



# ROSeCO

**“ A sustainable zero waste solution  
for the better world ”**

An effective way to relieve Food Insecurity and Plastic Waste issues



# THE IMPACT OF CLIMATE CHANGE

**Climate change** refers to long term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. But since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil and gas. Burning fossil fuels generates greenhouse gas emissions that act like a blanket wrapped around the Earth, trapping the sun's heat and raising temperatures.

Examples of greenhouse gas emissions that are causing climate change include carbon dioxide and methane. These come from using gasoline for driving a car or coal for heating a building, for example. Clearing land and forests can also release carbon dioxide. Landfills for garbage are a major source of methane emissions. Energy, industry, transport, buildings, agriculture and land use are among the main emitters. (1)

Extreme weather events are already more intense, threatening lives and livelihoods. With further warming, some regions could become uninhabitable, as farmland turns into desert. In other regions, the opposite is happening, with extreme rainfall causing historic flooding as seen recently in China, Germany, Belgium and the Netherlands.

People in poorer countries will suffer the most as they do not have the money to adapt to climate change.

**Many farms in developing countries already have to endure climates that are too hot and this will only get worse. (2)**

(1) United Nations: <https://www.un.org/en/climatechange/what-is-climate-change>

(2) BBC News: <https://www.bbc.com/news/science-environment-24021772>

# MICROPLASTIC ISSUE



**Microplastics**, which are basically plastic pieces smaller than 5 millimeters, comparable to the size of a small grain of rice, have been famously known for effecting both the global ecosystem and the popular consciousness, especially killing seabirds and raining down on wilderness areas. While the media and scientists have given serious attention to ocean microplastics' impacts, researchers have said that microplastics are made on land, including farmfield areas. A study estimated that 107,000 to 30,000 tons of microplastics could possibly be dumped on agricultural soils in the U.S. and Europe, annually, compared to the 93,000 to 236,000 tons that enter the oceans.

Microplastics enter farmlands through fertilizers, plastic mulches and sometimes intentionally added as slow-release fertilizers and seed coatings. A surge in studies over the last few years has revealed frightening potential effects of this contamination on all elements of agricultural systems, from soil quality to human health. (3)

Any wildlife in or around rivers is exposed to the threats of microplastic pollution. Subsequently, this also affects human health. This proves that microplastics, like climate change, can cause great problems to the world, both man and animals. It also has a great negative impact on sustainability.



# CARBON NEUTRALITY ISSUE

## Focus on sustainability

The Climate Neutral Agricultural Products Approach (CNAC) identifies options that can make the agricultural sector an integral part of the world's climate-neutral future. This is an innovative approach to sustainability, climate protection and adaptation to climate change.

According to the Intergovernmental Panel on Climate Change (IPCC) Special Report on Climate Change and Land, the agricultural food system is now affected by global greenhouse gas emissions due to agricultural production, changes in land use and energy consumption from processing. It accounts for more than 30%.

At the same time, agriculture has the potential to significantly reduce emissions, primarily through adaptation measures. CNAC's approach focuses on mitigating climate change throughout the food and agriculture value chain. (4)

**“ Carbon neutrality is our solution to the better agricultural sector and as well as humanity’s future ”**



# THE BENEFITS OF USING PLASTIC MULCHING

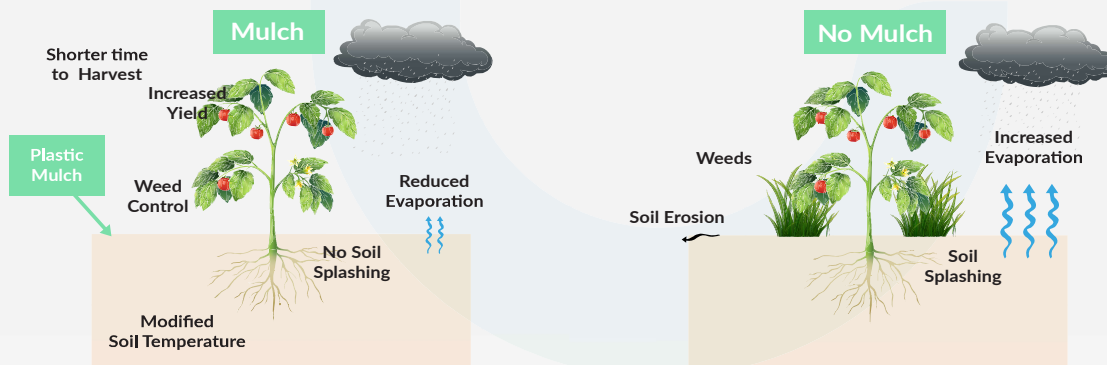


## Mulch Film

Plastic mulch is a product used in plasticulture in a similar fashion to mulch, to suppress weeds and conserve water in crop production and landscaping. Certain plastic mulches also act as a barrier to keep methyl bromide, both a powerful fumigant and ozone depleter, in the soil. Crops grow through slits or holes in thin plastic sheeting. Plastic mulch is often used in conjunction with drip irrigation. Some research has been done using different colors of mulch to affect crop growth. This method is predominant in large-scale vegetable growing, with millions of acres cultivated under plastic mulch worldwide each year.

Plastic mulching has become a common practice now to improve dryland agricultural production, water consumption efficiency, and also to improve soil fertility and crop yield. Some of mulch film widely known benefits are:

- Improves Soil Structure
- Insulates the Soil
- Effective Weed Control
- Earlier Crop Growth
- Higher Crop Quality
- Reduces the Risk of Root Damage



**However**, the use of plastic mulch film can be labor-intensive with farmers reporting problems in disposal of mulch film due to specialized equipment required and difficulty in disposing the removed plastic products. Several landfills require extra costs for plastic disposals, which ends up increasing the overall cost of using plastic mulching.

**WORSE**, the disposal of conventional plastic mulch used widely in the agricultural industry is an environmental problem. About 80% of the plastic waste is generated by plastic mulch films. Their waste collection is difficult and significant parts stay in the fields, generating microplastics that end up in rivers and oceans. A Spanish Operational Group (OG) encourages farmers in their region to use biodegradable mulch films and provides solutions for accelerating the degradation progress.(5)

# SUCCESS OF BIO-COMPOSTABLE MULCH FILM AND AGRICULTURAL PRODUCTS



## A Long-Term Sustainable Solution

As conventional agricultural plastic can last long and results in microplastics which affect soil properties, retarding crop growth, field operations, and potentially harming wildlife animals through decomposition process - creating long term problems.

**Thus, it is our responsibility to create agricultural bioplastics for farm management in order to bring sustainability by using efficient resources and lower plastic contamination in the world.**

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**Reduce plastic-film residue pollution by using bio mulch film and agricultural products made of ROSECO**

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## Bio Mulch Film made of RosEco is the solution



### SUSTAINABLE AGRICULTURE

For large area farming, it is often challenging to remove all the film and lay the film out while preparing for the new crops. The same challenge is also presented for long cycle crops. After long use of conventional mulch film, it is usually broken during harvesting. Therefore Polyethylene and conventional mulch film or other agricultural products e.g. nursery bag, fruit cover bags, would become micro plastics that contaminate the soil. With bio-mulch film and compostable agricultural products, farmers can have the option to manually and/or mechanically harvest without worrying about leaving film residue in the soil.



### LESS PROCESS

Instead of requiring labor-intensive manual or mechanical processes to remove and recycle the films. Films that are made from RosEco can be left in the soil after the harvesting process, directly saving on labor and processing costs.



### FEED THE SOIL

Mulch Film made of RosEco is soil degradable, and can be ploughed into the soil after harvest. The biofilm will become nutrients and food for microorganisms that are good for soil.



# ROSECO



## MEET ROSECO!

**ROSECO** was founded by a group of experts and scientists who want to prove that the world didn't need to compromise on performance to switch to bioplastics that bioplastics can be better for consumers, businesses, societies and the world at large. Today, RosEco offers both TPS and high performance TPS Compound compatible with advanced composites with superior processability and product stability. RosEco believes the sooner we stop relying on petroleum-based plastics and move towards a zero waste solution, the better.

Building on Thai Wah Group's 75 years of leadership in starch and starch-related products, our tapioca-based TPS is derived from renewable feedstock with >90% bio content and better elongation suitable for flexible packaging application of mulch film, bags and other blown film applications. Our first generation of TPS compounds, suitable for end-of-life applications thermo forming, injection molding and extrusion, are a unique blend of high performing biodegradable feedstock that are both industrial and home compostable.

RosEco TPS and TPS compounds are produced at Thai Wah's facilities in Thailand, at the heart of where our tapioca grows. We take pride in working closely with our network of farmers while improving their livelihood through fairtrade and conserving land that we call "home". While producing closer to the source, we are proudly reducing carbon emissions from transportation and creating thousands of jobs in Asia.

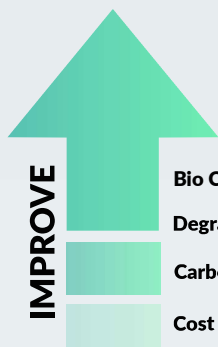
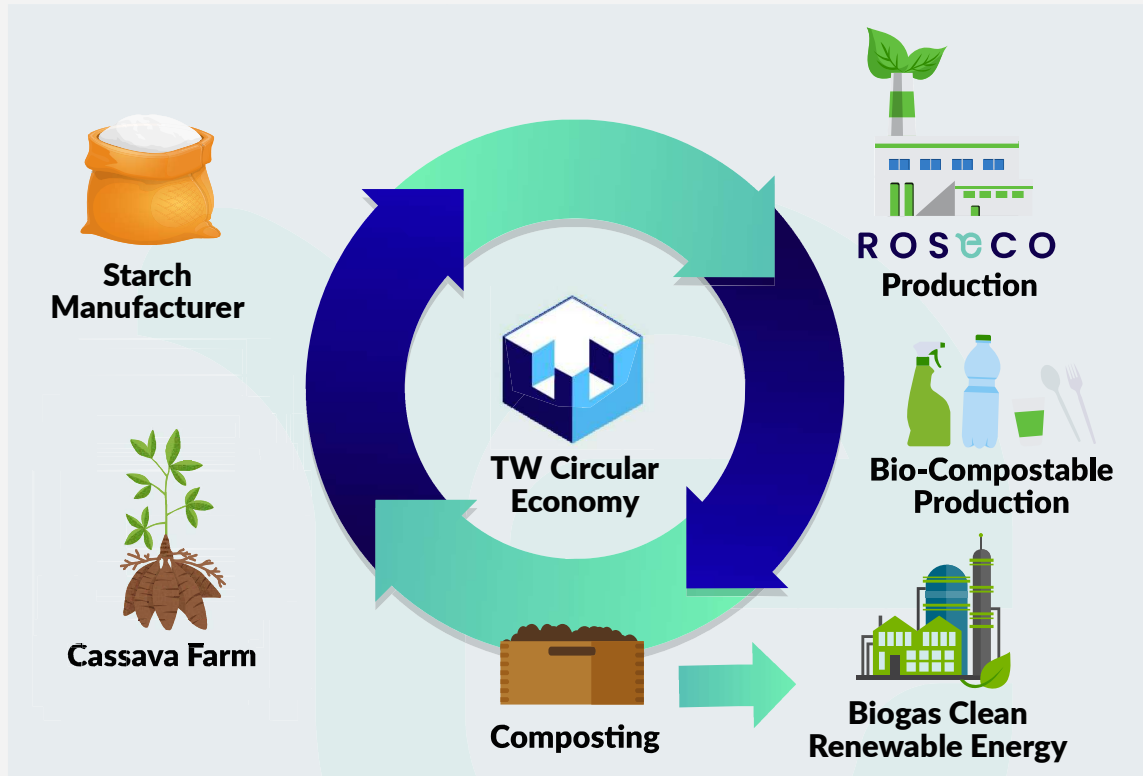


We are children of the land. We respect the nature that has allowed us to do what we do for three quarters of a century. We are now ready and compelled to create a solution, a better solution that will leave no microplastics waste in our water and soil - that is the future we will create together.

And we're just getting started.



# RENEWABLE-BASED AND CLOSED LOOP SOLUTIONS BY ROSECO



Bio Content  
Degradable Rate  
Carbon Footprint  
Cost Saving

**THAI WAH PCL** has innovated “**ROSECO series**”, which is the unique type of thermoplastic starch resin, derived from Tapioca starch. It can be used in various applications such as organic waste bags, shopping bags, thermoform tray, cutlery, agricultural bio mulch film, consumer goods, etc. **ROSECO series** will help you to

- **Increase** the renewable content of your products more than 50%
- **Reduce** your carbon footprint and “End of life” waste solution
- **Provide** cost saving formulation to increase market potential
- **Solution** for conventional application processes blown and cast film, injection

**Thai Wah** offers **Tapioca Starch-Based Solutions** as an innovative enabler for your Bioplastic journey to achieve your desired functional, increasing bio-based content with home and industrial compostability needs. We are excited to partner with you for joint development and innovation together we can create sustainable solutions to solve plastic waste issues.

# NATIVE AND MODIFIED TAPIOCA STARCH

Building on Thai Wah Group's leadership in starch and starch-related products, our tapioca starch and modified tapioca starch have been used in composite materials and compounds for many years. From the ideal combination of mechanical properties, natural-born materials, and biodegradability, we offer our customers a wide range of products, modification types, and process ability resistances.

## Thermoplastic Starch ROSECO TPS



- Affordable solution
- Renewable Feedstock
- Bio-Content > 90% Increase renewable
- Higher Elongation VS Corn Based
- Suitable For Flexible Packaging Application Due To Its Flexibility
- Home Compostable Within 60 Days

## Bio-Compound From ROSECO TPS



- High Performance And Thin Film Applications
- Compatible With Advance Composites/Good Processibility And Product Stability
- Sustainable Compound For End-Of-Life Application
- Home/Industrial Compostable

Our **tapioca-based TPS** is derived from renewable feedstock with **>90% bio content** and better mechanical properties suitable for flexible packaging application of mulch film, bags and other blown film applications. Our first generation of TPS compounds, suitable for end-of-life applications thermo forming, injection molding and extrusion, are a unique blend of high performing biodegradable feedstock that are both industrial and home compostable.

Increase the sustainability of your plastic products with our **ROSECO series**, tapioca based functional thermoplastic biopolymers. It is a great option to replace 30-50% of petroleum based or compostable polymer resins in blown film, injection molding and casting application with the goal of biodegradability and composability. The blend and compound of thermoplastic starch with all bio-polymers and additives are recently globally developed for greater performance in commercial use.



**ROSECO** Bio-compost compound could be processed in conventional blown film line in stable process. The final products mechanical performance meets commercial target requirement

*Bio-compost compounds with renewable materials*

**ROSECO TPS** is good compatible with biopolymers to produce compostable compounds, suitable for end-of-life applications blown and cast films, thermoforming, injection molding and extrusion, are unique blend of high performing biodegradable feedstock that are both industrial and home compostable.



*Disintegration test of ROSECO Bio-compost compound (according to ISO 16929)*





Agricultural plastic mulch films are widely used in specialty crop production systems because of their agronomic benefits. Biodegradable plastic mulches (BDMs) offer an environmentally sustainable alternative to conventional polyethylene (PE) mulch. Unlike PE films, which need to be removed after use, BDMs are tilled into soil where they are expected to biodegrade. Biodegradable mulch film made of ROSECO is the solution and the way to achieve sustainability in the long run. (6)

Sustainable Development Goals (SDG) is a shared blueprint for peace and prosperity for people and the planet, now and into the future.(7) It contains 17 goals. As our biodegradable mulch film can actually decompose, it is environmentally friendly and will eventually abate previously mentioned problems. Therefore, biodegradable mulch film made of ROSECO is the solution and the way to achieve sustainability in the long run.

(6) *Frontiers in Microbiology* : <https://www.frontiersin.org/articles/10.3389/fmicb.2018.00819/full>

(7) *United Nations* : <https://sdgs.un.org/goals>

# ABOUT THE COMPANY

**ROSECO** is a bioplastics manufacturing company under Thai Wah Public Company Limited, a 75 year old regional leader in starch and starch-related food products. Thai Wah PCL has always taken pride in tapioca manufacturing as there are five tapioca manufacturing plants run by Thai Wah PCL and an aggregate production capacity of 335,000 tons per year.

In a world where food security and plastic waste have become a serious long-term global issue, our mission is to create a sustainable zero-waste solution for the better world with ROSECO thermoplastic starch and compounds innovated by Thai Wah PCL.


As plastic which has been used widely nowadays could result in microplastics, our company's core business is manufacture of composting tapioca based bioplastics and compounds as an innovative solution for home, agricultural, and industrial needs to create a long-term solution and sustainability for the society.

By conducting our business with accountability to social communities, our mission is to continue redefining plastic-used possibilities into sustainable zero waste bio products for a better world.



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