

The Partnership

— news and views from Enza Zaden, no.13

ENZA ZADEN



SCIENCE

Biodiversity

MARKETS

Poland: 15 years of transformation

TRENDS

Analysing shelf-life

PRODUCT

Growth and movement in heated tomato



Dear reader, dear partner,

Welcome to the 13th edition of the Enza Zaden 'The Partnership' magazine!

In this edition we present a wide range of articles. From the latest developments in our Enza Zaden worldwide melon breeding program, via an overview of developments and trends in the Polish market to biodiversity and high tech seed production in Tanzania. The Partnership reflects the enormous diversity in markets, products and customers throughout the world and emphasizes how complex the vegetable seed world has become.

Enza Zaden is expanding rapidly: new subsidiaries in Eastern Europe, Asia and Africa, continuous investments in research and development, in technology and increased attention for seed processing and packaging.

Our ambition is to create new vegetable varieties for all different markets and climatic zones. So that all people around the world

have access to healthy, varied vegetables.

We can only realise this by being close to our customers, in partnerships.

Wish you a joyful read of this latest edition of The Partnership.

Jan Panman

Regional Sales Director Enza Zaden Export

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*Cover: Mariann Börner
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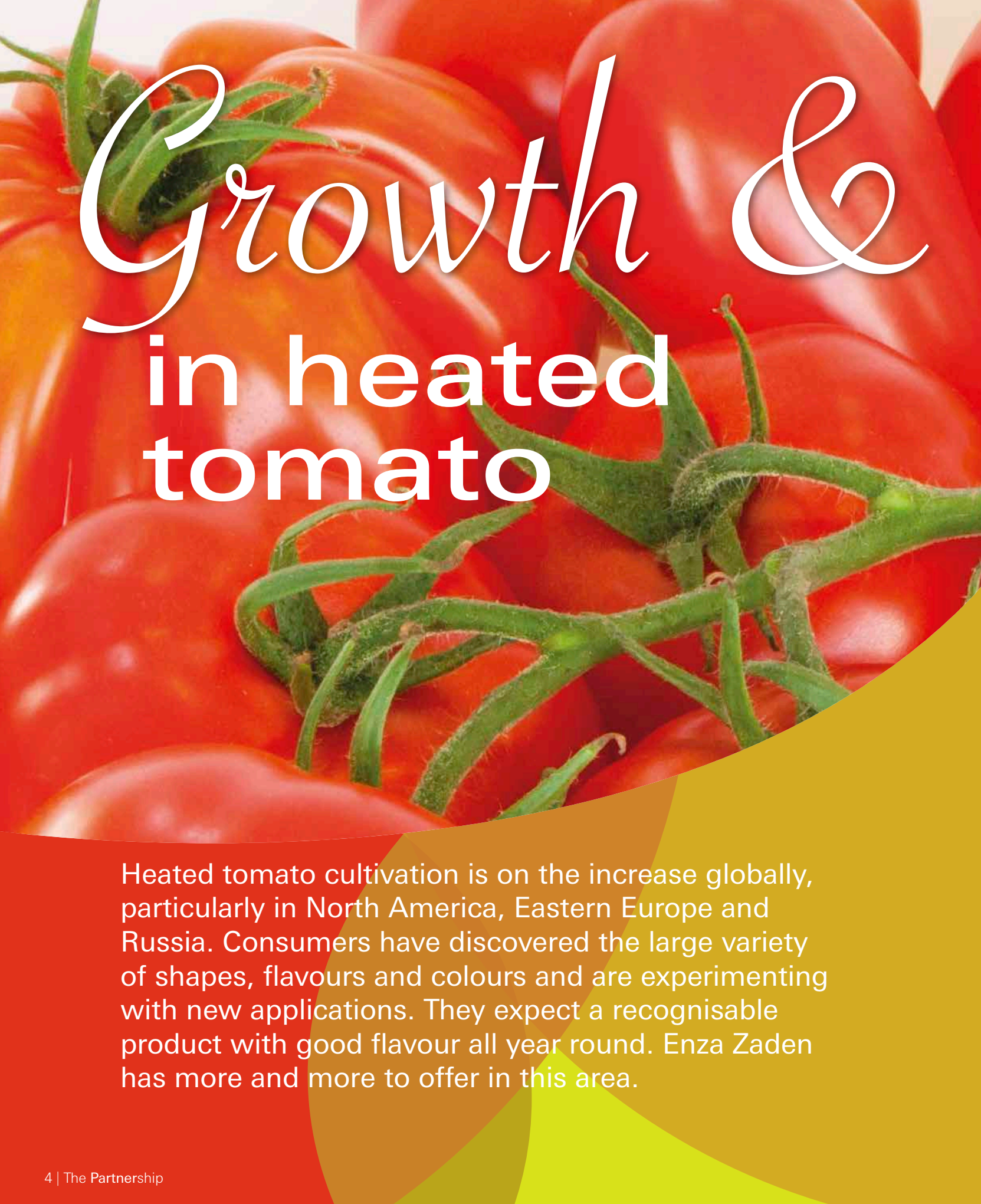
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Growth & **in heated tomato**

Heated tomato cultivation is on the increase globally, particularly in North America, Eastern Europe and Russia. Consumers have discovered the large variety of shapes, flavours and colours and are experimenting with new applications. They expect a recognisable product with good flavour all year round. Enza Zaden has more and more to offer in this area.



Movement

There have been drastic changes to the range of fresh tomatoes on offer in the past 25 years. Depending on the region, the range on offer used to consist primarily of beef tomatoes, loose round tomatoes and – as a sign of what was about to happen – cherry tomatoes. Western Europe was the first region to witness a differentiation in the range of tomatoes on offer. Starting in the early 1990s, the range expanded to include cocktail tomatoes, plum tomatoes, truss tomatoes and snack tomatoes in all sorts of shapes, sizes and colours.

Experimenting

“Consumers have discovered the enormous variety and are experimenting with new uses and forms of preparation,” says Crop Breeding Manager Martijn van Stee. “This stimulates the consumptions, but the pattern of expectations also expands; the consumer expects to be able to buy a recognisable product with good flavour all year round.” This trend has consequences for the strategy and growing methods of producers. Investment in growth, geographic distribution and assimilation lighting has resulted in companies that are able to offer their customers fruit of a consistent, very high quality all year round.

North America

This development has been visible for some time in North America, according to Area Sales Manager Freek Knol. In addition to the beef tomatoes grown under glass – for which the acreage has remained fairly consistent for a long time – a large acreage of truss tomatoes, cocktail tomatoes, plum, cherry and snack tomatoes has also been added. Initially it was mainly the large truss tomatoes that were gaining ground. In recent years, the more refined flavour tomatoes are exhibiting the strongest growth. 25 years ago, most of the supermarkets had one – maybe two – types of tomatoes on their shelves. Nowadays this has increased to five or six in many cases.

Autonomous growth and takeovers

The renowned tomato producers are expanding under their own strength and through takeovers of nurseries in regions where they want to strengthen their presence. They are aiming at long-term relationships with supermarket chains and short logistics chains, in order to get their products on the shelves as quickly and freshly as possible. The relationships between seed companies and producers has therefore become closer.

Knol notes that Enza Zaden is an emerging name. “Everyone recognises us from Campari, which has been well-known here for twenty years. This variety played a trailblazing role in the differentiation of the tomato segment. In the past, the fresh market consisted almost exclusively of beef tomatoes, grown both under glass and in polytunnels. As supermarkets and consumers became more demanding, the heated cultivation has expanded significantly and the outdoor cultivation has become less important.”

In Canada (1,200 ha heated tomato, primarily in Ontario and British Columbia) and the Northern part of the United States, the relatively cheap double polytunnels are gradually being replaced by modern, better insulated glasshouses. Some of these glasshouses are fitted with grow light installations, which make it possible to grow top quality fruit even in the depths of winter. The need for extra grow light is not as high in the Southern part of the United States. This also applies to central Mexico, where the heated cultivation takes place in polytunnels. Knol: “These polytunnels are also very suitable for high-tech tomato cultivation. The heated cultivation in Mexico currently covers approximately 1,500 ha. Fruit grown here is primarily exported to the United States and Canada during the winter months. However, Mexico is an emerging market with a growing middle class. This results in local demand for a more differentiated product range in the slightly more expensive segments.”



Organic is a growth segment

"In recent years the expansion of organic farming has stagnated somewhat, due to the discussion surrounding the requirements for organic farming. Now that the National Organic Standards Board in the United States has expressed their views on this – the rules remain as they were – Knol is counting on further expansion. "There is room for expansion, because the demand in recent years has outstripped the supply."

Enza Zaden is growing too


"Our tomato portfolio has become significantly broader and stronger in recent years," says Van Stee. "Maxeza gives us a competitive variety in the large truss segment. It has better scores on flavour and colour than the established varieties and has a comparable physical yield."

Knol: "Many growers have tried the variety and are satisfied with

its performance. However, the market is competitive and it is not easy to get a higher price for a variety of higher quality. This does not encourage growers to make the switch, but I am hopeful that Maxeza will win their confidence."

An emerging market segment that Enza Zaden can successfully enter is that of the medley packs: boxes of fine (flavour) tomatoes of various types and colours. Growers and retailers have targeted these medley packs at the curious consumer who likes diversity. The area sales manager: "Our breeders have developed a line of tomatoes with various colours, which can be grown in a uniform manner. We are going to introduce this line here in 2018."

Other varieties for which there is a growing interest include Garincha (mini plum), Laudrup (mini plum), the small cocktail tomatoes Annamay and Anaisa, the large cocktail tomato Avalantino and the new beef tomato EZ 1197, which is performing well in Mexico.



"The more refined flavour tomatoes are exhibiting the strongest growth"

Russia is stimulating home-grown

The cultivation of heated tomatoes is expanding strongly in Russia. The government wants to reduce the dependence on import products and has assigned a high priority to high-tech food crop cultivation.

"They have invested heavily in ultra-modern glasshouses," according to Product Manager Export (Eastern Europe) Mike Lemmen. "Established companies and new investors are rolling out projects covering dozens of hectares. The major emphasis lies on tomatoes and cucumbers. In the summer there is usually an adequate supply of these products from unheated polytunnels and the many vegetable gardens. Farmers and investors are therefore focusing primarily on the illuminated, heavily heated glasshouse production."

According to Lemmen, the Russian acreage of high-tech glasshouse farming now covers 750 ha, whilst it was less than 600 ha a few years ago. Almost half of this acreage is fitted with assimilation lighting. "A further 300 ha will be added over the next three years, particularly around Moscow, Saint Petersburg and in the south of Russia," says the product manager. "In addition, neighbouring countries are investing in large-scale horticultural projects. This is happening particularly in the Caucasus region and in Kazakhstan. These regions traditionally have a strong bond with Russia and are helping to make Russia less dependent on imports from Europe, North Africa and Turkey."

Expansion of product range

The rapid expansion of Russian tomato farming is taking place across the full spectrum of varieties. In addition to the traditionally grown beef tomatoes, the large truss tomato is also showing strong growth. An even more recent development is the interest in flavour tomatoes, which is translating into a rapidly expanding acreage.

Lemmen: "It is good to see that our market share is also expanding. Maxeza is doing very well in Russia, because this variety performs exceptionally well in a continental climate. Savantas, Tomagino and Robagino are also very popular. Other specialties will gain a foothold in the coming years."

According to the product manager, the Russians appreciate the practical support offered by Enza Zaden in Russia and the Netherlands. "Rapidly expanding high-tech companies have to focus all their efforts on keeping up with this growth in terms of growth management. We are used to sharing our know-how and offering very pragmatic support to customers. That is quite a challenge, because there are often enormous distances between the companies. A quick visit to a company is not possible; that often takes several days."

Poland

With 1,000 ha of heated tomato farming, Poland is a major export country. The domestic demand is dominated by pink beef tomatoes, which account for half of the total acreage. "Seven years ago this product accounted for less than 100 ha. It is a relatively expensive, nostalgic tomato variety with a good flavour. The strong growth in this segment is typical of the economic growth and increased affluence in this country."

Enza Zaden very recently developed a variety that is making a big impression in this segment. "We will expand this variety on a trial basis in 2018," the product manager concludes. "We are doing the same with the large truss tomato Maxeza, which is gradually gaining ground here." ■



Polish vegetable sector forging ahead



For decades now, Poland has produced more vegetables than it needs to feed its 38 million inhabitants. It is therefore a major exporting country. “The economy is growing and the international market offers many opportunities and challenges,” says Marketing & Sales Manager Jacek Malinowski of Enza Zaden Poland. “This is reflected by the developments in the horticultural sector, that is becoming more large-scale, modern and professional.”

In addition to open-field cultivation, Poland also has a significant amount of greenhouse cultivation. This was the case even during the Communist era. Following the demise of the Iron Curtain – particularly since joining the European Union in 2004 – the export of fresh products has really taken off. “The largest export volumes used to travel east, until the mutual trade embargoes between the Union and Russia were announced in 2014,” according to Malinowski. “For a long time Russia was the main buyer of traditional products that have also been a favourite here for a long time, such as cabbages, carrots, onions, beef tomatoes and cucumbers. Since the embargo, growers and trading companies have focussed more specifically on the markets to the south and west of Poland. Of course these markets have their own preferences, so a shift in the product range occurred.”

A long journey

The Marketing & Sales Manager compares the development process of the Polish vegetable sector to a long, challenging journey along changing markets and consumer needs. Before Poland became a member of the EU, the agricultural sector was characterised by small-scale family businesses. Almost all activities were performed manually. This was not really a problem, because cheap labour was widely available. This all changed very quickly after 2004. “Hundreds of thousands of Polish people started looking for and found better paying jobs in the richer parts of Europe. Including in the Dutch agricultural sector, which was much larger and more modern than in our country.”

The exodus had various consequences. In order to cope with the reduction in local labour supply, an influx of cheaper labour from the Ukraine gradually took place. A mechanisation wave took place simultaneously, which was associated with an expansion of scale and consolidation. “This modernisation was stimulated with European development funds. Without that assistance, it would have been a much more time-consuming and difficult process. Both for the primary sector and for the processing and trade. This allowed many sorting, packaging and cooling facilities to be developed in a relatively short space of time, something which the Polish vegetable chain was urgently in need of.”



More eye for demand

The several million Polish people who lived elsewhere in Europe for a limited period or indefinitely were also introduced to fruit and vegetables that were hardly known or available in their home country. These new experiences and the gradual increase in prosperity of the population resulted in major shifts in supply and demand.

"In the larger cities, the vegetable sections currently look very different than ten years ago, when supply was much more limited and traditional. As far as lettuce was concerned, you used to see almost nothing other than butterhead lettuce. In addition to butterhead lettuce, the Polish consumer can now choose from iceberg lettuce, oakleaf lettuce, radicchio rosso, rocket and corn salad. Many leaf crops are now also supplied ready-to-eat, because the Polish consumer is also more frequently opting for the convenience of ready-made meal components."

The supply of cabbage crops has also undergone significant changes. Previously the heavy headed cabbages dominated, sometimes weighing 6 or 7 kilograms each. The growers are now using different varieties, which produce much smaller cabbages. This fits in better with the current requirements,

which are characterised by smaller households and a more varied menu. Due to this same expansion, crops such as pak choi, that were virtually unknown until recently, are now finding their way into the Polish growing plans and store shelves.

A third product category that has seen a strong development over the past decade is the tomato. "At the start of the century we almost exclusively grew beef tomatoes here. This type is still very important, but it has now received company from a wide range of vine tomatoes, cocktail tomatoes and cherry tomatoes."

More high-tech glasshouse cultivation

According to Malinowski, the growth of the Polish high-tech glasshouse industry, which currently comprises about 1100 ha of high tech tomatoes glasshouses and 650 ha of high tech cucumber glasshouses, can be attributed to both the increased demand for new tomato types and the more stringent quality requirements from wholesale, retail and consumer. "You can manage the growing conditions more accurately in modern glasshouses. This results not only in a longer growing season and a higher, more predictable yield, but also in improved and more consistent product quality."



Today's consumers are a lot more demanding than they were twenty years ago. This has resulted in the open-field cultivation being entirely or partially replaced by cultivation under protection for a number of products. Sometimes under foil, but increasingly in ultra-modern glasshouses. In addition, glasshouse crops offer more options to use biological pest controls and reduce the use of chemical crop protection products. This wish expressed by society is becoming increasingly evident in the primary sector."

Transformation

Reflecting on the past 15 years, Malinowski concludes that the Polish vegetable cultivation has undergone a real transformation. This process is far from complete. The number of companies is still decreasing. Particularly the small, often outdated farms are ceasing production or being taken over by larger, modern and market-oriented companies that have greater financial clout.

"The market is very dynamic and presents many challenges. One of these challenges is the increasing domestic demand for organically grown vegetables. This market segment is really developing now and Polish farmers could benefit from this more than they are currently doing. In that regard, their colleagues in Western Europe and North America really are a few steps ahead."

Enza Zaden can make a valuable contribution in helping Poland to catch up. Both via the strongly expanding organic seed division Vitalis and via the Polish subsidiary, which recently expanded its sales force to five people.

Market-oriented collaboration

According to Malinowski, a second challenge for Polish farmers is to strengthen their market knowledge, marketing skills and sales power. He emphasises that "The main requirement for this is cooperation. The message that I would like to pass on is that your neighbours are not only your competitors, they can also be really good partners. With an open mindset and the willingness to share knowledge, risks and success with each other, some ambitions can be achieved more quickly and efficiently than when you operate alone. I realise that many entrepreneurs will need time to get used to such cooperation. However, I think that many will recognise the value of it when they take a good look around."

Cooperation can make it possible to change developments that form a threat to the position of the company into opportunities. Malinowski lists geo-political issues and energy costs as examples. "These are the things that you cannot influence as an individual entrepreneur, but you do have to deal with them. You can often achieve better solutions when you work together." ■



Russia is investing heavily in modern greenhouse horticulture. The ultra-modern company LipetskAgro is an example of this new impetus. Under high-level growth light, the company produces various types of tomatoes and cucumbers all year round in semi-enclosed Ultra-Clima greenhouses. The close cooperation with Enza Zaden has resulted in a balanced range and high production of top quality produce.

*Oleg Kharlamov and
Olga Tolmacheva*

LipetskAgro continues to expand in Russian high-tech sector

The region of Lipetsk is located about 350 km south of Moscow. After it was designated as a special agro-economic zone by the government, LipetskAgro started building the first business phase of nearly 10 ha in 2013. Following several expansions, the company now has about 45 ha of glasshouses, commercial premises and technical installations for the propagation, cultivation and processing – sorting and packaging – of tomatoes and cucumbers. “We supply Russian consumers with locally grown, high-quality tomatoes and cucumbers,” says General Manager Lubovi Kharlamova. “We aim for the higher market segments. To ensure a high yield, excellent quality and efficient use of energy, we grow our produce in Ultra-Clima greenhouses at a very high light level for fruiting vegetables. So far, this has proven to be a good decision.”

Investing in people

With its ultra-modern greenhouses and installations, Lipetsk Agro is a technological frontrunner in its own country and is also one of the most innovative greenhouse horticulture businesses in the world. That is great of course, but more is required to make such a costly investment profitable. “You want to reach maximum potential,” says Production Manager Olga Tolmacheva. “That can only be achieved when the people who work here are motivated, have the right knowledge and experience, and are not afraid to take responsibility. We focus consistently on this, especially since the workforce is expanding just as rapidly as the company. We also invest in contacts with external specialists. They maintain a high level of knowledge and help us to perform to the best of our ability. Enza Zaden is a valuable partner in this context. Not only because of their varieties, but also due to their growing experience in various climate zones and their knowledge of the Russian market.”

Sharing knowledge

The contacts between both companies take place primarily between Tolmacheva and Chief Agronomist Oleg Kharlamov on behalf of Lipetsk Agro and Renat Dushanbiev on behalf of Enza Zaden. “LipetskAgro is a fantastic company, which operates at a high level,” he explains. “It is wonderful to contribute to this. I receive a great deal of support from my colleagues in the Netherlands. The breeders and growth advisors know exactly which conditions are best for our varieties. We are happy to share this knowledge with our customers and they greatly appreciate it. By the same token, we also learn from the wishes and experiences that they share with us.” Oleg Kharlamov confirms this. “The growing conditions can be managed perfectly in the Ultra-

Clima greenhouse,” he explains. “Even in the summer, because the greenhouse has a large air treatment capacity and we are able to cool it very well. However, the greenhouse has a somewhat vegetative character compared to standard greenhouses. It is quite easy to grow a sturdy crop, but you will have to put more effort into achieving a generative balance. Of course we take this into consideration, not only with the climate settings, the water dose and the EC during the cultivation, but also with the selection of varieties.”

Wide range

LipetskAgro carries a wide range of quality tomatoes and cucumbers. Varieties from Enza Zaden are represented in both product groups. For tomatoes, this currently includes the small beef tomato Kanavaro, the vine cherry tomato Tomagino and the plum/cocktail tomato Ardiles. For the first time this winter, LipetskAgro is growing the Long European Type cucumber DeeLite, which has already been trialed on a small scale.

“You want to reach maximum potential”

“Many factors play a role in our selection of varieties,” explains Kharlamov. “In addition to the vegetative or generative character of a variety, we also look closely at quality characteristics, at the expected production level and at resistances and resilience. We only use chemical crop protection products when we have no other choice. The crop construction also comes into consideration, as this is partly determined by the amount of labour required for crop maintenance and harvesting. The people at Enza Zaden know what our preferences are.”

The future

LipetskAgro wants to expand significantly in the coming years and is counting on the continued collaboration with Enza Zaden. Tolmacheva: “We are aiming to achieve sustainable relationships with parties that can increase our added value for customers. Good varieties and cultivation advice are important building blocks. Enza Zaden is also really good at the conceptual approach. Perhaps this will soon lead to new propositions in which varieties from the company play a role. After all, we both greatly value innovation.” ■





Today's trends ask for
shelf-life analysis



Pre-packaged leafy crops – often mixed and pre-cut – are meeting the growing demand for healthy vegetables that are easy to prepare. Supermarkets and other chain partners like to see these products retain their fresh flavour, smell, texture and appearance for a prolonged period. Enza Zaden has pushed the boundaries – both in genetics and in the commercial support of customers – in this field based on years of shelf-life analysis.

As Senior Portfolio Manager, Ian Botes considers the Portfolio department to be a spider in the web formed by Breeding (Research and Development), Marketing and Sales and Seed Operations within Enza Zaden. “My main task is to manage the lifecycle of our leafy crops portfolio,” he explains. “The management of these segments requires coordination and consultation with both internal and external parties.”

Major change

Botes is in contact with market parties within the fresh chain almost on a daily basis. Firstly, this includes the growers of leafy crops, who provide valuable feedback about the cultivation properties of varieties and explain what they would like to see changed or improved. Secondly, the Portfolio Manager also speaks to parties further along the chain, who do not belong to the group of direct customers: processing companies, retailers and bulk consumers within the food service segment.

“A major change has taken place in the sales of leafy crops, from unprocessed to processed, ready-to-use products. This applies not only to the individual consumer, who nowadays prefers to select ready-to-use salads from the refrigerated section. Bulk consumers – such as hospitals, care facilities and caterers – are also increasingly buying washed and pre-cut products, sometimes even ready-to-use mixtures. As the quality of processed products generally deteriorates more quickly than unprocessed products, the shelf-life is a major point of attention.”

Complex range of factors

The success of existing and new varieties depends on more than just cultivation properties. Although this will undoubtedly be the first thing that growers look at, they will ultimately choose varieties that offer a high added value for customers. Leafy crops that are likely to end up as pre-cut vegetables in transparent bags in the refrigerated section of a supermarket must have a reasonable shelf-life in this situation.

Botes: "Shelf-life is a broad term. For leafy crops, shelf-life includes retained sturdiness, colour, smell and flavour, for instance. The quality of each of these parameters gradually deteriorates as soon as the product is harvested. The extent and the speed at which this happens is determined by a complex range of factors, such as the cultivation conditions, the storage temperature and the micro-climate surrounding the product, particularly the humidity, the oxygen concentration and the presence of certain gases such as ethylene. These aspects form a delicate balance for processed products."

Early screening

A variety is only as good as its worst characteristic. This also applies to shelf-life, particularly for fresh cut leafy products. Therefore, it is important to gain insight into this at an early stage. "The phenomenon of shelf-life is especially interesting to us, as good genetics can play an important role in improving shelf-life. Thanks to our expanding knowledge of plant genomes and the advancing market technology, our breeders and scientists are able to screen new crossbreeds for shelf-life characteristics more quickly and at an earlier stage. This makes the breeding and selection process a lot more efficient. It also ensures that we can offer our customers well-substantiated advice about the appropriate varieties, depending on their wishes and options."

Lab and practice

As you might expect from a broad and complex concept such as shelf-life, the investigations into this concept are also broad. "Our objective is to compare varieties under circumstances that correspond to the reality of the fresh chain," says Post-harvest Researcher Anne Marie Schoevaars. "To achieve this, we need to recreate in a standardised manner the circumstances to which the products are exposed in practice. Relevant questions in this context include: which forms of processing take place and when, to which temperature regimens is the product exposed, how is the product packaged and how long must the product retain its flavour, colour, smell and texture? We can only really evaluate our varieties once we are certain that we have accurately recreated the practical situation. Consumers and chain partners are also involved in this process."

Post-harvest USA

Before Schoevaars started working in Enkhuizen, she spent ten years on post-harvest research at the subsidiaries in France and the United States. Sandra Escribano followed in her footsteps in America, bringing innovations to the table. "It is fascinating work," says Escribano. "We examine many different parameters, which all need to be measured and recorded in a standardised manner. We use specific

measuring instruments to monitor the changes in colour, concentrations of sugars, acids and dry matter, the texture and the stability of the cell walls. In addition, we ask consumer panels to evaluate the taste and the smell of the product, if possible, at various points in the shelf-life course. In order to promote objectivity, we work with sensory profiles wherever possible, within which the consumers make their choices."

Customised research

According to Escribano, Enza Zaden has made real progress in the breeding of crops such as rocket salad, lettuce and basil thanks to this thorough research methodology. "The focus is slightly different in the United States compared to Europe or other parts of the world. Both our direct customers and American retailers expect custom work. This is why we offer customised research. It makes my work even more fun, because it places me in direct contact with the market parties that are interested in our varieties. Due to the – on average – long logistics lines, the bar for shelf-life has always been high. In America, a pre-packaged salad has to last two weeks without any problems. In Europe, the limit is usually around seven days."

Three locations

That does not necessarily mean that an American salad is better than a European salad, or vice versa. It does mean that the scientists need to take into consideration the differences between regions and between customers. Different shelf-life requirements of course demand different variety portfolios.

A shelf-life analysis of fresh cut leafy products is currently taking place in the United States and France. This will also start in the Netherlands in 2018.

"In Enkhuizen, the focus will be on the development of selection tools for the breeders," explains Schoevaars. "Ultimately, we want to test each variety in all the product groups for shelf-life, before the variety continues to the next phase in the selection and introduction process."

Clear progress

Ian Botes is very satisfied with the progress in the shelf-life analysis in recent years. In addition to the crops mentioned by Escribano, he thinks that good progress has also been made for butterhead lettuce. "This research is crucial in several ways," he notes. "Firstly, it offers the breeders and selectors a firmer grasp on the targeted and efficient improvement of the varieties. This is already yielding results in various product groups. In addition, this is a very valuable instrument for the commercial support of our chain partners. Thanks to our input, the fresh chain will make a better-substantiated selection of varieties and consumers can buy freshly cut leafy products that are just that bit better and tastier." ■



The importance of the appropriate bag

Over the years, the processors of leafy crops have developed several methods to extend the shelf-life of their products. These vary from additives – such as chlorine – in the water used for washing the crops to slow down the growth of micro-organisms, to macro-perforated bags to allow replenishment of air and controlled removal of moisture, to micro-perforated packages that naturally creates a protected gas condition (low oxygen, high carbon dioxide) to prevent quality reduction.

Excellent collaboration

“We want to recreate the practical circumstances in the best possible way,” says Post-harvest Researcher Anne Marie Schoevaars. “We have asked the Dutch subsidiary of Amcor (one of the largest packaging company in the world, ed.) to help us in determining which packaging would be best to use. This was an excellent collaboration and has resulted in the selection of four different test packages that we will use at the test locations.”

Four standard packaging options

Stefan van Oostrum and Luuk Janssen were involved in the selection process on behalf of Amcor. They also felt that it was a very successful and informative collaboration. “We have been supplying (micro-perforated) packaging materials to processors for about 30 years and we have hundreds of variations in use all over the world,” says Janssen. “Seed companies offer us the possibility to focus on the whole chain. It was fun to deliver a custom-made product for them.” Van Oostrum adds: “Enza Zaden asked us to select a limited number of packaging materials from the many options that are available, which would be suitable for shelf-life analysis of processed leafy crops. In addition, these packaging options had to represent what was currently available on the market.”

Following meetings and small-scale trials at the various test locations, the broad pre-selection initially made by Amcor was whittled down to the four standard packaging options which started to be used in 2017. “Our research methods are now completely in line with market standards and up-to-date,” a satisfied Schoevaars concludes.





Local flavour heroes conquer the north

Piel de Sapo, Italian Netted, Charantais? Three local melon heroes and greatly loved in their country of origin: Spain, Italy and France respectively. Until the turn of the century, these melons were hardly seen outside their respective regions, but this is slowly changing now that they are being given the opportunity in countries in Northwestern Europe. And taking these opportunities!

"None of these countries have specifically focused on export with their local type," says Sales Manager Miguel Salinas Torres. "Why would they? There are plenty of domestic sales opportunities for the melons that are produced, meaning that there was never a need to look any further. In addition, there were plenty of reasons not to look any further: logistics, sales opportunities, consumers' wishes. The 'time to market' is much more attractive on the domestic market, meaning that none of the flavour of the products is lost."

Galia

The balance between shelf life and flavour has traditionally been one of the most important criteria in breeding activities for the export market. Melons produce fructose during the ripening process, an important factor in the flavour. However, due to restrictions in transport, it is impossible to get a ripe fruit on the supermarket shelves in time, except in the country of origin. As a result, melons for export are harvested whilst unripe and 'allowed to ripen' during transport.

"Until recently, the dominant melon in northern Europe was the Galia," explains Salinas Torres. "This type is also harvested whilst still unripe, in order to bridge the journey to the northern countries. And yes, some of the flavour is lost, as the ripening process does not take place on the plant. As there were hardly any alternatives in this product category for the northern European consumer, this did not have any negative consequences. In addition, melon is not consumed in large quantities when compared to the southern countries around the Mediterranean Sea. However, the offer in this product category is now slowly changing in countries such as the United Kingdom, Germany and the Netherlands. The consumer's wishes and demands are also changing as a result. Incidentally, we are witnessing this development not only in northern Europe; the product category is also expanding at a higher quality level in North America."

Sensory learning curve

"This broadening and deepening activates the sensory learning curve," says Marketing Analyst Hans Verwegen. "The consumer suddenly has better tasting material for comparison, as was the case many years ago with wines from various regions, for example. The northern European consumer will only learn about the true taste of melon when a wider range is available and this learning process has now started. We also see the consumer's expectation pattern rising and we see that they are willing to pay more for quality, particularly when it comes to flavour. This, combined with the improved logistics, creates opportunities for the local heroes from the south."


Are the improved logistics and the consumer's expectation pattern the only factors that have caused the local melon types to travel more across Europe? Definitely not. The current marketing trends have also assisted this development. The trends for convenience and health in particular have played a



Taste experience

What is taste actually? In fact, it is a combination between smell, brix and texture. The nose and the mouth are connected to each other. When a person eats, aromatic air flows from the mouth to the nose. This allows us to observe the more specific 'secondary flavours'. So actually, these 'nose flavours' are scents, such as vanilla, menthol and cinnamon. A scent consists of volatile compounds. In combination with the brix concentration – the total of sugars and acids – these compounds form an important part of determining the flavour of what we eat. The texture determines the mouthfeel. It is important that the melon has a certain 'bite'. If this is lacking, the fruit is often perceived as being mealy.

"A lot of progress can be made
with good information"



role, in this case the pre-cut pieces of melon in mixed packages. This has resulted in consumers in the north eating more melon. Salinas Torres: “The Spanish Piel de Sapo appears less attractive to the consumer due to its dark green skin. This colour is associated with unripe fruit. The mixed packages, containing various types of melon or mixed with other fruit, form an easy way of getting to know the new types.”

Weight

Nevertheless, the emergence of local melon types in the north is a slow development, on the one hand because breeding needs to be performed specifically for the export market and on the other hand due to the modest position that melon has occupied until now on the shopping list of these countries. The Sales Manager explains that the export market definitely does demand specific breeding activities. A good shelf-life remains important, despite improved logistics. In addition, the Spanish Piel de Sapo is a big melon. Salinas Torres: “In Spain this melon usually weighs at least 3.0 kilograms. For the consumers from Northwest Europe this weight is too much; as soon as they have become familiar with the Piel de Sapo – for example in a mixed package – and they want to buy a fresh melon, a weight between 1.5 to 1.7 kilograms is really the maximum. In addition to the flavour and shelf-life, we are therefore also focusing on the size of the product.”

Value versus space

In France, 90% of consumers buy melon very regularly, versus 70% for cucumber. This is exactly the other way around in the northern countries; though some do not even achieve 70% for melon. This shows where the focus lies: the product category ‘melon’ has definitely not matured yet in the northern market. It is not without reason that the supermarkets are hesitant about expanding their range of melons, when they take up so much space and cannot offer any guarantees yet. Verwegen: “In contrast, plastic containers with processed melon are easy to stack and require a lot less space. In addition, this concept ties in better with the trend for smaller packaging, food services and ‘on the go’. The containers offer diversity, health and convenience, because the fork is even included. We see that this segment is expanding rapidly compared to the traditional melon segment, in which you buy whole melons. Over the last five years, a large part of the growth in consumer spending in the UK has been attributable to fresh cut.”

Interaction

Nevertheless, Verwegen has a critical comment about this fresh cut segment. The mixed packages do not always state which types of melon have been used. In addition, the northern European consumer often eats the fruit mix too cold, resulting in insufficient release of the aromas. “How can you know in that case that the tasty melon is a Piel de Sapo? A lot of progress can be made with good information. Think, for example, of information boards in the store, articles in store magazines and messages on internet and social media in which we link the convenience product to the original fruit. In this way, we can create a product experience and generate curiosity in the consumer for both product forms. The result? More sales and less unnecessary store losses. Our contacts with the northern European retail market reveal that this understanding of the need for product information about the melon product range is growing, but not yet sufficiently.”

Competition

Now that the range on offer is growing, the competition between the different types is also growing. There is more choice now, so alternatives are within easy reach. Salinas Torres: “Each local type will need to prove itself in the product range, both fresh and processed. Flavour is what really allows you to distinguish yourself. It is important to remember that you have only one chance at making a first impression. If the northern consumer decides to buy an Italian Netted instead of the Galia, then this type must immediately offer a different experience. A positive experience, if the consumer is going to buy this type again, because the consumer is most critical when it comes to the quality of the fruit. This makes the marketing of melons so different to vegetables; for example, if the flavour of a tomato is disappointing one week, the consumer will still place it in the shopping basket the next week.”

Future

Where are we heading? Both gentlemen agree: flavour and information. “And that we can act even better and faster on the wishes of the consumer,” adds Salinas Torres. “When it comes to local types, we should no longer listen only to consumers in the south. The sugar content, the taste experience, the aroma, the juice content, etc. are all properties that we are working on in melon breeding. We do this in close cooperation with the rest of the chain. And with respect for the traditional parameters of shelf-life and uniformity. In the past, these last two parameters were reserved exclusively for the export qualities and the local qualities focused more on flavour. We are now seeing an overlap developing: export qualities also need to excel in flavour.” ■



State-of-the-art in Tanzania

Seed production at Enza Zaden is performed according to strict hygiene guidelines. Sometimes these are tailored to specific crop/pathogen combinations. For example, the GSPP protocol focuses specifically on clavibacter in tomato. The company is also investing by other means in technology and people, to ensure that seed is produced according to the highest standards. A good example of this is the production station in Tanzania, which recently underwent further expansion.

Seed production

For Enza Zaden customers – growers and nurseries – healthy and high-quality starting materials are of the utmost importance. The lengthy process of achieving this starts during the setting up and further course of seed production. Particular attention is paid to diseases that can be transmitted to the crop via the seed. Well known examples of this include *clavibacter* and pepino in tomato, tobamoviruses in tomato and sweet pepper and CGMMV in Cucurbitaceae.

Hygiene guidelines

“The process of seed production includes many steps and actions,” explains Director Seed Production Manuel van Eijk. “Each of these steps and actions pose certain risks of disease transmission and spreading. We follow strict hygiene guidelines to minimise these risks. We use the GSPP protocol for tomato, sweet pepper, cucumber and melon, which was developed by France

and the Netherlands in 2010 to prevent *clavibacter* infection and is now the global standard for seed production facilities and nurseries. This protocol, in combination with a number of additional measures, also reduces the risks for other pathogens and crops such as sweet pepper, cucumber and melon.”

Good Seed and Plant Practices

GSPP stands for Good Seed and Plant Practices. The protocol provides a detailed process description, risk analysis and description of measures required to prevent infections and disease transmission. Examples of such measures include quarantine areas for packaging and plant materials that have not been disinfected, hygiene sluices in critical areas for disinfection of shoes and hands, special work clothing, and equipment to clean and disinfect packaging and transportation equipment.

Enza Zaden has been accredited for GSPP since 2010. The protocol stipulates an annual audit of the facilities where GSPP is implemented by an independent auditor. All facilities worldwide are inspected by the specialists from the Dutch quality service Naktuinbouw.

Tanzania

The production facility in Arusha, Tanzania, was set up in 2003 for the propagation of high-value crops. General Manager Wytze Salomons and Assistant General Manager Monique Salomons have been managing this facility since 2006 and describe what this currently involves. “Our main activity is the commercial seed production for tomato, sweet pepper, cucumber and melon,” explains the general manager. A small section of the company is dedicated to maintaining parent lines of these crops and producing seed for breeding purposes.”

Everything under one roof

When the Salomons first arrived in Arusha, the glasshouses, working area and offices covered an area of about 2 ha. “We doubled in size in 2007,” the general manager continues to explain. “The company was completely redesigned in 2010, due to the implementation of GSPP. This was coupled with the building of a corridor measuring 5,000 m², so that all departments can now be accessed from inside.”



Employee working in the new glasshouses build in 2017.

Monique Salomons ensured that this operation ran smoothly. “The implementation of GSPP had an enormous impact on the company,” she explains. “New facilities were added to ensure that hygiene was improved systematically, stricter segregation with corridors between the various business divisions and separation of entrances and exits with one-way traffic.”

“We literally wanted to have everything under one roof,” Wytze Salomons adds. “This means that the production employees only need to change when they arrive and leave, which significantly reduces the risk of transmitting pathogens. They are given clean work clothes every day, which always remain at the facility. Our professional launderette sometimes operates for 12 hours per day.”

Now that everything happens under one roof, the GSPP protocol also applies to other crops that are propagated in Arusha. “You cannot achieve any greater certainty about a hygienic method of work,” according to Monique Salomons.

“You cannot achieve any greater certainty about a hygienic method of work”

Human factor

A lot has also happened at a human level. Monique Salomons: “Many of the 240 employees have few qualifications and they know very little about disease transmission and hygiene. Therefore, everyone – including office workers – has received extensive training from lecturers at the local agricultural college, with support from the Netherlands. They now fully understand why they have received work clothing, why you cannot simply pop outside and walk back inside and why other procedures and disinfection measures are essential. Not much effort is required to keep the standard high and we always pass the audits with flying colours.”

Most recent expansion

The production facility expanded again in 2017. A further 6,000 m² of glasshouses – four divisions – were built, fitted with cooling systems. Wytze Salomons: “It is great that we can now cool the glasshouses for sweet pepper and tomato, because temperatures here are sometimes a bit too high for these crops. Other than that we are in the perfect location here: virtually on the equator and at a slight altitude. This ensures that both the temperature and the day length remain fairly constant. In combination with our modern glasshouses and substrate cultivation, this means that we can plant and harvest all year round. The facility is expensive due to the location, the special layout and the many high-tech provisions, but it is definitely worth the investment for the fruity vegetables that we propagate here.” ■

Partnership without boundaries

We are living in a world that becomes more global and digital by the day. We can travel wherever we want to go. If we are not able to travel, we can visit those places digitally, through the internet and Google Maps. 'Living in dark Africa' is an expression that is no longer applicable. Googling Nelson Mandela Road, Arusha brings you to the Enza Zaden Africa production site. Another Enza Zaden company that can be seen as a dynamic high-tech bee hive coming together as a blend of cultures, tribes and religion.

Such a blend requires a good partnership between people. It is built on trust, respect and cooperation. It takes time, understanding and a drive to get there. The core to achieve the partnership is to create an environment wherein everybody works towards and stays on the same road forward. Together realising the company's set goals. This requires great partnership. Especially when third world meets first world.

One goal

At the end of 2017, a new greenhouse was build at the Arusha site. Seventeen 40ft containers arrived at the site. Filled with materials needed to build this high-tech 6,000m² greenhouse. A temporary construction team of 70 Tanzanian men was put together. All working towards this one goal: finishing the greenhouse in time for planting. And they succeeded, by means of great partnership.

Producing excellent seeds

Now the greenhouse is finished, the current Enza Zaden Africa team takes on the challenge to make the project successful. Working with the latest technology on pad&fan cooling to create optimum production circumstances. To produce excellent seeds for the high value market.

Together we can do it


To be a partner in the Enza Zaden Africa team is a true privilege. There is great respect for culture, tribe, religion and nationality. Partnership that we experience here, is a great example of a successful partnership between first world technology and third world man power. It proves that no matter your background, culture, tribe, religion, nationality, together we can do it. ■

Monique Salomons is Assistant Station Manager at the Enza Zaden Production Station in Tanzania. Together with her husband Wytze Salomons she is responsible for this high-tech seed production location. Working together with local people has proven to be a great recipe for success.



The dynamic world of biodiversity

Biodiversity is a trend worldwide. In all layers of society, there is a need to protect our fragile planet and its natural resources. The United Nations has even nominated the decade 2011-2020 the 'decade of biodiversity'. So what's going on in this dynamic world of diversity?



Biodiversity embraces the total diversity in nature, so microorganisms, plants and animals. "In plant breeding, biodiversity stands for the wild relatives of our food crops as well as for landraces that have adapted perfectly to their surrounding natural habitat over centuries," explains Gene Bank Manager Mariann Börner. "But it also stands for the new diversity created by a breeder with his crossings and selections during the breeding process. Biodiversity is the basis and the result of plant breeding. A breeder is only as good as the genetic diversity of the plants he breeds. Biodiversity is thus the basis of our food."

Biodiversity and future challenges

For a breeder, the natural occurring diversity is the most important source of his work. Here valuable new traits can be found and integrated in a new variety. Traits like resistance to new diseases or traits that help adaptation to new production systems. Besides resistance, productivity, colour, shape and taste, other traits that may also be important in the near future are present.

Conserving our plant biodiversity can help us tackle future global challenges like natural and societal changes. For example, different natural habitats, new production systems, new evolving plant diseases, climate change and food security. "With an ever-changing environment, we may find the answers amongst the wild relatives. But biodiversity also enables us to adapt our products to the changing demands of the end-consumer. Whenever a breeder wants to look for new traits, he starts his journey through his own genetic diversity."

Nikolai Vavilov

The Russian researcher Nikolai Vavilov is at the very heart of the gene banks. In the 1920's of the last century, he worked for the Institute of Applied Botany and New Crops in Petrograd – today Saint Petersburg. The main goal of this institute was to collect plant diversity worldwide and to study this for the benefit of plant breeding.

Vavilov was the first researcher to travel to no less than five continents in search of crop seeds, starting in the Southern regions of Russia. In his life, he organised or took part in over more than a hundred expeditions. Moreover, he established over four hundred research institutes in a short time. Vavilov conserved the seeds he collected in the institute he worked for. These plant collections formed the basis for new theories on how cultivated varieties develop. This laid the foundation of present-day plant breeding and of one of the largest gene banks in the world.



The Svalbard Global Seed Vault in the Norwegian permafrost is a perfect example of the added value of gene banks.

Gene banks

However, one might ask whether breeding with cultivated varieties harms biodiversity. The gene pool of a cultivated variety is less diverse than that of its wild cousin. In fact, the reverse is true: breeders bring traits together and thus help nature create even more diversity. Furthermore, the plant breeding sector plays an essential role in the support of global gene banks.

Through climate change, urbanisation and other social developments, plant genetic resources, like the ancestors of the vegetables that are so familiar to us, are at risk. Every day, species are lost. Over a hundred years ago, the first public and private gene banks were created to protect endangered plant species. Plant material, usually in the form of seeds, is stored here at a low temperature and low humidity. Such initiatives are vital for the survival and innovation of plant breeding. Breeding companies therefore support the activities of the global gene banks with their expertise. "We exchange knowledge, study how we can optimally protect biodiversity and analyse the wild material to see what traits they possess. We also support gene banks in their seed production to protect the plant genetic resources. Together, we ensure that we maintain genetic diversity within society."

National collections

Gene banks thus guarantee a living environment for the plant. But this is also where the challenge lies. Every country is proud of its own biodiversity and wants to keep it for itself. The result? A vast number of national collections, with no one knowing exactly what the other country has to offer. "Each country has its own information system with traits that they record. Furthermore, many collections are not accessible to everyone and no one is exactly sure about the extent of the biodiversity. If the advantages and the potential of gene banks are not immediately visible, how can you then justify the necessity for the high, long-term investments?"

Global effort

The Svalbard Global Seed Vault in the Norwegian permafrost is a perfect example of the added value of gene banks. The vault was set up to guarantee a backup of our plant biodiversity in the case of drought, disease or catastrophes. Many countries save a backup of their seeds in this joint gene bank. In September 2015, the first extraordinary request was made: the Syrian gene bank, formerly based in Aleppo, requested back thousands of crop samples because of the effect of the Syrian war. These samples

are now stored in a gene bank in Lebanon to safeguard the agricultural heritage and its independent use. Fresh material will be brought back to the vault after successful regeneration. "Assuming that the doors of Svalbard are not opened for the next 200 years, the importance of this biodiversity backup showed much sooner. Once again, it demonstrates that conserving biodiversity is a global effort.

Politics

With growing awareness of biodiversity in society and increasing numbers of interested parties, the subject is becoming a more prominent feature on political agendas. The Convention of Biological Diversity (CBD), the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Nagoya Protocol stimulate and regulate the joint protection of

biodiversity, its sustainable use and fair distribution of the benefits for the use of material. But there's still a long way to go with new international legislation. "We all agree that the protection of plant biodiversity, its use in plant breeding and the fair and equitable sharing of benefits should be a global effort. Currently the political and juridical field is scattered. Access to new germplasm is regulated by country specific laws worldwide as well as by European access and benefit-sharing regulation. Our goal is to get a uniform and practical guidance, that is accessible in English for all countries on how to access germplasm and how to negotiate the conditions of use. For many years, Enza Zaden has been actively sharing practical experiences on political platforms at Dutch, European and global level. We are going in the right direction." ■

The origin of biodiversity

People have been breeding and selecting plants for decades. But somewhere there is an origin. Lettuce for example, originates in the Mediterranean, cucumbers and the cucumber family have their origins in India and Southeast Asia, while peppers and tomatoes come from South America. It is here where the crop once originated centuries ago that we find the greatest biodiversity for that particular crop.

From the place of origin, the crop wandered all over the world, adapting through evolution to the different living conditions. In addition, farmers sometimes worked with a certain variety for a long time: they harvested the seeds and then sowed them for the new crop. This is how the many different varieties originated and how biodiversity expanded over the centuries.





Fair Planet

Nuri sells his tomatoes in the Butajira market. Amir, Fair Planet training coordinator, joins the market day.

What a difference in a period of just five years. In 2012, Dr. Shoshan Haran started the non-profit organisation Fair Planet to increase food and nutrition security, and provide new economic opportunities for smallholder farmers in developing countries. Now, the results of the project are very visible.

Bridging the Seed Gap

Dr. Shoshan Haran used to work for an Israeli seed company where she learnt how varieties developed for a number of different growing conditions delivered a solution to many farmers all over the world. Haran: "At the same time, I was aware that malnutrition and hunger were rife in some parts of Africa. This was what prompted me to set up Fair Planet with the idea to bridge the gap between the leading seed companies and the smallholder farmers in hunger stricken countries."

Pioneering

The first step of the project was to identify tomato varieties that significantly increased local farmers' yields and proved what professionals in the seed industry know so well: high-quality seeds are the key success factor for any farmer in the world. "The three pioneering seed companies, among which Enza Zaden, trusted and joined us from day one and made our open-aid platform possible. Enza Zaden is providing its best varieties for the benefit of the Ethiopian farmers, while taking its share in this growing seed market." Other seed companies joined the project at a later stage, as did the Netherlands Enterprise Agency (RVO) which supports the capacity-building programme for smallholder farmers.

Training centres

The project started with the tomato trials in Butajira, the southern central part of Ethiopia. The first results were already very promising as the quality hybrid varieties turned out to yield five times as many tomatoes as the average national harvest. "Following this proof of concept, we expanded the programme and established three training centres in collaboration with one of the leading agricultural universities in the country Haramaya University, and the regional offices of agriculture. They play a major role in increasing productivity and delivering technology transfer and capacity development."



Meseret

Meseret from the Harari region in East Ethiopia is a widow and a mother of four children. She joined the Fair Planet training programme last season, and grew tomatoes on her small plot of 750 m². She harvested 2,800 kgs of high quality tomatoes and made a profit of €670. Meseret: "My life has changed for the best. I used the money I earned to buy two oxen and will continue with vegetables! Batam Amsa-Genalo Fair Planet."



Nourishing Nuri

Nuri is one of the 600 Lead Farmers that have been trained to date by Fair Planet. He lives with his wife and their eight children in Mamuja, a tiny village near Butajira. Nuri has grown tomatoes of a local variety before, but his results were very poor. When Nuri joined the training programme and gained access to high quality seeds, he dramatically improved his farming productivity: from his small tomato plot of 1650 m², he produced 10,000 kgs of tomatoes, a yield that is eight times higher than average in Ethiopia.

The average household income in rural Ethiopia is about €700 per year, whereas Nuri's profit, from his first production season of high quality tomatoes, was €700. In the second training season, Nuri grew more tomatoes and saved more than €2080! With this money, he fixed his house and sent his kids to school and his elder son to University. Three years after joining the programme, Nuri planted 400 grafted avocado trees; built a fishpond and a hen house and continues to grow high-value vegetables. From being a subsistence peasant, Nuri became an agribusiness entrepreneur.

Nuri used the profits from his vegetable plot to buy and plant 400 grafted avocado trees and to build a fishpond and a hen house to support his family.

"The results are much better than we were hoping for: many of the smallholder farmers generated profits – in only one production season that doubled their annual income – allowing them to reach sustainable economic growth and improve their families' livelihood. Principally, they can thus break the trap of hunger and poverty, aspiring and achieving much improved lives."

The training centres are located in the three main agro-climatic regions of Ethiopia. In each centre, professional variety trials are performed, nowadays not only for tomato anymore, but also for pepper, onion and cabbage varieties. The concept is still the same as five years ago: high quality seeds from the partnering seed companies are tested to identify the best performing varieties for local needs. "Moreover, we have developed a unique extension model and now train hundreds of Lead Farmers, every year, how to improve their productivity with minimal changes to their traditional production practices."

Double income

And the results don't lie. Due to better seeds and improved farming practices, smallholder farmers in Ethiopia are able to increase their crop productivity more than fivefold while improving their produce quality and marketability. They benefit from improved nutrition for their families, and are able to provide fresh and locally produced food for their communities.

Spreading the knowhow

Currently a novel '1:10' extension methodology is developed that will upscale the impact of the programme and spread the knowhow from each Lead Farmer to ten neighbouring farmers. "Our aim is to reach about 50,000 smallholder farmers. However, the need is much greater: the challenge that we face is how to reach the millions of smallholder farmers in this country. To address this challenge, we have recently met with the Ethiopian Minister of Agriculture, Dr. Eyasu Abraha, to discuss how the programme could be implemented on a national scale, in collaboration with his Ministry." Haran concludes with her pride of the Ethiopian smallholder farmers, who make the best out of these high quality seeds. "I am sure that all participating seed companies join our pride with what we have achieved as of to date. The success of Fair Planet depends on their expertise and goodwill and it has paid off."



Flavour and Sensory Analysis

Within Enza Zaden we do a lot of so called post-harvest research. This entails research focused on taste, shelf-life, fresh-cut quality, nutrition and cold tolerance of our products. With the data we get from these analysis we can further improve our products and attune them to consumers' wants and needs. We looked up some facts on how we experience taste.

Some facts

1. How it all started

During the 1940s and through the mid-1950s the first research in food acceptance took place at the U.S. Army Quartermaster Food and Container Institute in Chicago, Illinois. The military found that adequate nutrition, as measured by analysis of diets or preparation of elaborate menus, did not necessarily represent food acceptance by military personnel. These initial studies acknowledged research on consumer acceptance.

2. Our brain

Sensory evaluation is the scientific method used to evoke, measure, analyse and interpret those responses to products as perceived through the senses of sight, smell, touch and hearing. The brain can make adjustments based on feedback from the muscles and the jaw while chewing, allowing for controlled, and smooth movements. This also tells us about the internal structure or texture of the product.

3. Effect of colour

If a colour difference exists, the brain may signal that a flavour difference exists when in fact, it is not there when the visual differences are masked. For example, if a taster receives two cookies and one is darker in colour, they may perceive the darker one to be sweeter, when in fact it may not be.

4. Taste buds

Gustation is a chemical sense mediated by structures that contain taste buds. Taste buds are located on the surface of the tongue, in the mucosa of the palate, and on areas of the throat. General chemical sensitivity in the mouth is tactile or irritation sensations that are felt in areas where there are no taste buds. Examples of these general chemical sensitivities are astringency or drying from tannins in foods, and the cooling effects of menthol, or the warmth or irritation from hot pepper.

5. Sweetness blocker

Gymnema Sylvestre blocks the sweet receptors, such that sweet foods do not taste sweet anymore. It is often used in diets to lose weight.

6. The strongest will survive

In a mixture of quinine and sucrose, both ingredients will be partially suppressed by the other. A balanced sweet/sour wine will taste very sour after eating a sweet dessert, while the same wine would seem to lack sourness, and taste too sweet when taken with a salad having a vinegar dressing.

7. Sweet, sour, salty, bitter and umami

The four classical tastes are sweet, sour, salty, and bitter. These qualities suffice for most purposes. Other suggested tastes are metallic, astringent and umami. Umami is an oral sensation stimulated primarily, but not only, by monosodium glutamate. Astringency is a chemically induced complex of tactile sensations. Metallic taste is little understood.

8. Smelling vs. chewing

Smelling an aromatic food through the front of the nose may produce a different experience than when the aroma is perceived during chewing of food.

EVENT CALENDAR



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MAR

APR

MAY

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FEB
WEEK 5

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Thessaloniki | Greece

FEB
WEEK 6

Fruit Logistica (E)
Berlin | Germany



FEB
WEEK 6

Demo Day Culiacan (FD)
Culiacan | Mexico



FEB
WEEK 8

Horticonact (E)
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FEB
WEEK 8

Agra International (E)
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JUN
WEEK 24

European Tomato Forum (C)
Düsseldorf | Germany

JUN
WEEK 24

House Fair The Netherlands (E/FD)
's-Gravenzande | The Netherlands

C = Conference | D = Demo | E = Exhibition | FD = Field Day | ● = Organized by Enza Zaden



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Holambra | Brazil



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AMSAC annual meeting (C)
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Asia Fruit Logistica (E)
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Allonnes | France

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Field Day Germany (FD)
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More information about our events on enzazaden.com

Colophon

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the power of smart innovations

ENZA ZADEN



Are you looking for opportunities in your market? Reliable and outstanding varieties? Or innovative solutions for your customers' needs?

On a daily basis our breeders work on developing strong vegetable varieties. Totally attuned to the latest market demands.

We do research on disease resistances, yield, shelf-life, but also on taste, fragrance, texture and colour of vegetable varieties. The results: smart innovations that are a win-win situation for the whole chain. From the grower to the consumer.

Teamwork

So, we are driven by customers' demands and needs. And we aim to continuously boost vegetable categories with innovative products.

But we can't do this on our own. Teamwork with all partners in the chain is key to achieve the best results. Together we can create smart innovations for consumers and be able to develop new opportunities for each other.



the power of smart innovations
the power of Enza Zaden



Visit us!
Fruit Logistica Berlin
7-9 February 2018
Hall 1.2
Booth **C-08**

Britt Laske
Secretary Production

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