



Innovating to feed 9 billion people in 2050

Providing adequate safe, nutritious and affordable food in a sustainable manner

Innovations for a **better** world.

 **BUHLER**

Our global market is changing.



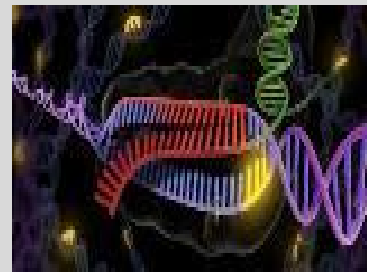
Technology is unlocking opportunities....



Smart agriculture



IoT, Data Services, AI



**CRISPR CAS/
Synthetic Biology**



Blockchain



Logistics transparency



**Real-time
Compositional Analytics**



**DNA sequencing
and tracking**



MOOCs

Undernutrition

159 million
children
stunted

Bühler 2018 | Ian Roberts | IOAM Nairobi | 23rd October 2018



HAS OBAMA SOLD OUT TO THE BANKS?

MAY 14, 2012

Newsweek

**When I
Grow
Up, I'm
Going
to Weigh
300 Lbs.
Help!**

P. 32

MELINDA
GATES'S BIRTH-
CONTROL
BOMBSHELL

BILL MAHER
REMEMBERS
JOHNNY
CARSON

THE RAW
COURAGE OF
CHINA'S
BLIND
FUGITIVE



How do we feed our gut microbiome?

- 1-3 % of body weight
- 500 - 1000 types in healthy people
- 36000 different types
- highly influenced by diet
- metagenomic patterns for auto immune conditions
(ulcerative colitis, crohns disease or celiacs)

Food safety



GMP/Hygienic Design

Reduce risk and clean efficiently



Validation of processes & Kill Steps



Non-Thermal Processing

Maintain the nutrition



Selective Kill Steps

Maintain the good bacteria

A large group of yellow chicks, likely in a farm setting, filling the background of the slide.

Antibiotic resistance to become a major issue

50 000
deaths/ y in
EU & USA

2/3

of global antibiotic use is
in livestock production

USD 100 trillions

GDP loss due to antibiotic resistance by 2050

New Scientist

7 December 2015

Resistance to last-resort antibiotic has now spread across globe

THE WALL STREET JOURNAL. 4 March 2015

McDonald's to Curb Antibiotics in Chicken

27 May 2016

The Washington Post

The superbug that doctors have been dreading just reached the U.S.

(I) INVESTOPEDIA

29 July 2015

Costco Dumps Chilean Salmon Over Antibiotics Usage

South China Morning Post

24 June 2015

Chinese government must tackle the overuse of antibiotics



INDEPENDENT

7 February 2016

Poultry farmers 'using more antibiotics linked to resistant food poisoning bugs'

Crisis

The AMR superbug is among us

Challenges

**Protein gap: 50%
protein production
increase necessary
until 2050**

Already today feeding the world exceeds the limits of our planet



1.8 Planets

25%

of global
GHG emissions
is from agriculture

71%

of total
Water usage
come from agriculture

1/3

of global energy
goes into food
production

1/3

of all food
produced
is waste

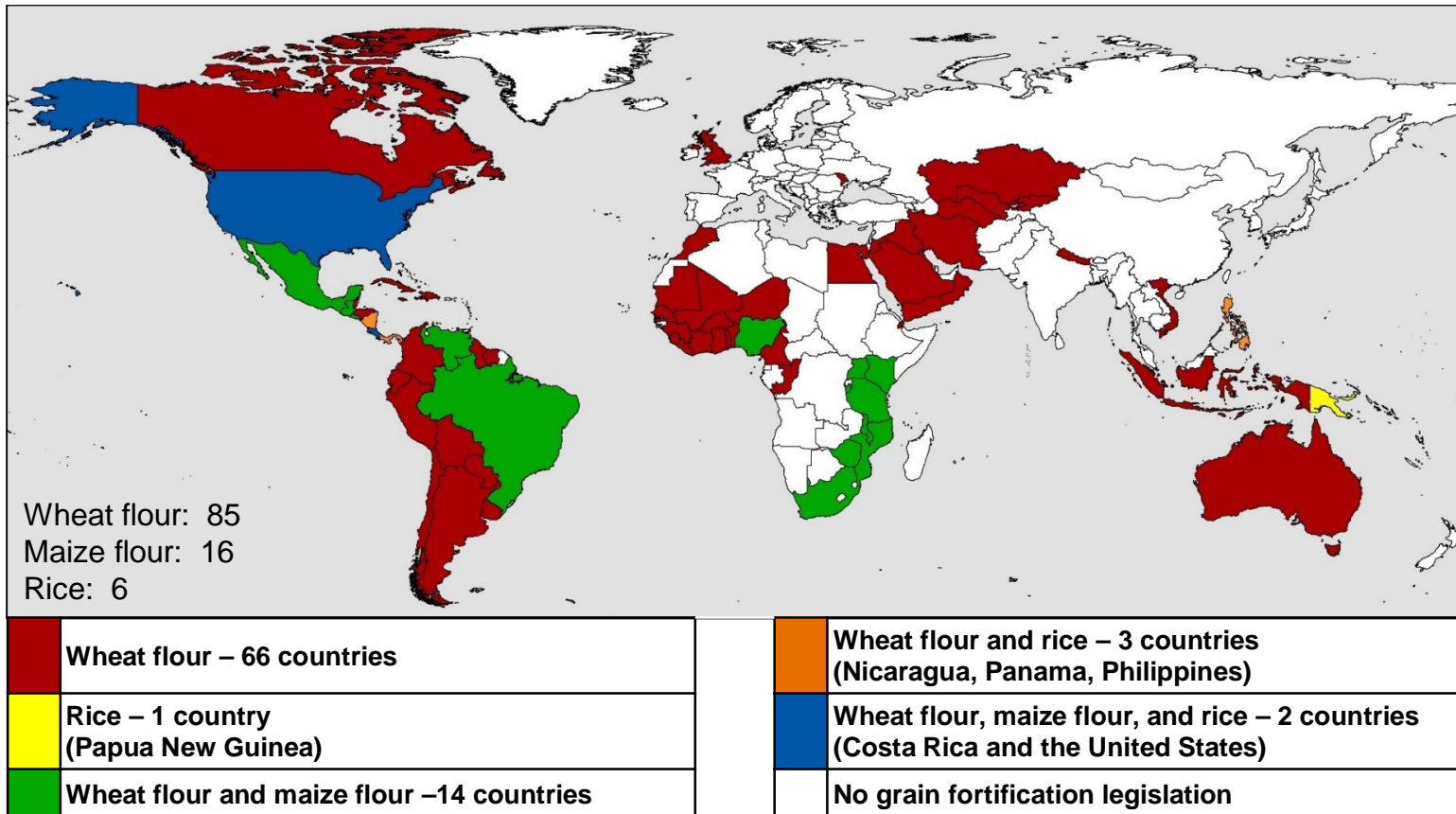
Our target for sustainable value chains.

30% less



Global Fortification Status 2018.

86 countries require fortification of wheat flour, maize flour and/or rice.

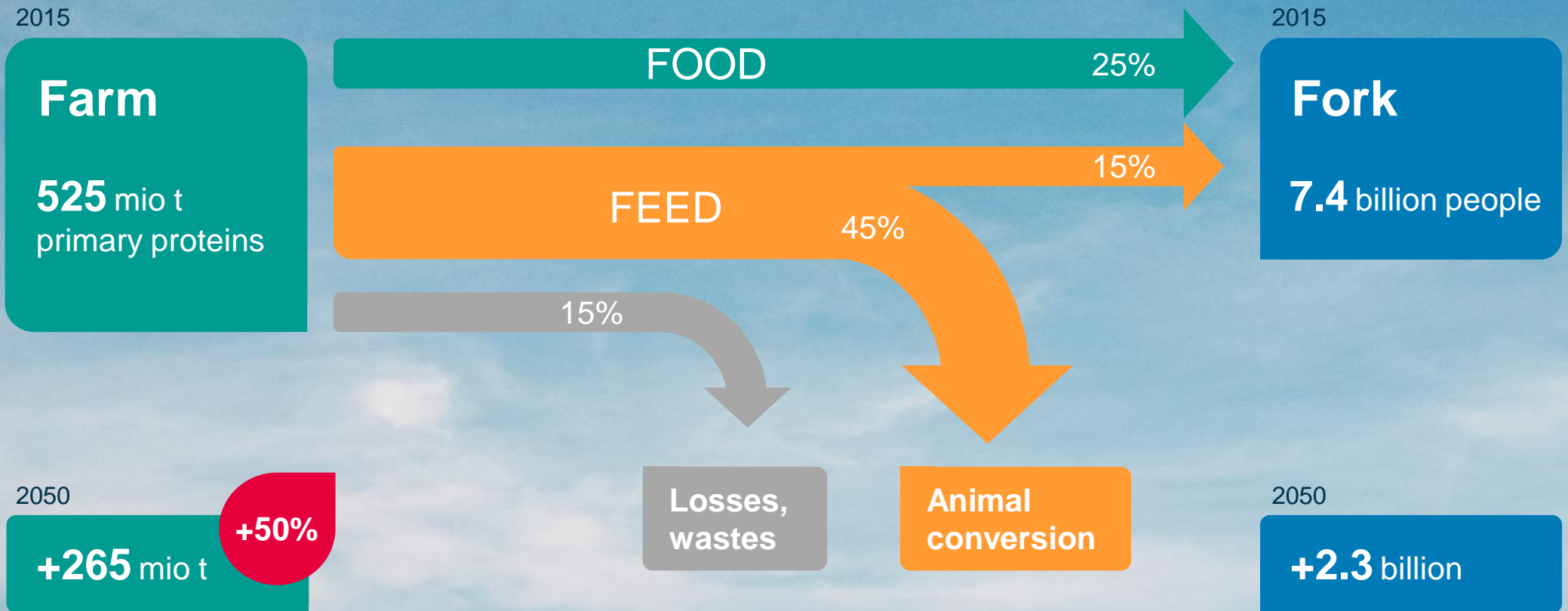


* Legislation has effect of mandating grain fortification with at least iron or folic acid.
Legislation status from the Food Fortification Initiative (www.FFInetwork.org) January 2018

Pregnant women with anemia are *twice as likely to die* during or shortly after pregnancy than those without anemia

Based on international study of more than 300,000 people across 29 countries

Only 40% of vegetable proteins make it to our plates



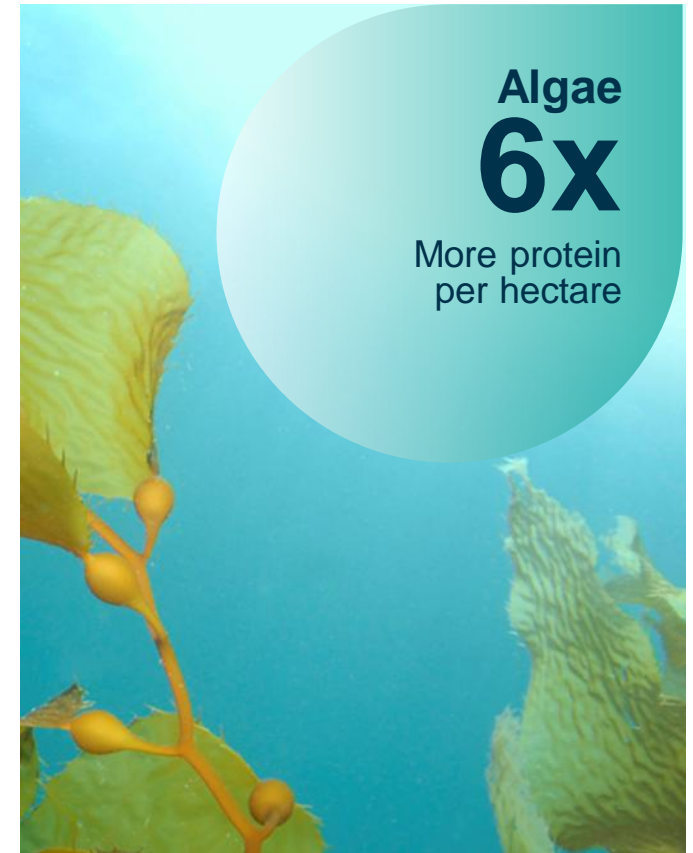
Providing adequate protein requires a change of approach



Plant-based diet



Eliminate waste

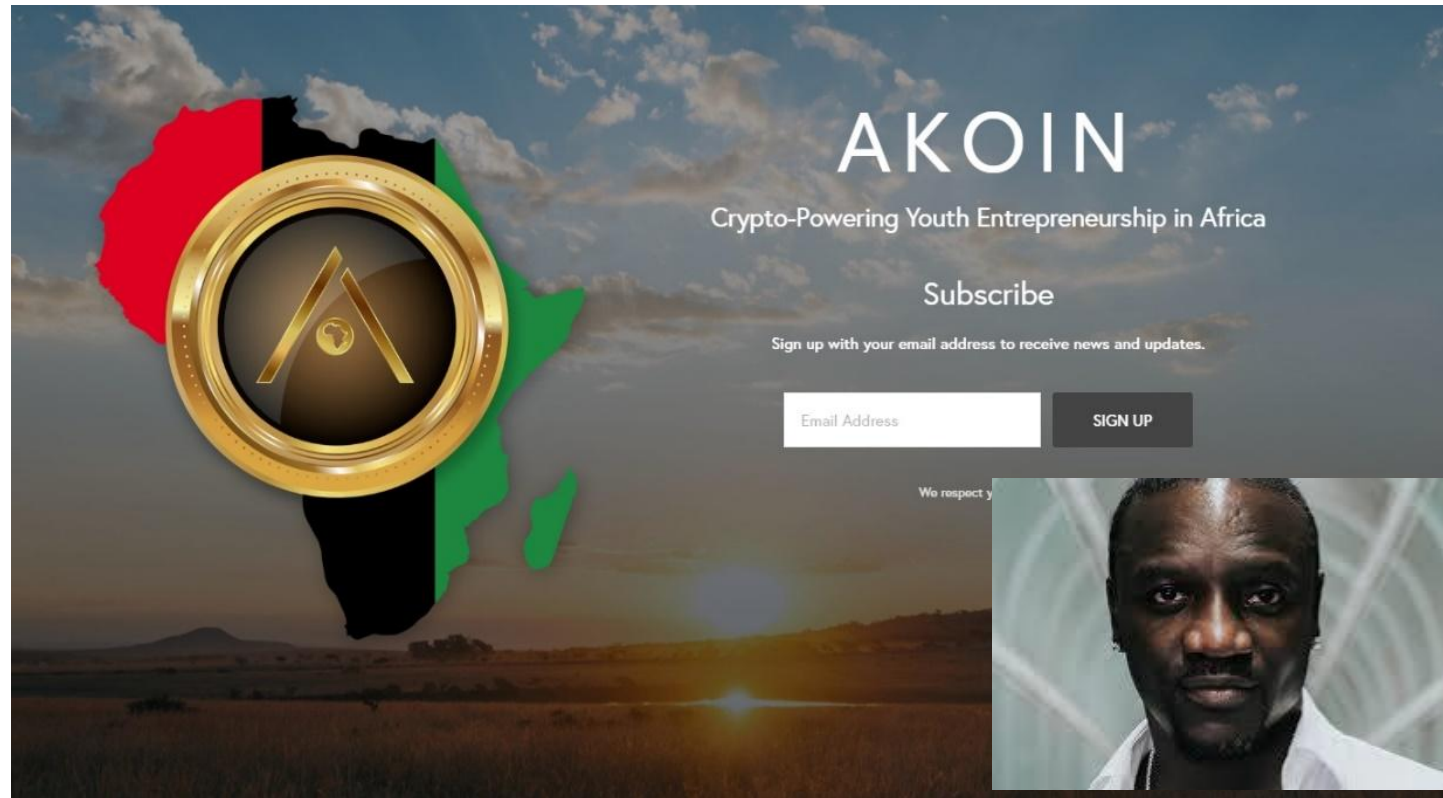


Sustainable feed



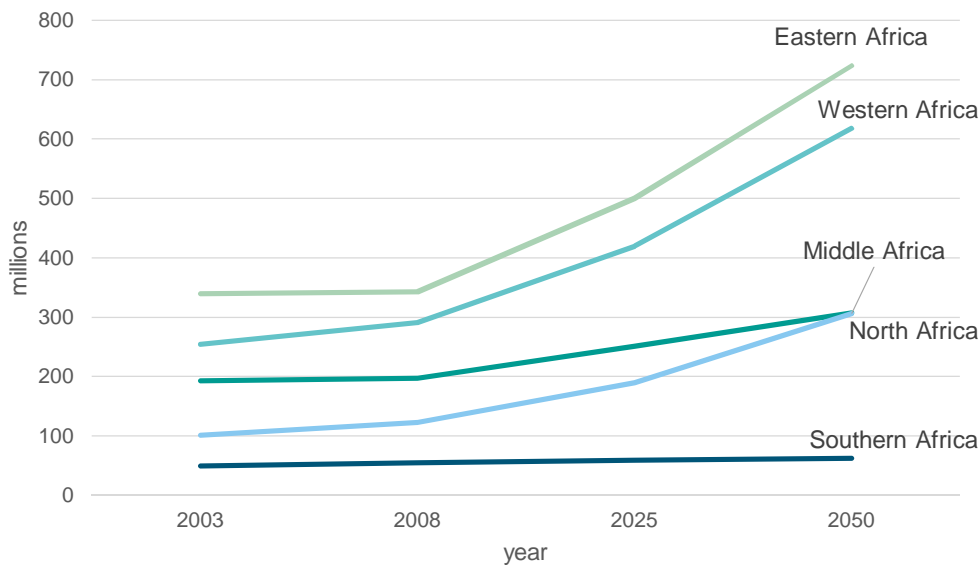
Digital Connectivity and Big Data

Will there be another leapfrog with Crypto currency?

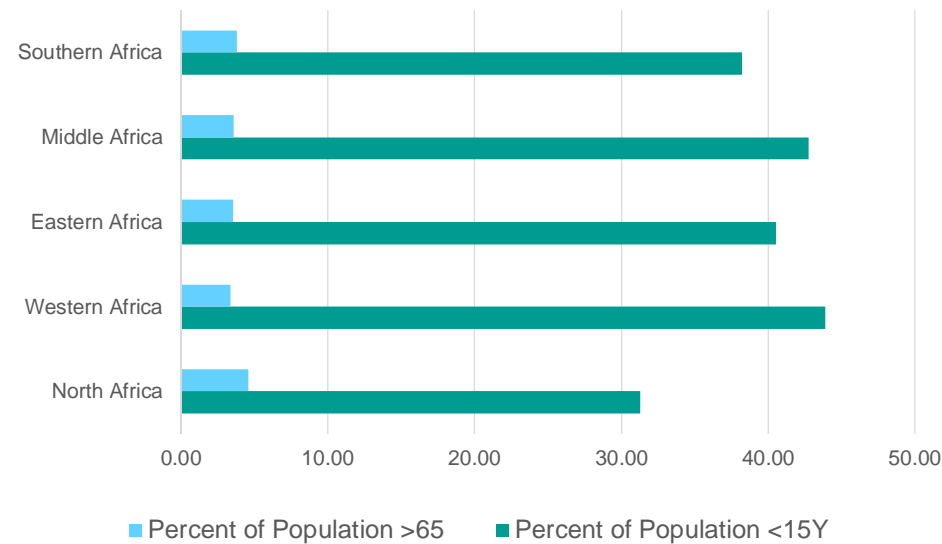


The young will embrace digital

Expected population growth



Percentage of population aged <15 vs. >65



Data source FAO.

Blockchain in Action | Provenance tracking



Farmer	Carrier	Manufacturer	Distributor	Retailer	Customer
<ul style="list-style-type: none">✓ Plot #839049✓ 25 tons of cocoa beans✓ Certifications	<ul style="list-style-type: none">✓ Shipped 2/5/2018✓ Organic✓ Fair Trade	<ul style="list-style-type: none">✓ Delivered 2/12/2018✓ Organic✓ Fair Trade	<ul style="list-style-type: none">✓ Delivered 2/19/2018✓ Organic✓ Fair Trade	<ul style="list-style-type: none">✓ Delivered 2/26/2018✓ Organic✓ Fair Trade	<ul style="list-style-type: none">✓ Guaranteed fresh✓ Certified organic✓ Certified Fair Trade
					Consumer visibility

At various points in the journey, an IoT device scans the product and records its status and condition which are updated on the blockchain

Intelligent sensors

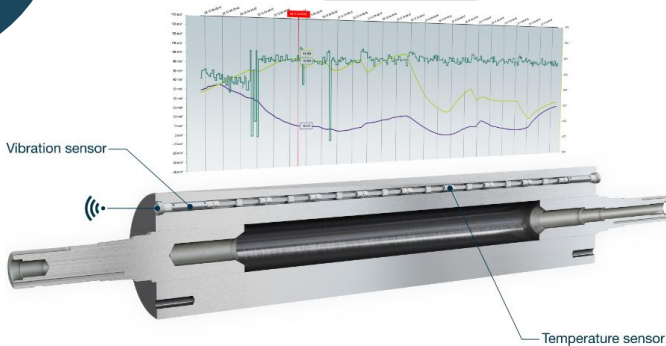
Bühler process knowhow

Collection of data is nothing without process knowledge. Intelligent sensors provide real-time quality measurement.

Consistent product quality



Optimized process control

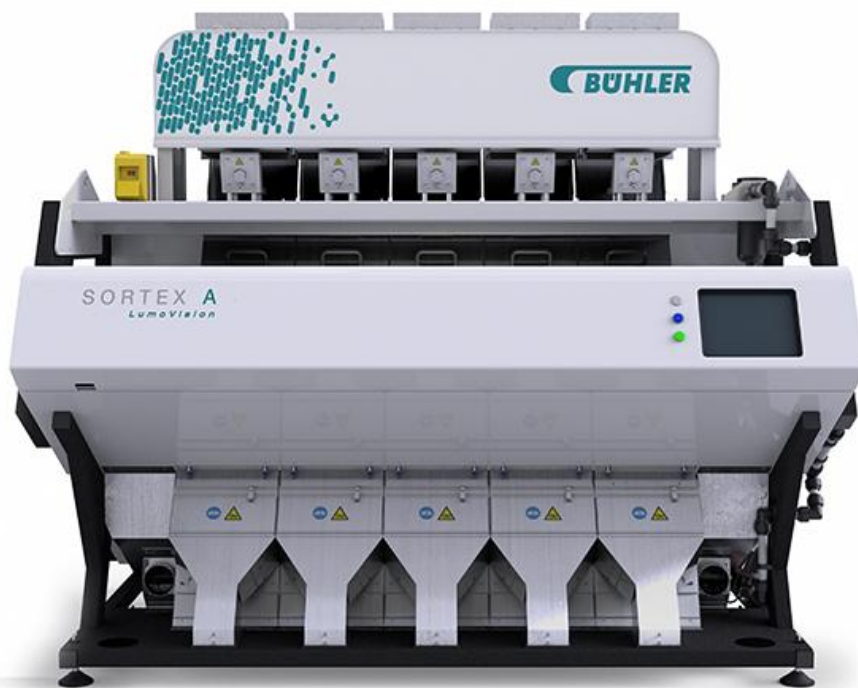


Online color & speck analysis



Real-time particle size measurement & control





90% reduction of contamination, yield loss reduced to less than 5%.

Partnership with Microsoft. Machine utilises the cloud through Microsoft Azure.



500 Mio. people at risk, 155,000 cases of liver cancer due to aflatoxin contamination.

Bühler LumoVision is the first industrial solution to address this global issue.

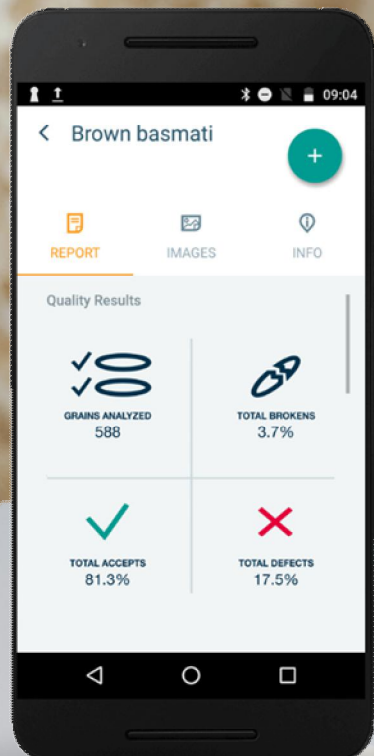
TotalSense Mobile rice analyzer (broken)

Light box and
app-based cloud
solution.

Replacement
of manual and
subjective
process.

Continuous
monitoring and
process
adjustments.

Up to
2%
higher yield.



Digital solutions for a safe food value chain



Agriculture



Storage



Transportation



Mill



Food processor



Retailer



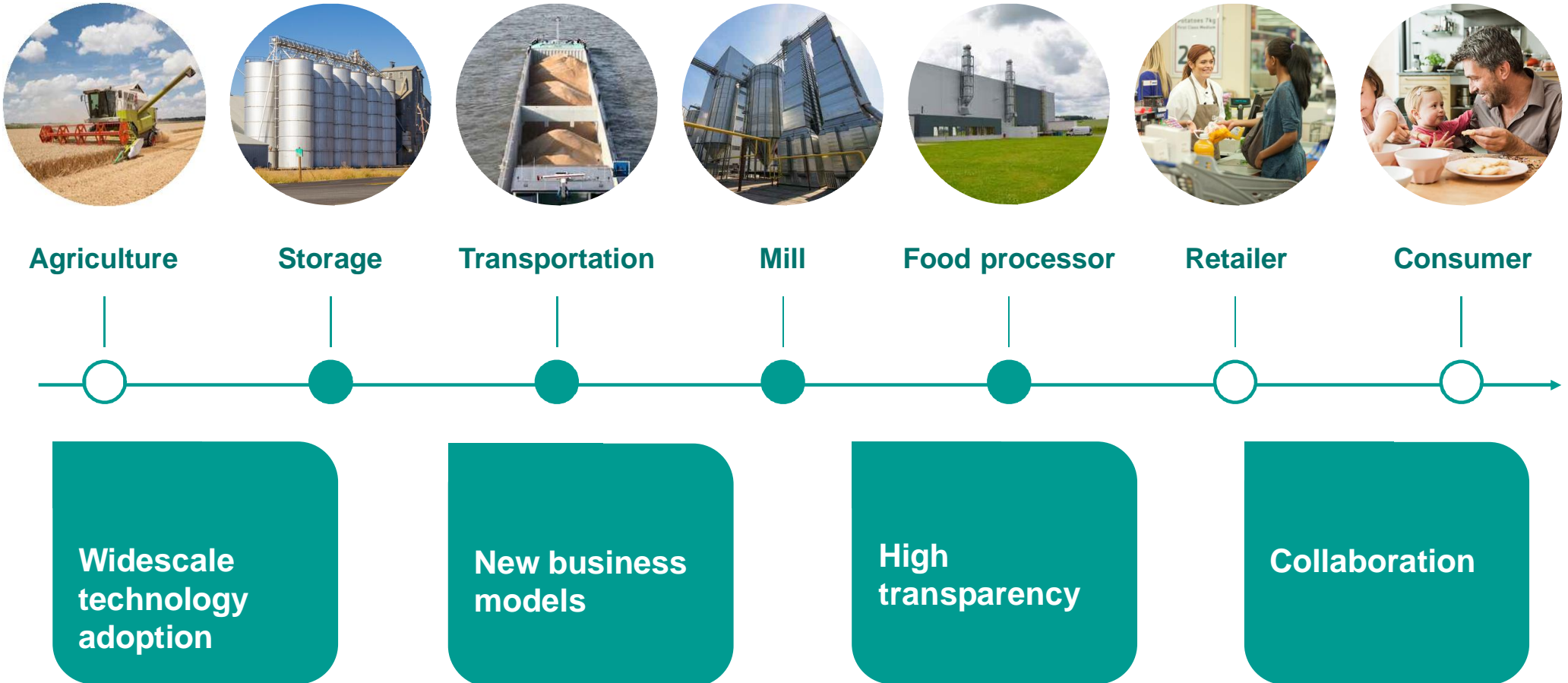
Consumer

Transparency (e.g. smart farm, business practice, DNA tracking, grain by grain examination, nutritional profile, origin, authenticity, environmental impact, consumer visibility)

Elimination of food safety hazards (mycotoxins and fraud)

Resource efficiency – reduction of energy and waste by 30%

Can we feed 9 billion people+ sustainably by 2050?



The CUBIC innovation campus.
Bringing the ecosystem together
to solve global challenges.

Bühler 2018 | Ian Roberts | IOAM Nairobi | 23rd October 2018

**Good business
doing good.**

**Innovations for a
better world.**

