Elaeis guineensis* lines have increased the density of trees on plantations beyond industry standards, increasing productivity.⁶

Breeding cycles for oil palm typically last from 13 to 18 years, and so development of new varieties that address the challenges of modern oil palm production requires keen insight and informed innovation. Ghana Sumatra continues to work closely with CSIR-OPRI to develop new seed varieties with novel cultivars that meet the needs of oil palm growers worldwide, whether smallholders or large plantation owners. CSIR-OPRI and Ghana Sumatra work together to produce novel seed varieties every ten years and are currently developing a compact seed variety with short annual stem growth, to make palms more accessible for harvesters.

Ghana Sumatra and PBS International share a decade-long relationship. Mr. Dakogre reflects on the impact using PBS International products has had on Ghana Sumatra, and looks ahead to the future:

“PBS pollination control bags have improved our dura contamination protection because they are designed to protect against extreme weather conditions and against pests such as insects. The bags are durable enough to not rip, and that prevents holes that can act as conduits for contamination. The bags we used before were not purpose-built, but PBS International bags are, and provide superior protection. We will certainly be ordering more bags in the new year.”

To learn more about how PBS International bags can support your oil palm cultivation, visit: <https://www.pbsinternational.com/key-sectors/oil-palm/>

References

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PBS International, Salter Rd, Eastfield,
Scarborough YO11 3UP
T: +44 (0)1723 587 231
sales@pbsinternational.com

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