TERRABIO

Molecular diagnostics without a lab

For agro and food processing sector

2022

www.terrabio.tech

The first genetic analyzer dedicated to the agri-food market

Terrabio is a biotechnology company developing a **fully automated pathogen detection platform** for use at the site of sample collection, which offers unprecedented ease-of-use, sensitivity, and breadth of pathogen detection.

99.9%

Terrabio solution **is effective in almost 99.9%** in the detection of any pre-defined pathogen, which will greatly help food processors, vets, grains, fruit and vegetable producers.

Terrabio team

Marcin Babilas

Chief Operating Officer

A graduate of the Agricultural University in Poznań, a manager with multi-year experience in the agro and agri-food processing industry. Worked as a manager, among others, for Nutripol, Cefetra, Energa, ZT Kruszwica, Agrii .

Bartosz Pencakowski

CEO/CTO, co-founder

Graduated from Medical University in Wroclaw, scientist at Pharmaceutical Biotechnology Institute. Researcher and lecturer in Clinical Hospital and Medical University in Wrocław.

Grzegorz Bonikowski

Head of the Construction Team

Graduated from Wroclaw Technical University, constructor and programmer of EMBEDED. For over 12 years Independent Chef Costructor in IASE.

Marta Stafiniak

Molecular Biology Specialist

Graduated from University of Environmental and Life in Wroclaw, a scientist at Pharmaceutical Biotechnology Institute with more than 10 years of experience in molecular biology.

Agata Kaczmarek - Pieńczewska

Microbiologist

A graduate of the Faculty of Plant Protection at the University of Life Sciences in Wrocław, co-author of numerous scientific publications. More than 15 years of experience as a scientist in Wroclaw University of Environmental and Life Sciences, Wroclaw.

Supervisory Board

Beata Turlejska

Leonarto VC

Dawid Wesołowski

EVIG Alfa

Karol Hop

Leonarto VC

The problem

Pathogens decrease the productivity of agriculture and food industry. The EU is commited to reducing pesticidesusage.

! Decline in biodiversity due to pesticide use.

CAUSE

Pathogens: Viruses, bacteria, fungi i parasites

Current diagnostics do not match the needs:

- **Lenghty** – from 3 up to 21 days or even more
- **Complex** – requires delivery to a laboratory and work of a lab staff
- **Expensive** – from 35 USD to 165 USD for test for one pathogen
- **With gaps** – missinig test for many pathogens

Source: own analysis based on: materials of International Society for Plant Pathology, Mandrich, L. (2014). Endocrine disrupters: The hazards for human health. Cloning & Transgenesis; M. Grotowska,at al., Influence of pesticides on human health, Pomeranian J Life Sci 2018, „Food Safety Testing Market", interviews, European Environmental Agency (EEA): "The state of soil in Europe"

Outcome

up to 80%

Low production efficiency

Losses in yields and in cold storage due to pathogens.

~ 40%

Non-ecological use of pesticides

Decrease in mineral substance in soil in the EU in the last 60 years (soil degradation).

1 mln

Human and animal diseases

Europeans suffer from consequences of food contaminations.

Our solution - technology

Terralyzer® + dedicated tests

Terrabio patented solution

- Portable analyzer
- Freeze-dried assays
- Diagnostic and prognostic algorithm

Scope of analysis

Any samples with DNA can be tested:

Plant elements, animals tissues and secretions, water, soil and meat.

TESTING PROCESS

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Sampling (done by end user)	Input sample into tube 1 with buffer A	Insert tube 1 into the analyzer (DNA isolation)	Insert DNA material into tube 2 with buffer B	Automated analysis	Result and suggested action

60 min

90 min

Our solution: advantages

Terralyzer® will bring savings and better food safety.

The result in just 90 minutes
On site testing, small and light device

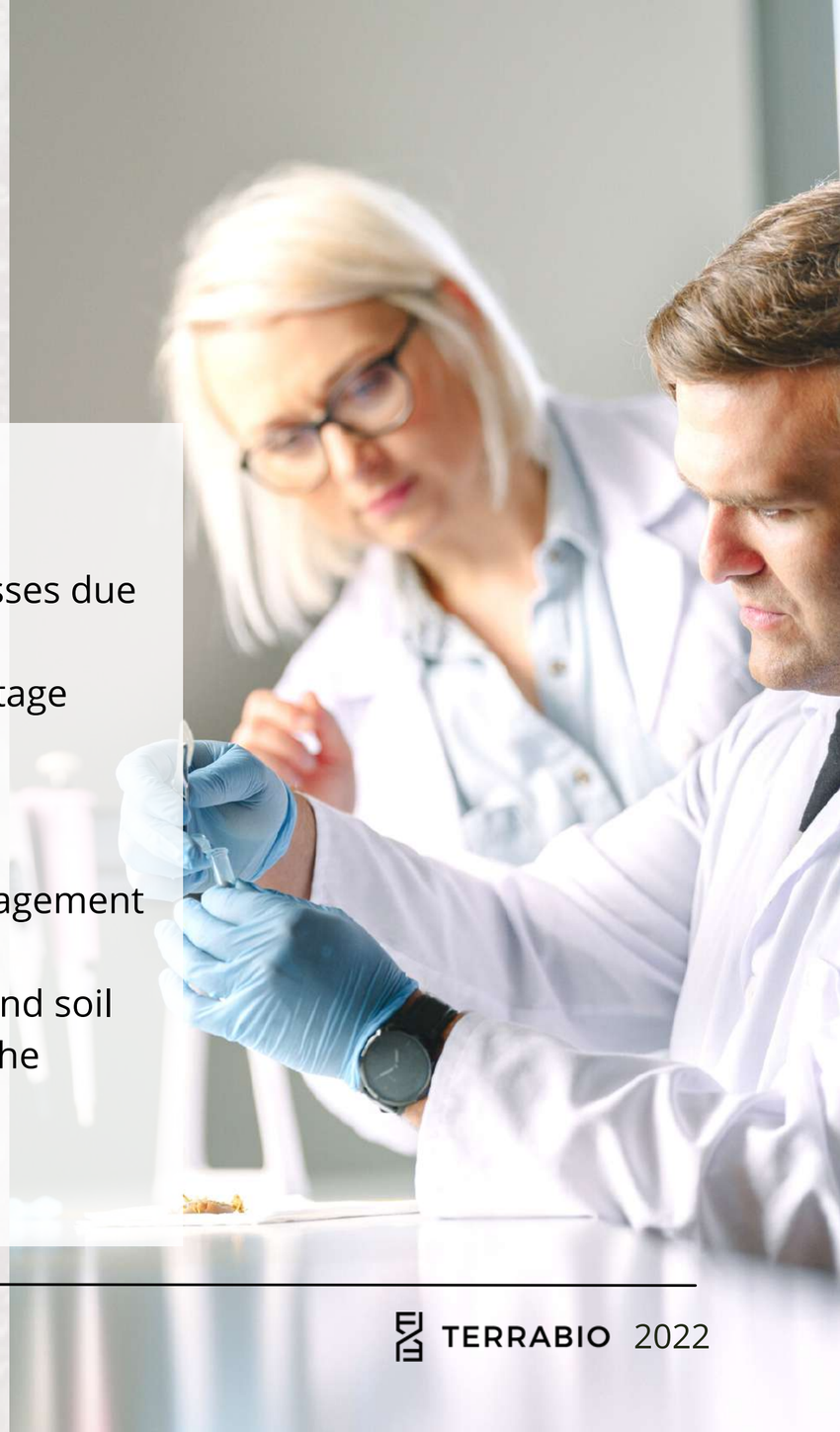
Simple to use and operate
Closed operational system, many pathogens in one assay, software decision support

Precise detection
Early detection of pathogens through qPCR technology

Dedicated tests
Assays for pathogens relevant for dedicated group of customers

Beneficts for end-users

1. Financial savings from reduced risk of losses due to disease
2. Elimination of the pathogen at an early stage (before symptoms appear)
3. Rapid production quality control
4. Lower and sustainable use of pesticides
5. Faster disease detection and better management of disease outbreaks
6. Reduced environmental contamination and soil degradation, adaptation of pesticides to the pathogen - meeting EU targets



Value proposition

Rapid pathogens detection generates savings and improves food safety

Analyzer, assays, algorithm

Rapid pathogen detection

Precise disease outbreak management, quicker decisions with food processing

Savings, food quality and safety improvement

TERRABIO

- 3 mln potential customers in EU
- Way to decrease negative environmental impact of pesticides
- Limits food wastes
- Helps achieving the new goals of the Common Agriculture Policy by the EU
- Botrytis fungus attacks 500 plant species and leads to more than 10 bn USD losses globally
- qPCR – the same technique we detect COVID-19

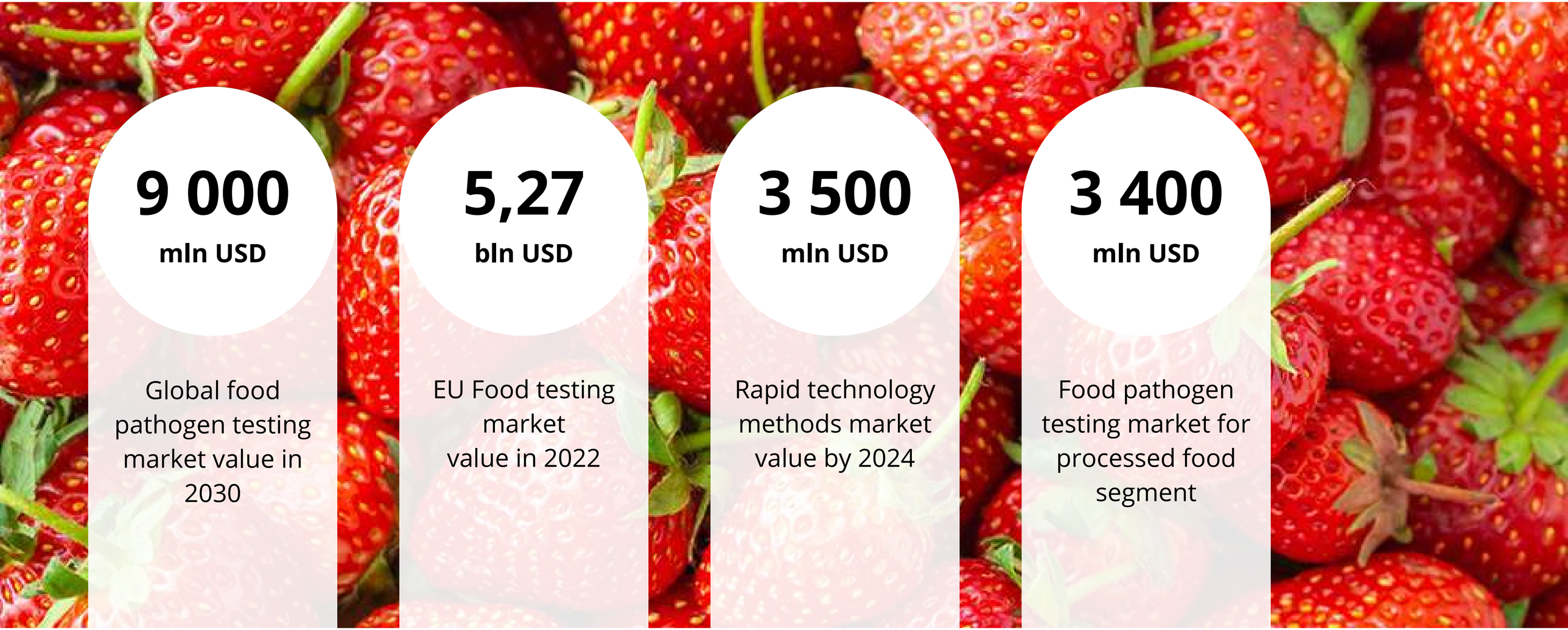
Main competitors

	Terrabio Terralyzer®	Biomolecular systems Mic qPCR Cycler	Nippon Sheet Glass PicoGene PCR1100	Chai Open qPCR	Anitoa Systems Maverick	Bioer Technology LineGene Mini	MiniPCR
Entire process in the device	✓	✗	✗	✗	✗	✗	✗
Speed of heating	**20°C/s**	5°C/s	sectoral card heating	5°C/s	5°C/s	5°C/s	2.4°C/s
Heating technology	**resistive heating**	induction	microflores	peltier	peltier	peltier	resistive heating
Volumen of reaction	**20-200 µl**	5-30 µl	15-20 µl	10-50 µl	10-60 µl	10-100 µl	10-200 µl
Weight	**0,9 kg**	2 kg	0.6 kg	4 kg	1.0 kg	6.5 kg	0.5 kg
Price	**$1.600**	$12.000	$7.800	$7.000	$4.500	$2.500	$650

Other on-site test technics: Rapid strips: relatively cheap, but with low pecision of the result. Microchips: very expensive, prices from 12.000 USD and more.

Test conducted in lab long-lasting, complex, expensive: qPCR, microbiologic (lab culture), antibody tests, ELISA and Sanger's sequencing.

The market



9 000
mln USD

Global food pathogen testing market value in 2030

5,27
bln USD

EU Food testing market value in 2022

3 500
mln USD

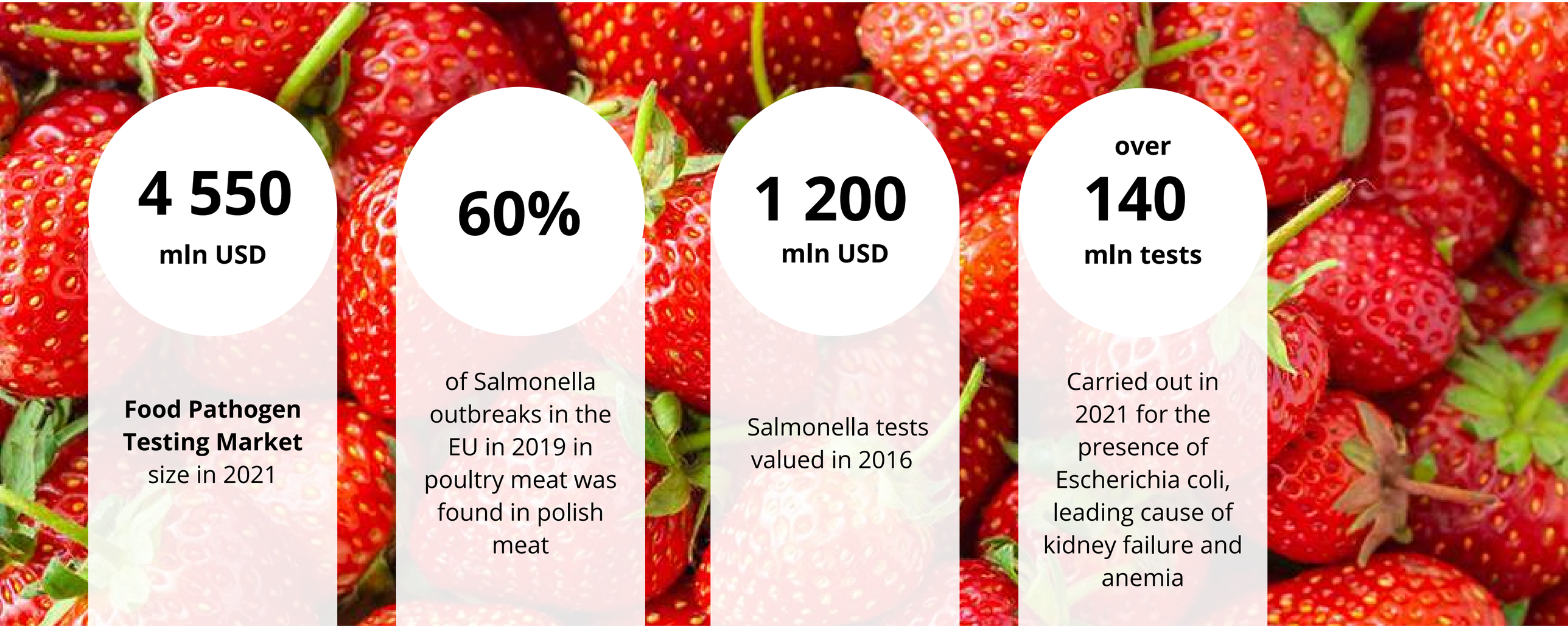
Rapid technology methods market value by 2024

3 400
mln USD

Food pathogen testing market for processed food segment

Source: https://www.gminsights.com/industry-analysis/food-pathogen-testing-market

The market



4 550
mln USD

Food Pathogen Testing Market size in 2021

60%

of Salmonella outbreaks in the EU in 2019 in poultry meat was found in polish meat

1 200
mln USD

Salmonella tests valued in 2016

over
140
mln tests

Carried out in 2021 for the presence of Escherichia coli, leading cause of kidney failure and anemia

Source: https://www.gminsights.com/industry-analysis/food-pathogen-testing-market

Key area of Terrabio interest: food safety

Safety in the poultry sector

Poland is responsible in over **60%** outbreaks of Salmonella in poultry meat in EU. This is critical for Polish meat exports to improve safety of their products.

Business case: poultry industry

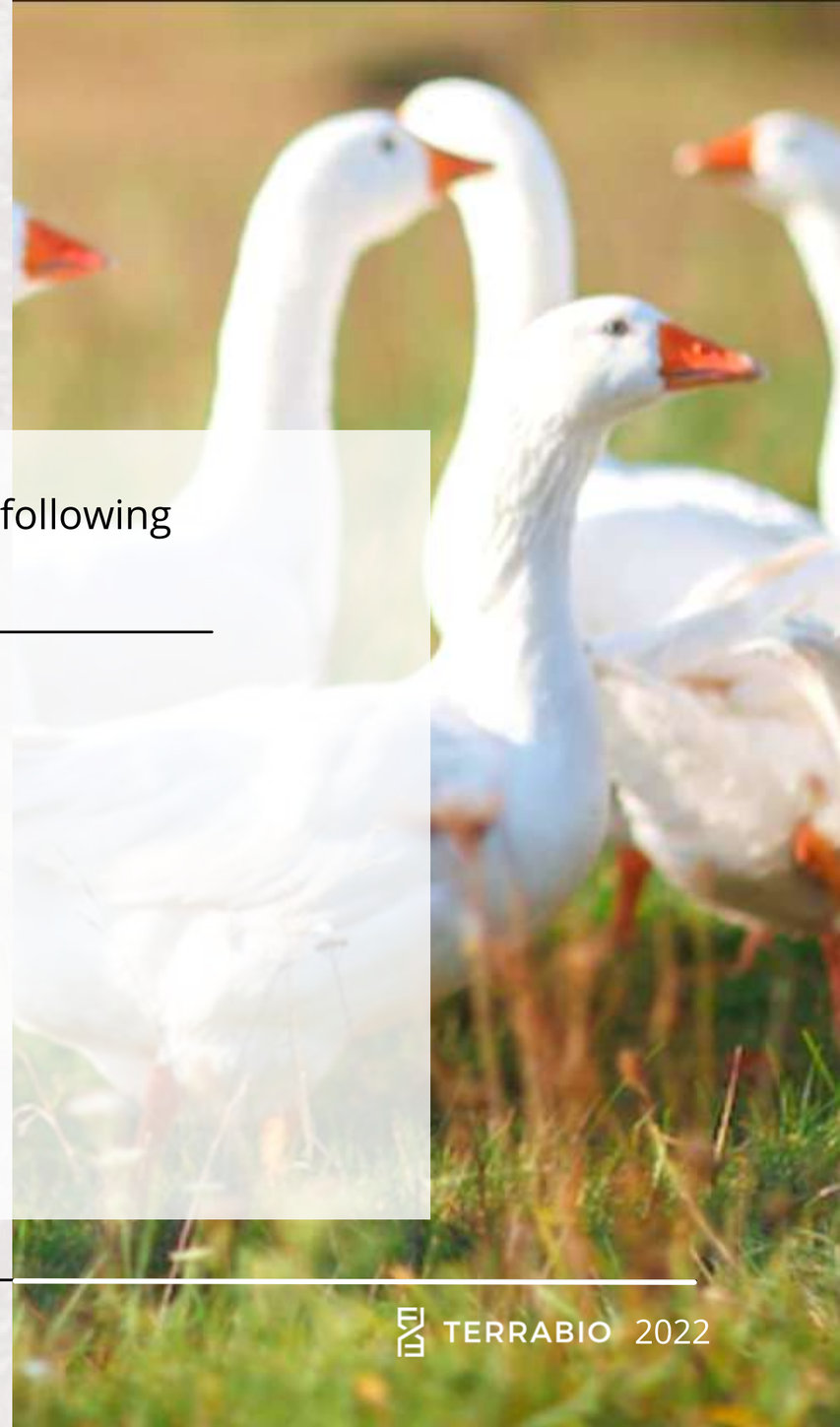
1 poultry processing factory
AVG number of running tests per year: **5 000**
AVG number of Terralyzer's needed: **10**
AVG testsprice: **120 [PLN]**
AVG revenue: **670 000 [PLN]**

Business case: Water safety tests

Water safety tests are crucial in food production proces
AVG number of water tests per year / Poland: **8 160**
AVG price per water test: **120 [PLN]**
AVG revenue: **979 200 PLN / per year**

Controlled detection of following pathogens:

- Salmonella
- Listeria
- Campylobacter
- Escherichia
- Enterococcus
- and more...



Key area of Terrabio interest – agro

Strategic partnerships

Cooperation with market leaders who offers products or services for farmers in **Poland**, **EU** and **US** such as AmPlus, Agro Efekt, Pop Vriend, Animal Health International, 1385 companies in Poland in food processing sector.

Market potential in numbers

TAM: 10,5 million farms in the EU
SAM: 66% of them had less than 5 ha of agricultural land and only7% had more than 50 ha of agricultural land (735 000 farms),
SOM: 10% of SAM (73 500) * AVG Reve per farm
AVG Revenue per year = 588 MLN PLN / per year

Key corps in EU:

Softfruits:

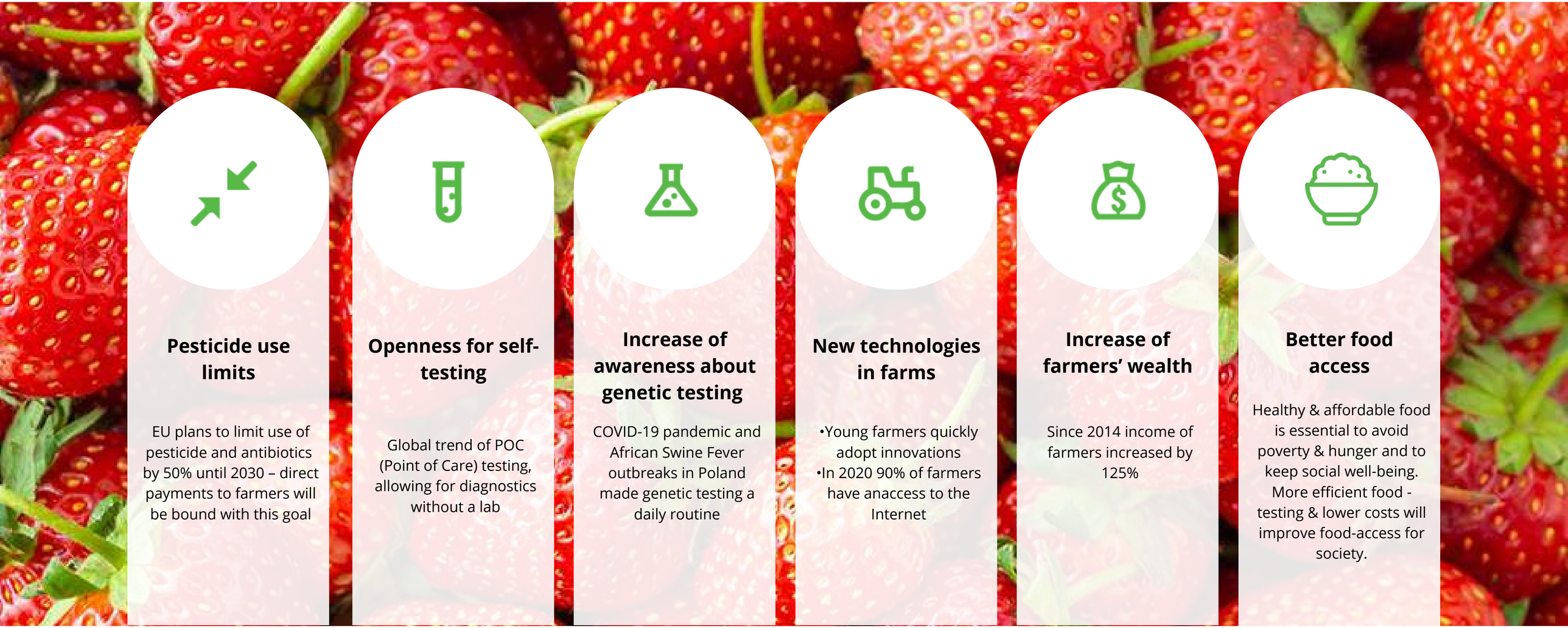
Strawberries |Plums | Pears | Blueberries

Vegetables - most important ones:

Potatoes | Lettuce | Onions | Cabbages | Carrots

Nuts producers

Broader impact: What the future looks like?



Pesticide use limits

EU plans to limit use of pesticide and antibiotics by 50% until 2030 – direct payments to farmers will be bound with this goal

Openness for self-testing

Global trend of POC (Point of Care) testing, allowing for diagnostics without a lab

Increase of awareness about genetic testing

COVID-19 pandemic and African Swine Fever outbreaks in Poland made genetic testing a daily routine

New technologies in farms

•Young farmers quickly adopt innovations
•In 2020 90% of farmers have anaccess to the Internet

Increase of farmers' wealth

Since 2014 income of farmers increased by 125%

Better food access

Healthy & affordable food is essential to avoid poverty & hunger and to keep social well-being. More efficient food - testing & lower costs will improve food-access for society.

Company development stages

2018

START

Concept validation

Company set-up

2019

Analyzer technology development

Patent submission for elements of analyzer

AcquiringVC investor

Financial grants from Horizon 2020 – Phase 1

2020

Fusarium spp. and ***Botrytis cinerea*** tests development

R&D infrastructure purchase

Patent submission for starter sequence (tests)

3 prototypes development v.1.0 – final tests ongoing

Finalists of Innovation Prizes Poland 2020

Finalists of EIT Seedbed

2021

Concept of Terralyzer 2.0 – monoplexing vs multiplexing

Food safety tests development;

Signing a cooperation agreements with a partners from the agro-industry and food processing industry

Patents:

- Heating & detection system patent
- Assays composition and primer sequences

Trademarks:

- Terrabio™
- Terralyzer™

Prototype:

Collaboration:

- TopFarms
- Amplus
- Indykpol
- Experts from IUNG –Institute of Soil Science and Plant Cultivation

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By 10.2022 total outlays amounted:

0,6 mln EUR.

Main sources:
VC, Idustry inwestor, Business Angel

TERRABIO 2022

Terrabio development schedule

2022

- Terralyzer 2.0: validation
- Food safety tests validation and certification
- Soft fruits and Vegetables tests development
- Patent application EU/US/Poland: detection tests

2023

- Commercialization of Terrabio technology, Expansion in the EU
- Reaching new sector: veterinary diagnostics
- Terralyzer 2.0: CE certification

2024

- Terralyzer v3.0 concept
- Reaching new sector: vinery
- Partnership in North America: market expansion
- Patent application for developed tests

2025

- Reaching new sector: diary industry
- Reaching new sectors: olives, citrus
- Terralyzer v3.0 development and certification
- Improvement of cloud services and data analysis systems
- Patent application for developed assays

Commercialization plan - company roadmap

2022	2023	2024	2025
Locating the first batch of second-generation Terralyzer prototypes with our commercial partners: **AgroSmartLab, Serwis Plus**	Sales development **in Poland**	Sales development **in EU**	
First sale of assays in Poland	Signing at least 3 business agreements with partners in Italy, Spain and the Netherlands: **Tepro**, **Pop Vriend**, **Spontella**, **Coldiretti**	Entry to new sectors: **dairy industry, olives, citrus, almonds and organic production**	
Start negotiations with business partners on commercial cooperation in Poland (e.g. Syngenta, Procam, HZPC, TopFarms, Alab, Agrii)	Signing min. 4 contracts with distributors from Germany, France and Benelux: **Unifer Intl. GmbH**, **IMV Technologies**	Sales start in USA and **Australia**	
New markets, new opportunities - food processing sectors (Salmonella tracing, meat processing, farms welfare)	Continuation of patent processes in the US and EU, signing first agreements with distrubiutors: **Animal Health International**, **BirdX Inc**		

Investment needs

€ 1 200 000

Funding needs	Purpose
€ 330 000	Completion of R&D work (including software licences)
€ 120 000	Certification of Terralyzer® and first assay panels (CE, IFS/Global GAP)
€ 180 000	International patent protection / patent cloud
€ 570 000	Commercialisation including production line, team new members
€ 1 200 000	**TOTAL**

TERRABIO

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