



# The Present Status on World Aquaculture Production and Market: Challenges and Trends

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[www.globalseafood.org](http://www.globalseafood.org)

An international nongovernmental organization dedicated to advancing responsible seafood practices through education, advocacy and third-party assurances.

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Digital magazine: 1.5 million page views/year



Annual leadership meeting since 2001



Aquaculture certification

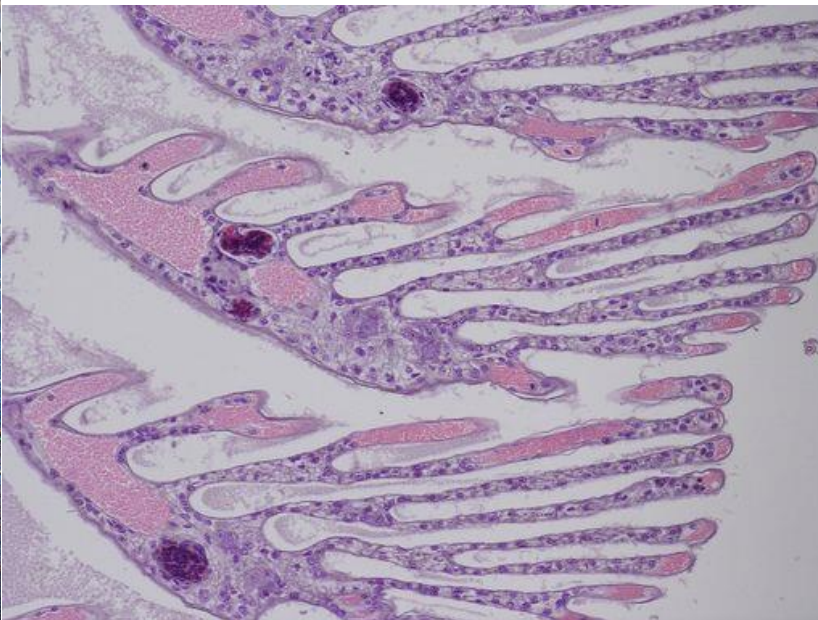


Wild-catch certification

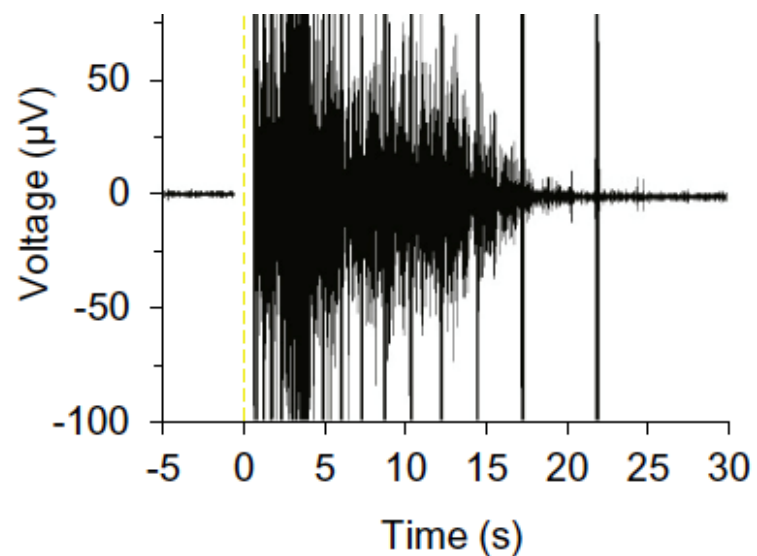
- Charitable organization founded in 2009
- 750 members
- Knowledge sharing through online educational modules and Community Platform
- Applied research



Infectious salmon anemia, Chile



Early mortality syndrome, Vietnam



Electroencephalograph for fish welfare



Revitalizing black tiger shrimp farming



Conserving hammerhead sharks in ETP

## Present Status of Global Fish Production



Courtesy of Gorjan Nikolic, Rabobank  
GOAL 2022 in Seattle

• 1

# *Salmonids*

KONTALI

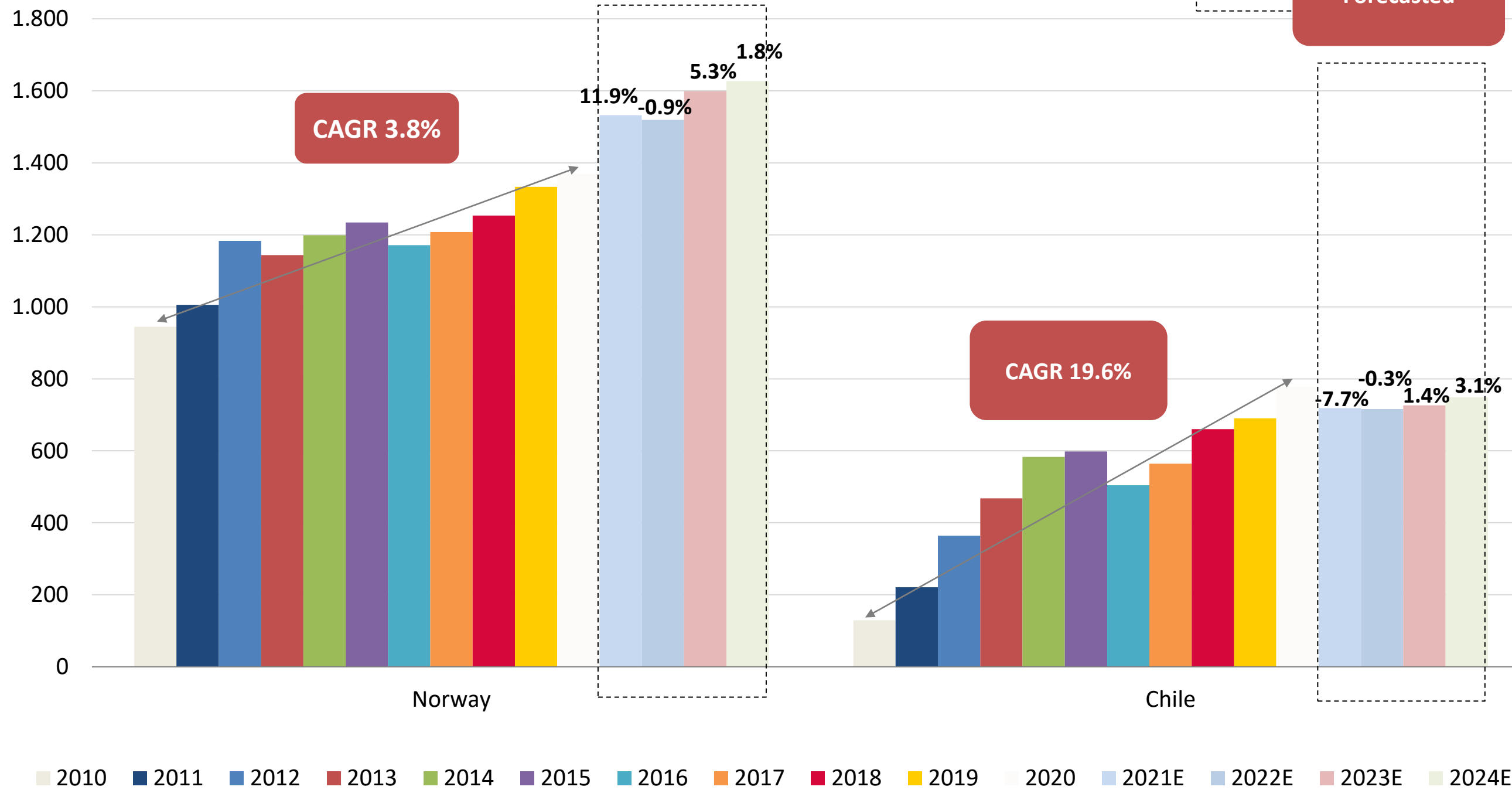


Rabobank

# Norway and Chile both with low growth after a volatile 2021

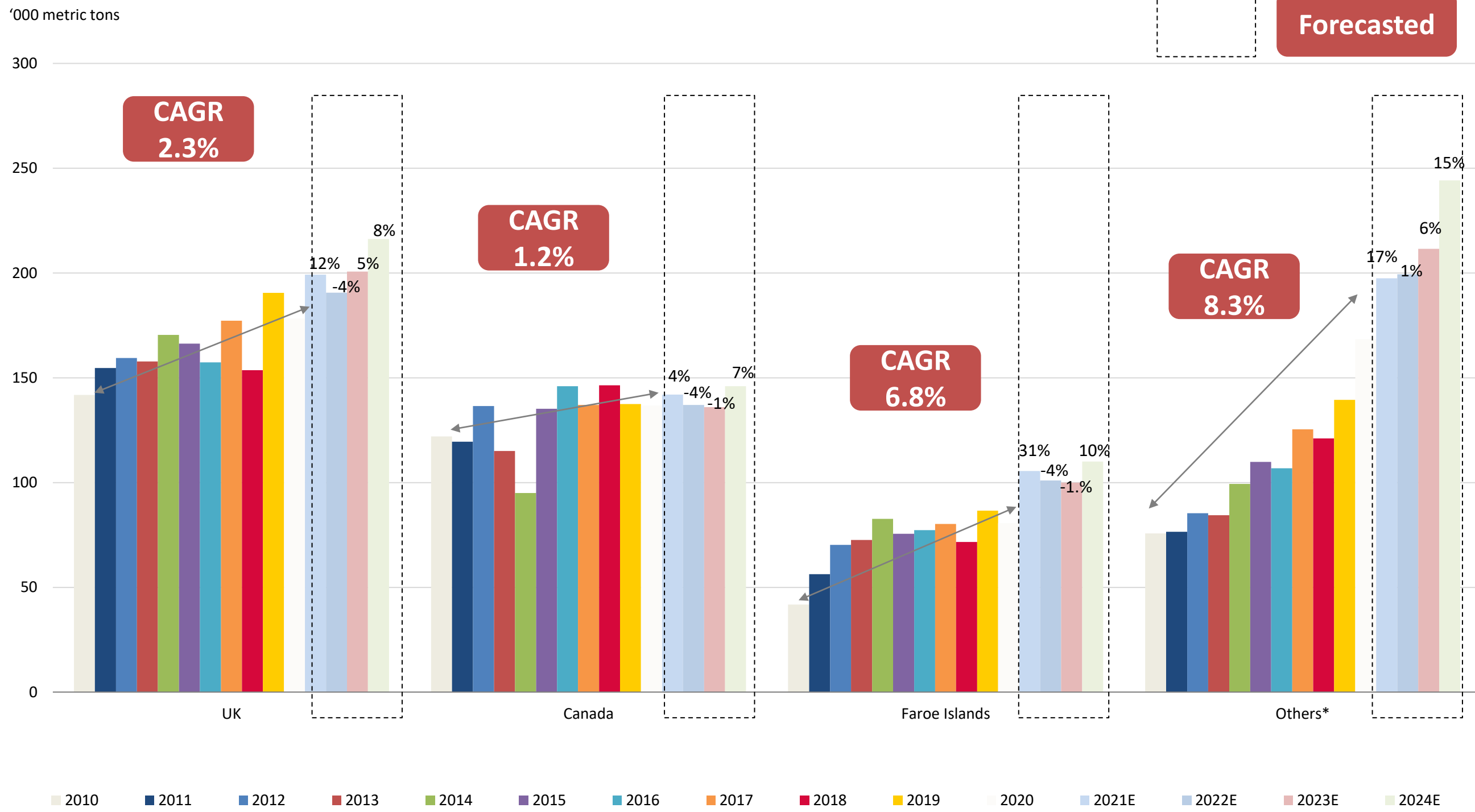
Atlantic salmon; production and forecast by Kontali

'000 metric tons (MT)



# Canada stable in supply; UK, Faroe and all others are becoming an increasingly relevant driver

Atlantic salmon; Kontali

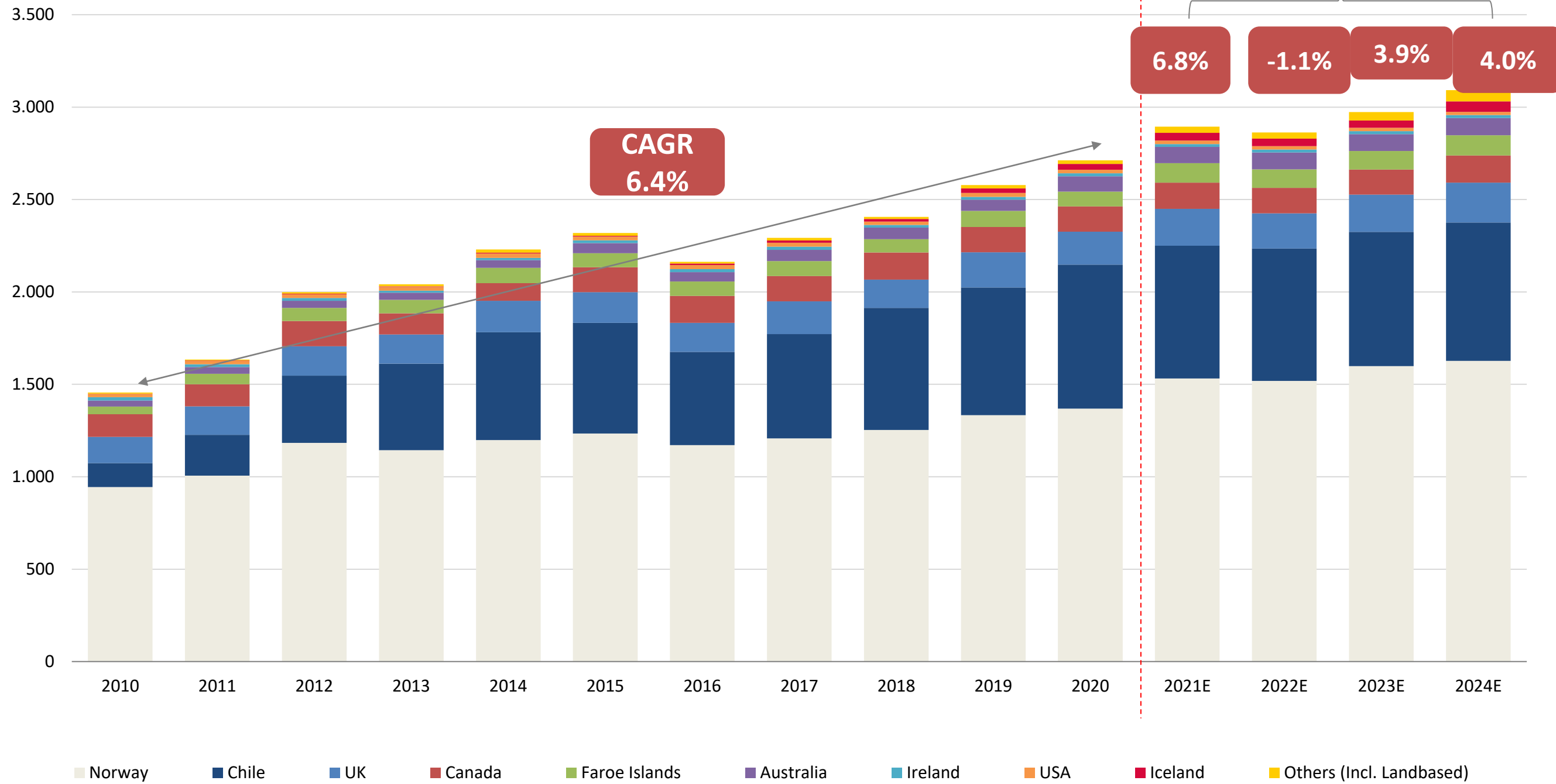


- Source: Rabobank, Kontali 2022
- Others\* Australia, Ireland, USA, Iceland, Others (Incl. Landbased)

# After a contraction in supply in 2022, the first since 2016, the salmon sector will continue with 4% growth

Atlantic salmon production; Kontali

'000 metric tons



Source: Rabobank, Kontali 2022



# Huge disruption caused by Norwegian government plans to impose an additional 40% tax on salmon business



**Mowi closes salmon factory over uncertainty caused by Norway tax proposal**

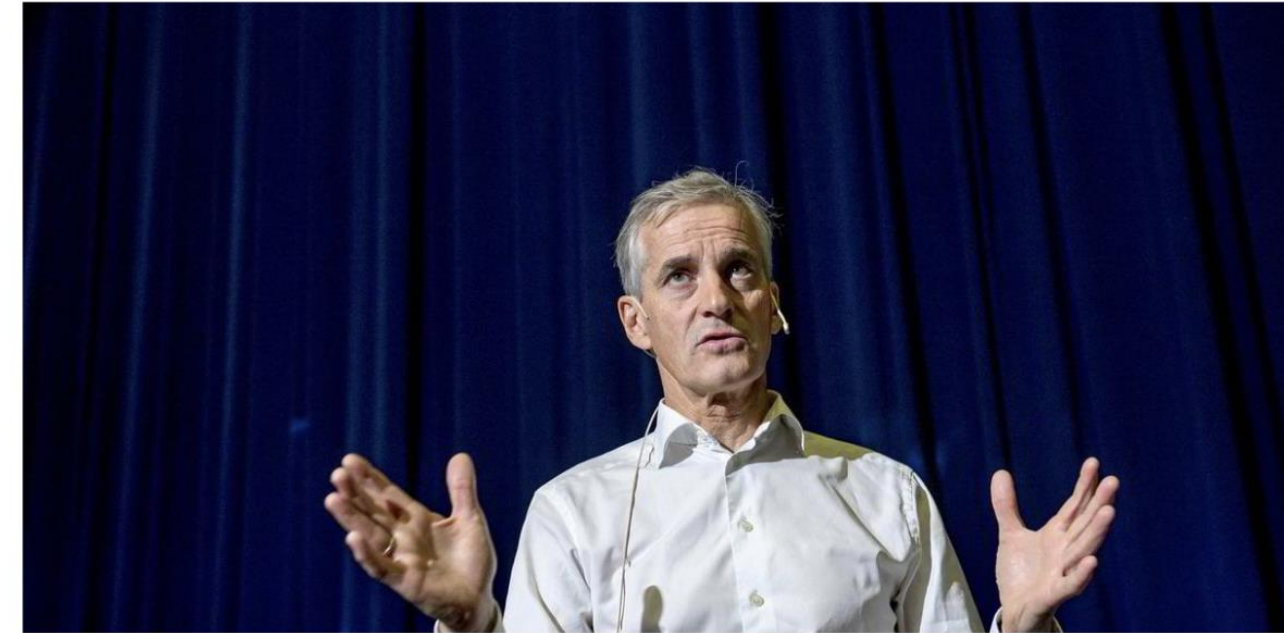
## Companies pull out investments ahead of Norway's salmon tax

October 7, 2022 By Hatchery International staff

News

**Norway's Finance Minister says salmon tax will go ahead**

By Vince McDonagh - 6th October 2022



**Norway's prime minister remains dead set on aquaculture tax, but meeting with top salmon farming executives may 'clarify' most controversial element**

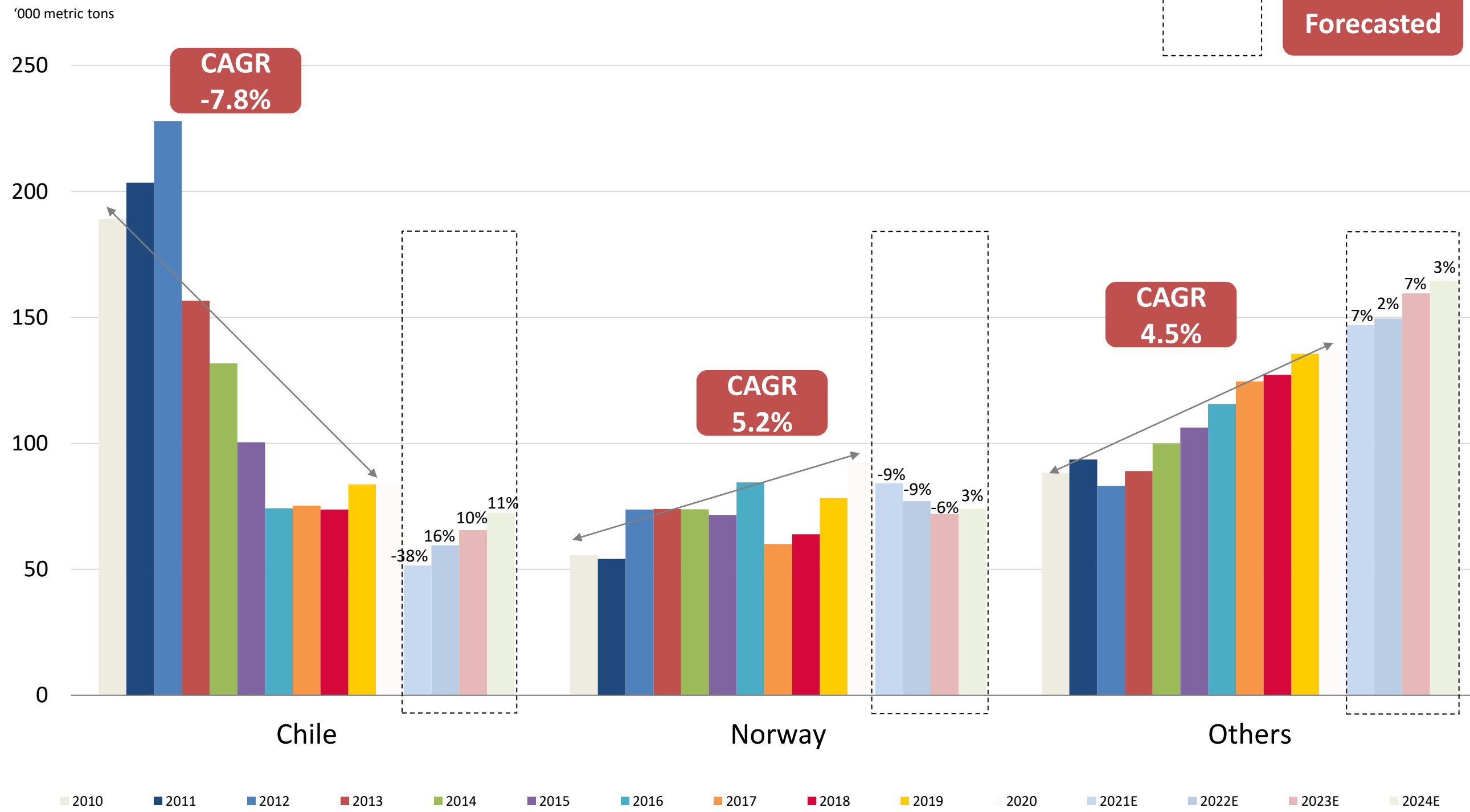
## New 'salmon tax' stirs up a storm

November 16, 2022

**Of all the new and higher taxes proposed in the Norwegian government's highly contested state budget, none has grabbed more attention than the one targeting large and highly profitable salmon-farming and electricity companies. Norway's powerful salmon lobby was still working hard this week to fend it off, but will likely have to settle for mere revisions.**

# Large rainbow trout production seems to be growing in supply, especially in “new” regions

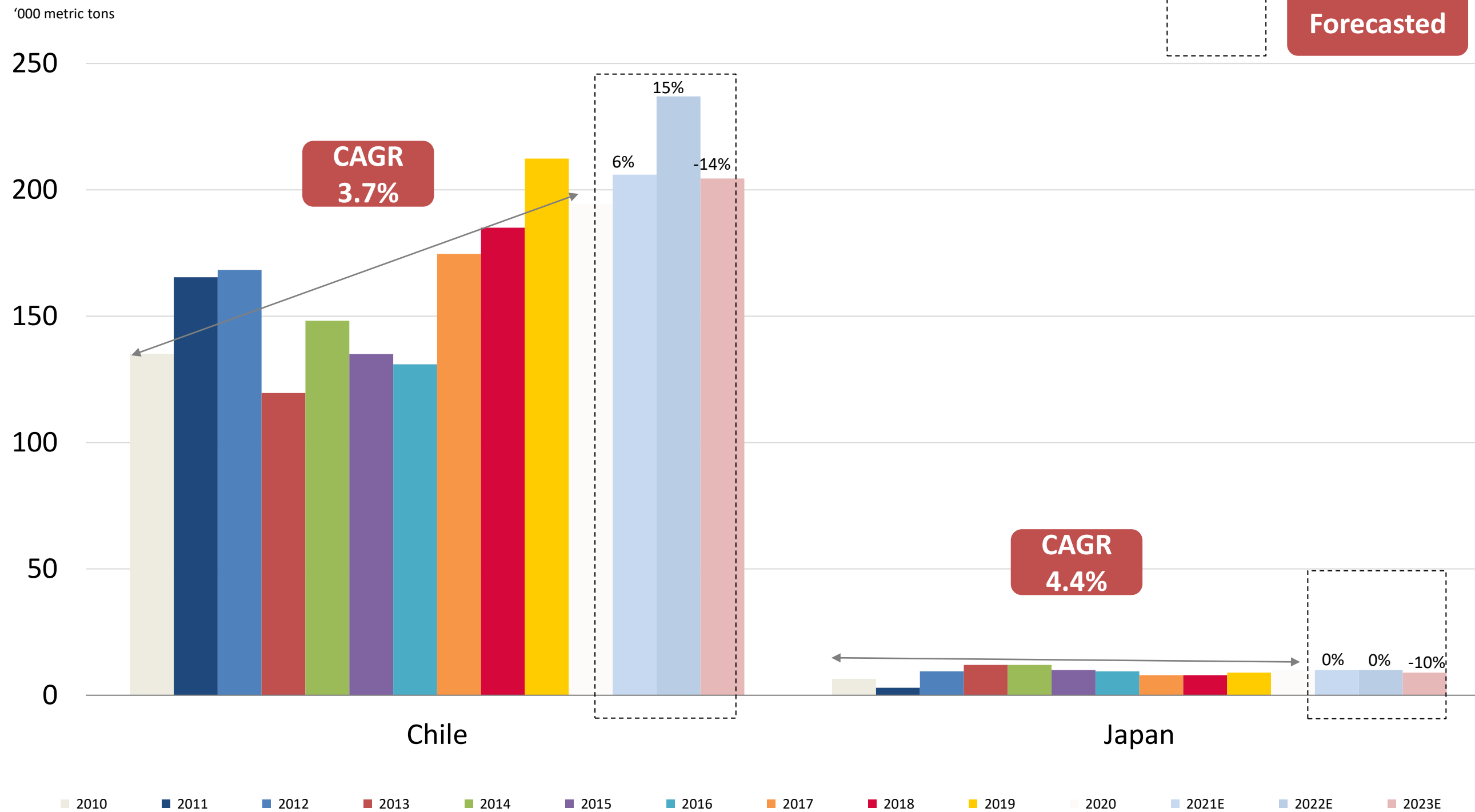
Large rainbow trout production, Kontali



- Source: Rabobank, Kontali 2022
- Others include Finland, China, Russia, Denmark, Sweden, France, Turkey, Others

# Coho salmon production is concentrated in Chile; has ups and downs, but seems to be on a long-term growth path

Coho salmon production, Kontali



- Source: Rabobank, Kontali 2022
- Note: The data is for the Salmon Year and not for the Calendar Year

•2

## *Sea bass and Sea bream*

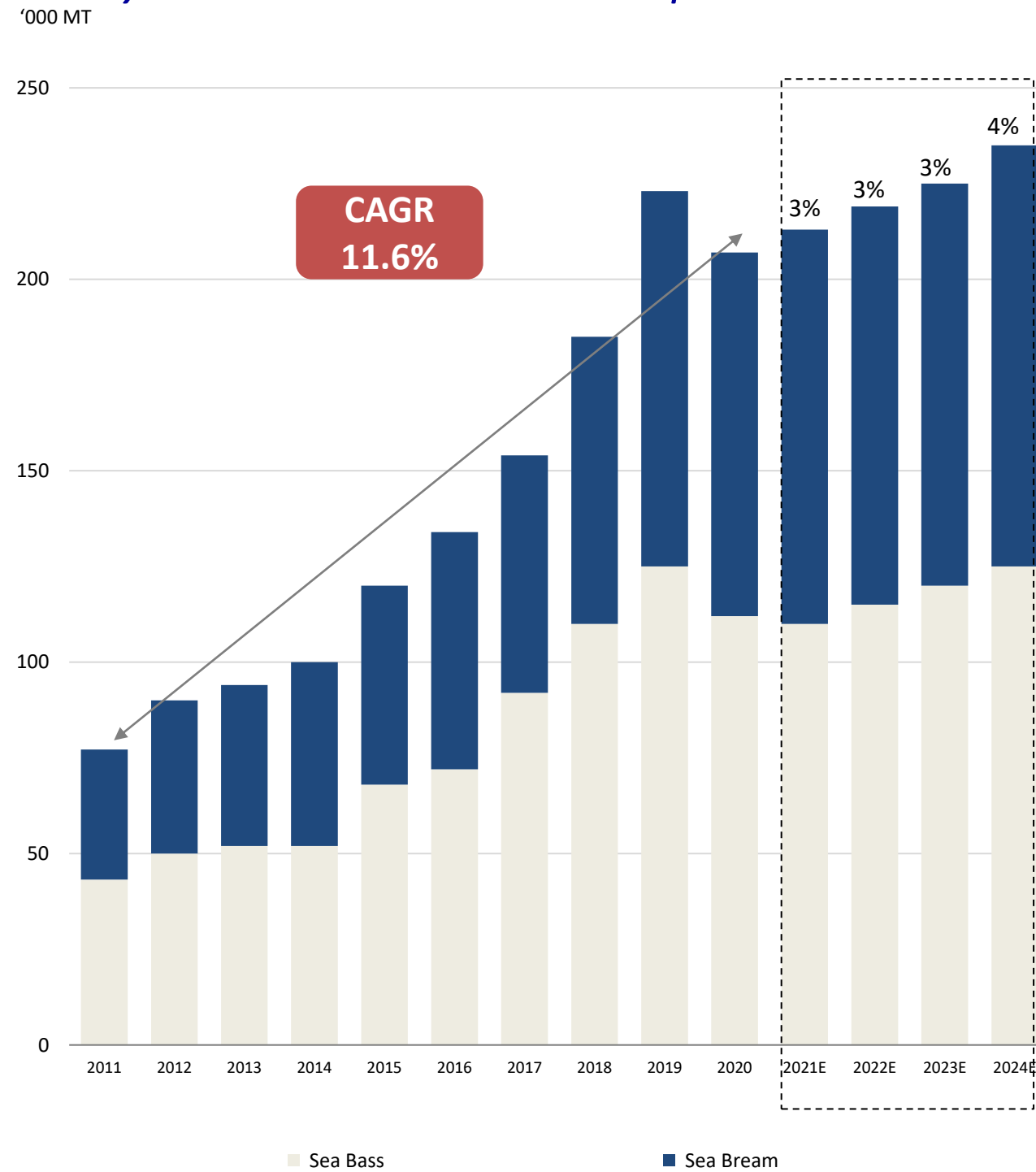
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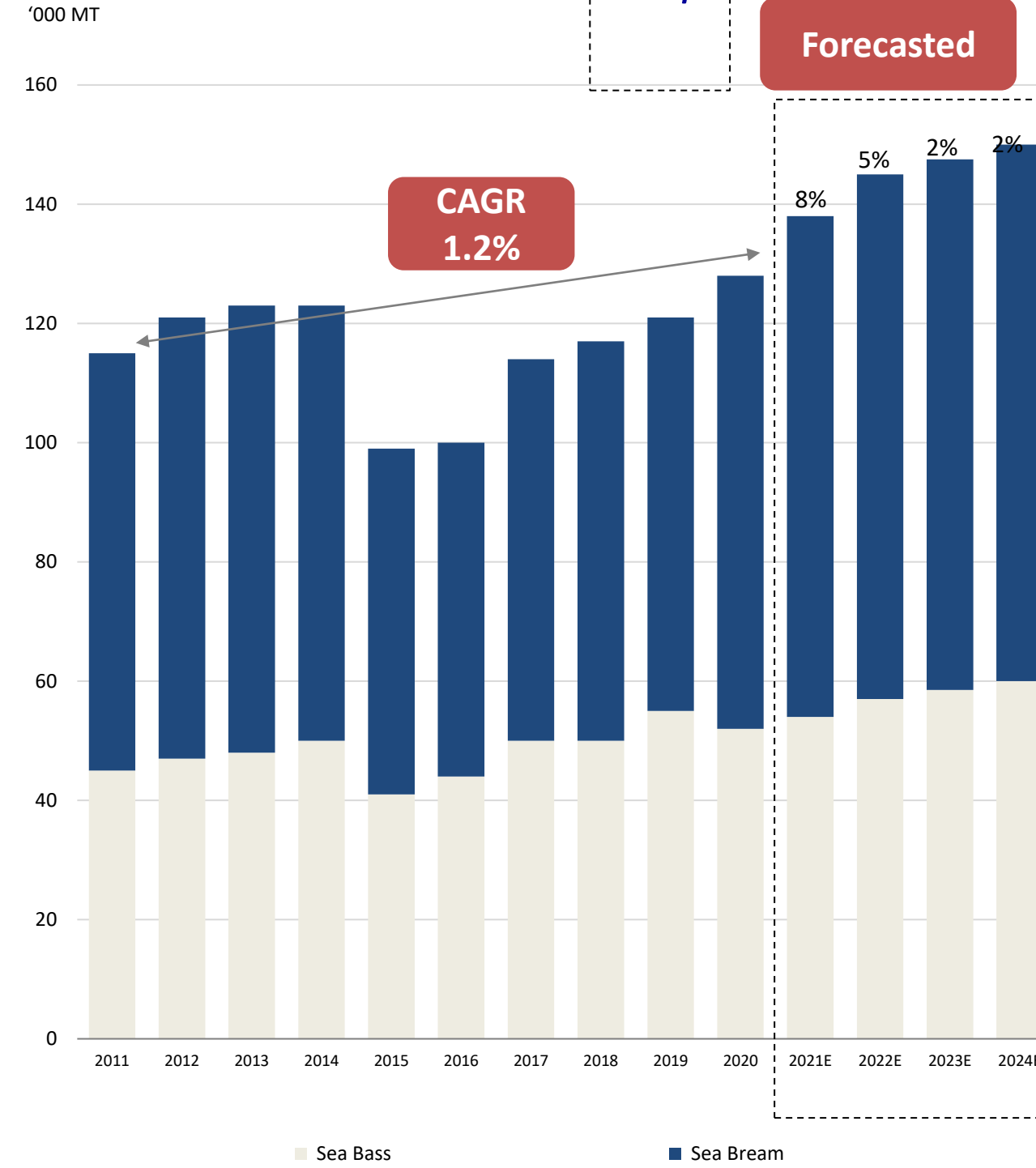
Rabobank

# Sea bass and sea bream production in both Turkey and Greece is slowing down, but remains a growth sector

Turkey sea bass and sea bream production



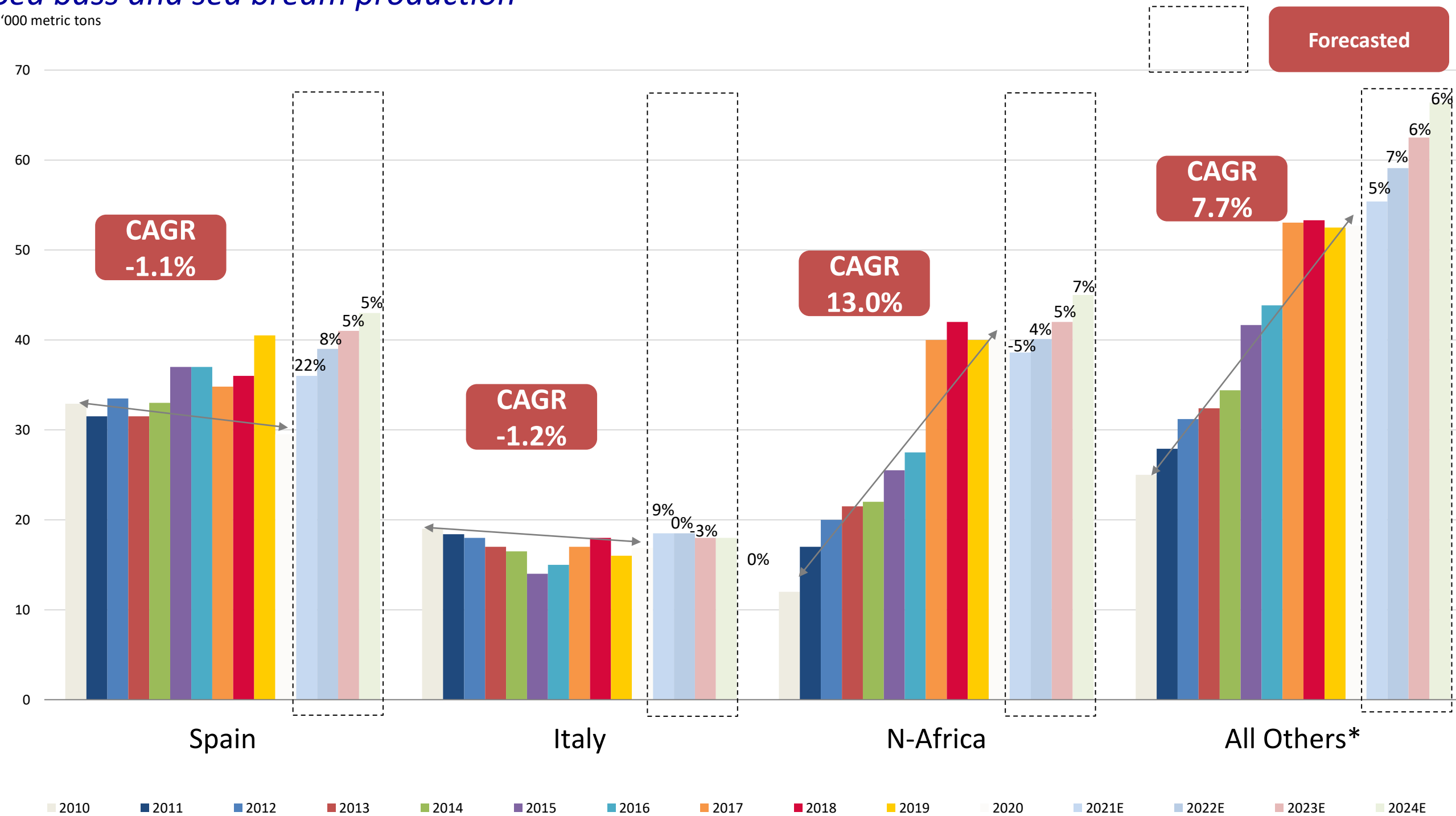
Greece sea bass and sea bream production



# In other Mediterranean regions sea bass and sea bream production is vibrant

## Sea bass and sea bream production

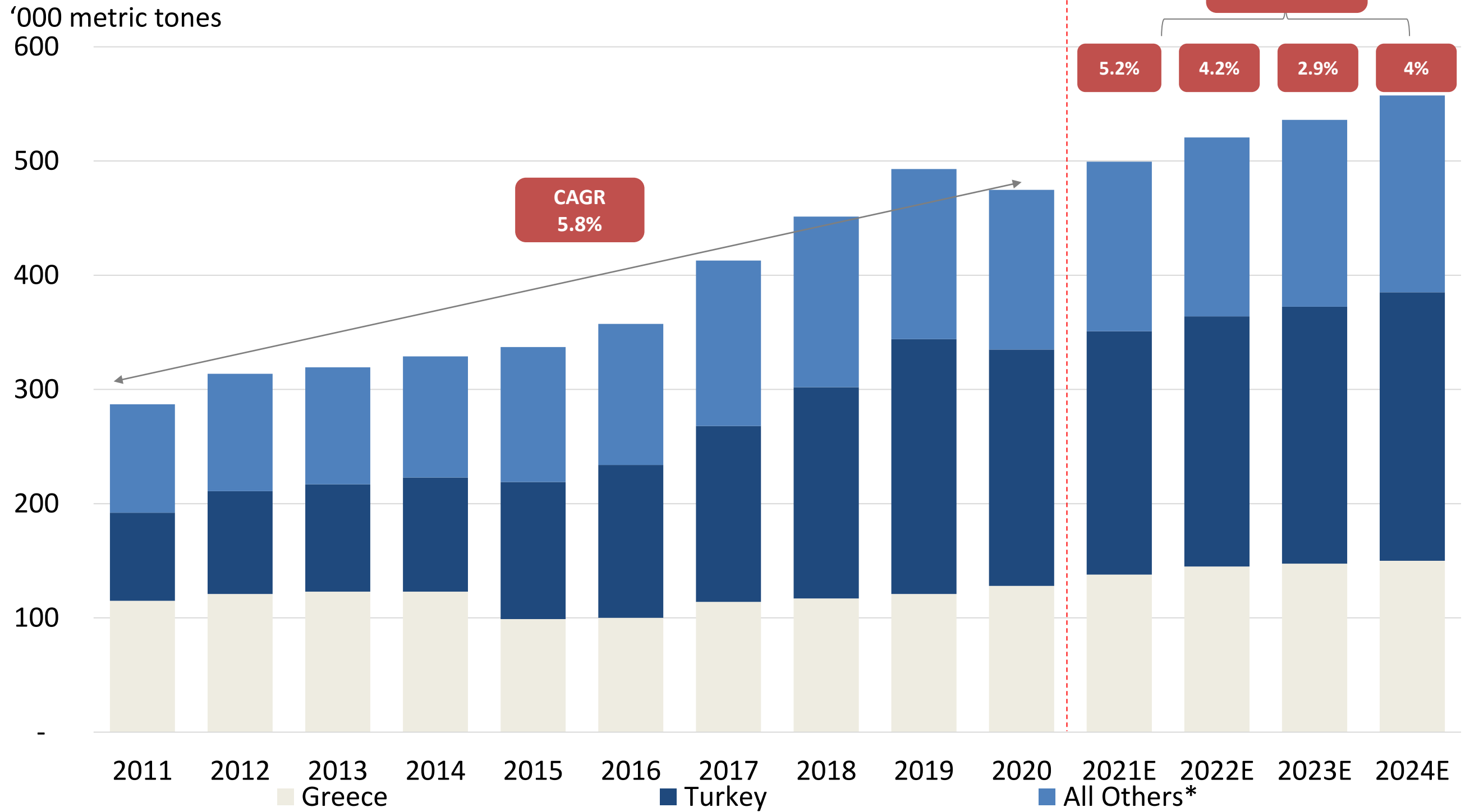
'000 metric tons



- Source: Raboabnk, Kontali 2022
- All Others – France, Portugal, Croatia, Cyprus, Malta, Israel, Others

# Sea bass and sea bream production is expected to have a good year in 2022, but is in a slower growth phase than historically

Sea bass and sea bream production



• Source: Rabobank, Kontali 2022  
 • All Others – Spain, Italy, North Africa, France, Portugal, Croatia, Cyprus, Malta, Israel, Others

•3

# Tilapia

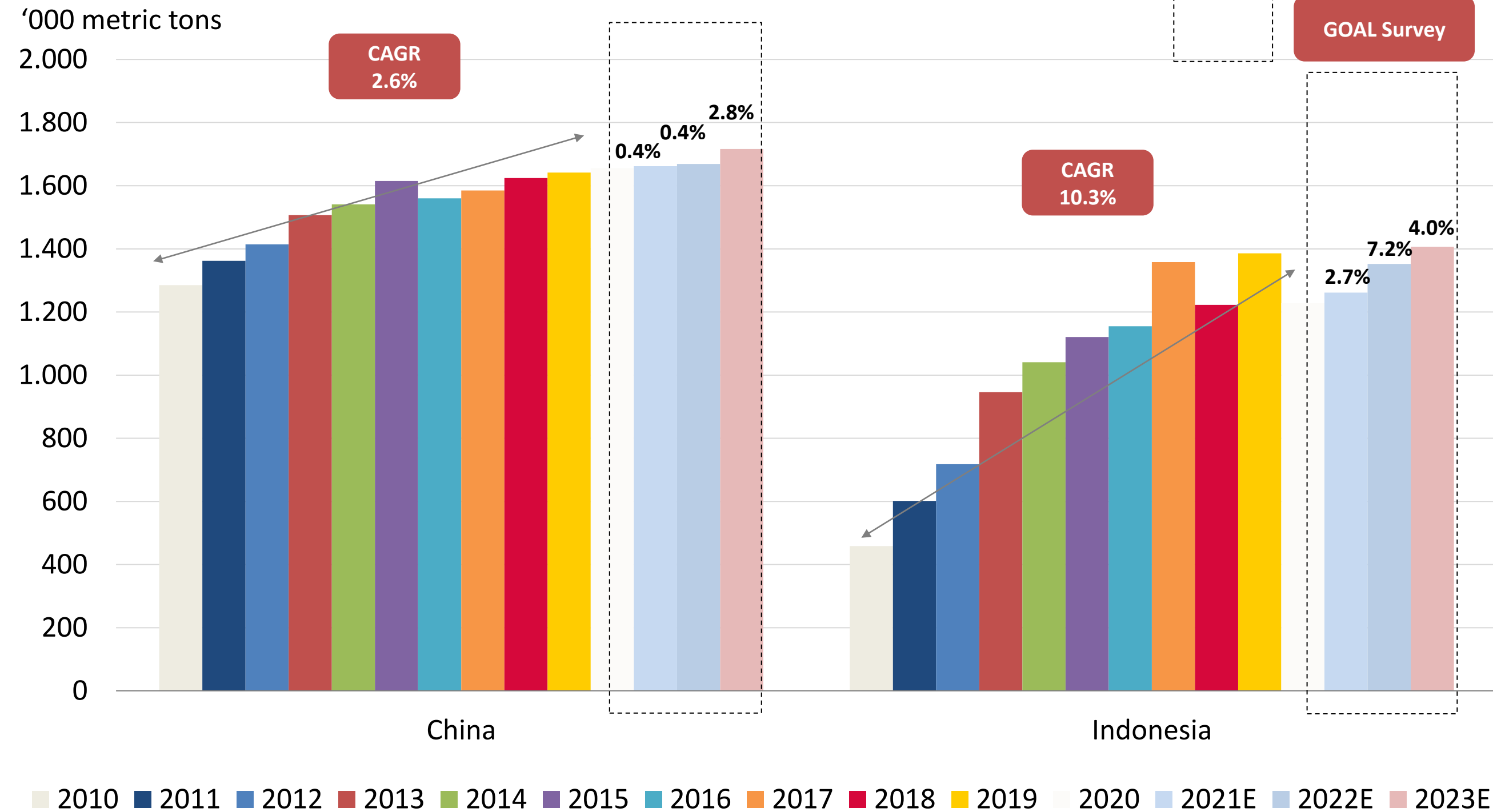


Rabobank



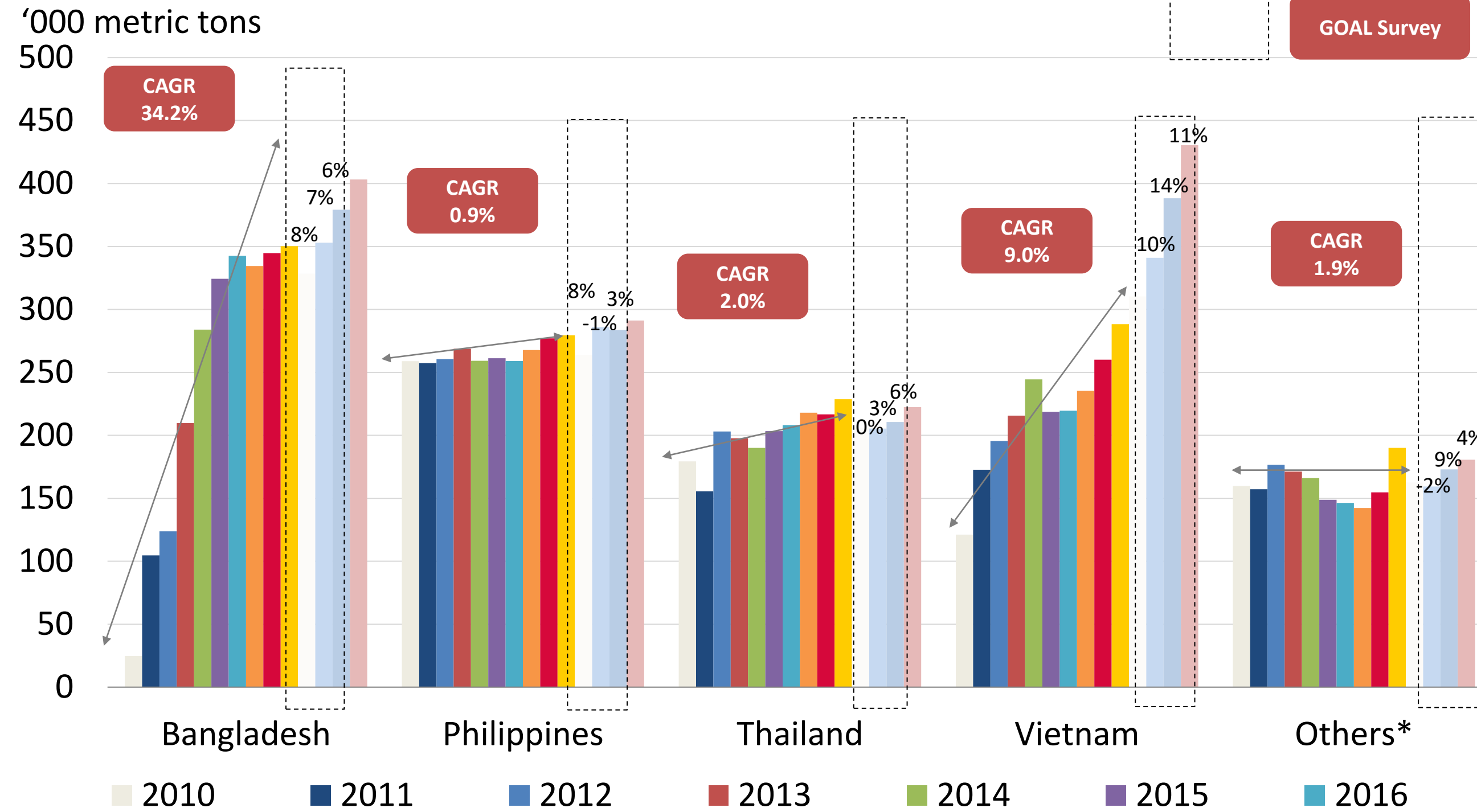
# Tilapia in China is slowing down further, while Indonesia is on a steady growth path albeit also below historical rates

Tilapias and other cichlids production



# Other Asian tilapia producers experience considerably more growth, especially Vietnam and Bangladesh

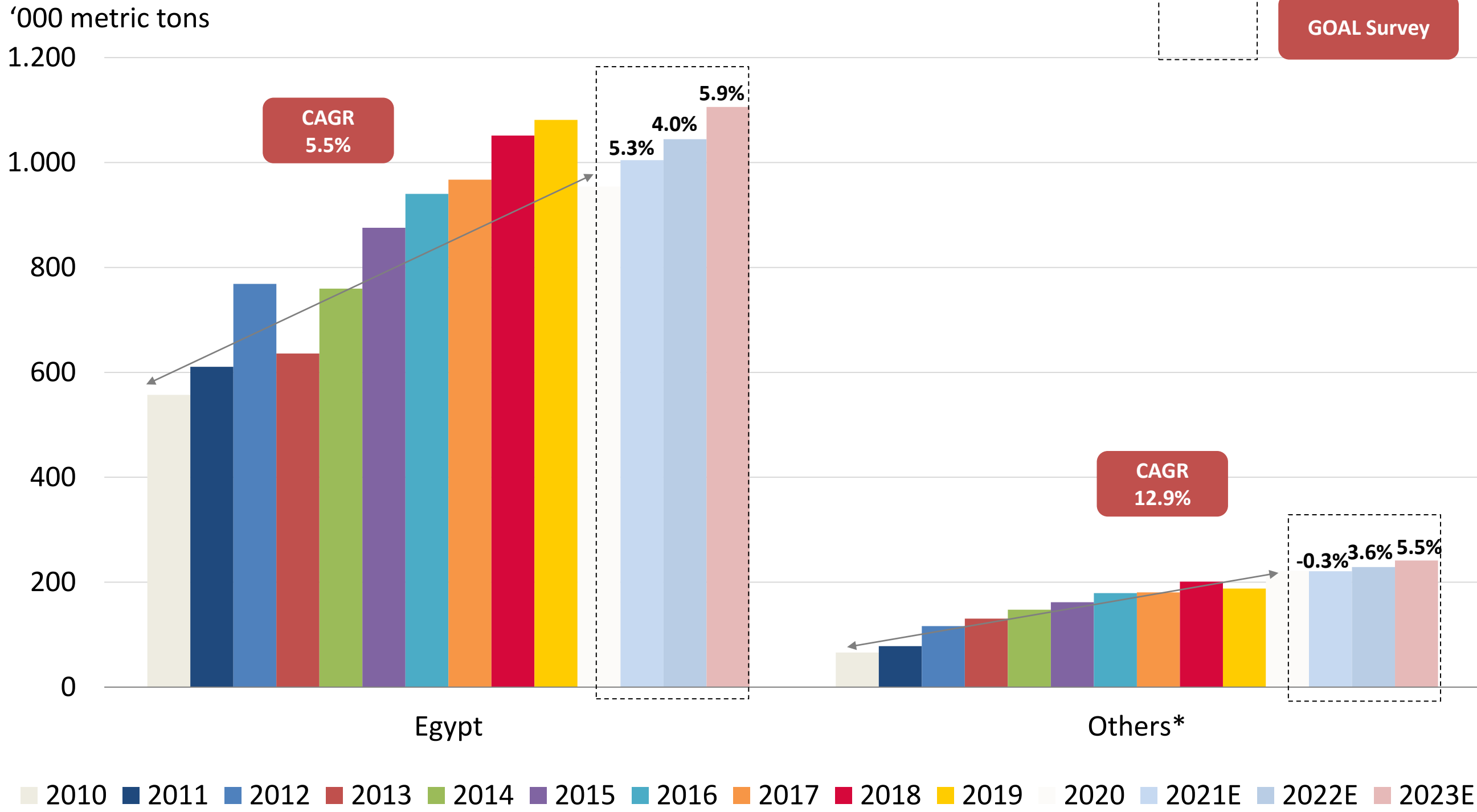
Tilapias and other cichlids production



• Source: Rabobank, FAO, GSA 2022  
 • Others\* Cambodia, Malaysia, Myanmar, Saudi Arabia and Taiwan

# Egypt, Africa's tilapia champion, is continuing the steady supply expansion (we expected a slow down in 2021)

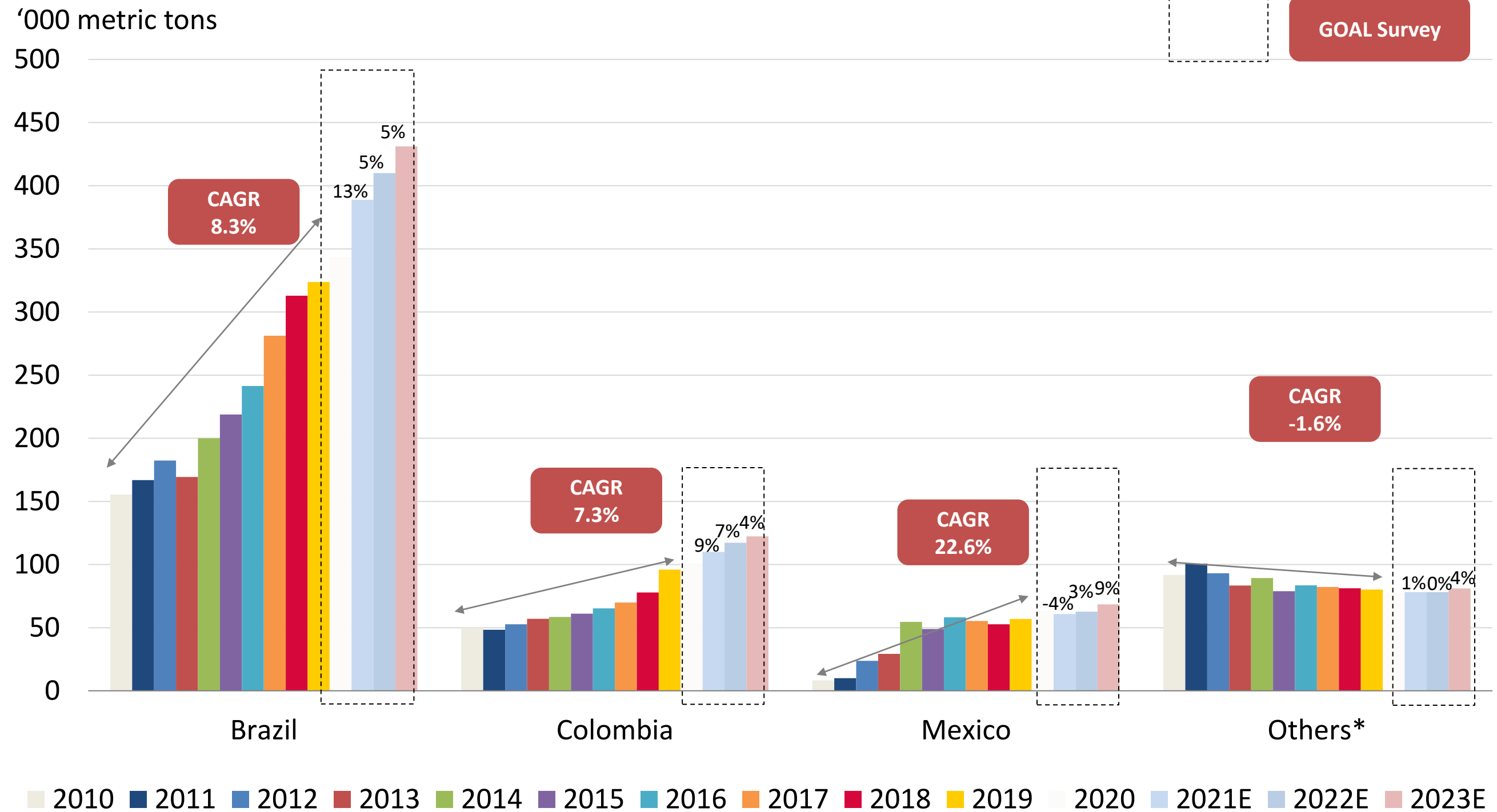
Tilapias and other cichlids production



- Source: Rabobank, FAO, GSA 2022
- Others\* Ghana, Nigeria, Uganda, Zambia, Zimbabwe

# Latin America is currently the fastest-growing tilapia growing continent, driven by Brazil

Tilapias and other cichlids production

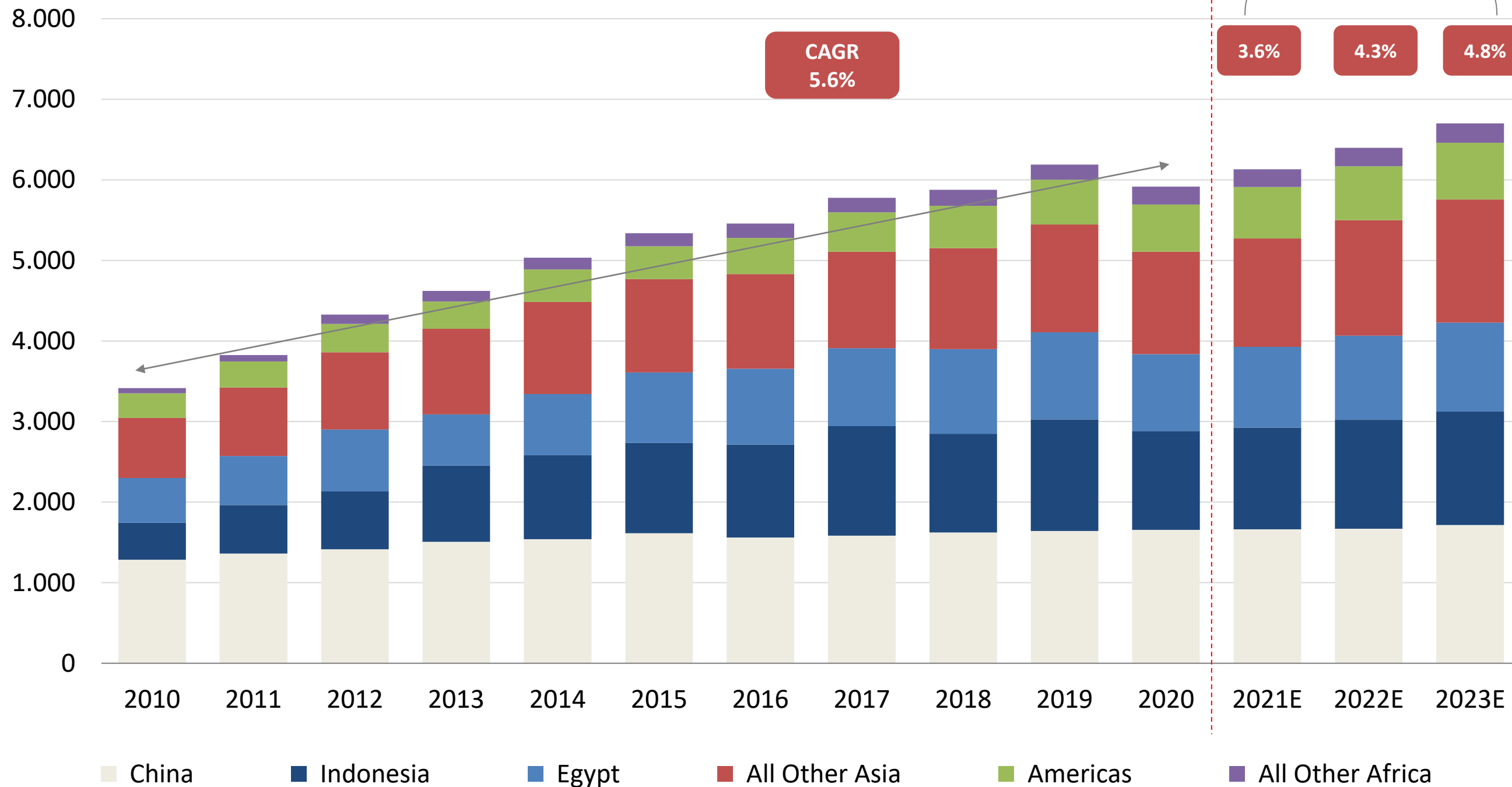


• Source: Rabobank, FAO, GSA 2022  
 • Others\* Belize, Costa Rica, Cuba, Ecuador, Guatemala, Honduras, Panama, Peru, Venezuela

# Global tilapia supply growth seems to have accelerated in 2022 and is only slightly below the long-term trend

*Tilapias and other cichlids production*

'000 metric tons



- Source: Rabobank, FAO, GSA 2022
- All Other Asia\* Bangladesh, Cambodia, Malaysia, Myanmar, Philippines, Saudi Arabia, Taiwan, Thailand, Vietnam
- All Other Africa\* Ghana, Nigeria, Uganda, Zambia, Zimbabwe
- Americas\* Belize, Brazil, Colombia, Costa Rica, Cuba, Ecuador, Guatemala, Honduras, Mexico, Panama, Peru, Venezuela

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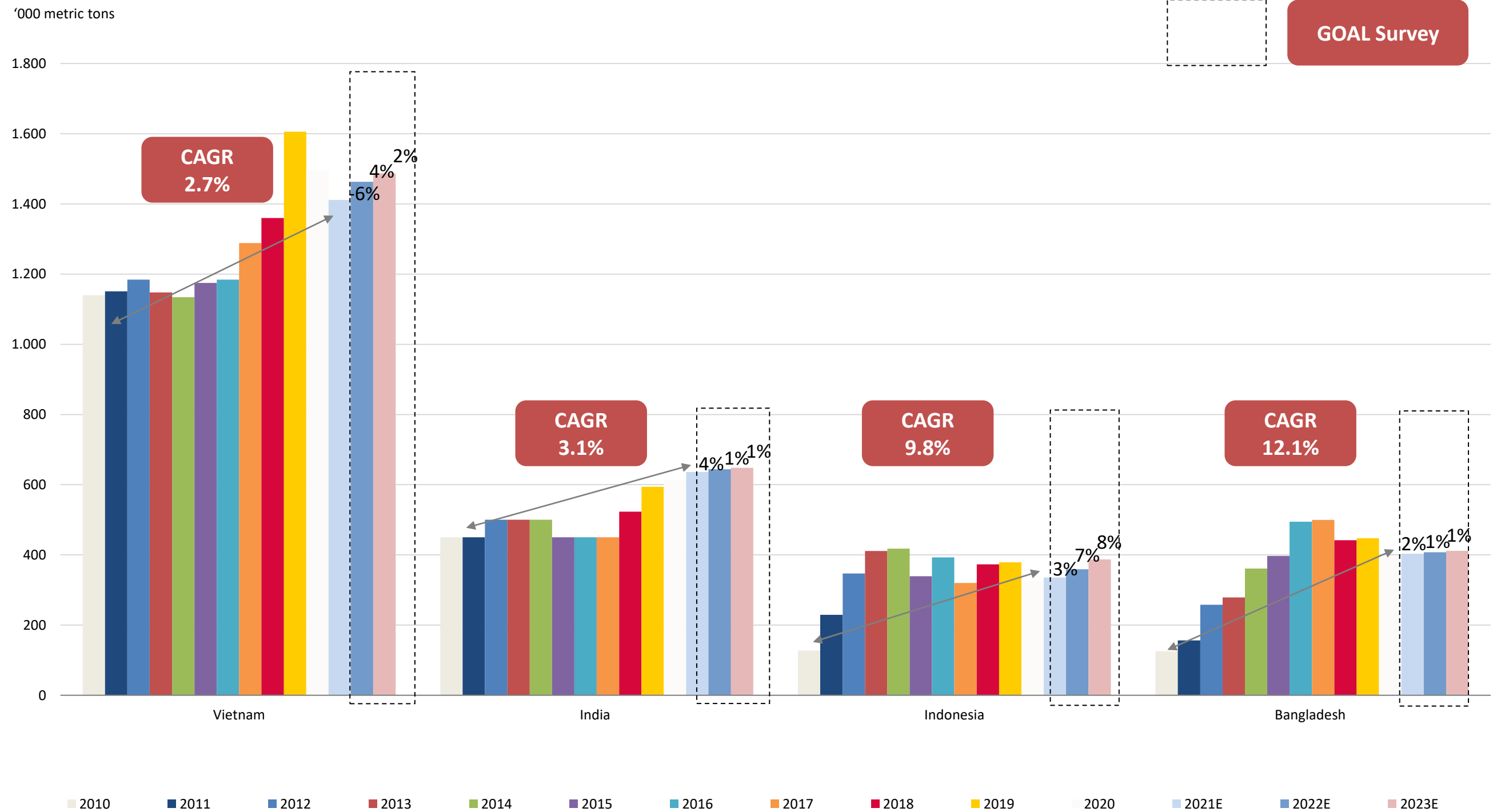
## *Pangasius (striped catfish)*



**Rabobank**

# Pangasius supply is driven by Vietnam; now in gradual recovery mode, but still well below the supply of 2019

Pangasius supply

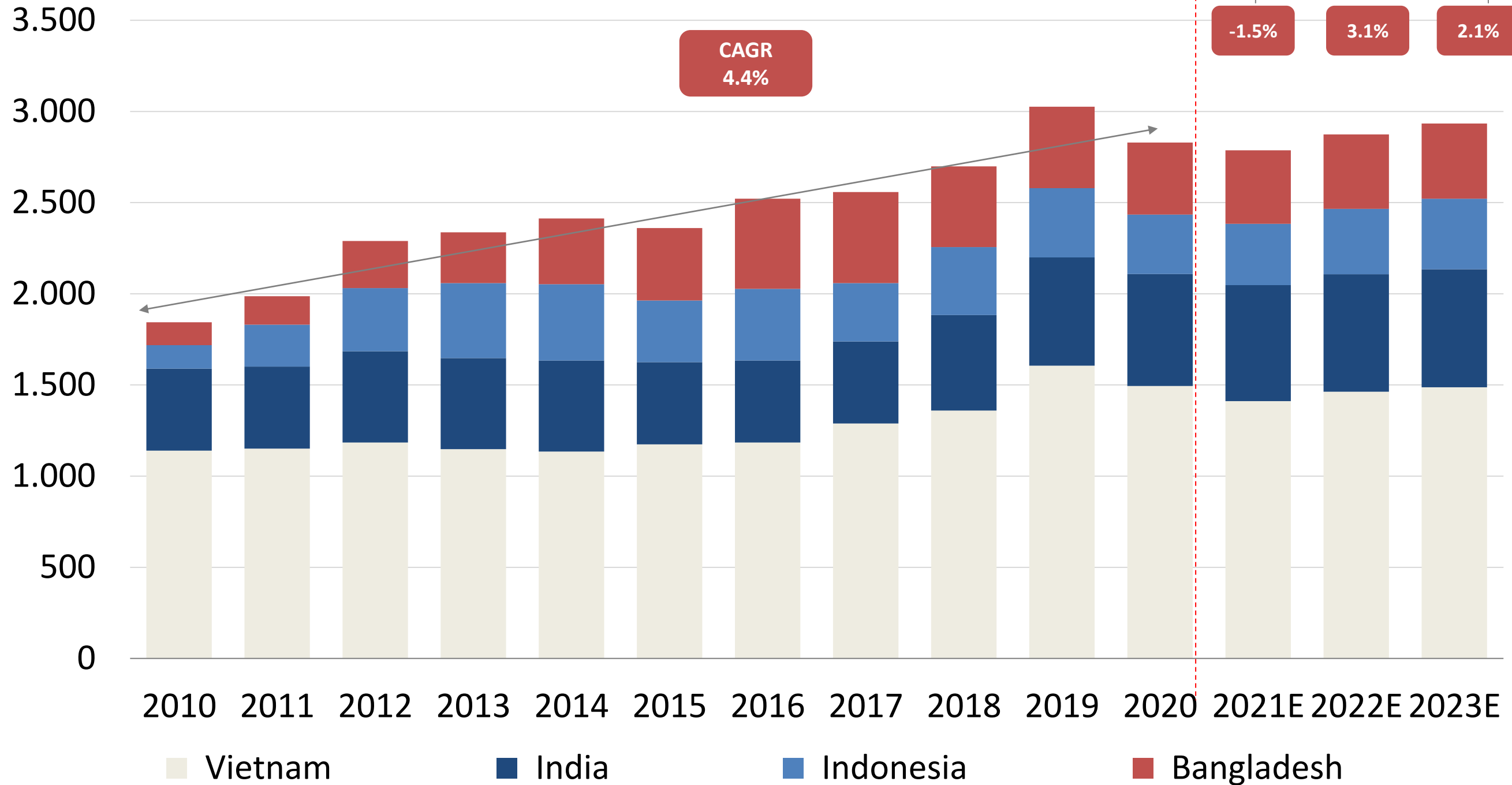


Source: Rabobank, FAO, GSA 2022

# Pangasius supply is still to recover to the supply levels reached in 2019

Total pangasius production FAO

'000 metric tons





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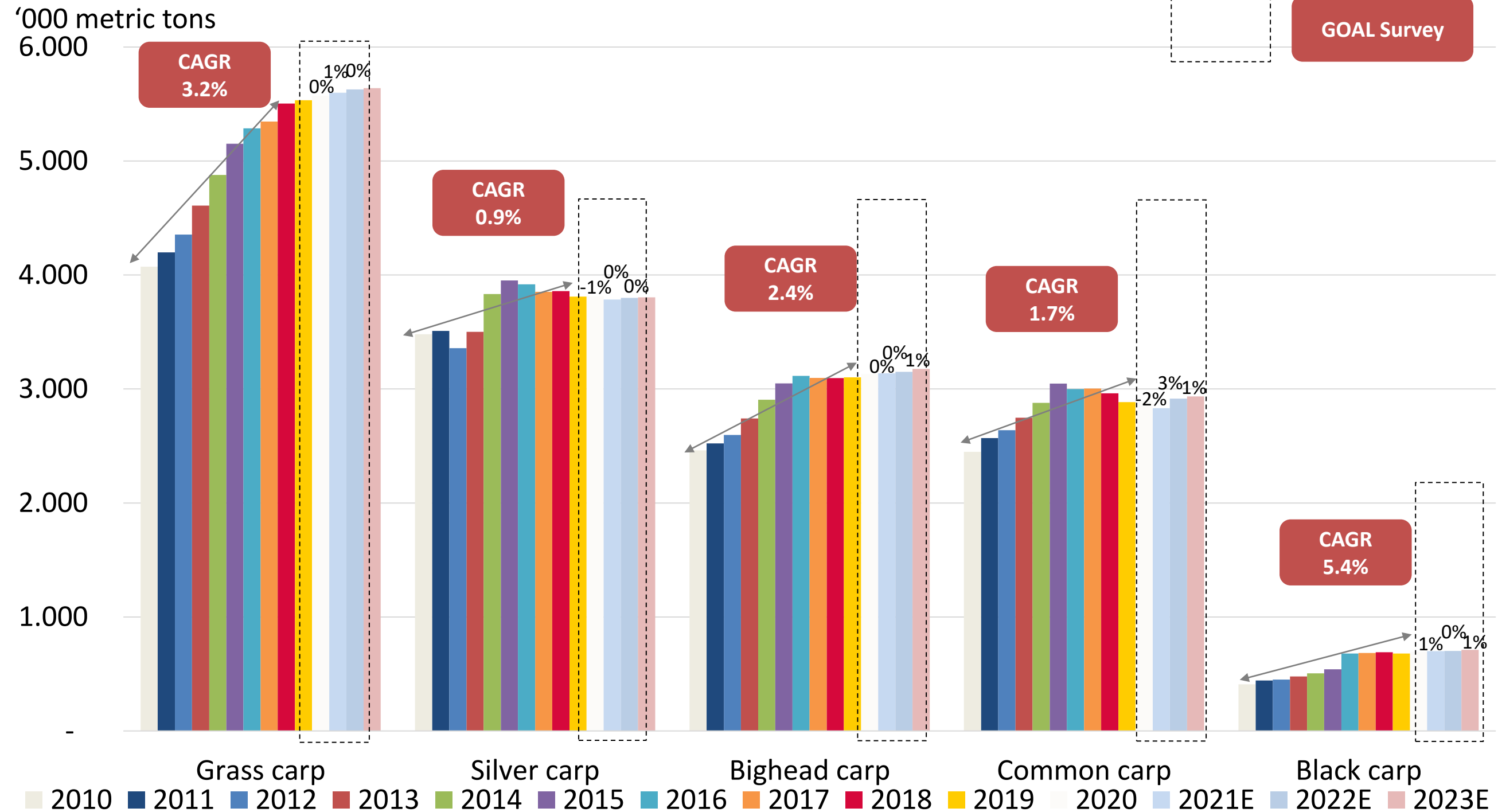
## *Carps*



**Rabobank**

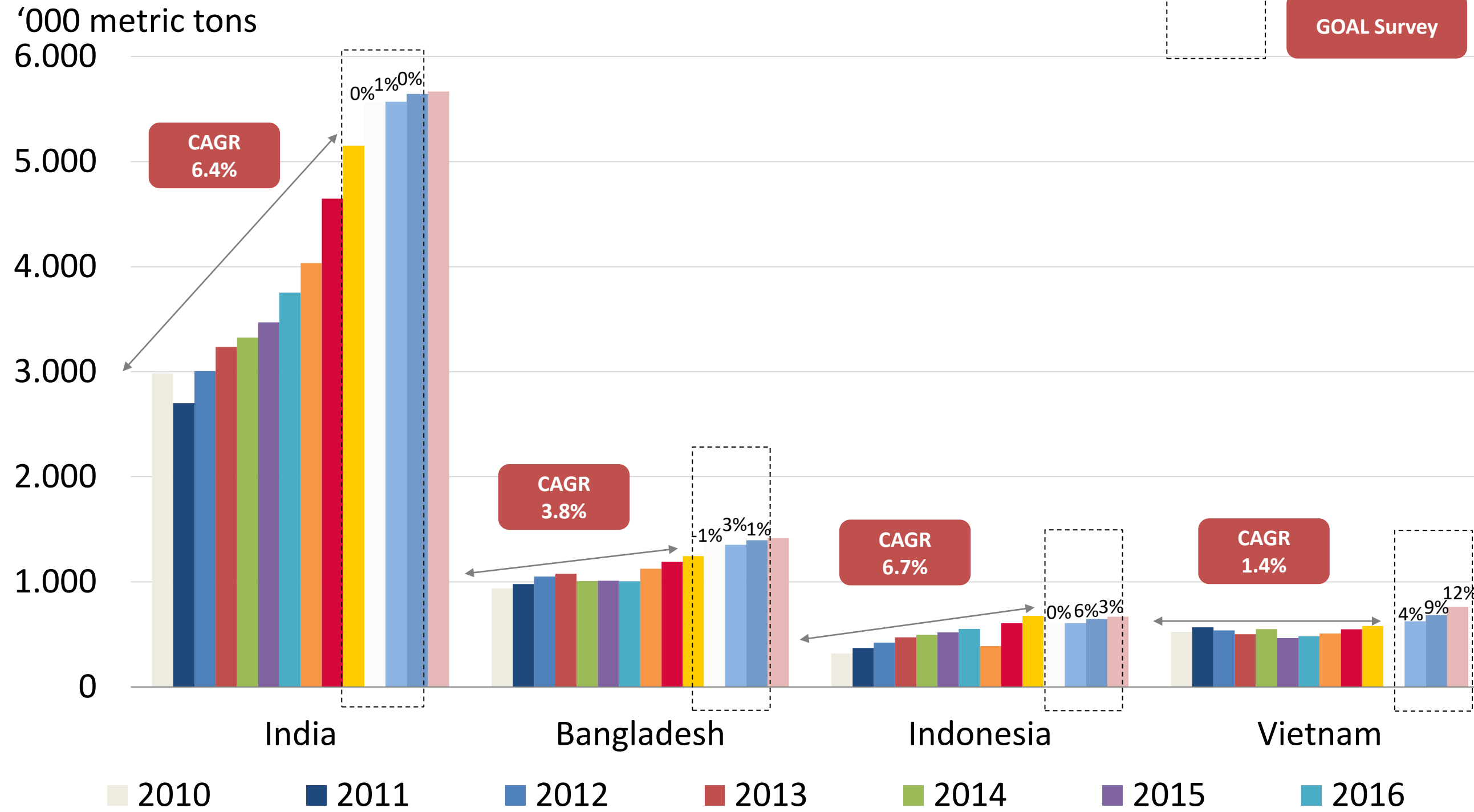
# In China, production of carps is slowing down further and is stable in some cases

China carps production



# Other carp producers globally, especially India, are also slowing down the supply growth rate

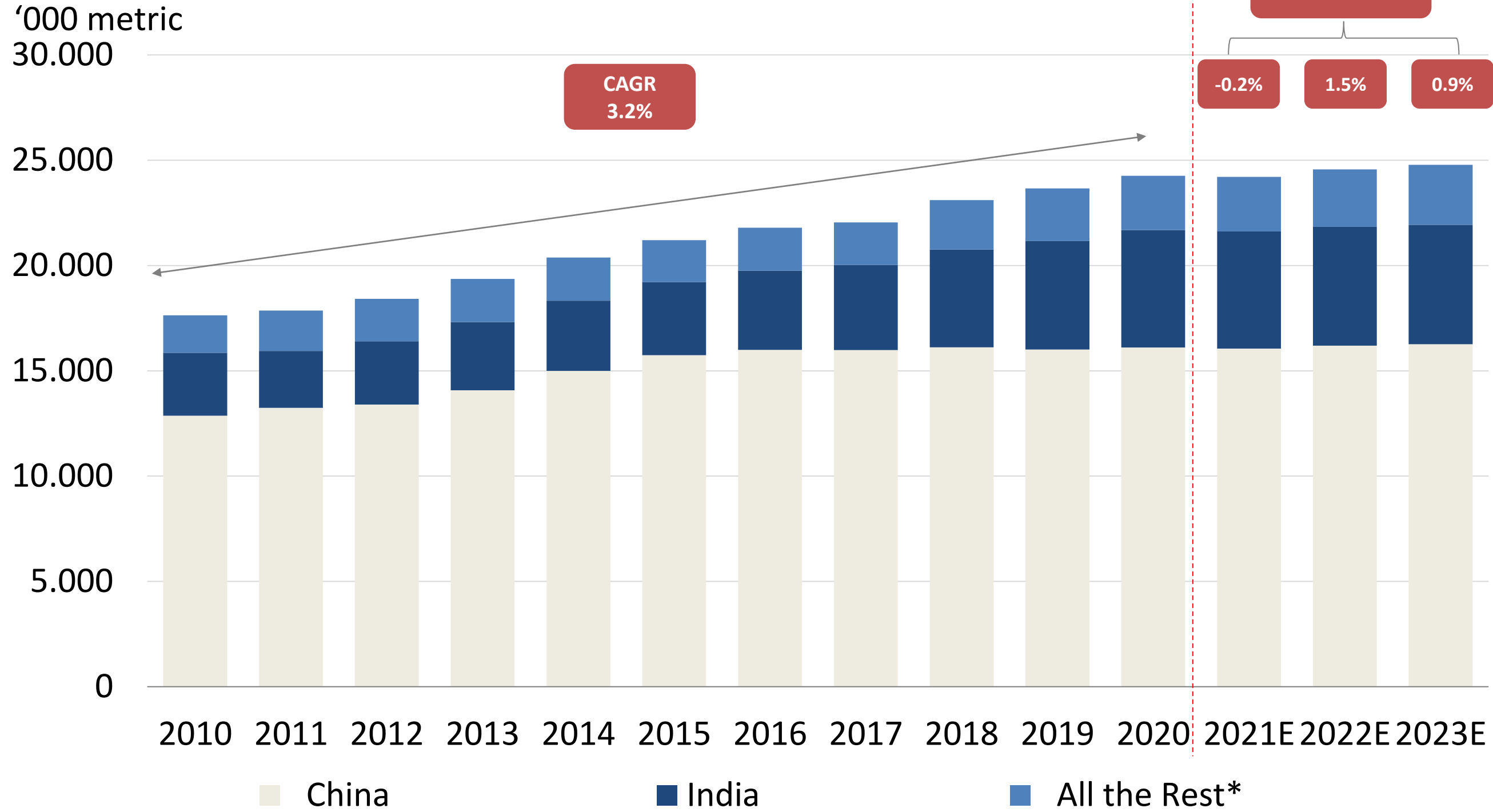
*Carp, barbels and other cyprinids production FAO*



Source: Rabobank, FAO, GSA 2022

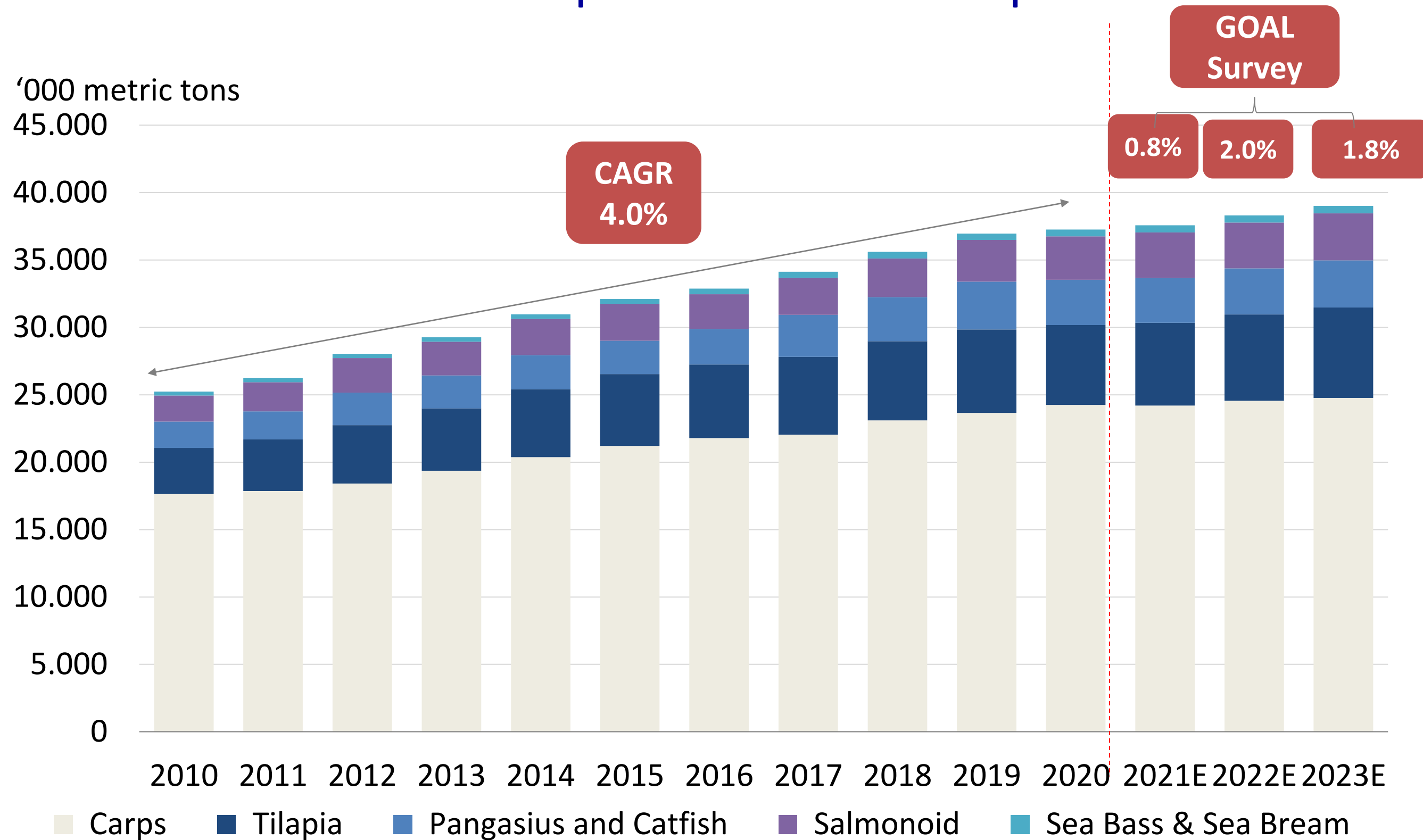
# Carp is now a 0 to 1.5% p.a. growth industry, down from 3.2%

*Carps production FAO*



- Source: Rabobank, FAO, GSA 2022
- Note – China includes Bighead carps, Black carps, Common Carps, Grass Carps, Silver Carps
- All the Rest – Bangladesh, Indonesia and Vietnam

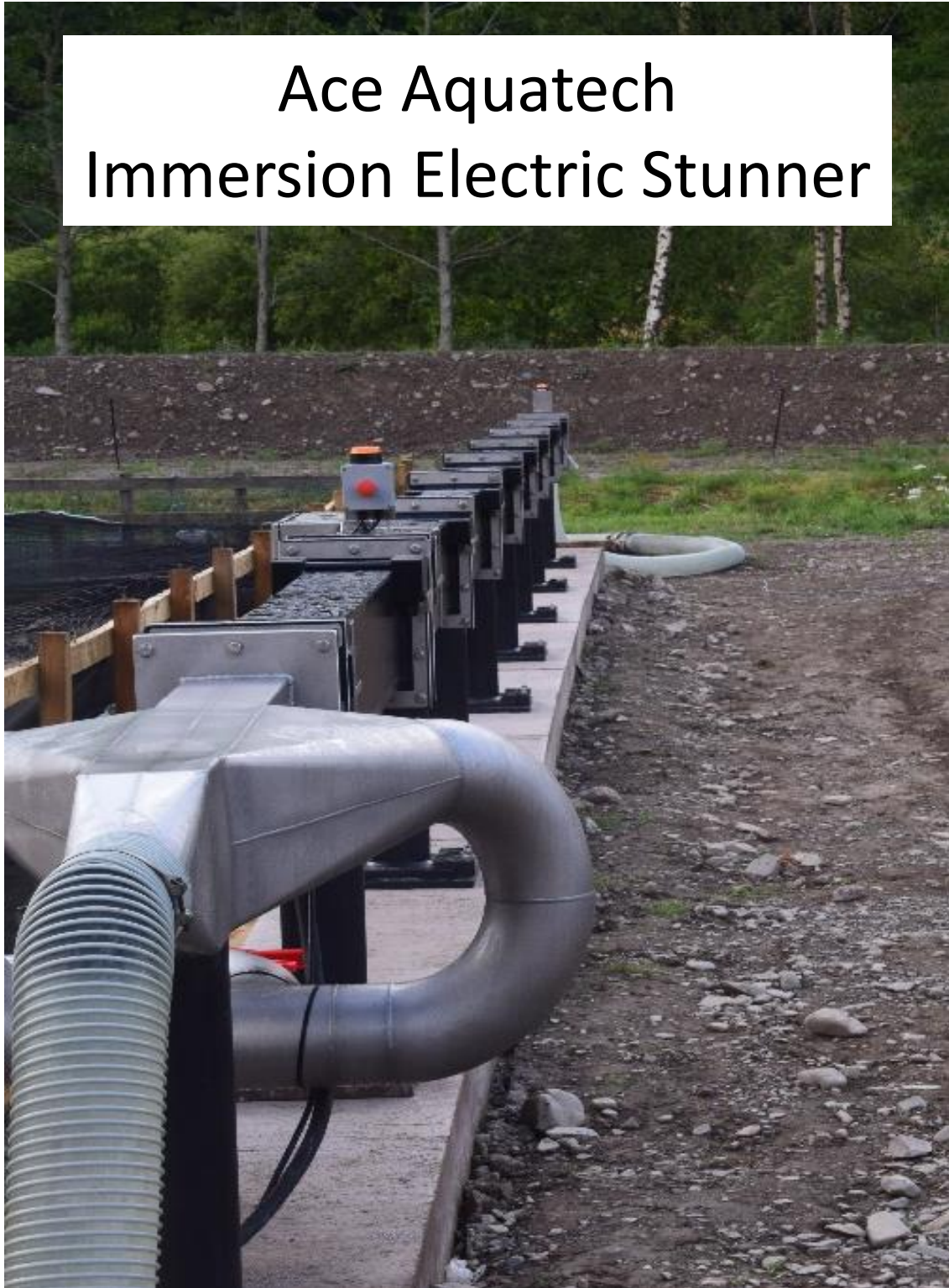
# The slower growth of carp and enormous volumes influences overall picture of finfish aquaculture



• Source: Rabobank, FAO, GSA 2022  
 • Note: The above data set covers approximately 2/3rds of all the farmed finfish species globally, in volume terms

# Advances in Fish Aquaculture

# Humane slaughter of tilapia achieved by immersion electric stunning followed by bleeding in warm water

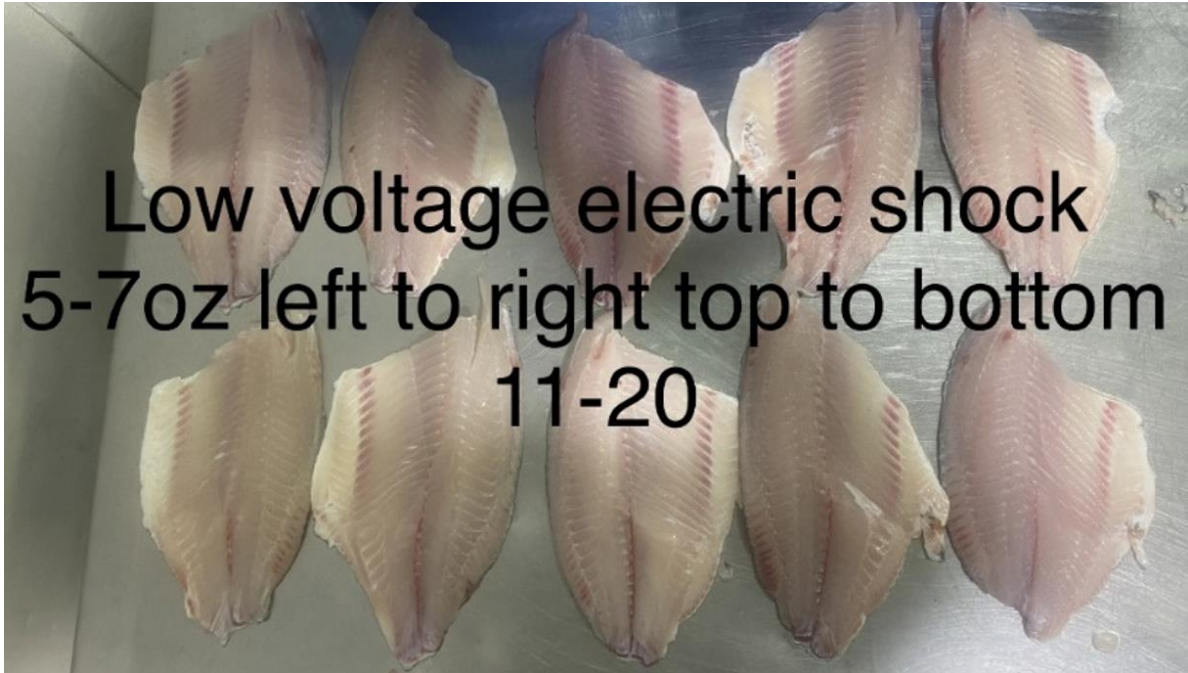


Ace Aquatech  
Immersion Electric Stunner

Flesh quality (gaping, blood spotting, and flesh color) was improved by electric stunning before slaughter



Chill Killed



Electrical Stunning

TCRS will use electro-encephalograph (EEG) to determine appropriate methods for stunning fish before slaughter

SLU

develop and validate stunning methods



Rainow trout      Atlantic salmon      Sea bream      Channel catfish

Arctic char      Pangasius      Sea bass



Nile tilapia      African sharptooth catfish      Baramundi

new species  
new problems

SLU

measuring EEG in fish

Visually Evoked Responses = **VERs**



conscious      uncounscious

Bowman & Gräns et al. Aquaculture Research 2019



# Bangladesh Freshwater Fish Breeding YY Male Technology

- Fish is the country's primary protein
- Bangladesh has become self sufficient in meeting its needs for fish (2.6 MMT)



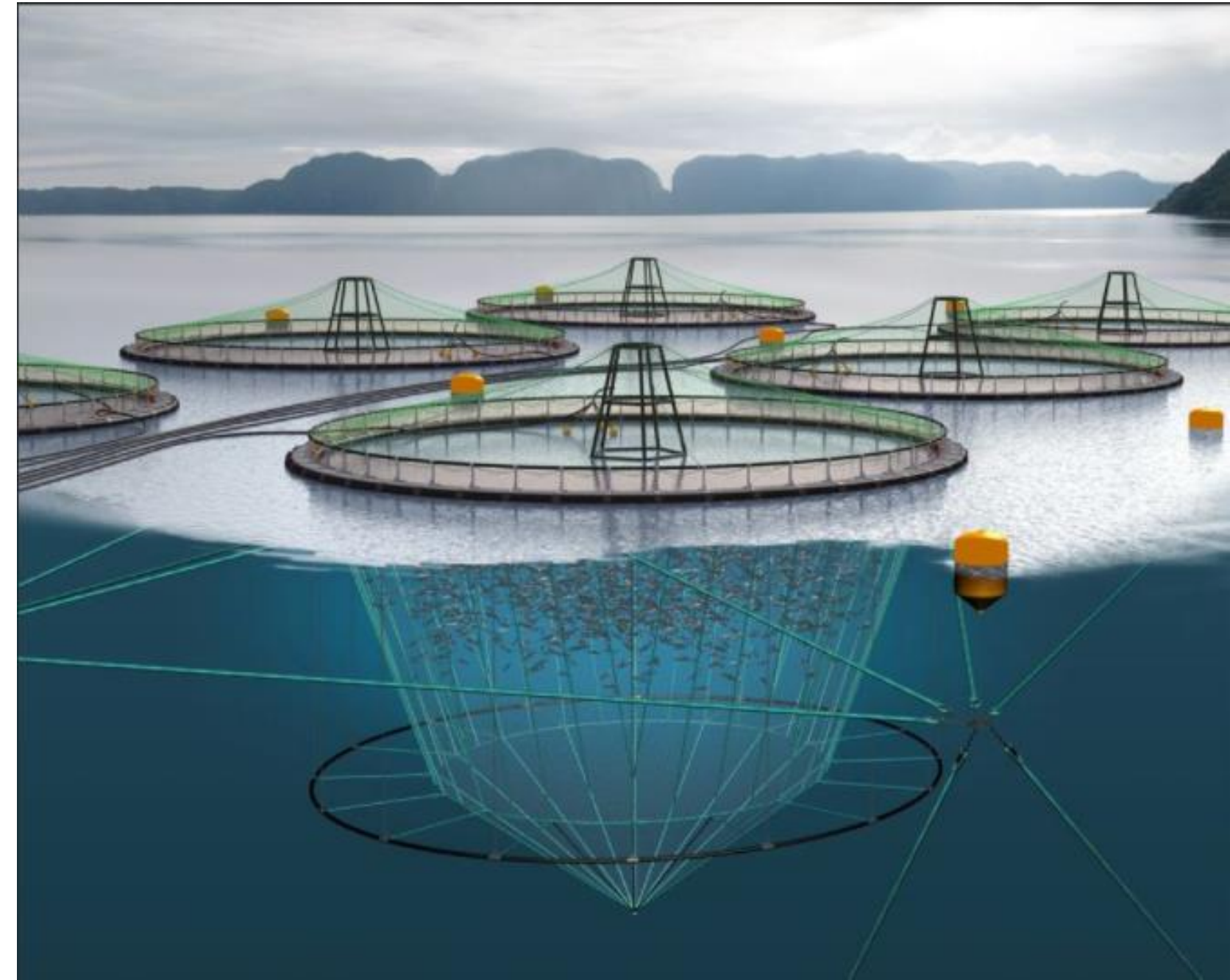
# New genome-editing method for creating sterile, single-sex fish

- The Center for Aquaculture Technologies (CAT) developed a means of producing
- Uses genome editing to produce reproductively sterile, single-sex populations
- Does not introduce new DNA, is inherited in each generation and results in 100% sterility in production animals while maintaining fertility in the broodstock.



# Innovations in Norwegian Salmon Production

- Principally Open-Cage Inshore Farms
  - Very productive
  - Rely on massive water exchange to flush wastes and replenish water quality
  - No control of sludge, temperature, sea lice pressure
  - Policymakers: 500% growth by 2050



# New Salmon Production Technologies

- Three major options to reduce eutrophication and disease risk

Semi-closed containment systems



Offshore farming systems



Indoor recirculating aquaculture systems

# New Offshore Aquaculture Value Chain

**Technology suppliers:** Nutreco Skretting, Moreld Aqua, ABB, a.o. **R&D:** Norce, VI, HI, UiS, HVL, NMBU, NTNU, UiB, Simula, U. Florida, U. Melbourne



## Per kg seafood:

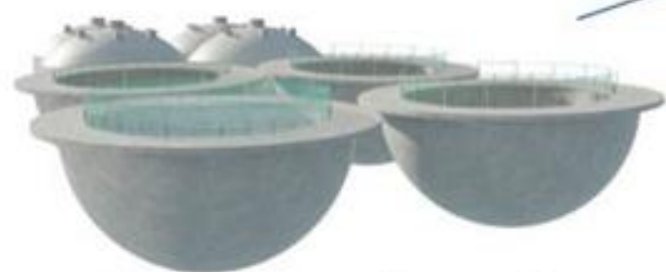
Climate gas emissions  
Energy consumption  
Production costs

## Offshore farm:

Farm structure tech.    Feed & feeding tech  
Energy technology    Operations  
Digital technologies    Scale of production

## Farm location:

Temperatures  
Currents  
Waves  
Oxygen  
Algae  
Water quality  
Water depth  
Marine organisms



## Closed sea-based systems:

Energy technology  
Biosecurity technology  
Sludge collection  
Live fish logistics



## Sea transportation:

Energy technology  
Multi-operational vessels  
# trips and trip distances  
Operations at offshore farm



Feed conversion rate

Fish escapees

Growth and mortality

Welfare & disease  
Sea lice





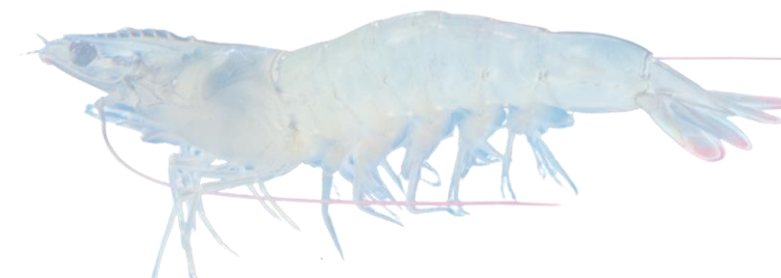
**FishGLOBE**

**A unique Norwegian technology  
with a global game changer potential**



# Summary

- Global finfish production is dominated by carp from China and from India
- Overall growth of farmed finfish has declined from 4% in the previous decade to 1-2% in this decade. Declines occurred in major producing countries for each species group and accelerated in secondary producing countries.
- Global tilapia production has accelerated in 2022 after a lag in 2020. Latin America is the fastest growing tilapia continent, driven by Brazil
- Tilapia production in China is slowing down, while Indonesia and Egypt are holding steady with expected 2022-2023 growth rates of 4-7%.
- Pangasius production is driven by Vietnam at 1.5 MMT, which is below its peak of 1.6 MMT in 2019.
- The Norwegian salmon sector is the leading aquaculture innovator with development of open ocean, semi-closed, and land-based recirculating aquaculture systems. However, the sector is shocked by a proposed government tax of an additional 40% on profits.







Obrigado

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