TEEB Agrifood
Virtual Inception Workshop

3 pm IST

The Economics of Ecosystems and Biodiversity
TEEB for Agriculture & Food – India

EU Partnership Instrument project on TEEBAgriFood Initiative

13 July 2020 Inception Workshop Day 2

Dr. Salman Hussain, TEEB Coordinator

UN environment
United Nations Environment Programme

European Commission

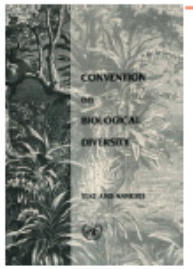
TEEB
The Economics of Ecosystems & Biodiversity

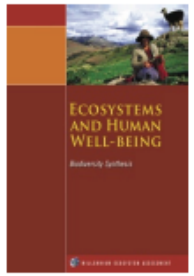
Image credit: Anup Deodar

teebweb.org

I. What is TEEBAgriFood?

TEEB initiative (2008-2012)





Ecol./Env. Economics literature

G8+5 Potsdam 2007

"Potsdam Initiative – Biological Diversity 2010"

The economic significance of the global loss of biological diversity….

Importance of recognising, demonstrating & responding to values of nature…

Interim Report

CBD COP 9 Bonn 2008

Climate Issues Update

Input to UNFCCC 2009

TEEB End User Reports Brussels 2009, London 2010

India, Brazil, Belgium, Japan & South Africa Sept. 2010

TEEB Synthesis

TEEB Books

BD COP 10 Nagoya, Oct 2010

CBD COP11 India

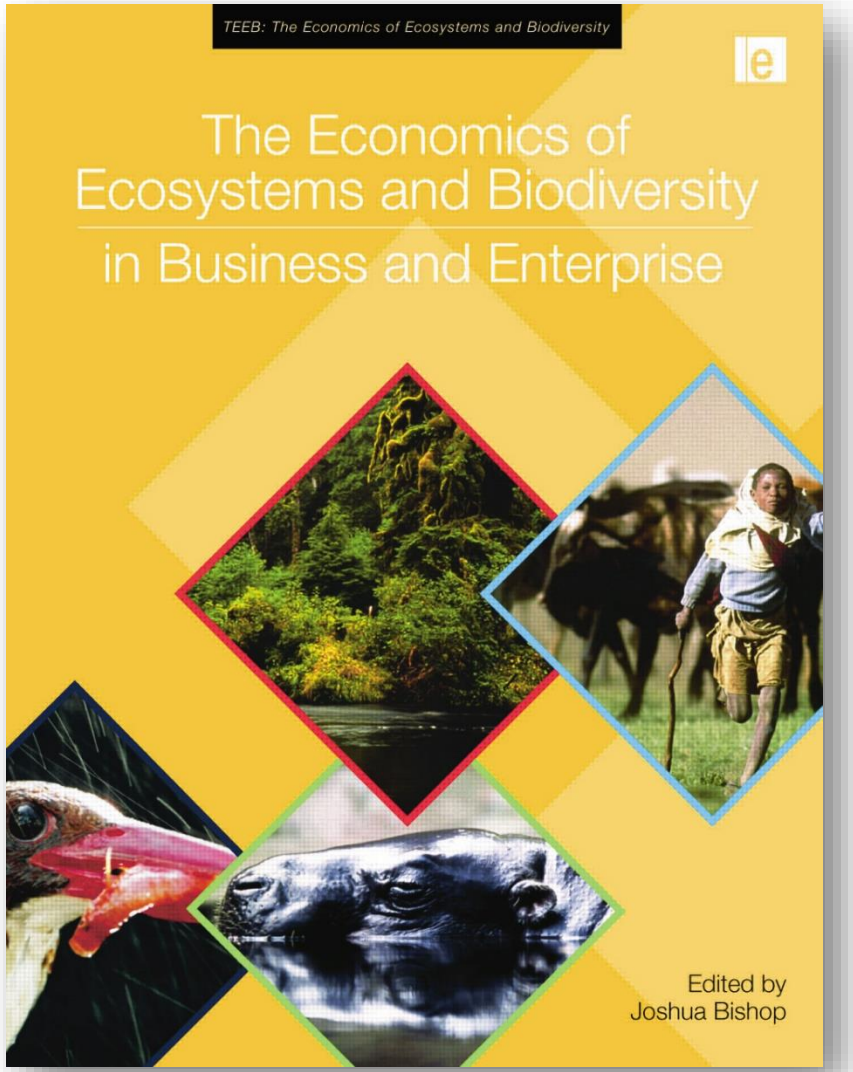
National TEEB Work

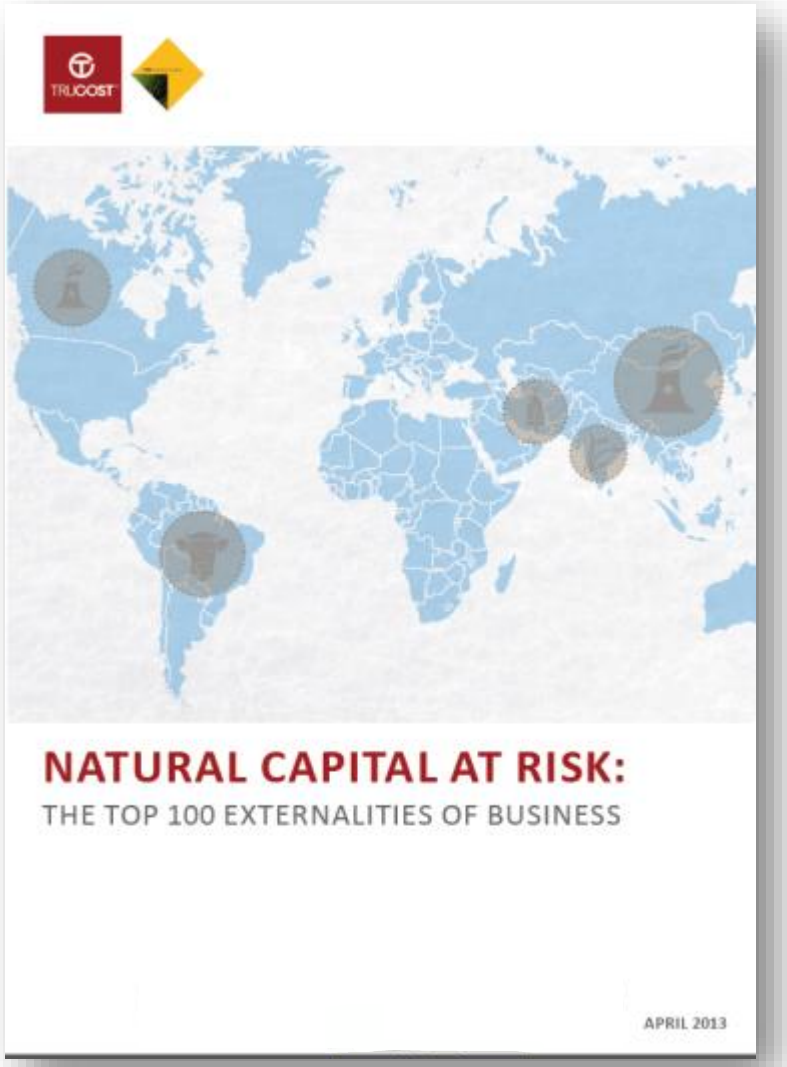
Sectoral TEEB Work

Business Externalities Work

Rio+20 Brazil

TEEB for business





Why select the agriculture sector?

7.1.2 THE GLOBAL 20 REGION-SECTORS

Ranking of the 20 region-sectors with the greatest total impact across the 6 EKPIs when measured in monetary terms.

RANK	SECTOR	REGION	NATURAL CAPITAL COST, US$ BN	REVENUE, US$ BN	IMPACT RATIO
1	COAL POWER GENERATION	EASTERN ASIA	452.8	443.1	1.0
2	CATTLE RANCHING AND FARMING	SOUTH AMERICA	353.8	16.6	18.8
3	COAL POWER GENERATION	NORTHERN AMERICA	316.8	246.7	1.3
4	WHEAT FARMING	SOUTHERN ASIA	266.6	31.8	8.4
5	RICE FARMING	SOUTHERN ASIA	235.6	65.8	3.6
6	IRON AND STEEL MILLS	EASTERN ASIA	225.6	604.7	0.4
7	CATTLE RANCHING AND FARMING	SOUTHERN ASIA	163.0	174.0	0.8
8	CEMENT MANUFACTURING	EASTERN ASIA	147.0	5.8	23.0
9	WATER SUPPLY	SOUTHERN ASIA	111.7	14.1	7.9
10	WHEAT FARMING	NORTHERN AFRICA	100.1	7.4	13.6
11	RICE FARMING	EASTERN ASIA	99.3	91.2	1.1
12	WATER SUPPLY	WESTERN ASIA	86.7	18.4	4.7
13	FISHING	GLOBAL	86.1	136.0	0.6
14	RICE FARMING	NORTHERN AFRICA	84.2	1.2	69.6
15	CORN FARMING	NORTHERN AFRICA	80.4	1.7	47.8
16	RICE FARMING	SOUTH-EASTERN ASIA	79.7	41.0	1.9
17	WATER SUPPLY	NORTHERN AFRICA	76.4	3.4	22.2
18	SUGARCANE	SOUTHERN ASIA	75.6	6.0	12.5
19	PETROLEUM AND NATURAL GAS EXTRACTION *(excludes water and land use)*	EASTERN EUROPE	72.6	371.6	0.2
20	NATURAL GAS POWER GENERATION	NORTHERN AMERICA	69.4	122.7	1 .0

The visible and invisible flows of agricultural production

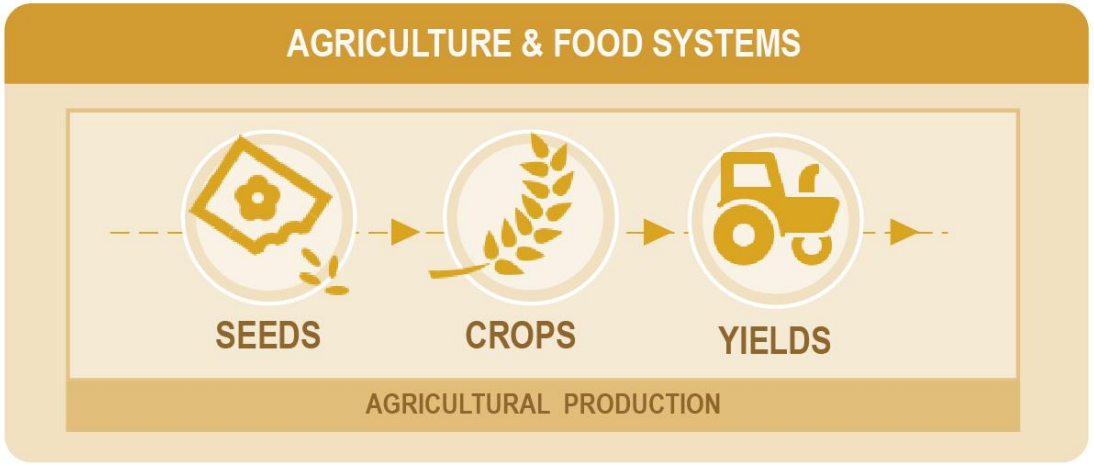
ZAKIR HOSSAIN CHOWDHURY/ANADOLU AGENCY/GETTY

Drying red chillis under the sun provides one of the few sources of employment for women in an area of Bangladesh.

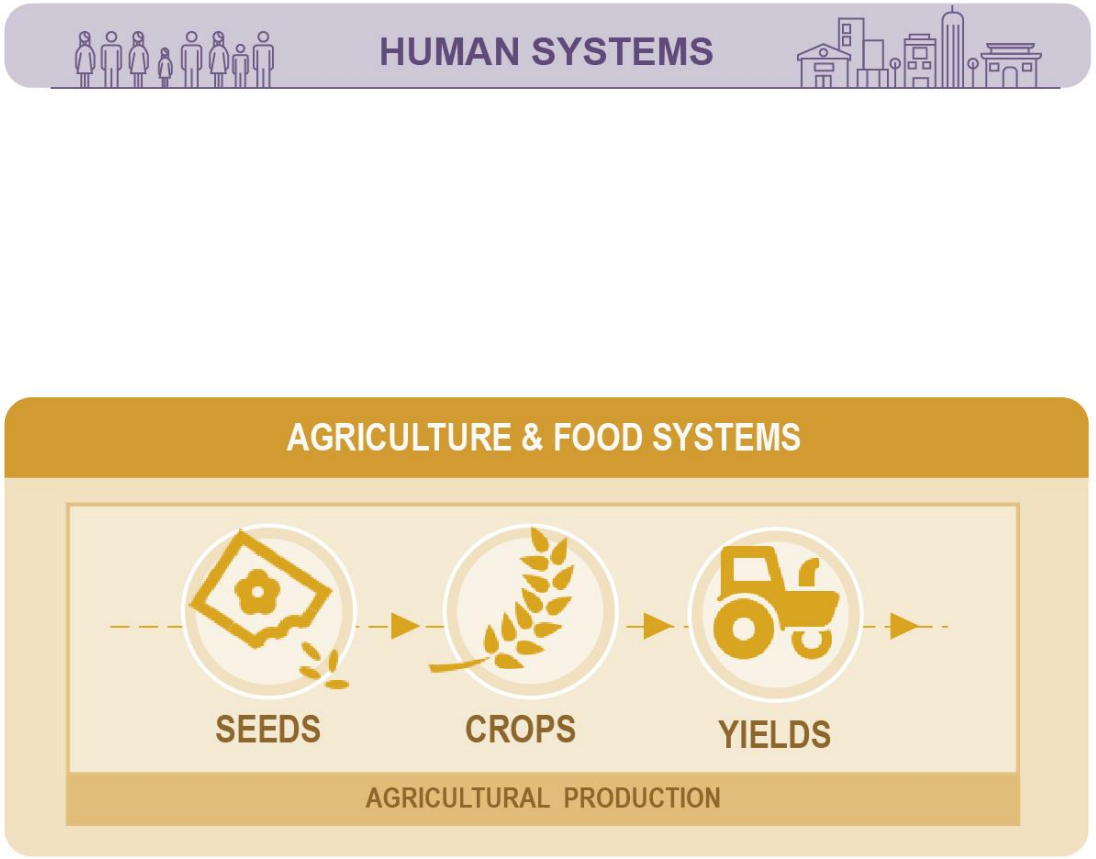
Fix food metrics

For sustainable, equitable nutrition we must count the true global costs and benefits of food production, urge **Pavan Sukhdev**, **Peter May** and **Alexander Müller**.

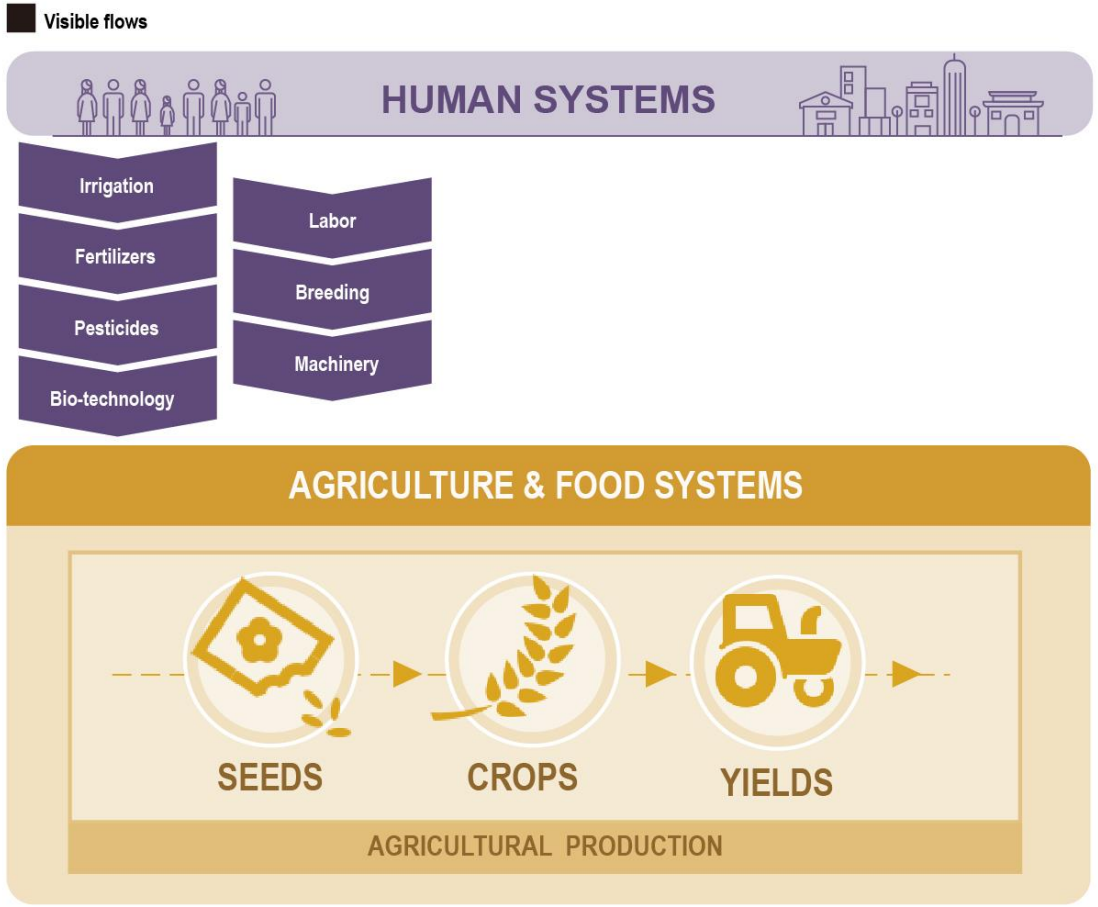
The visible and invisible flows of agricultural production



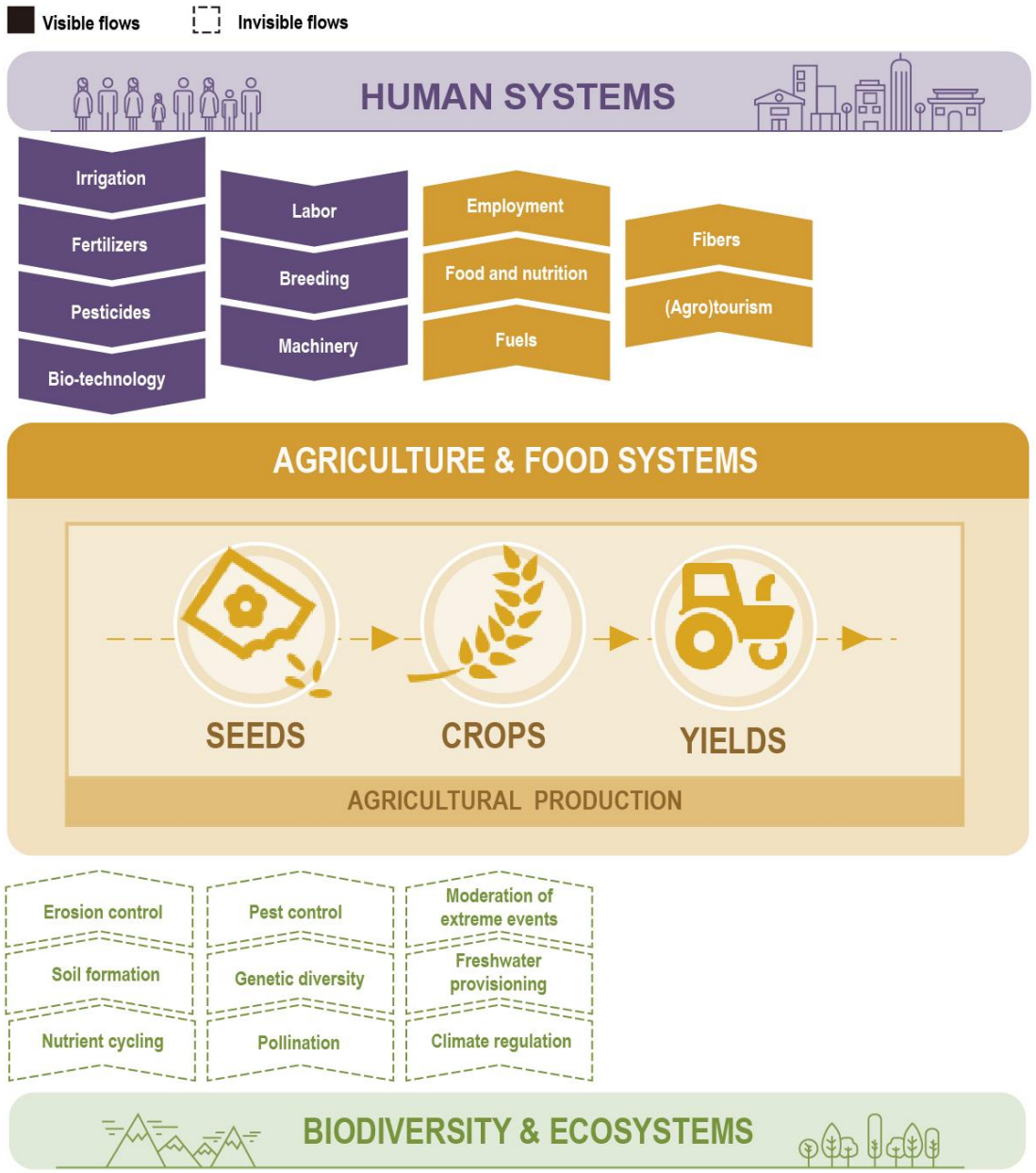
The visible and invisible flows of agricultural production



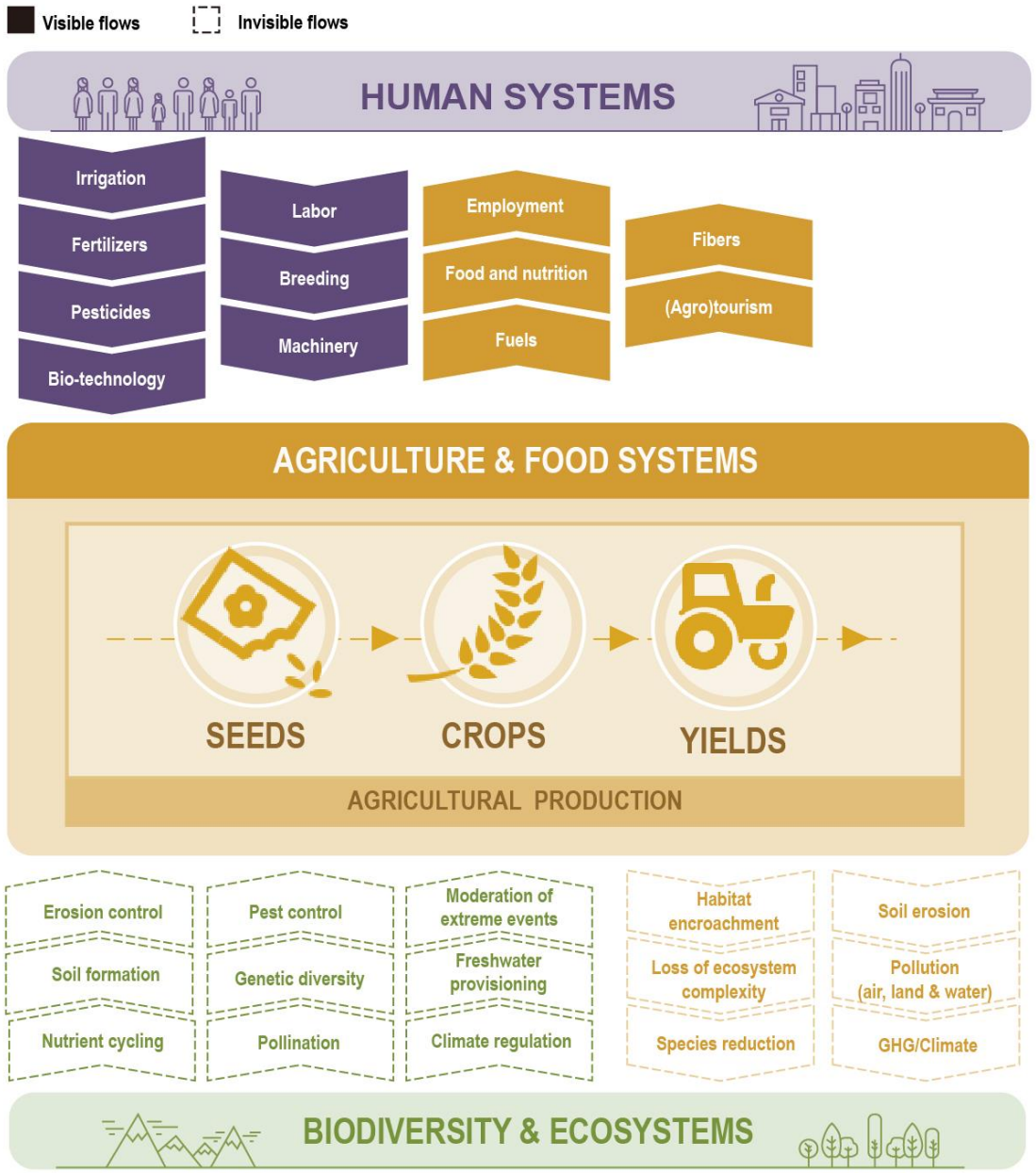
The visible and invisible flows of agricultural production



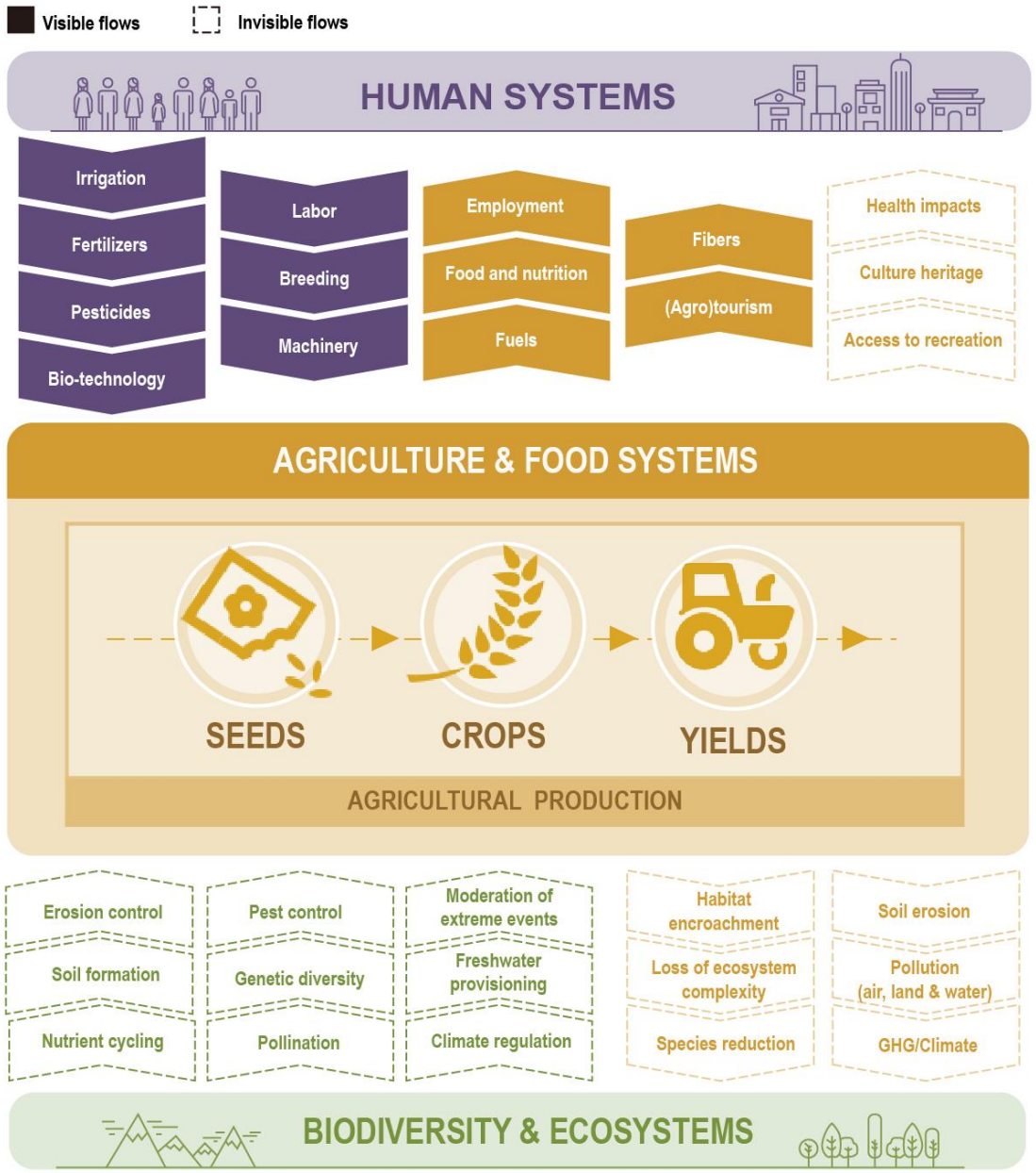
The visible and invisible flows of agricultural production



The visible and invisible flows of agricultural production



The visible and invisible flows of agricultural production



The visible and invisible flows of agricultural production

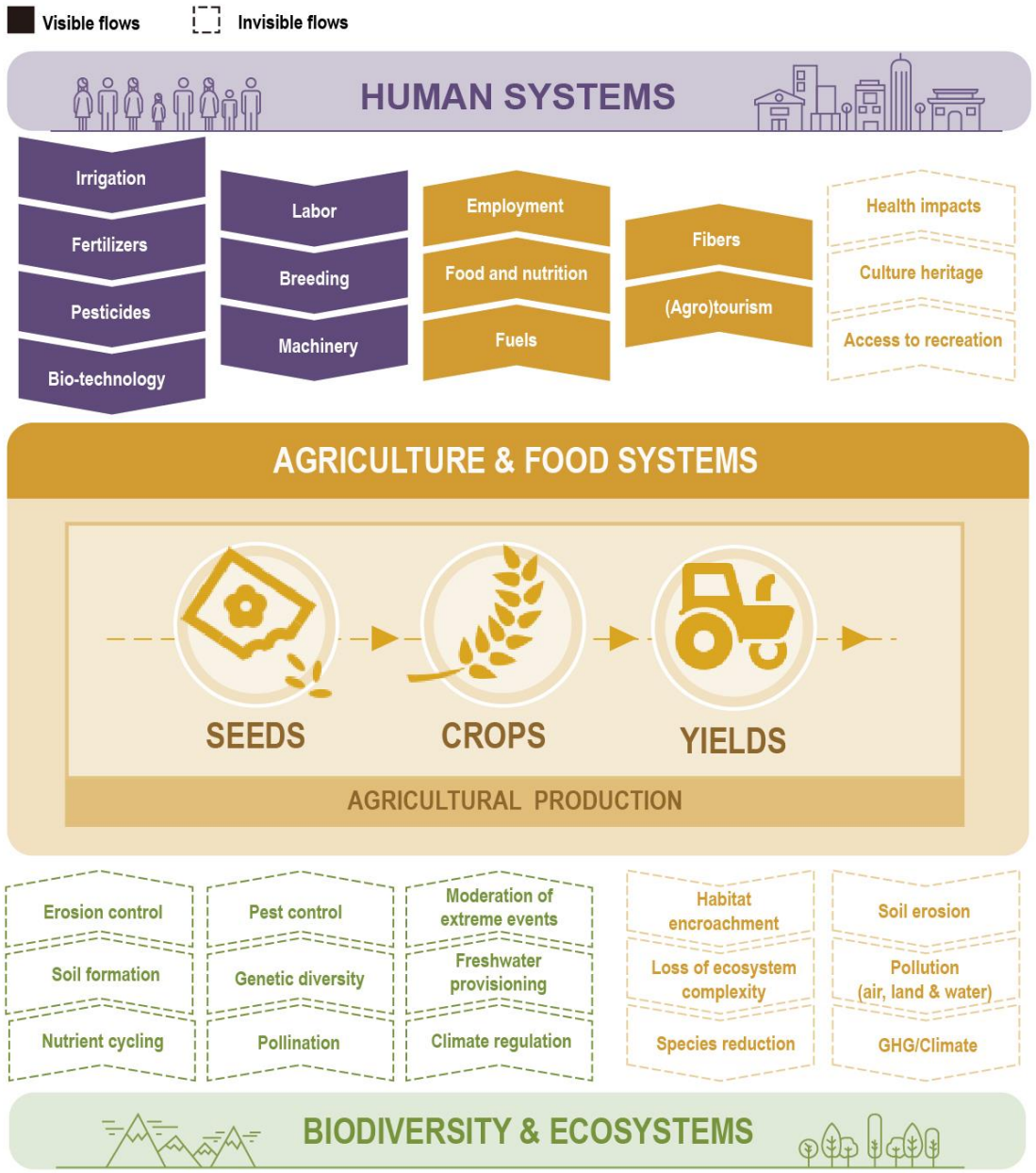
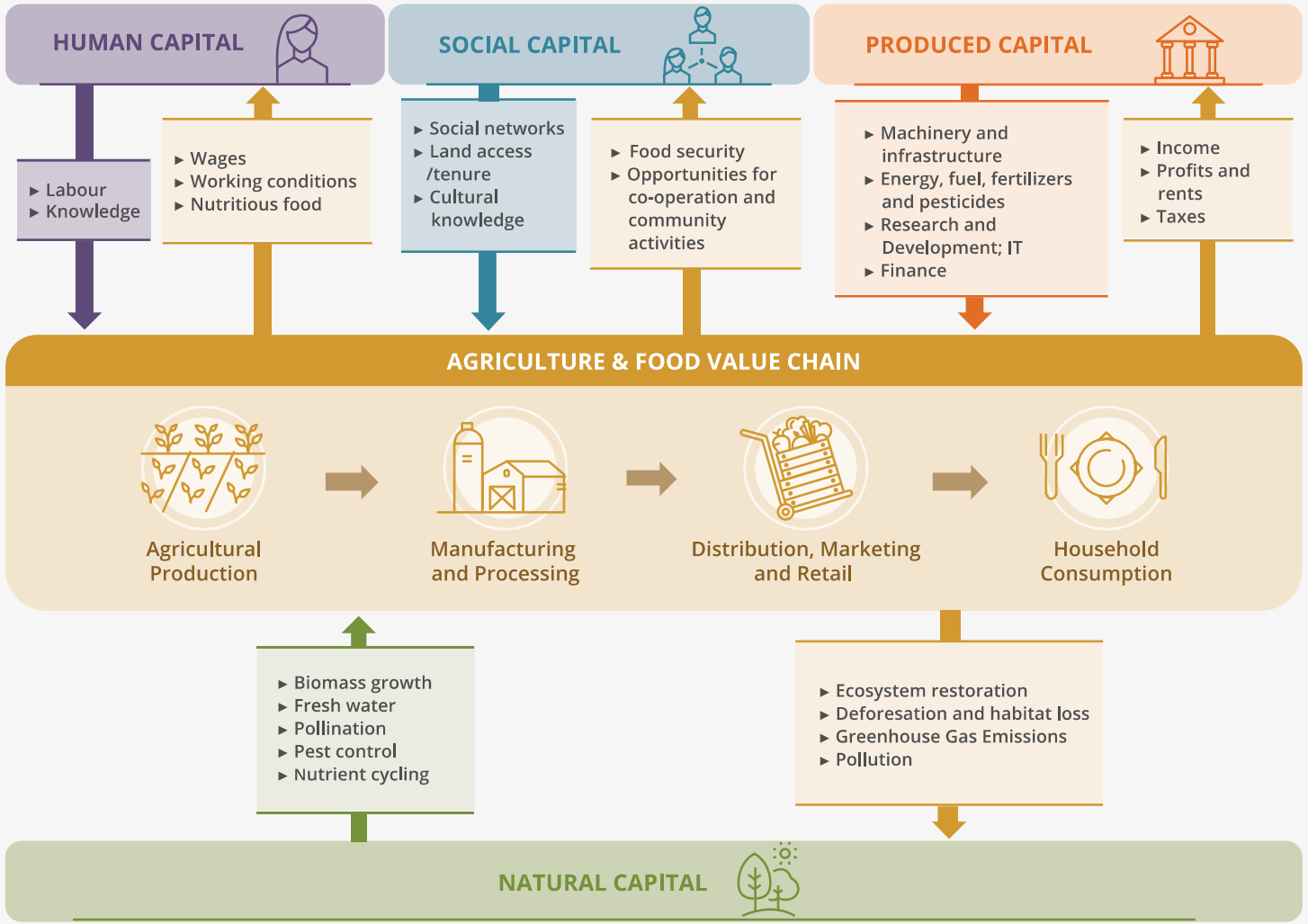
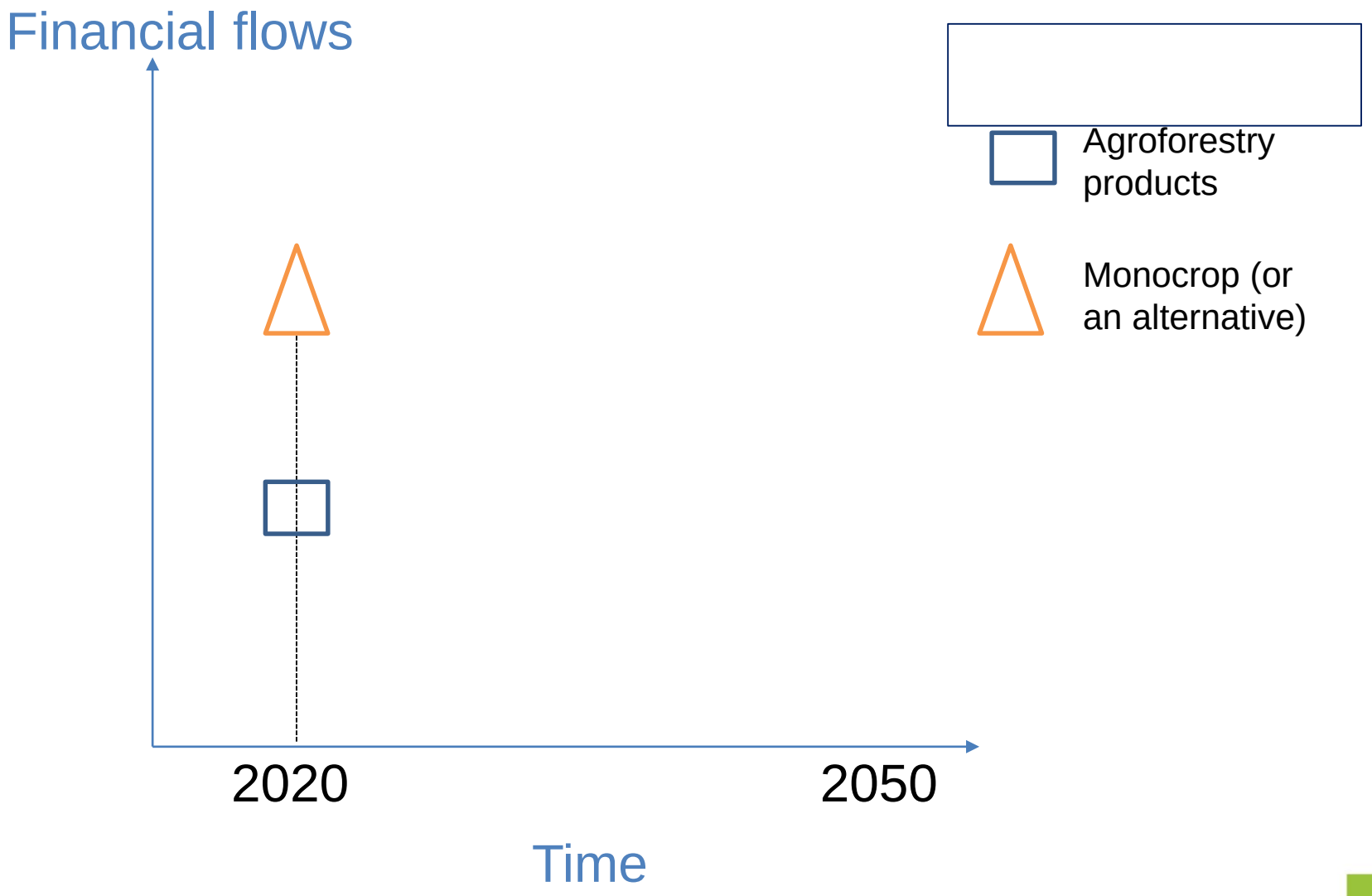


Figure 2.1 Capital stocks and value flows in eco-agri-food systems (Source: Hussain and Vause 2018)

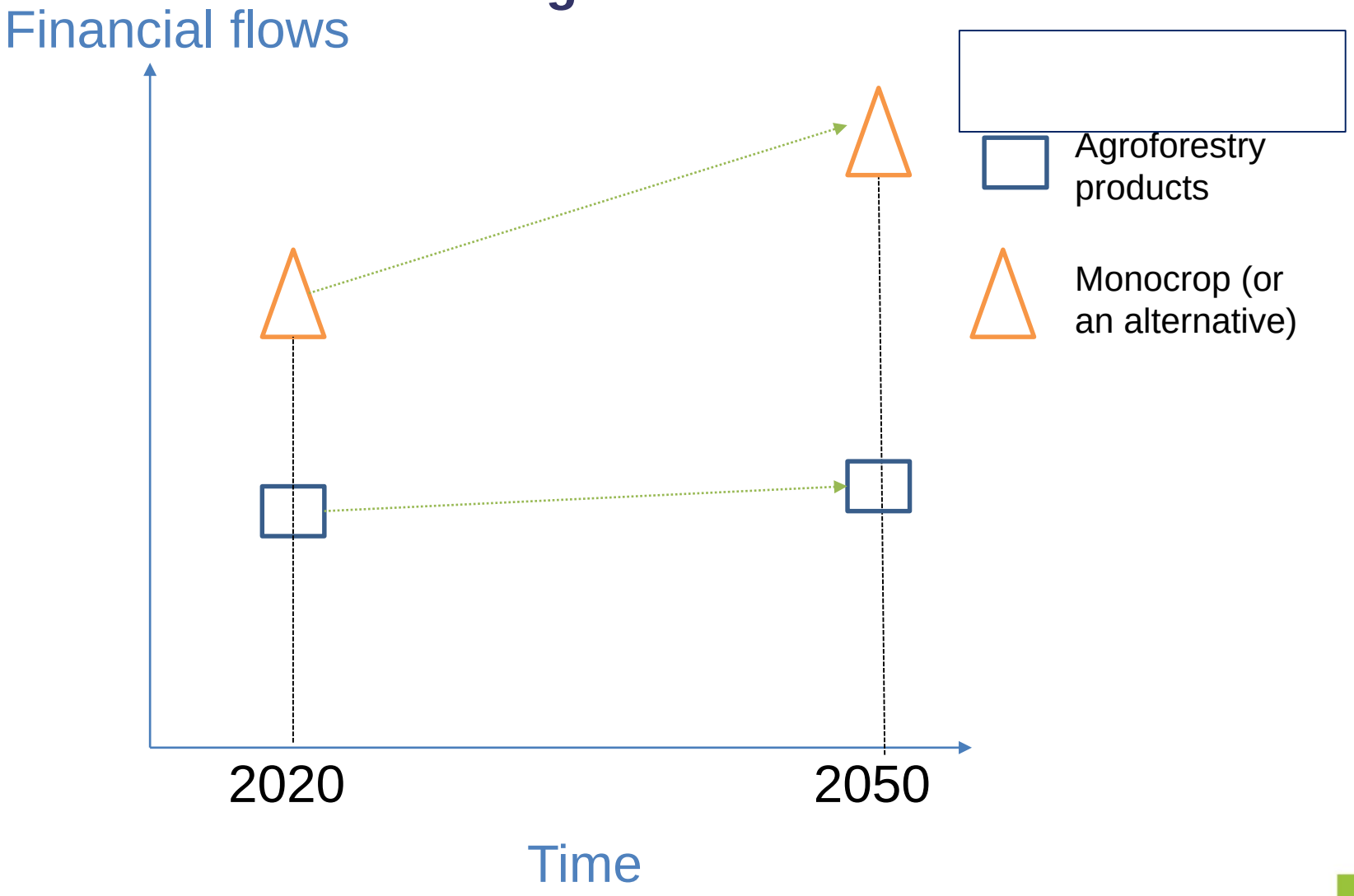


II. Why should the Indian government and private sector be engaged with the project?

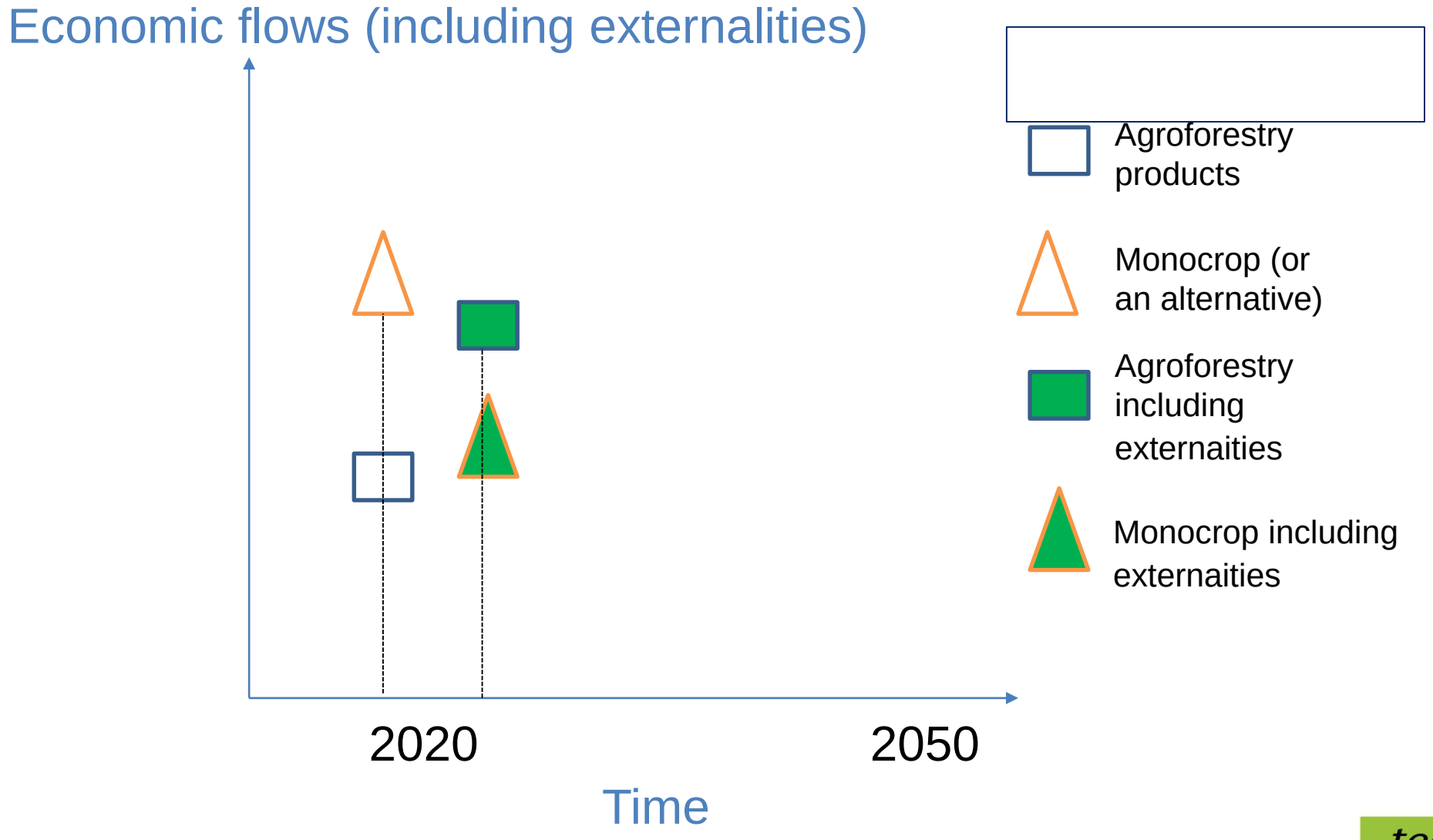
Agro-forestry [or ZBNF, or organic production, or agro-ecology, or a multi-use landscape...] versus monoculture: *current assumption*



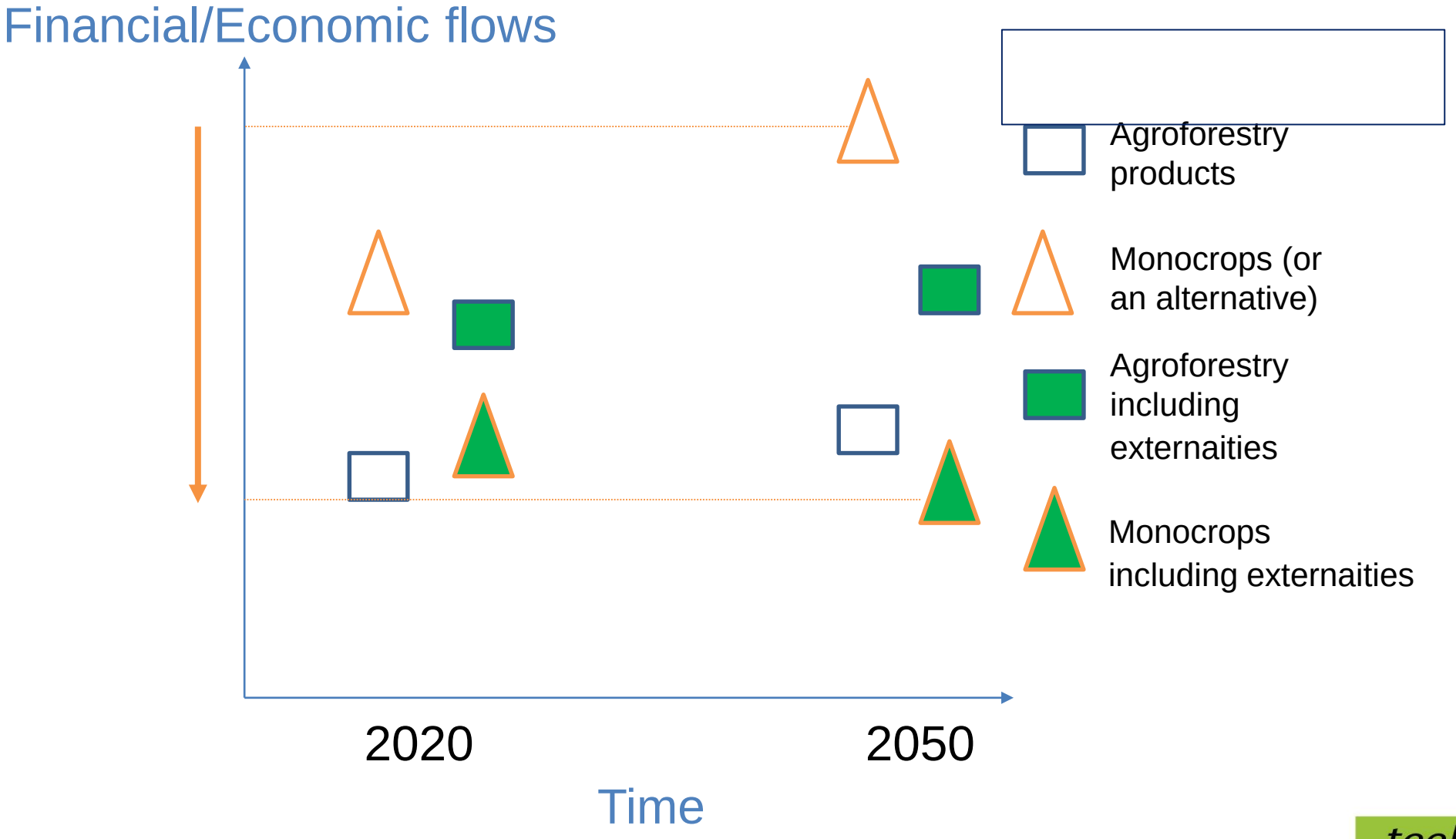
Agro-forestry versus monocrop: Assumption about changes over time



Agro-forestry versus monocrop:
2020 including externalities



Agro-forestry versus monocrops:
2050 for the monocrop



Agro-forestry study

- Agroforestry is a practice involving the **deliberate integration of trees or shrubs in farming landscapes** involving crops or livestock in order to obtain benefits from the interactions between trees and/or shrubs the tree and crop or livestock component

Agro-forestry case studies

Selection criteria	Cocoa agroforestry Ghana	Coffee agroforestry Ethiopia	Ngitili system Tanzania
Trend of agroforestry system	Increased by about twice the area in the 1990s to about 1.6 million ha (FAOSTAT 2013)	Increased by 100% since the 1990s to about 520,000 ha (FAOSTAT 2013)	Increased from **600 ha in 1986 to >350000 ha in 2003** (Mlenge 2004)
Number of people benefiting from the system	Between 1.9 million (Coulombe & Wondon 2007) to 6 million people (Anthonio and Aikins, 2009) - 700,000 smallholder farmers (Kolavalli & Vigneri 2011)	**7 million to 15 million people** (Petit 2007); 95% of the coffee produced by smallholder farmers About 4.5 million smallholder farmers (Central Statistical Agency 2013)	No data available, but estimated about 1500 households employed in Shinyanga's formal and informal forestry sector, in which ngitili products play a major role
Contribution to national economy	18.9% of the agricultural GDP; 8.2% of the Ghana's GDP and 30% of total export earnings (GAIN, 2012)	**36% of national export income in 2006/07** (Ejigie 2005) *Approximately* 10% of national GDP (Economic Report on Africa 2013)	No data available but estimated to contribute approximately 0.43% of Shinyanga region's GDP

Agro-forestry: Scenarios and modelling

- Scenarios include **conversion of existing systems** to heavy shade system, or growing alternative crops such as maize

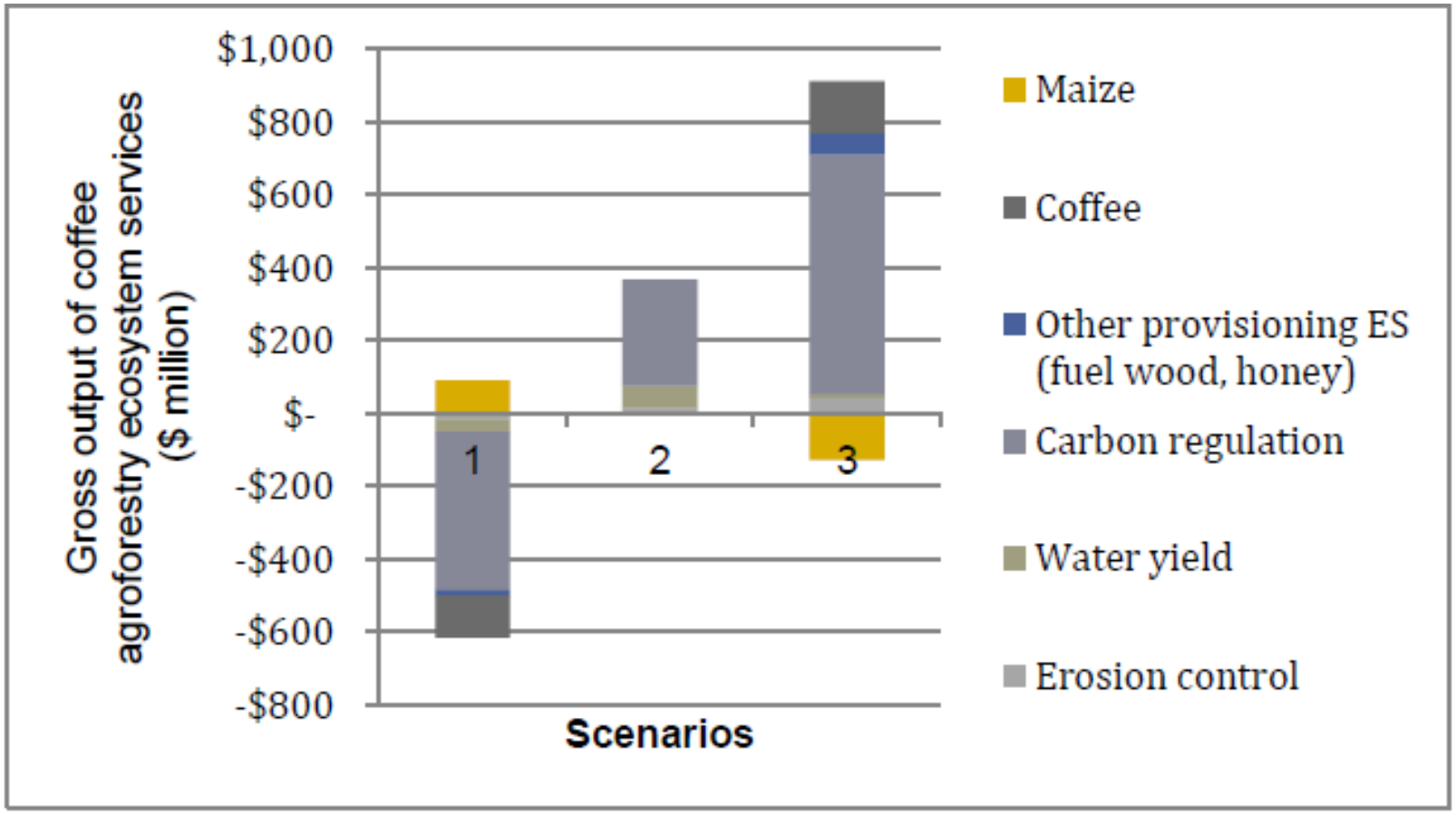
- The **WaterWorld model** was also used to model ecosystem services change
  - freshwater provision and runoff
  - increased water quality
  - above ground carbon stock
  - reduction of soil erosion

Agro-forestry valuation methods

Ecosystem Service	Agroforestry System			Valuation Method
	Cocoa	Coffee	Ngitili	
Provisioning				
Cash Crops	***	***	N/A	Market price[16]
Food Crops	***	***	***	Market price
Tree Crop Products	***	***	N/A	Market price
Medicines	*	*	***	Shadow price[17], replacement cost
Wild Food and all other NTFP	*	***	***	Shadow price
Timber and Poles	***	***	***	Market price
Energy (Wood fuel and Charcoal)	*	***	***	Market price, shadow price, replacement cost
Regulating and Supporting				
Soil and biomass C stocks	***	***	***	Market price, avoided cost
Erosion control	ND	***	ND	Contingent valuation, replacement cost
Soil fertility (Soil N also P and K where available)	**[18]	**	***	Replacement cost
Biological Pest Control	**	**	ND	Insufficient data for benefit transfer
Pollination	**	**	N/A	Insufficient data for benefit transfer
Biodiversity	**	**	**	Insufficient data for monetary valuation
Avian Diversity	**	**	**	Insufficient data for monetary valuation
Vegetative Diversity	**	**	**	Insufficient data for monetary valuation
Other mammalian diversity	**	ND	ND	Insufficient data for monetary valuation

*** Sufficient data for biophysical quantification and monetary valuation;
** Quantitative biophysical data available, but insufficient data for monetary valuation;
* Qualitative information available; ND No relevant data available; N/A No applicable

Agro-forestry
Scenario analysis



III. The EU Partnership Instrument
Project specifics

Project Objectives

- The core project goal is to **stimulate biodiversity conservation and ecosystem service provisioning** for agricultural landscapes for the seven countries in scope (Brazil, China, India, Indonesia, Malaysia, Mexico, Thailand)

Project log frame (overview)

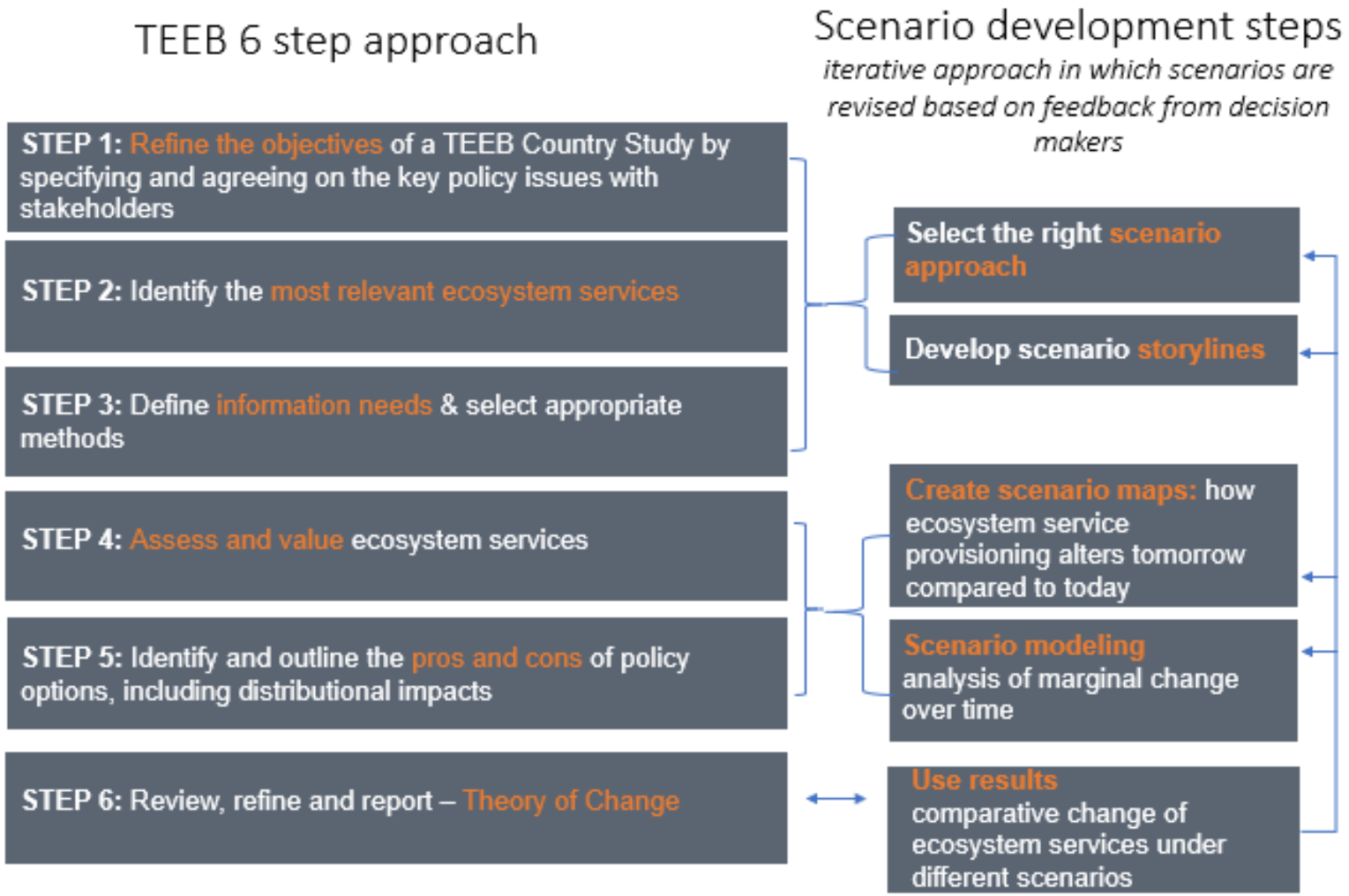
Year		Year 1				Year 2				Year 3				Year 4			
	Work Packages and activities	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
WP 1	Country specific analysis – lessons learned from previous interventions																
WP 2	Policy mapping																
WP 3	Determine and refine the case studies																
WP 4	Engaging agri-business with NCP																
WP 5	Scenario Analysis																
WP 6	Develop a roadmap of concrete steps to implement a change																
WP 7	Deliver the change and ensure project sustainability																
WP 8	Communicating biodiversity benefits and mainstreaming																

IV. Developing scenarios

Developing scenarios

- Selection of **which policy interventions to test/apply** using the TEEBAgriFood Framework will be determined by government and stakeholder priorities
- In carrying out the **scenario analysis**, Business-as-Usual and the policy-on scenarios includes known changes
  - Urbanization
  - Population demographics
  - Changing dietary patterns
  - Climate change scenarios
  - Covid19 responses

TEEB Six-Step Approach



TEEB

The Economics of Ecosystems & Biodiversity

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European Commission

TEEB: Challenges and Policy Options for Agriculture and Food Systems in India

Dr Harpinder Sandhu

Virtual Inception Workshop for UNEP Project

TEEB Implementation: Promoting a Sustainable Agriculture and Food Sector

13-14 July 2020

Transformations of global agriculture and food systems

- Global agriculture and food systems are at crossroads — struggling to produce nutritious food in adequate quantity for a growing population and reduce risks to ecosystems and society
- 0.8 billion people still go to bed hungry
- 2 billion people suffer from malnutrition
- 1.9 billion adults are overweight, and of these, 0.65 billion are obese (FAO, 2018)

Feature

Transformation of Agriculture and Food Systems: Application of TEEBAgriFood Framework

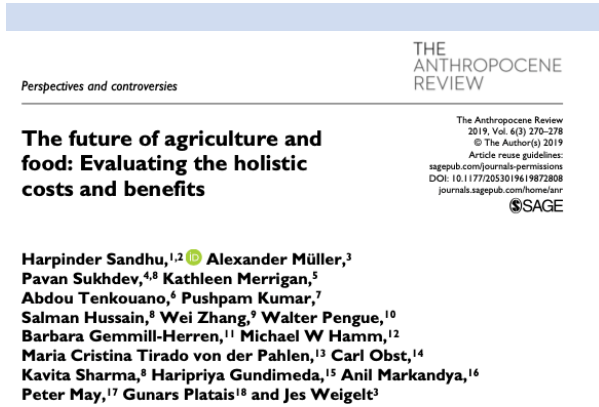
by Harpinder Sandhu, Alexander Müller, and Pavan Sukhdev

H. Sandhu

Canola field in South Australia

In Brief

The focus of global agriculture since the Green Revolution of 1960s is only on increasing productivity by practicing intensive agriculture. This intensive agriculture is often supported by large quantities of subsidies for inputs such as fertilizers, pesticides, and improved seed etc. Worldwide research shows, however, that these intensive practices have resulted in negative consequences for biodiversity, the environment and human health. And at the same time more than 800 million people are still hungry. Therefore, such a focus on productivity supported by subsidised agriculture that leads to perverse and pervasive outcomes is obsolete for future agriculture and food systems. Globally, agricultural and food systems need to transform and modify their approach and bring the desired change with new ways to integrate natural capital into social and economic systems. They also need to recognise and reward human capital. We recommend adoption of the TEEBAgriFood framework to measure and quantify all inter-dependencies between agriculture and the environment and to highlight the role of human and social capital. This transformed approach has the potential to secure food and ecological security to all, and to improve planetary health and well-being in society.



Perspectives and controversies

THE ANTHROPOCENE REVIEW

The future of agriculture and food: Evaluating the holistic costs and benefits

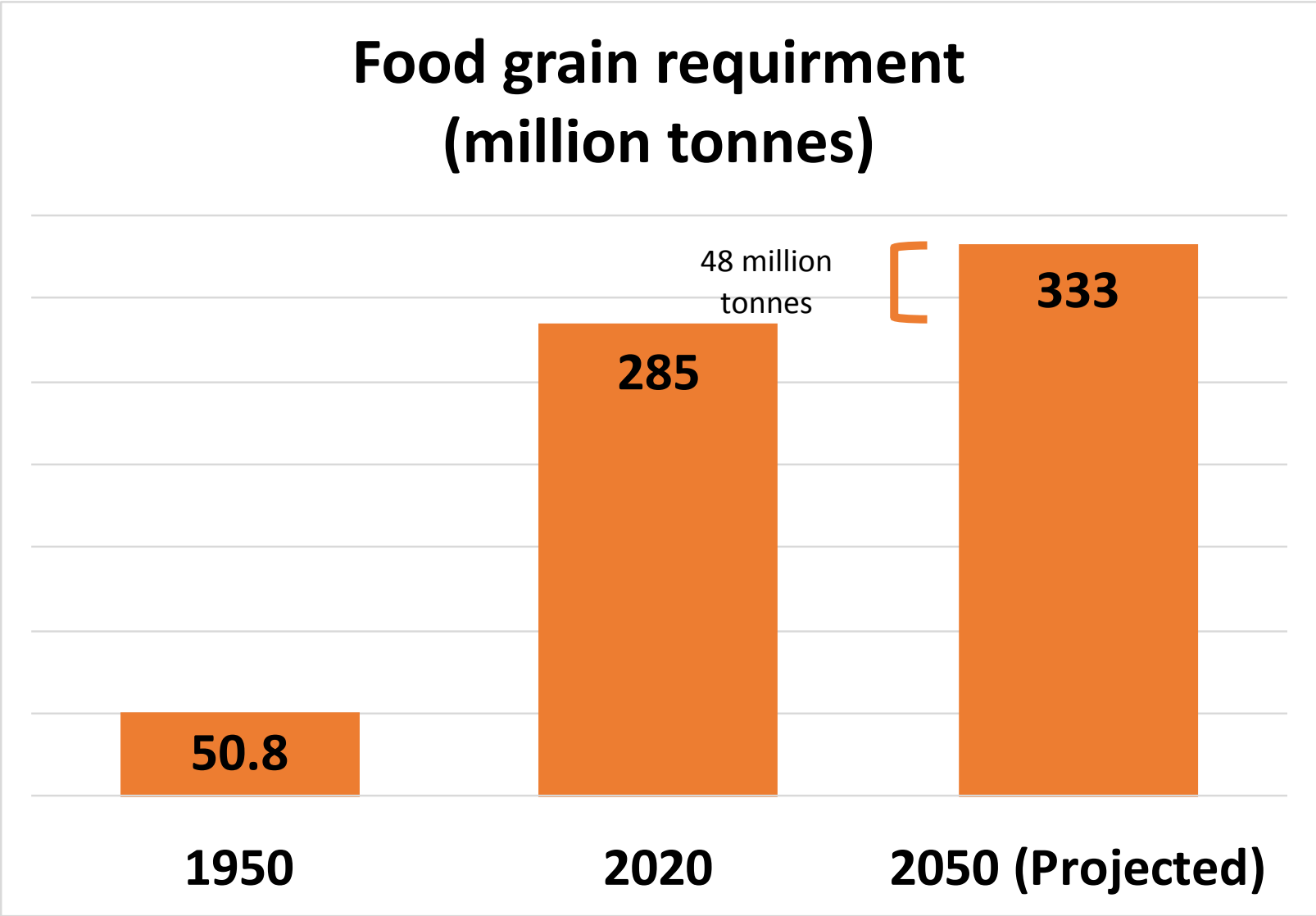
The Anthropocene Review
2019, Vol. 6(3) 270–278

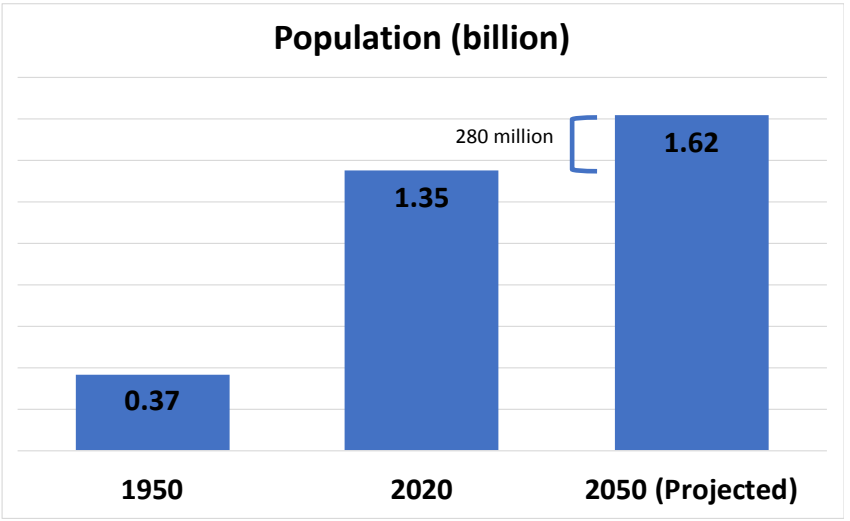
DOI: 10.1177/2053019619872808
journals.sagepub.com/home/anr
SAGE

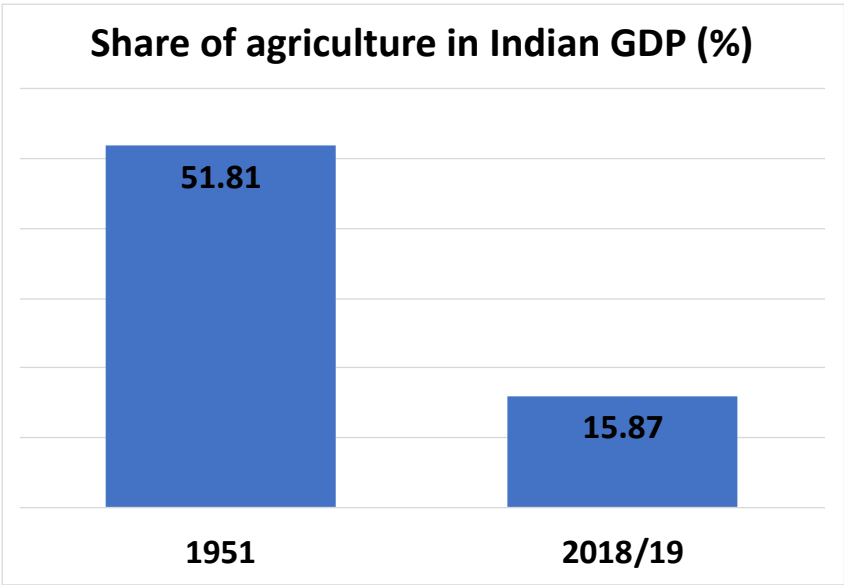
Harpinder Sandhu,[1,2] Alexander Müller,[3] Pavan Sukhdev,[4,8] Kathleen Merrigan,[5] Abdou Tenkouano,[6] Pushpam Kumar,[7] Salman Hussain,[8] Wei Zhang,[9] Walter Pengue,[10] Barbara Gemmill-Herren,[11] Michael W Hamm,[12] Maria Cristina Tirado von der Pahlen,[13] Carl Obst,[14] Kavita Sharma,[8] Haripriya Gundimeda,[15] Anil Markandya,[16] Peter May,[17] Gunars Platais[18] and Jes Weigelt[3]

Abstract

Inadequacies of the current agriculture and food systems are recognised globally in the form of damages to environment and human health. In addition, the prevailing economic and policy systems do not reflect these damages in its accounting systems and standards. These shortcomings lead to perverse and pervasive outcomes for society at large. Our proposal is to consider all social and environmental externalities – both negative and positive, in global agriculture and food systems and reflect them in an economic system by evaluating comprehensive costs and benefits. This can be done by adopting an innovative, universal, and inclusive framework (the 'TEEBAgriFood' framework) in order to stimulate appropriate policy responses.







Status of agriculture and food in India

Challenges in agrifood systems in India

- Produced capital
- Social capital
- Human capital
- Natural capital

Produced capital

GROSS VALUE ADDED
$271 BILLION

GVA SHARE 14%

LABOUR EMPLOYED
42%

Social capital

- Small and marginal land holdings
- 90 million agricultural households
- **Social inequity:** For example, smallholders or ‘resource poor’ farms in rainfed dryland landscapes, without access to private tube-well irrigation, have remained largely exempt from the benefits of agrarian policies such as free electricity for pumping groundwater experienced by more prosperous farmers in Punjab.
- **Low income:** average income of farmers, which is Rs 36,938 from cultivation of crops and Rs 9,176 from livestock per year per household, much below the average income from non-farm sector.

Food and nutritional security and health

CHILDREN UNDER 5 YEARS – 38% STUNTED

21 % ARE WASTED

WOMEN 15 -49 YEARS – 55.3% ANEMIA

ADOLESCENT GIRLS 15-18 YEARS - 44.7% WITH LOW BMI <18.5

23% OF WOMEN AND 20%OF MEN AGE 15-49 ARE THIN.

21% OF WOMEN AND 19% OF MEN ARE OBESE

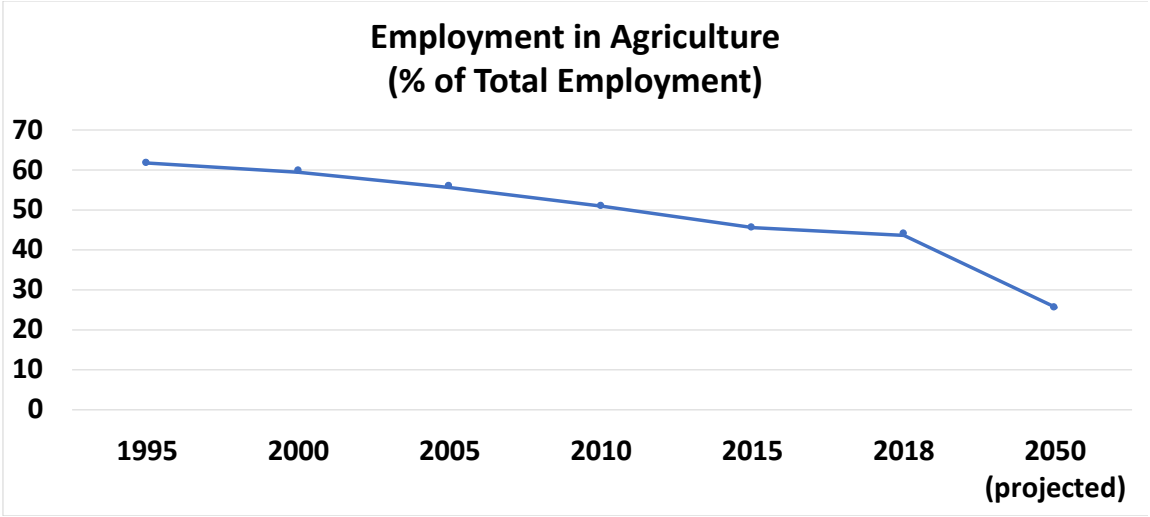
India ranks 76th amongst 113 countries with a score of 50.1 (world average is 58.4) in GFSI

Rising burden of non-communicable diseases in Indian States

- the largest disease burden from 1990 to 2016 was observed for diabetes, at 80%, and ischaemic heart disease, at 34%.
- 1081 disability-adjusted life-years (DALYs) per 100,000 population were lost in India in 2013 due to deficiencies of Fe, Zn and vitamin A,
- 2489 disability-adjusted life-years per 100,000 population were lost due to high serum total cholesterol or BMI.
- An estimated 20% of men and 21 % of women aged ≥20 years were obese in 2013 using South Asian-specific obesity cut-offs.

(Joy, E. et al. 2017)

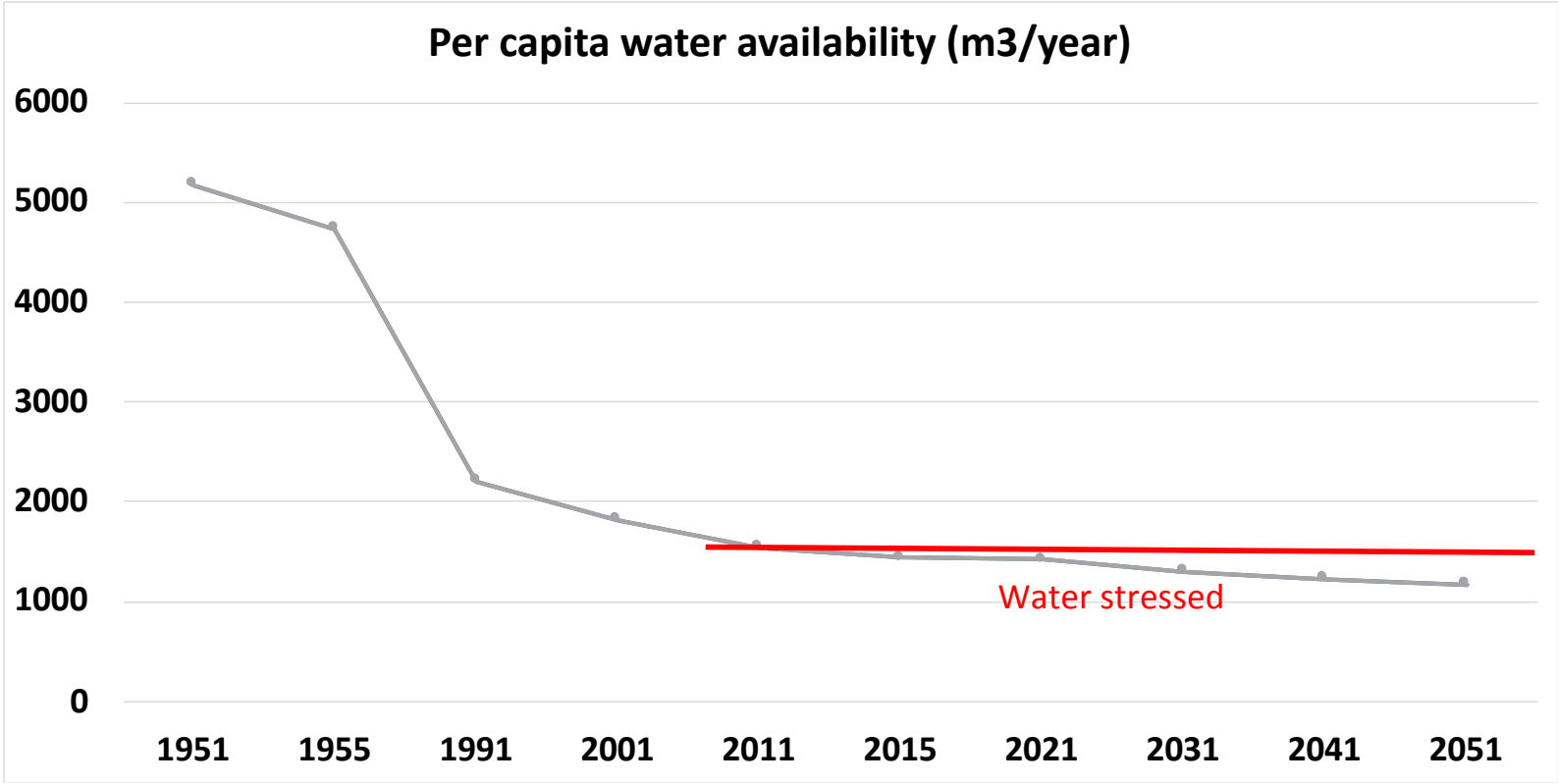
Human capital



Natural capital

Water

- Current water supply is 740 billion m^3.
- By 2030, demand in India will grow to almost 1.5 trillion m^3,
- Driven by domestic demand for rice, wheat, and sugar for a growing population.



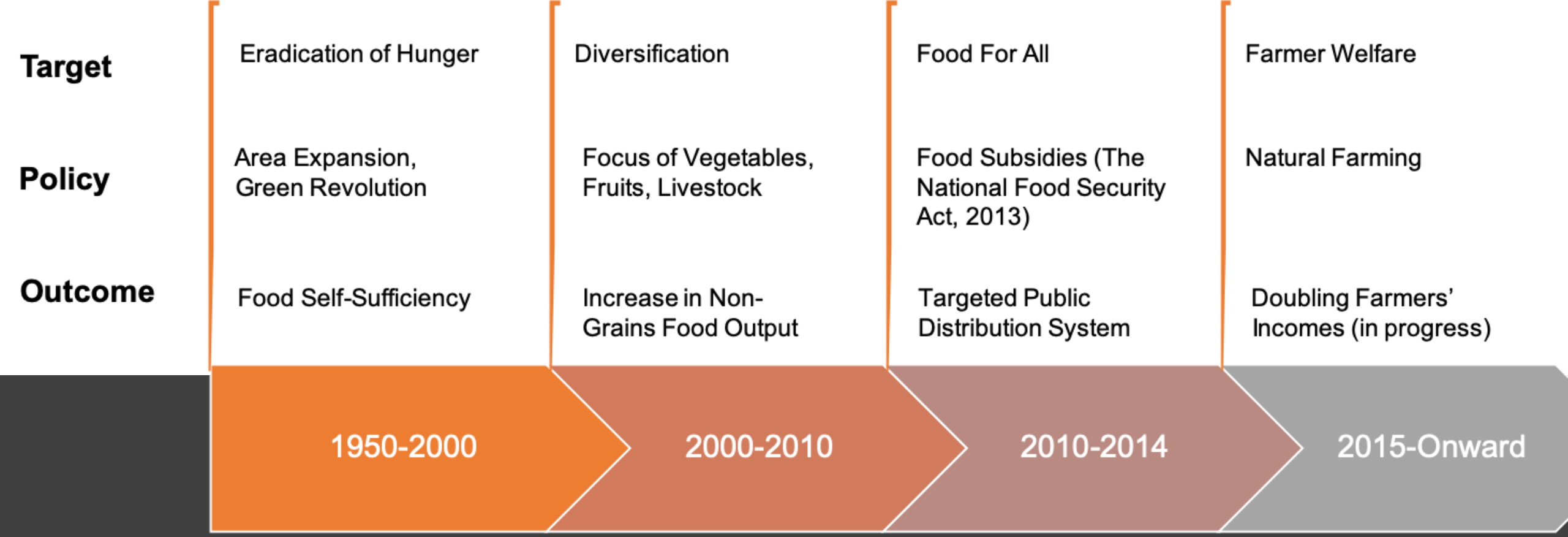
Climate change

3-4 degree Celsius rise by 2100
agricultural incomes will fall by 12% on average, and by as much as 18% in unirrigated areas by the end of the century.
impacts farmers' incomes and GDP.

Soil health

- 120.7 Million hectare (Mha) or 36.7% of the total arable and non-arable land surface of the country suffers from various forms of degradation.
- 15.35 tonnes per hectare of soil is lost resulting in loss of 5.37 to 8.4 Million tonnes (Mt) of nutrients, reduction in crop productivity, occurrence of floods/droughts, reduction in reservoirs capacity (1 to 2% annually), and loss of biodiversity

Policy options



Timeline of major agricultural policies and outcomes

Current policy response

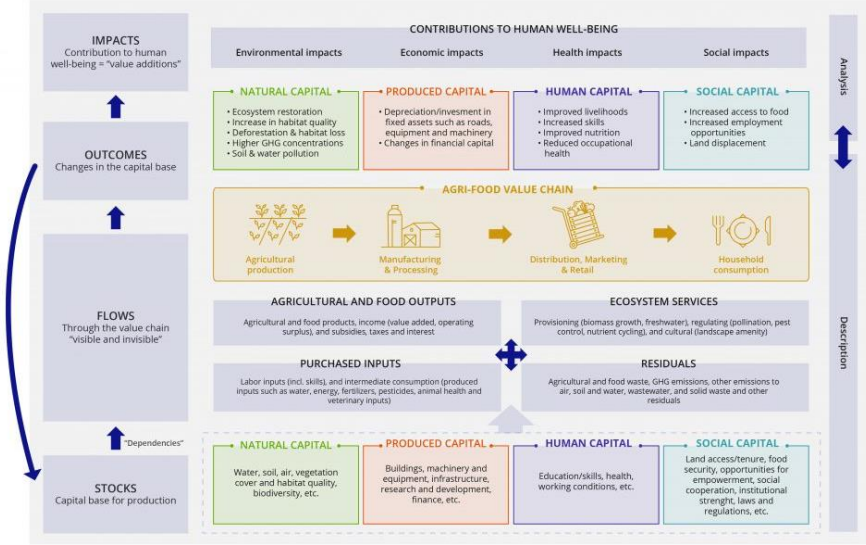
	Theme	Challenges	Policy response
1	Social capital	Food security	TPDS
		Nutritional security	Mission for Integrated Development of Horticulture (MIDH), National Horticulture Mission (NHM), National Horticulture Board, Horticulture Mission for Northeast and Himalayan States (HMNEH), Coconut Development Board (CDB), Central Institute of Horticulture
2	Human capital	Health	Nation Commission on Macroeconomics and Health
3	Natural capital	Sustainable agriculture	National Mission for Sustainable Agriculture (NMSA), Rainfed Area Development (RAD), Pradhan Mantri Krishi Sinchai Yojana-Per Drop More Crop (PMKSY-PMDC), Sub-mission on agroforestry (SMAF), Integrated Nutrient Management (INM), Soil Health Management (SHM), Paramparagat Krishi Vikas Yojana (PKVY), Soil and Land Use Survey of India (SLUSI), National Rainfed Area Authority (NRAA), Mission Organic Value Chain Development in North-Eastern Region (MOVCDNER), National Centre for Organic Farming (NCOF), Central Fertilizer Quality Control and Training Institute (CFQC&TI)

TEEB in India

TEEB has been applied in three sectors –

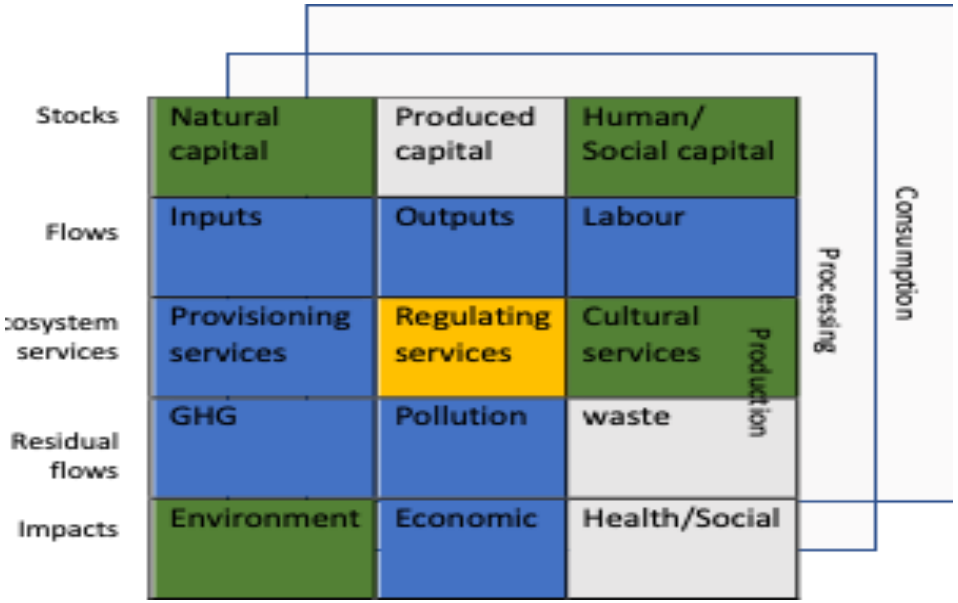
- Forests, Inland wetlands, Coastal and marine ecosystems
- to identify the importance, issues, and the challenges of economic valuation of ecosystems and biodiversity
- In addition to this, there are several Natural Resource Accounting (NRA) Projects being undertaken in India

TEEBAgriFood in India



TEEBAgriFood can help in identifying

- best practices or management systems that can be promoted by relevant policies.
- transitions to sustainable agriculture must follow three distinct non-linear phases: efficiency, substitution and redesign.



FOUR Options

1. EVALUATING ZERO BUDGET NATURAL FARMING
2. PROMOTING SUSTAINABLE LAND MANAGEMENT FOR AGRICULTURE IN DROUGHT PRONE AREAS
3. STRENGTHENING AGROFORESTRY INITIATIVES IN INDIA
4. MOVING TOWARDS A SUSTAINABLE RICE AGRONOMY

OPTION 1. Evaluating Zero Budget Natural Farming

What is ZBNF?

It is a farming practice involving natural growth of crops without adding any fertilizers and pesticides

Why is TEEB useful for this option ?

Multi-location studies are needed to scientifically validate the long-term impact and viability of the model before it can be scaled up

What should the study include?

- Go beyond productivity per hectare analysis
- Assess impact on soil health and yields **for different crops** overtime
- Identify potential region with opportunity for impact

Select Scientific Journal	
Centre for Economic and Social studies (2019) (commissioned by RySS)	↓COST OF INPUTS for paddy (with variation) ranged from 27 % to 90 % - depending on the district
Kumar et al (2019)	↑ yield for rice in AP ↓ Yield for sugar cane in both Karnataka and Andhra Pradesh
Smith et al. (2020)	↑ Yield in low input systems ↓ Yield in high input systems

Context of India

- Increasing fertilizer use- Between 1977 and 2019, **per hectare usage** increased from 24 kg to 138 kg (ICRIER, 2019).

- Growing body literature on the impact of ZBNF (placed in increasing order of credibility)
  1. Blogs - farmers success stories
  2. Newspaper articles - Moongbay and down to earth
  3. Scientific journals- Andhra Government / independent

  Several studies- positive impacts on yields, increase in income

More needs to be done to test the robustness of ZBNF

Option 1 Opportunity for Impact

Impact - ORGANIC FARMING Umbrella

- **Paramparagat Krishi Vikas Yojana (PMKSY)** launched to promote organic farming among small and marginal farmers.
- **The National Project on Organic Farming** of MoAFW saw a significant jump in allocation between 2018-19 and 2020-21 (from 20 million INR to 125 million INR).
- **High level Panel at NITI Aayog** reiterated the importance of natural farming and the need to look beyond yields at diversity and nutrition. (May 2020)

Impact- ZBNF

- **Finance minister's announcement** "there will be "strengthening organic farming in the country,…, and also ZBNF (February, 2019)

Option 2: Sustainable Land Management for Agriculture in Drought Prone Areas

What is SLM?

- It is defined as "**use of land resources …** to meet changing human needs, while simultaneously ensuring the **long-term productive potential of these resources** and the maintenance of their environmental functions".(IPCC Report- Climate Change and Land, 2019)
- Long term-> zoom in long terms scenarios of Climate Change deeply

Why is TEEB needed for this option ?

- To investigate, land-water- climate change and agriculture with a systems approach in drought prone areas

What should the study do?

- Include Scenario Analysis for agriculture (modelled with climate)
- Include Human and Social dimensions - impact of climate variability on land-water- crops- biodiversity and livelihoods
- Identify potential region with opportunity for impact

Context:

- 96.4 million ha of the country is affected by land degradation (29.32% of the Geographic Area of India) (SAC, 2016)
- Water erosion (10.98%), vegetation degradation (8.91%) are top two causes of land degradation. (SAC, 2016)
- During 1996-2015, nearly 17.5 million people annually were affected by droughts in India. (United Nations World Water Development Report, 2019)
- An economic loss of 2.5 percent of GDP due to land degradation in India (TERI, 2018)
- Increasing trends in the frequency of dry days in most parts of the country. (India's 2nd BUR to UNFCCC - Indian Meteorological Department (IMD Data)
- Climate change exacerbates land degradation (IPCC Report- Climate Change and Land Report, 2019)

Challenges

- Over extraction of groundwater, monoculture, growing high water use crops in drought areas
- Silo approach – land- water- energy- agriculture- climate

Option 2 Opportunity for Impact

- **National Mission for Sustainable Agriculture** under the Sustainable Agriculture Mission, one of the eight Missions outlined under National Action Plan on Climate Change (NAPCC).

- **Pradhan Mantri Krishi Sinchayee Yojana** (PMKSY)- inter-ministerial scheme of MoJS, MORD and MoAFW- to extend the coverage of irrigation and improve water use efficiency with end-to-end solutions for source creation, distribution, management, field application and extension.

Option 3: Strengthening agroforestry initiatives in India

What is Agroforestry?

- It is defined as land-use systems whereby a combinatory approach is utilized for the cultivation of woody perennials such as trees, shrubs, palm, bamboo etc. along with crops and/or animals within the same land management unit

Why is TEEB needed for this option ?

- More research is needed to identify different agroforestry models suitable for diverse ecological landscapes of India

What should the study do?

- ➢ Quantify value of environmental benefits
- ➢ Identify potential region with opportunity for impact

Context:

- 23.25 million hectares is under agroforestry in India, i.e. 8.69% of the total geographical area- Central Agroforestry Research Institute (ICAR-CAFRI, 2019)
- 1st country to have National Agroforestry policy- 2014- The policy seeks to address the bottlenecks impeding large scale implementation
- Potential for agroforestry untapped- Studies show increase in farm profitability with an annual income of INR 3.64 lakhs per hectare as compared to a rice-wheat cropping system of INR 1.66 lakhs per hectare (Singh, M. et al., 2018).

Challenges:

- Lack of marketing infrastructure and agricultural extension services.
- Lack of research studies on agroforestry systems at an ecosystem or landscape level as most research focuses on small plots of land.

Option 3 Opportunity for Impact

- National Agroforestry Policy (2014)
- **India's NDC Commitments**- 1) to increase forest cover to 33 per cent of its geographical area 2) increase carbon sinks- to create an additional **carbon sink** of 2.5 to 3 billion tons of carbon dioxide equivalent through additional forest
- **Nation Mission for a Green India** (2014) under India's National Action Plan on Climate Change (NAPCC)- To enhance India's diminishing forest cover by increasing green cover across India by five million hectares (mha) and increasing the existing quality of tree cover in another 5 mha.
- **Sub-mission on Agroforestry** (SMAF) under the National Mission for Sustainable Agriculture
- **Mission for Integrated Development of Horticulture** (MIDH). Agroforestry initiatives is integral for the success of the mission.

OPTION 4: Moving towards a sustainable rice agronomy

What is ‘Sustainable Rice Agronomy’ ?

- Agronomy - maximise yields for profit.
- Combines sustainable rice production with Agronomy

Why is TEEB needed for this option ?

- A systems approach for medium and long-term studies is required to assess costs and benefits associated with different rice management practices .

What should the study do?

- A range of approaches to sustainable rice production, depending on the context for instance, conservation agriculture practices such as zero-tillage, dry direct seeding of rice.

Context

- 1/3rd of the total rice cultivation in the world happens in India. (World: 157 million hectares India: 44.1 million hectares)FAOSTAT
- Largest exporter of rice in the world, I/4th of the global exports of rice (MoAFW, 2019)
- Concerns over soil fertility, productivity and declining yields.

Challenges

- High intensity rice production resulting in salinization, water-logging, loss of soil biodiversity etc.(Shukla, A. K., and Behera, S. K. (2011).
- Number of small and marginal farmers in the country- over 78% of farmers with limited resources for increasing efficiency and productivity .
- To meet a projected Indian population of 1.8 billion by 2050, India would need to double its current cereal production (Swaminathan, M.S., Bhavani, R.V., 2013)

Option 4 Opportunity for Impact

- **National Food Security Mission** (NFSM) was launched in 2007-08 to increase the production of rice, wheat and pulses through area expansion and productivity enhancement; restoring soil fertility and productivity; creating employment opportunities; and enhancing farm level economy.
- **National Policy for Farmers 2007** aims aims to improve economic viability of farming and increase net income of farmers.
- **National Mission for Sustainable Agriculture** (NMSA) under National Action Plan on Climate Change.
- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)** is an inter-ministerial scheme of MoJS, MoRD and MoAFW.

Thank you

PANEL 1

PANEL 1

Promoting a sustainable food and agriculture sector: The economics of biodiversity and ecosystem services

Panelists:

- Mr. T Vijay Kumar, Government of Andhra Pradesh
- Dr. Madhu Verma, Chief Economist, World Resources Institute
- Prof. Haripriya Gundimeda, IIT Bombay
- Dr. Javed Rizvi, World Agroforestry (ICRAF)

Mr. T Vijay Kumar, Government of Andhra Pradesh

- T Vijay Kumar is presently the Advisor to Govt of A.P for Agriculture & Cooperation, and Co-Vice Chairman, Rythu Sadhikara Samstha (RYSS), a company for Farmers empowerment, set up by the state government.
- As a Special Chief Secretary, Agriculture, Government of Andhra Pradesh, T Vijay Kumar is leading the implementation of the climate resilient ZBNF efforts in the state, with a vision to cover 60 lakh farmers with an area of 80 lakh hectares under cultivation.

Dr. Madhu Verma, WRI

- Madhu Verma is the Chief Economist at the World Resources Institute, India. An Environment and Developmental Economist, and Policy Analyst, Verma's work at WRI India focuses on providing the thread of Economics across various ongoing and new programs in India, supporting the global Economics team and leading research on 'Economic Valuation of Ecosystems and Green Accounting' and to bring this body of knowledge in the radar of policymakers and other stakeholders.

- She has been an expert/team member/contributing author/ lead author in several international reports like the UN's Millennium Ecosystem Assessment Report (2004-06); The Economics of Ecosystem and Biodiversity (TEEB) Reports (2007-11); and the Global Biodiversity Assessment Report of the Inter-Governmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) (2013-19).

Prof. Haripriya Gundimeda, IIT Bombay

- Haripriya Gundimeda is a professor in the Department of Humanities and Social Sciences, at the Indian Institute of Technology Bombay, India. She is the Joint Local and Regional Policymakers and Administrators Coordinator for the TEEB study.
- Her main areas of research have been green accounting, mitigation aspects of climate change, energy demand and pricing, valuation of environmental resources, and issues relating to the development in India. Haripriya is actively involved with the Green Indian States Trust (GIST) in India and has been the lead author of six of the eight monographs for the GIST.

Dr. Javed Rizvi, World Agroforestry (ICRAF)

- Javed Rizvi is an Agricultural Scientist with a broad experience of working on national agricultural policy, research-for-development strategies, and advocacy-related issues.
- He has managed several large multi-disciplinary agricultural programs including aspects of research, extension, technology transfer and capacity development, all aimed at improving food and nutritional security, diversification and intensification of crop-livestock-silviculture production systems, soil-water conservation, alternative livelihoods and small-scale processing and marketing of agricultural and forest products through community-based organizations.

PANEL 2

PANEL 2
Mainstreaming Biodiversity and Ecosystem Services in India:
Challenges and Opportunities

Panelists:

- Dr. Rita Pandey, Senior Fellow, National Institute of Public Finance and Policy
- Dr. J. Ranna, Alliance of Biodiversity International and the International Center for Tropical Agriculture
- Prof . A. Damodaran, Professor, IIM Bangalore
- Mr. Ravindra Singh, Director, Biodiversity Programme, GIZ

Dr. Rita Pandey, National Institute of Public Finance and Policy (NIPFP)

- Rita Pandey is a Professor at the National Institute of Public Finance and Policy, New Delhi.
- Her primary area of research is environmental economics. She has been a member of the Technological and Finance Standing Committee to implement the Montreal Protocol, appointed by the Ministry of Environment and Forests, Government of India.
- She has undertaken a broad range of studies examining the different links between environment and the economy and has worked extensively on market-based instruments to protect and improve environment including the potential benefits of using tradable permits, non-tax and differential tax instruments for sustainable development. She has obtained her Ph.D. in economics from Indian Institute of Technology Kanpur.

Dr. Jai Rana, Alliance of Biodiversity International and the International Center for Tropical Agriculture

- He has held the position as the Head of the Division of Germplasm Evaluation at the Indian Council of Agricultural Research (ICAR) – National Bureau of Plant Genetic Resources from 2014 to 2018.
- As a scientist his areas of research include plant genetic resources management, on-farm conservation and climate change.

Prof. A. Damodaran, Indian Institute of Management, Bangalore

- Damomdaran is a professor of Economics and Social Sciences at the Indian Institute of Management, Bangalore.
- He has worked extensively on climate change and biodiversity financing; he led the initiative on Biodiversity Financing for the United Nation's Convention on Biological Diversity (CBD) in 2011 which has morphed into the UNDP driven BIOFIN Project. Since 2015 he has been the Chairperson of the GOI Technical Advisory Committee of BIOFIN India. He was part of India's delegation to CBD to negotiate biodiversity Financing issues in COP 11.

Mr. Ravindra Singh, Director, Biodiversity Programme, GIZ

- Ravindra Singh is the Director for the Biodiversity Programme at GIZ with a progressive experience of over 15 years in programme development and management in the fields of natural resources management and rural livelihoods, adaptation to climate change and biodiversity management.
- He joined GIZ in 2004 and has been involved with designing and implementation of various projects in natural resource management, adaptation to climate change and biodiversity management.

PRIVATE SECTOR ENGAGEMENT

TEEBAgriFood Implementation Project
BUSSINESS ENGAGEMENT

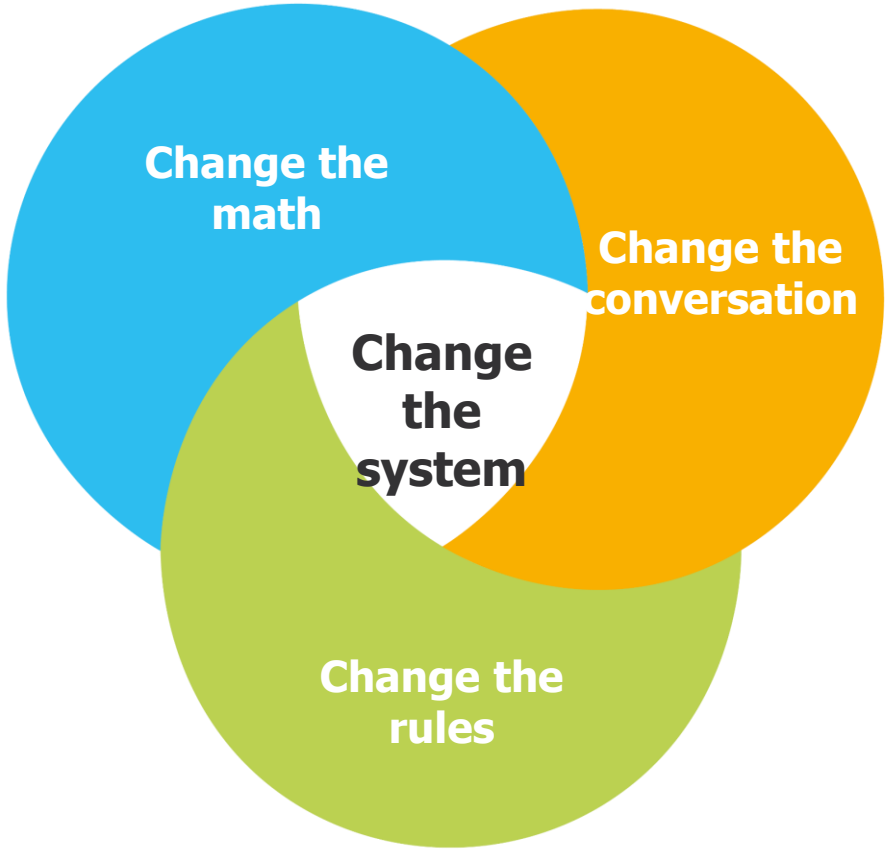
Funded by the European Union

CAPITALS COALITION

We are a **global collaboration transforming the way decisions are made** by including the value provided by nature, people and society.

We work through collaboration with **370+ organizations from across the entire system** at the core & thousands more engaged around the world.

This systems approach provides us with a **unique oversight of the gaps and challenges**, and also provides inspiration, ideas and resources to get things done. The Coalition shares a common belief that we can do more together than we can alone.



CAPITALS COALITION

The Economics of Ecosystems and Biodiversity: promoting a sustainable agriculture and food sector

TEEBAgriFood Framework Implementation

Public sector engagement

UN environment programme

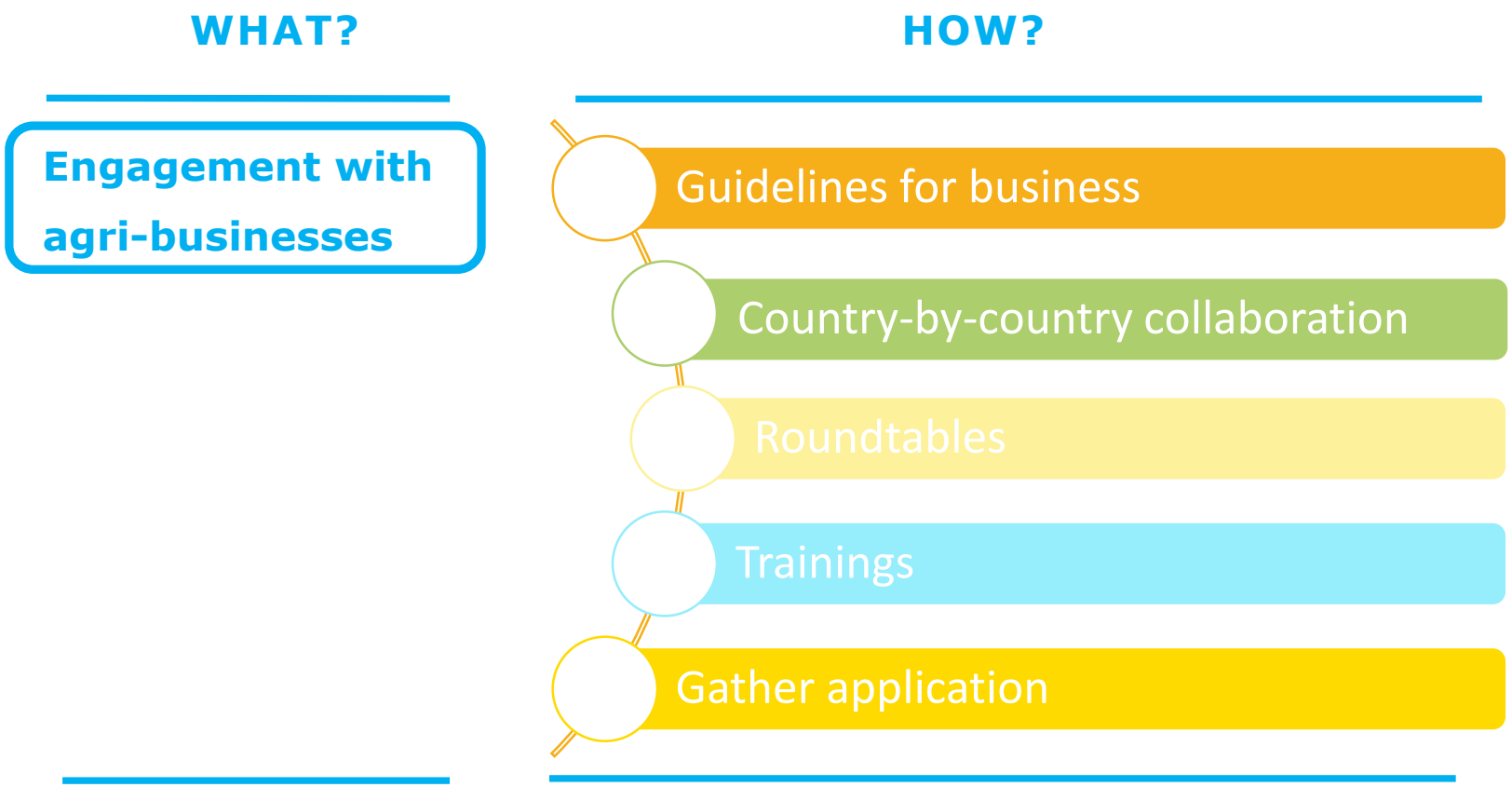
TEEB

Private sector engagement

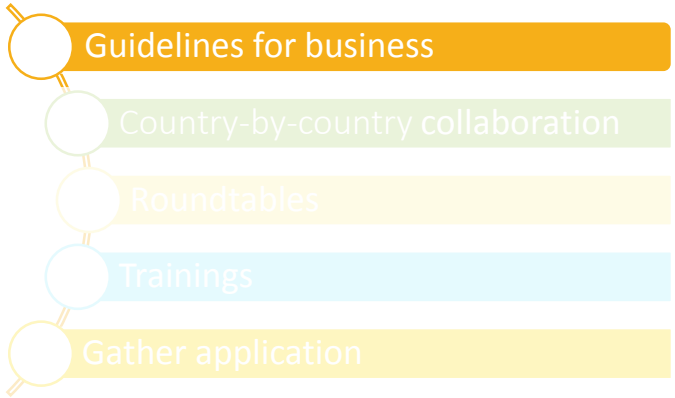
CAPITALS COALITION

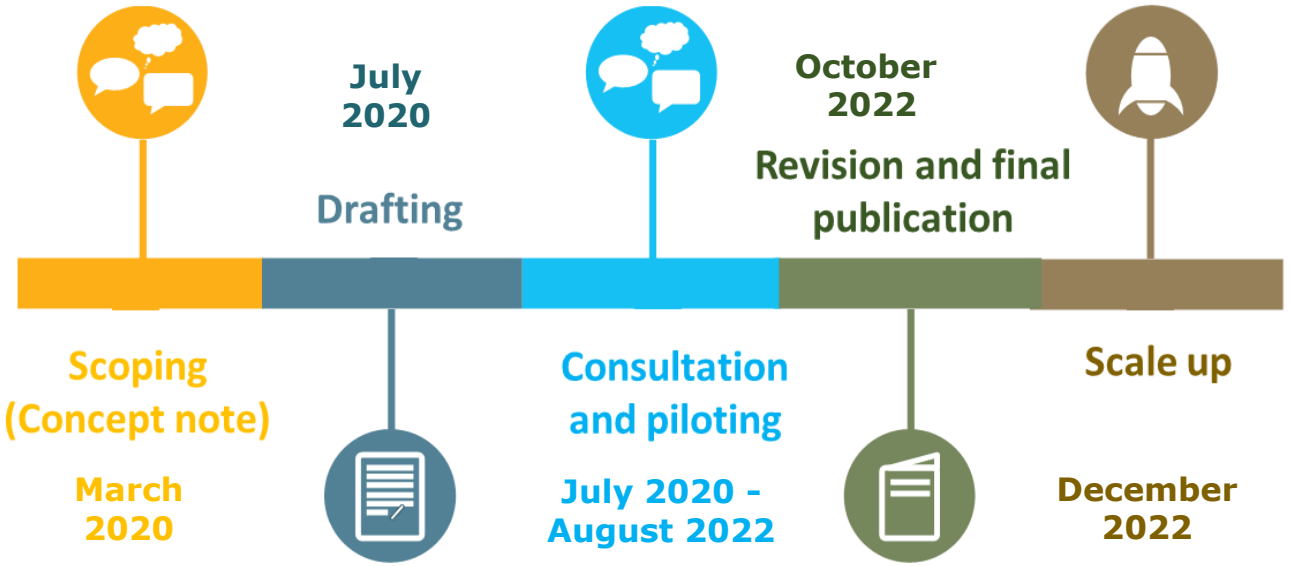
Funded by the European Union

Engagement with business

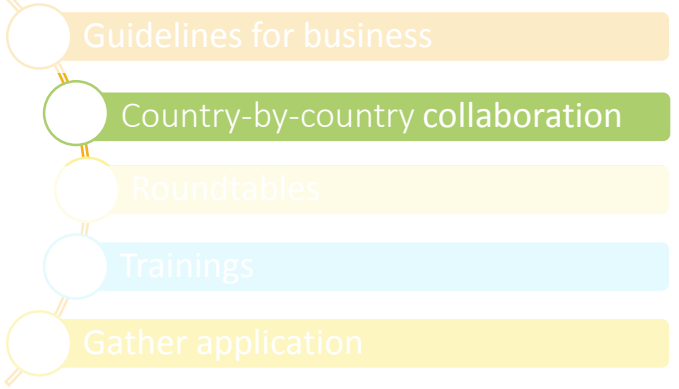


Guidelines for business





Country by country collaboration



India

CRB CENTRE for RESPONSIBLE BUSINESS
Enabling Change for Impact

CII
Confederation of Indian Industry

wbcsd

Global

DHI

cebds
Brazilian Business Council for Sustainable Development (BCSD-Brazil)

ibcsd
Indonesia Business Council For Sustainable Development

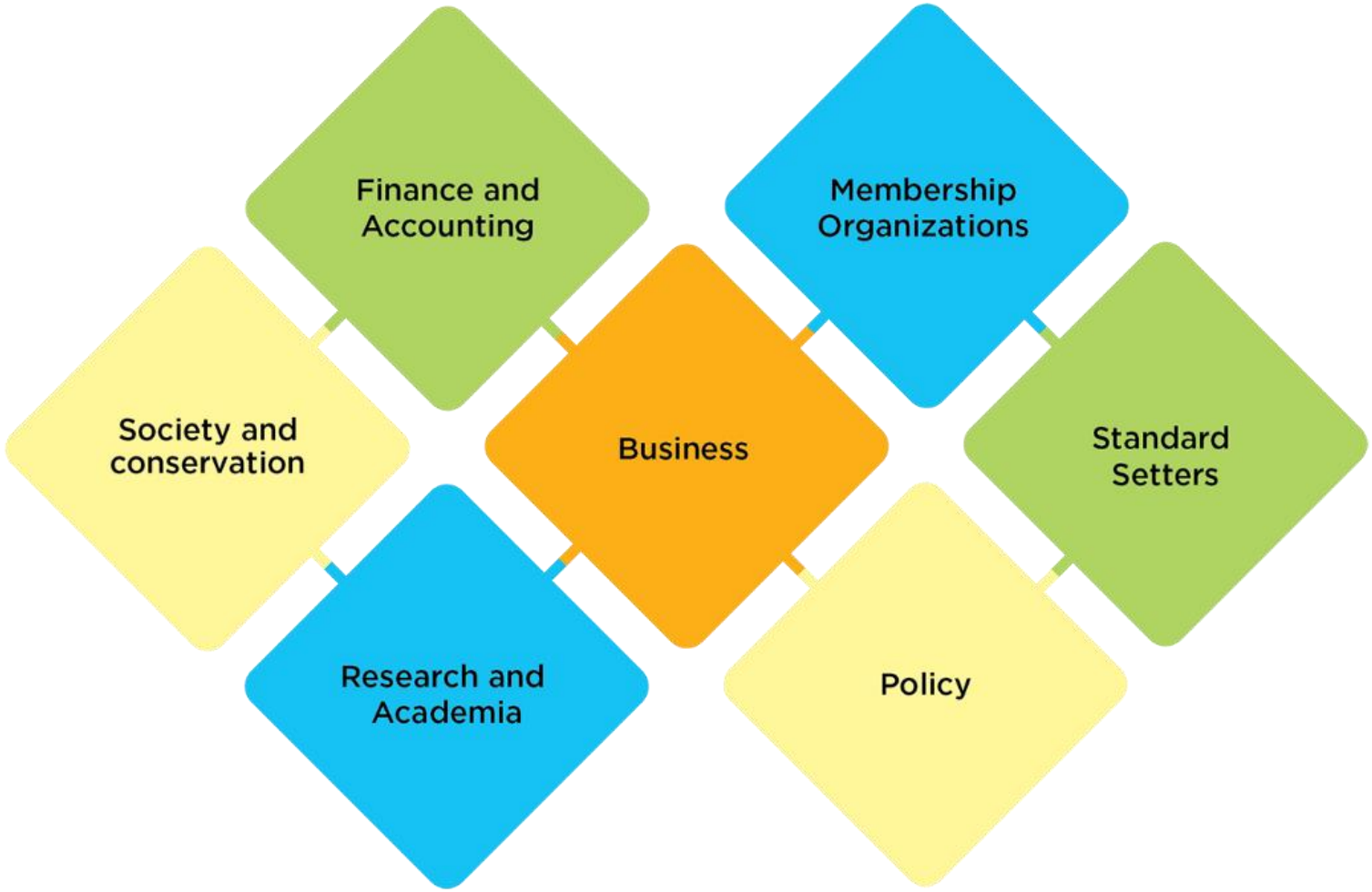
GoldenBee
Corporate Social Responsibility Consulting

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

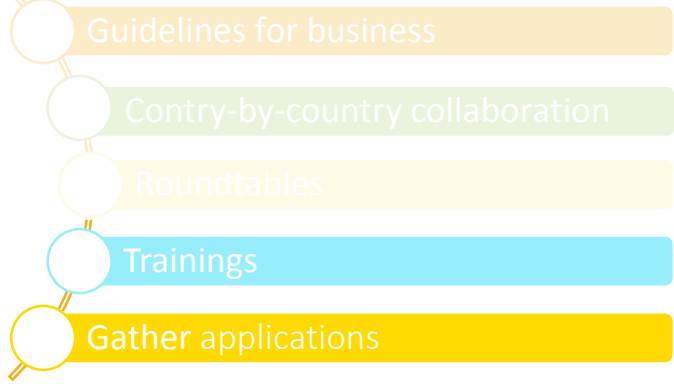
AMEBIN
Alianza Mexicana de Biodiversidad y Negocios

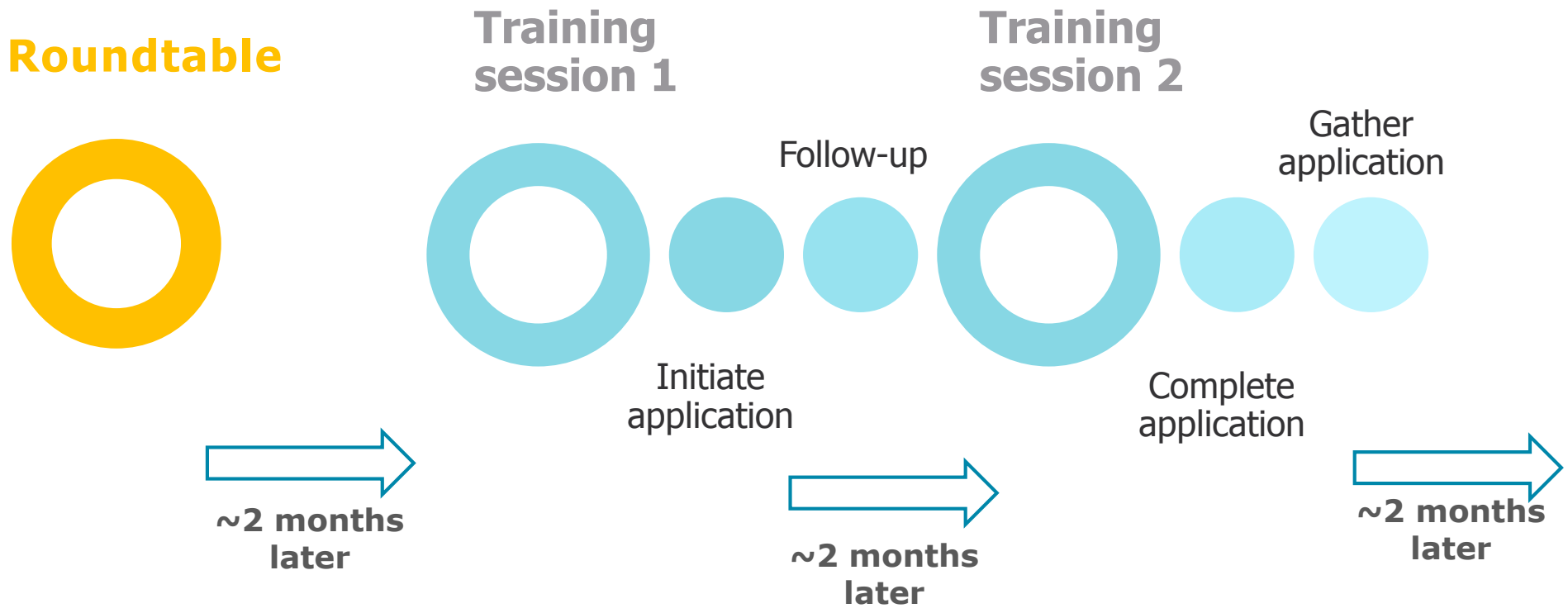
Roundtable discussions

- Guidelines for business
- Country-by-country collaboration
- Roundtables
- Trainings
- Gather application

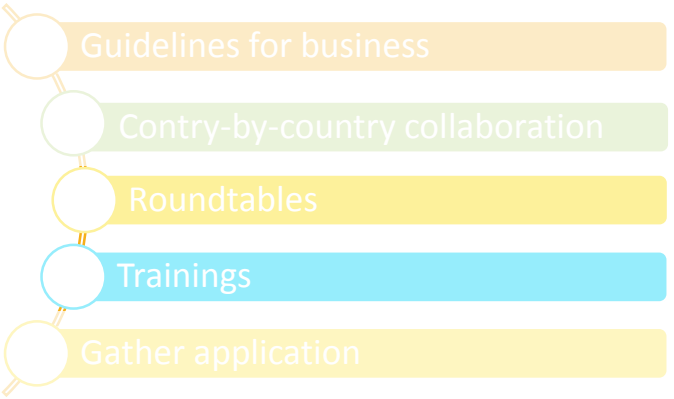


Training and gathering applications





Roundtable and training timeline



2020

Mexico

Brazil

2021

China

India

Indonesia

2022

Thailand

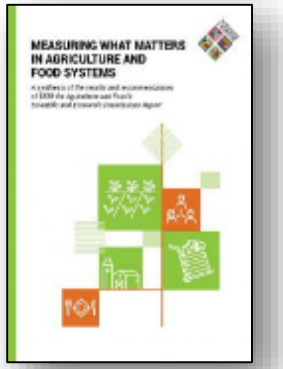
Malaysia

TEEBAgriFood Implementation Operational Guidelines for Business

LANDSCAPE OF FRAMEWORKS TO SUPPORT CAPITALS DECISION MAKING

Mainstreaming the Economics of Nature

The Economics of Ecosystems and Biodiversity foundation report



TEEB AgriFood Evaluation Framework

The case for measuring impacts and dependencies in agriculture and food systems

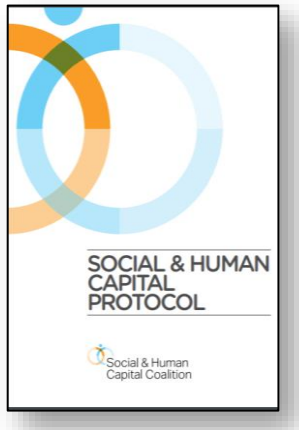
Our project

Specific guidance for agri- businesses based on TEEBAgriFood framework and the Natural and Social & Human Capital Protocols

2010 **2016** **2018** **2019** **2020**

Natural Capital Protocol

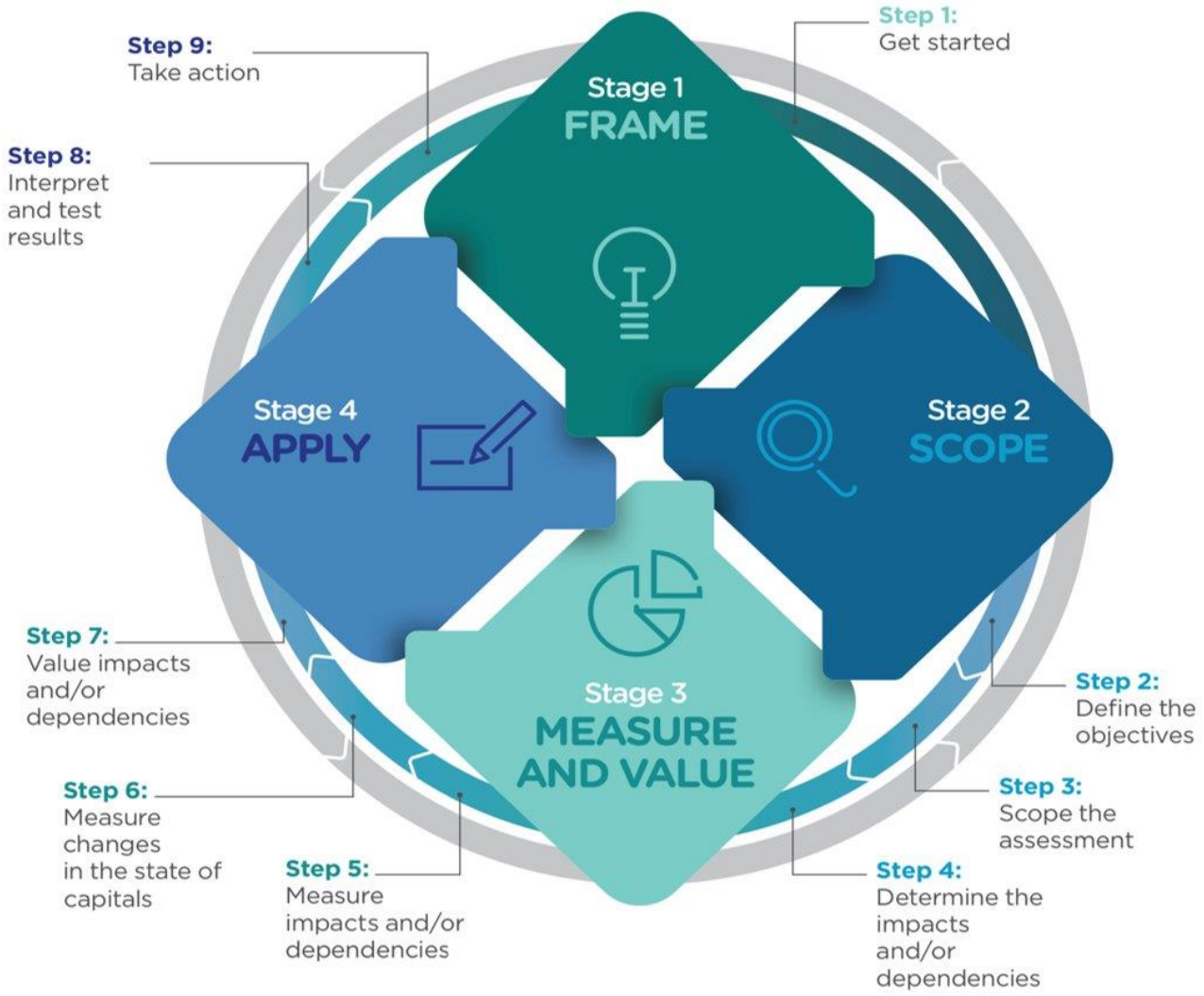
Framework to measure business impact and dependency on nature developed by the Natural Capital Coalition



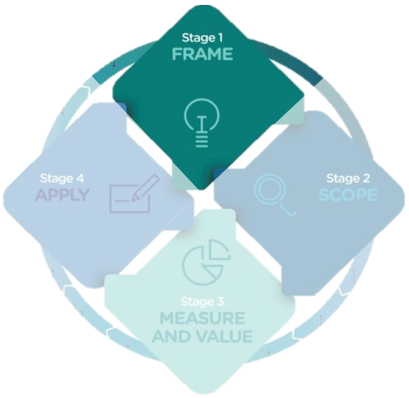
Social & Human Capital Protocol

Framework to measure business impact and dependency on people developed by the Social & Human Capital Coalition

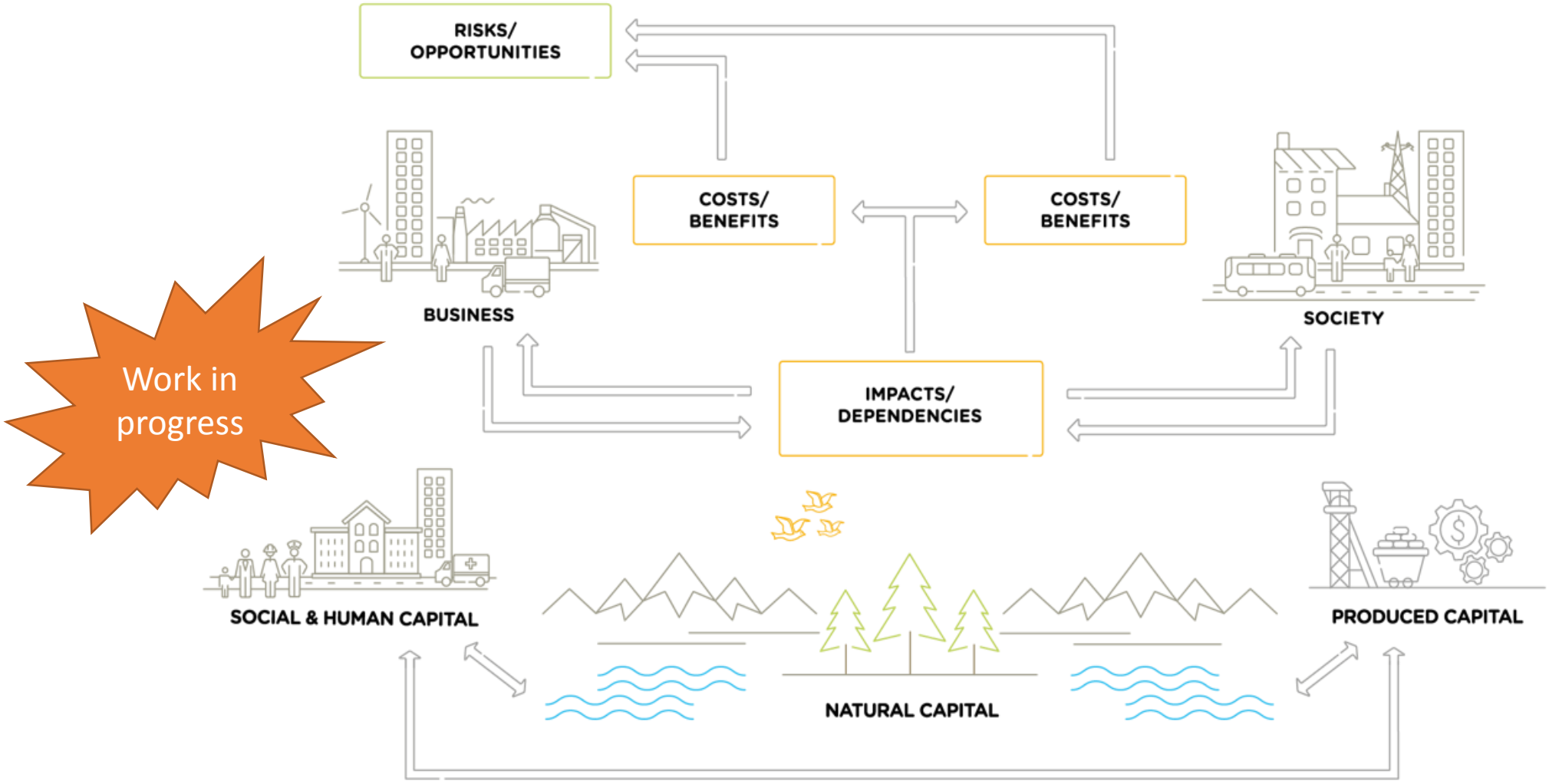
Natural and Social & Human Capital Protocols Framework



Frame Stage: WHY?

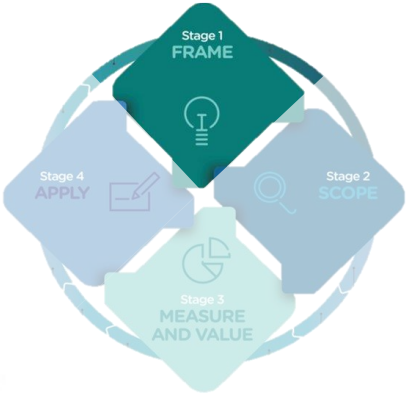


Capital impacts and dependencies: conceptual model for business

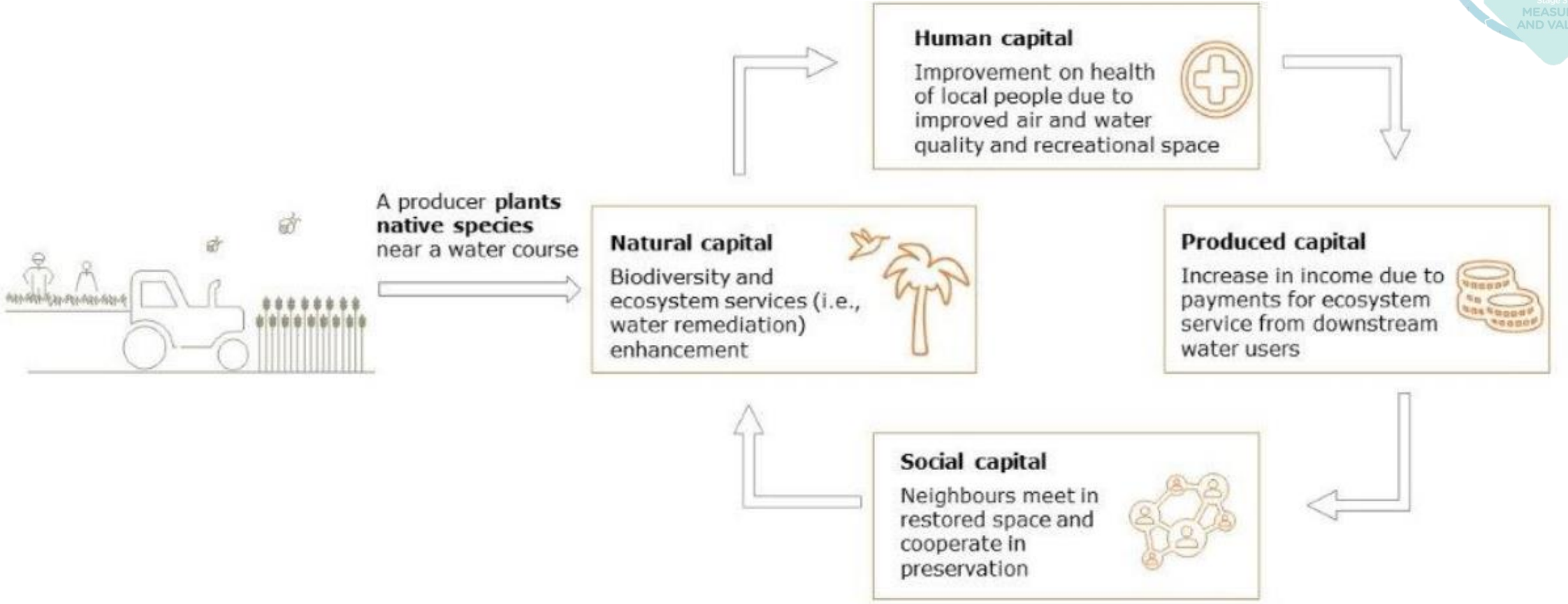


Work in progress

Frame Stage: WHY?



Example of interactions between capitals



Work in progress

Scope – WHAT?

Table 4.1 Indicative Materiality matrix

DEPENDENCIES																VALUE CHAIN	IMPACT DRIVERS																				
NATURAL							HUMAN				SOCIAL				PR.		NATURAL								HUMAN									SOCIAL			
Water availability	Water quality	Energy	Regulation of physical environment	Regulation of biological environment	Regulation of waste and emissions	Skills and Knowledge	Experience	Workforce availability	Health of workers	Social networks and cooperation	Property rights	Social acceptance and trust	Law and order	Accesibility to infrastrure and technology		Water use	Terrestrial ecosystem use	GHG emissions	Pesticide and herbicide use	Fertilizer use	soil degradation	Solid waste	Livestock conditions	Nutritional content of food	Use of harmful substances for consumers	Food safety practices	Employee health and safety conditions	Salaries and benefits	Workers living conditions	Labour rights	Gender rights	Worker's representation	Food security	Food loss or waste	Integrity of communities	Benefit sharing with indigenous people
M	H	H	H	H	H	H	H	H	H	M	H	M	M	H	INPUT MATERIALS	H	H	H	M	M	M	M	H	L	H	M	H	M	M	H	H	M	H	M	M	H
H	H	H	H	H	H	H	H	H	H	M	H	H	H	H	AGRICULTURAL PRODUCTION	H	H	H	H	H	H	M	H	L	H	H	H	H	H	H	H	M	H	H	H	M
H	H	H	M	M	H	H	M	M	H	M	L	M	H	H	MANUFACTURING & PROCESSING	H	L	H	L	L	L	H	H	H	H	H	H	M	M	H	M	M	M	M	M	L
M	M	H	L	L	H	M	M	M	H	M	L	L	H	H	DISTRIBUTION & RETAIL	M	M	H	N	N	N	H	M	N	N	H	H	H	M	H	M	H	H	H	M	N
L	L	H	N	L	H	L	N	N	N	M	N	H	M	L	CONSUMPTION	L	L	M	N	N	N	H	M	H	H	H	N	N	N	L	L	L	H	H	L	N

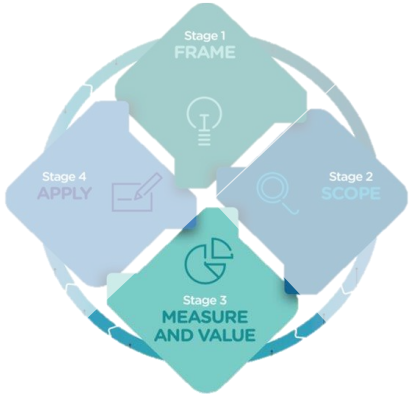
H HIGH MATERIALITY

M MEDIUM MATERIALITY

L LOW MATERIALITY

N NOT MATERIAL

Measure and Value Stage: HOW?

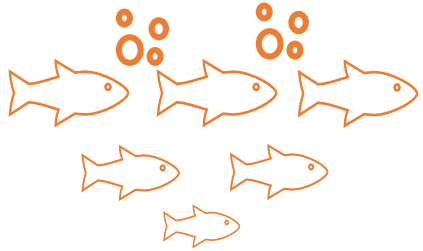


Example of indicators and assessment approaches

Indicator: Kilograms of Phosphorus in fertilizers applied

Data source: On farm data

Step 05: Measure impact drivers

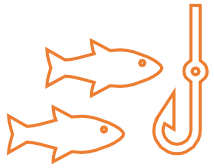


Indicator: Change in number of species in water ecosystems due to changes in nutrient level in water (eutrophication)

Method: Life Cycle Impact characterization factors

Step 6: Measure changes in capitals

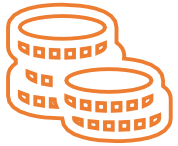
Work in progress



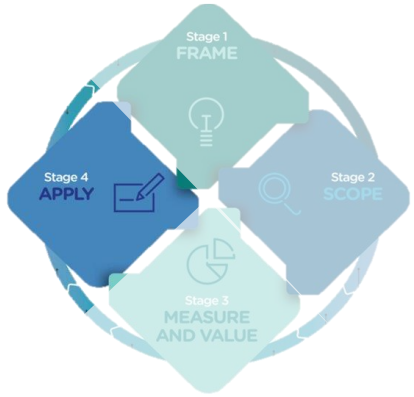
Impact: Loss of fish stocks

Method: Valuation of changes in ecosystem services

Step 7: Value impacts



CASE STUDY
OLAM Sugar Cane



WHAT:
Use of natural capital assessments on sugar cane plantation in Maharashtra and Madhya Pradesh

Result:
- ✓ Overall productivity increased by 15%
- ✓ 62 billion liter water avoidance over 3 years

Olam

Contact

Visit our website
Read our concept note
Register for updates

teebagrifood@capitalscoalition.org
isabel.hoffmann@capitalscoalition.org

OPEN DISCUSSION

Summary
Way Forward