



World-class **plant protein**
process technologies



Dairy

Food

Starch

Nutraceutical



Plant proteins

A world of opportunity

As the need for sustainable food production becomes ever-more acute, plant proteins are emerging as an increasingly important food ingredient. Plant proteins are an essential element of plant-based foods – burgers, minced vegetables, sausages and more. In fact, the global plant protein market is forecast to climb to above USD 40 billion by 2025¹.

But success in this growing, fast-changing market comes down to wise, timely investments in the right strategies, technologies and partners. With protein extraction as our core competency, we are here to help you capture the opportunity.

¹ Global plant-based protein industry projected to reach \$40.6 billion by 2025 (Dairy Foods, January 6, 2020)

Extraction expertise

With the acquisition of NivobaHovex and VTK, SiccaDania gained access to decades of experience and technology. By combining our knowledge, we have developed proven, sustainable protein extraction processes and technologies for a wide range of plant-based sources.

Regardless of the raw material or target market, we provide a customised, wall-to-wall process – from wet to dry to end-product. Using our upstream and downstream expertise, we can help you establish efficient, sustainable production processes for the plant protein of your choice.

With SiccaDania, you get a full-service technology provider as well as a partner for everything from project development to commissioning and plant maintenance. Our experts can advise you about the correct equipment and process for your project – helping you to ensure successful, sustainable operations.



The right process for your plant protein

The extreme versatility of our technology makes it applicable to many different plant families, while also enabling simultaneous production of numerous food and feed ingredients.

Our environmentally friendly process setup ensures that energy and water are recycled and that side streams are processed to maximise value.

SiccaDania's unique One-In-All-Out technology concept enables sustainable, efficient production of a wide range of products across many different plant families:

Plant families
Starch tuber crops: Potato, tapioca/cassava, yam, sweet potato
Leguminous crops: Pea, faba bean, chickpea, mung bean, lupin
Other: quinoa, amaranth, canola, rapeseed and others

Products
Native starch
Protein Isolates
Protein Concentrates
Insoluble dietary fibres
Soluble dietary fibres
Spent process water concentration (feed, fertilizer and energy)

World-class innovation centre

Our Innovation Centre near Copenhagen, Denmark is a state-of-the-art facility for pilot-scale testing. Here, we offer the ability to test processes and production equipment before scaling up to production level. Working together with you, our specialists offer insight into how to achieve optimal processing set-ups.

We run pilot-scale, proof of principle programs using, for example, dry raw material ranging from just a few kilograms up to several hundred. And, our testing of complete processes includes pilot-scale proof of principle, proof of concept of a complete process mimicking industrial processing, and single-stage processes.

Our pilot plant facility at the Innovation Centre covers a range of equipment and processes:

- Starch extraction
- Filtration
- Freeze drying
- Evaporation
- Zeta drying
- Spray drying
- Milling
- Fiber separation
- Mixing



Tailored functional properties

High-quality proteins contribute significantly to the desired nutritional and functional properties of vegan and vegetarian products. A protein's functionality is largely dependent on the extraction process setup and the composition of different protein types and other components, such as lipids, starch and fibers.

Applying the right extraction process is not only crucial to producing the protein ingredient you require, but also to developing tailored functional properties in your plant products – such as taste, colour, solubility, foaming, gelling, water binding and oil binding.

We can help you tailor functional properties by:

- Designing targeted processes for protein separation
- Designing processes to include tailor-made side stream products
- Using lab facilities to include compositional analyses
- Analysing protein solubility profiles
- Analysing particle size distribution of powder or dispersed particles



One-In-All-Out

We have developed a unique technology concept that ensures gentle fractionation of plant materials into high-value products tailored for specific markets. The One-In-All-Out concept involves optimising fractionation methods to produce native plant ingredients according to the following objectives:

- Producing high-quality food ingredients by gentle bio-fractionation of the raw material
- Maximising utilisation of plant raw materials and valorisation of side-streams
- Minimised use of core resources, such as water and energy

How it works

Conserving the native ingredient structure during processing allows you to utilise the functional properties of the natural products.

Different raw materials contain varying concentrations of main components, such as starch, protein, fibres and oil. The contents and concentrations of low-molecular constituents that may have significant impact on product quality also differ within the plant species.

One-In-All-Out is a concept focusing on maximising the yield of all valuable components in the raw material.

Post-processing modification of the functional properties can be achieved without impacting the entire production.



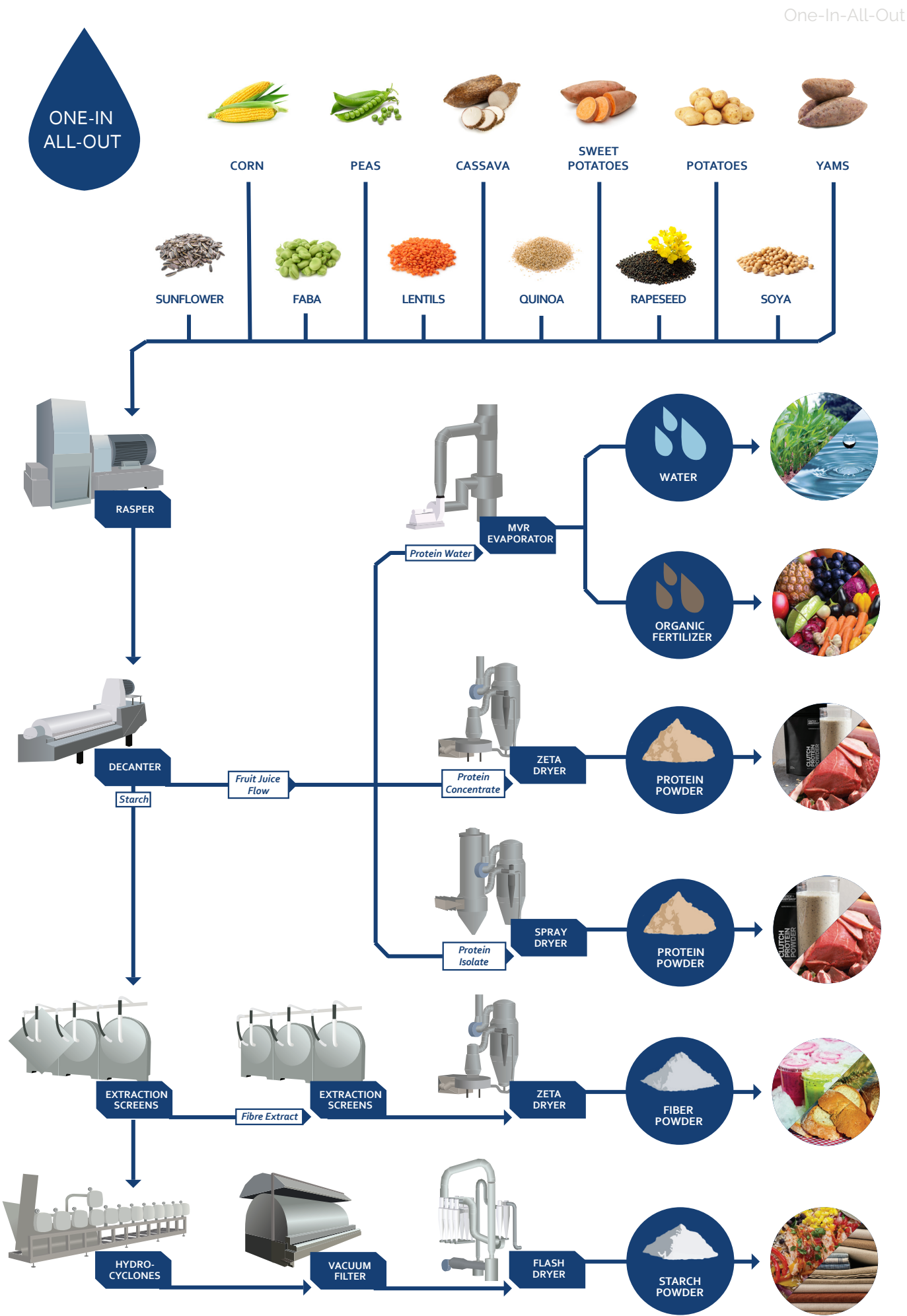
Key benefits

One-In-All-Out facilities are designed for production of high-quality products.

The concept allows for flexibility so the process can be tailored to meet the required characteristics of the final product such as high-quality protein isolates or concentrates, refined dietary fibers or modified starch and more.

This allows for implementation of additional processes at a later stage. For instance, adding a process line to further increase the protein extraction or the ability to modify products will help optimize your facility in increments and thereby allowing for continuous specialization and growth.

The concept focuses on minimising your facilities' environmental footprint – achieving this important objective by incorporating a process design to maximise water and heat recovery and reduce production of waste and side streams.



Your full-service technology partner

Our aim is simple: to deliver the best possible, turnkey solution for your process.

Working closely with you, we design our equipment to ensure you get the most efficient solution suited to your objectives.

Thanks to our inhouse expertise and know-how of upstream and downstream processes, we can help you apply the most advanced technology to developing commercially viable production facilities. Our experts design, engineer, manufacture and install state-of-the-art, hygienic, stainless-steel process plants of the highest quality.



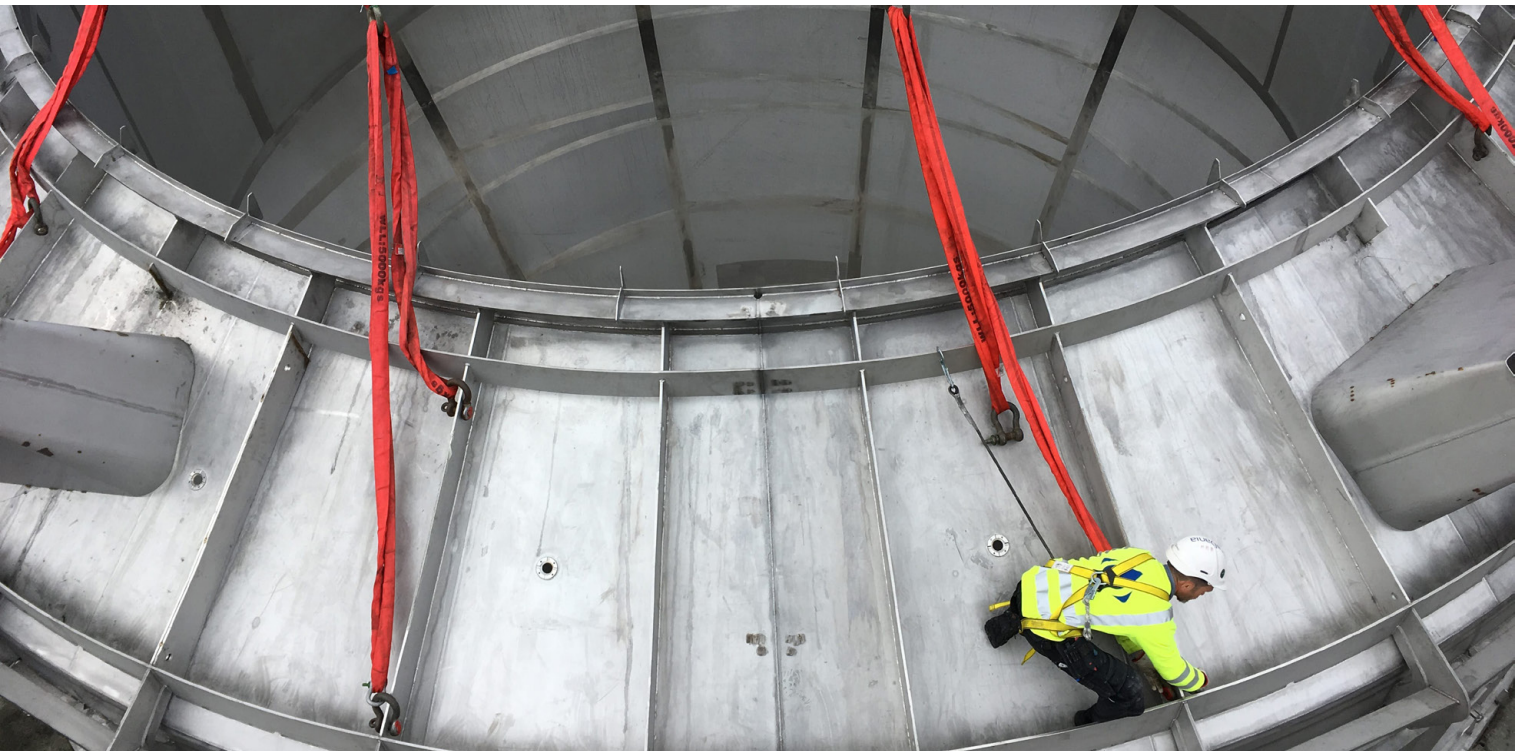
Your full-service technology partner

Automation

Process plants from SiccaDania are fully automated. For single machines, we often provide our own control system design, and for large integrated solutions, we work together with specialised automation integrators – often local.

Clean-in-place systems

Process optimisation depends on effective cleaning. Clean-in-Place (CIP) systems can be incorporated into equipment produced by SiccaDania, and our experts guarantee product safety at every point of the process.



Spray dryer



Cyclones



Evaporator

SiccaDania equipment

We provide a full range of equipment that can be manufactured to your specific production requirements within the plant protein process.

Extraction

Rasper

The SiccaDania rasper is designed for turning roots, peas and beans into wet meal at very high volumes. CAPEX and OPEX are extremely competitive compared with conventional milling systems.

De-sanding unit

A SiccaDania de-sanding unit removes sand and soil from the slurry after milling at very high capacities per unit. Because of the especially highly erosive nature of sand, our de-sanding units are made of stainless steel with a ceramic body.

Centrisieve

SiccaDania centrisieves are used to separate fibres from the starch and protein slurry. The slurry passes the fast-rotating conical screen and then leaves the centrisieve. The solids move towards the front of the screen and are discharged to the next process.

Hydrocyclone

Our hydrocyclones are used to concentrate and wash starch from the starch slurry ensuring contaminants are removed. A counter-current flow principle minimises the use of fresh water. The protein slurry continues in the overflow fraction.



Decanters and sedicanter

Decanters and sedicanter are used for protein separation, washing and concentration prior to drying. High centrifugal forces separate the finely distributed solid particles from the suspension.

Infusion UHT systems

SiccaDania infusion UHT systems are used to provide effective heat treatment and optimal functional properties of the proteins prior to spray drying. Other UHT principles are provided as well, including tubular systems and spiral heat exchangers, depending on the application.

Drying

Flash dryer

A SiccaDania flash dryer is used for drying starches, fibres and certain proteins (e.g. potato protein), usually in large volumes. In case of a very high moisture content of the wet feed, the flash dryer can be executed with back-mixing of dry product to improve flowability.

Zeta dryer

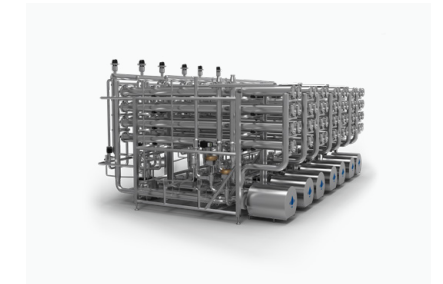
The zeta dryer is used for drying protein concentrates and fibres. It eliminates the need for back-mix feeding, hence generating improved product properties, such as better oil and water-binding properties.



Zeta dryer



Flash dryer



RO membrane filtration plant

Concentration of effluent water

Evaporator

MVR evaporators are used to concentrate high volumes of effluent process waters from the plant. The concentrate can be used as fertilizer, feed products or biogas and represents a commercial value. The cleaned process water can be re-used for Clean-in-Place and, in some cases, also in the process, reducing the need for freshwater intake.

Membrane filtration unit

Our membrane filtration systems include UF and RO systems. Our unique, patented LeanFlux system promises strongly reduced energy consumption and is highly suited to protein concentration in the main process and condensate cleaning (ROP) when re-using the process waters upstream. The condensate is often further treated with UV-light reducing bacteriology.

Our services

As your full-service technology provider, we can assist with the entire project phase – from idea to first draft to final implementation and commissioning. We provide complete, turnkey solutions based on your specific requirements, as your one-stop supplier.



Maintenance & repair

To keep our customers processes running perfectly SiccaDania offers a complete range of services like inspection, maintenance, repair, mounting, site supervision and commissioning. Our highly skilled and experienced personnel will be of service to maintain our products but also products delivered by third parties.

Our service divisions are:

- Maintenance & repair ad hoc
- Contract maintenance
- Online- and on-site training
- Supply of spare and wear parts

Manufacturing

We manufacture our equipment in our own, state-of-the-art workshops located in the EU, ensuring high quality at a competitive cost. Our capabilities include all the necessary manufacturing certificates, such as in welding and quality assurance, and the provision of pressure vessels.

Installation

The SiccaDania Installation Team – approximately 150 skilled workers and experienced installation supervisors – provides full mechanical installation of the process equipment supplied.

Project development

Entering a new market or bringing new products to market opens a world of opportunities – and challenges. Whether you are an established business or a start-up, we can help you achieve your vision through our project development company, SD Venture. Here, we put our extensive knowledge and hands-on experience to good use by helping you develop solid, comprehensive business and technology strategies.

In addition to providing development resources and support for plant protein projects, we help you with a range of business expansion services:

- Forecast modelling
- Raising debt and equity capital
- Accessing financing facilities at national Export Credit Agencies and growth/green funds
- Partner search and partnerships
- Establishing off-take of final protein, starch and fiber products

Learn more at sdventure.dk





www.siccadania.com

Delivering superior process **technology** worldwide.

SiccaDania is a full-service process technology provider for food, dairy, starch and nutraceutical producers. With extensive capabilities cover the entire value chain, we design our equipment in close cooperation with our customers, ensuring an efficient, customised solution perfectly suited to production requirements and business objectives.



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