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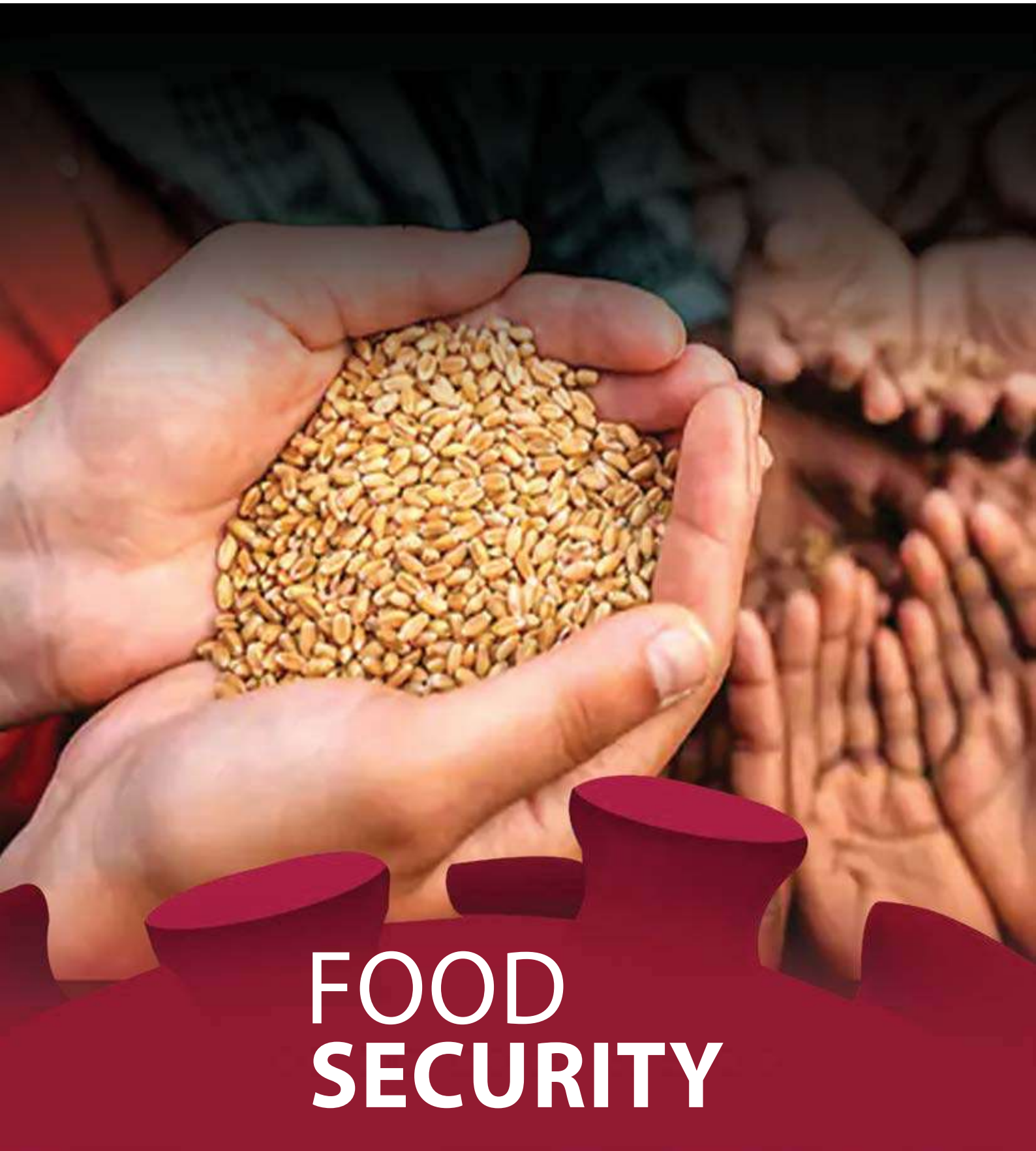
ORGANIC GROWTH

Vol 18



FOOD SECURITY

PLANTS PROVIDE OVER

80% OF

OUR ENERGY INTAKE

IN SOME CONTRIES AS MUCH AS

35% OF FOOD

AVAILABLE TO EAT IS WASTED

CONTENTS

JUNE 2021 | VOL 18

The views expressed by the authors are personal and the information or data has been sourced individually by them.

GENETIC RESOURCES & BIODIVERSITY

FOR FOOD AND AGRICULTURE

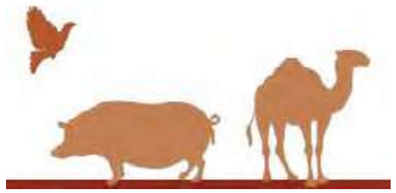
A treasure for the future

Genetic resources for food and agriculture are not only of actual but even more of potential value to food security, nutrition and livelihoods. However, biodiversity and in particular genetic diversity, is being lost at an alarming rate.

ANIMAL

Only 14 of the more than 30 domesticated mammalian and bird species provide 90% of human food supply from livestock

There are about 8800 breeds of which 7% are extinct and 17% at risk of extinction



FOREST

Forests are home to over 80% of terrestrial biodiversity

There are over 80 000 tree species, yet less than 1% have been studied in any depth for their present and future potential

AQUATIC

Fish provides about 3 billion people with almost 20% of their intake of animal protein

PLANT

Plants account for over 80% of the human diet

30000 terrestrial plants are known to be edible
7000 are cultivated or collected by humans for food
30 crops feed the world
5 cereal crops provide 60% energy intake of the world population

MICRO-ORGANISMS & INVERTEBRATES

Micro-organisms and invertebrates contribute to ecosystem services, such as disease and pest control, decomposition of organic matter and nitrogen fixation

Pollination services by insects and other animals, affect 35% of the world's crop production

Foreword

By 2050, the world will need to feed around 9.8 billion people - 3 billion more people than exist in the world today. Total food production needs to double to meet this demand, requiring over 500 million more hectares of land to be turned over to farming at current productivity levels. However, If the current trends continue, the UN estimates that 840 million people will be undernourished by 2030.

50% of the world's land is already used for farming. Agricultural land use change is the largest driver of deforestation globally, turning former carbon sinks into carbon emitters. A landmark FAO report on the state of biodiversity in food production revealed some illuminating facts. Nine species of plants contribute to 66% of the world's total food supply, out of 6000 species cultivated for food. Nearly a quarter of wild food species are in decline and pollinators, key soil organisms and natural pest enemies are in rapid decline. This shrinking biodiversity in our food system threatens the resilience and future of food production and security around the world.

Much of this degradation is down to how we use land to produce food. Overcultivation, forest clearances, intensive water use, overreliance on fertilizer, monocropping & monocultures, a shrinking gene pool of crops all contribute to a food production system that takes its toll on land, water and biodiversity resources - requiring more and more inputs for greater productivity.

Simply changing these practices, towards more sustainable land and ocean use, the World Economic Forum estimates, will create $3.5 trillion in business opportunities and 191 million jobs. In a country like India, where over half the workforce depends on agriculture for their livelihoods and where 200 million people are food insecure, transforming how we grow food is a must.

This issue explores how we can close this gap between hungry, food insecure people and the smallholder farmers who constitute the backbone of food production through sustainable and climate-friendly practices. It delves into the policies and programmes that need to be designed for this, and the huge potential opportunity that awaits. Making this transition will unlock greater value for farmers and build food and nutritional security for all, through access to healthier, better quality food. Sustainable farming is more productive than industrial farming: agroforestry in tropical countries, for example, produces 40-60% more in yields.

Eliminating hunger is not a pipe dream. But to do it, we have to accept that good ecology is good agriculture and act to make it the norm, not the exception.

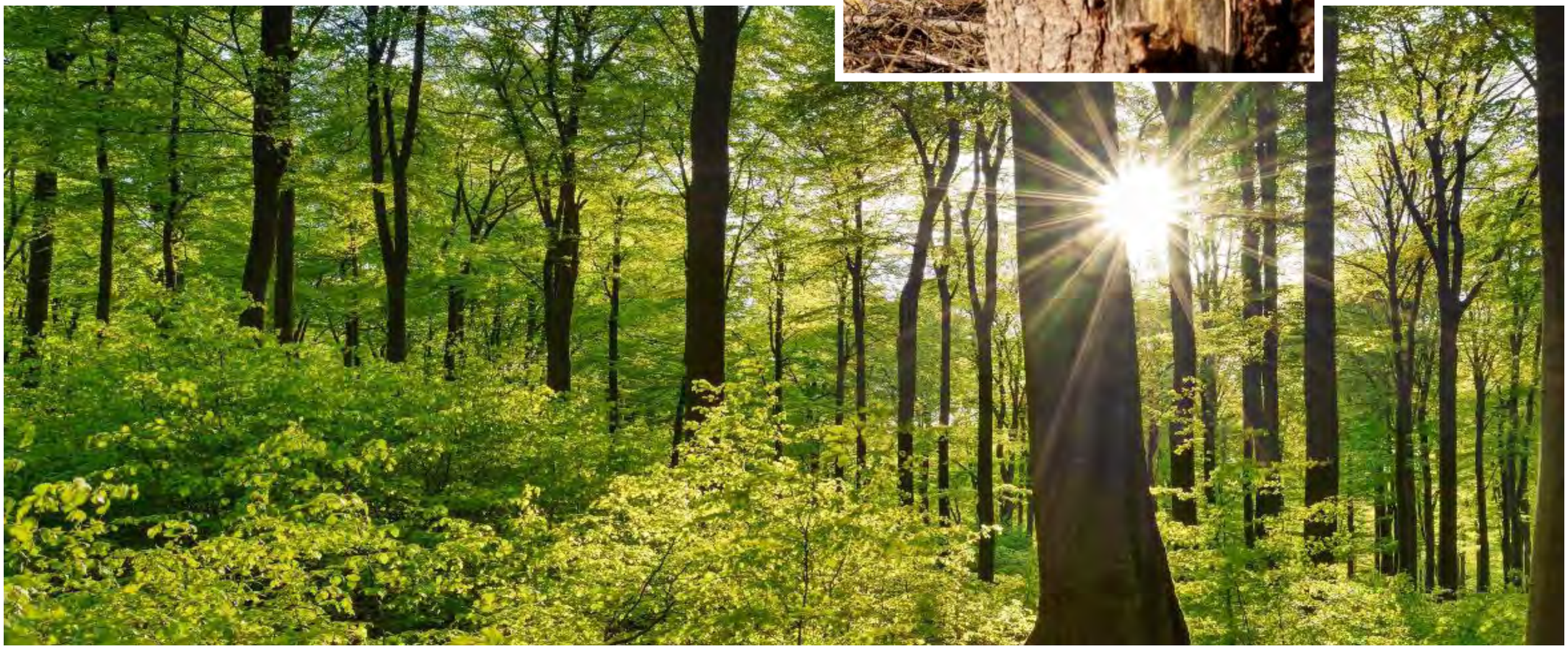
– Ranjit Barthakur

Feeding the world – the natural wealth of nations

– **Ranjit Barthakur,** *Founder, Balipara Foundation*

Forests are the key to life on earth today, providing food and water security to billions globally, enriching soil and maintaining the cycles that make life on earth possible. 25% of the world's population depends on forests for their survival. Yet, these forests are under threat today. Every minute, we lose 19 hectares of forests - a total of 10 million hectares every year, since 2015. In 2020, in an unprecedented way, the consequences of this forest loss hit and hit hard. The dangers of zoonotic disease transmission that doctors, scientists and think-tanks like the World Economic Forum had warned us about struck home: bringing a $20 trillion per month economy to a grinding halt. For the past decade, these warnings about increasing deforestation and its links with zoonotic diseases passed unheeded. Now, we can see in a tangible way, how forest cover reduction has a cross-sectional impact on nature: land, energy, waste, water, air and carbon (LEWWAC).

Declining forests shrink nature's immense absorptive and adaptive capacity - a capacity that has kept our planet living for so long. An estimated 1.7 million viruses live in mammals and birds, and 25% loss of intact forest increases contact between people and wildlife, exponentially increasing risks of transmission. Deforestation has



also led to the rising desertification of our land. Nearly 25% of land in the North East is degraded and the cost of this degradation is astronomical. Land degradation caused by forest loss costs India over INR 197,000 crores annually. More worryingly, this degradation is destroying our ability to feed ourselves.

Investing in Natural Assets

Take these facts about our soil. We are facing an annual loss of 5.37 to 8.4 Million tonnes of nutrients annually. It impacts 147 million hectares of cultivable land in India annually, causing rising deterioration annually - that is 92% of our total agricultural land. We cannot afford to continue destroying our natural capital, which includes our soil, which is the key to our food security. The North East has the potential to be the rice bowl of the country, but it has to change its trajectory of growth to build on its natural capital. We have to invest in a rewilding economy, to restore our degraded soil:

- Natural assets, which includes our land, by creating a rewilding economy - restoring our forests, halting deforestation, investing in our soil through better practices such as agroforestry, reducing chemical use in the soil and going organic. We have to invest cross-sectionally across LEWWAC - land, energy, waste, water, air and carbon.
- Employment not only will we increase the carrying capacity of our land by investing in natural assets, but also create employment in rural communities, creating sustainable socioeconomic mobility.
- Mitigate animal-human diseases - the Eastern Himalayas are particularly vulnerable to new diseases. Investing in protecting the region's standing forests can reduce zoonotic disease transmission risks by up to 40%.
- A Naturenomics™ economy - investing in natural assets will drive a balance between rural and urban communities and invest in rural communities to build Rural Futures: opportunities for natural capital employment and socioeconomic wellbeing through universal basic assets such as education and healthcare that reach all people.

Investing in Nutrition

Biodiversity is the hidden value that propels our food systems. Pollination increases the global value of crop production by US$235-577 billion/year. By 2050, land degradation and climate change are predicted to reduce crop yields by up to 50% in areas like India. The challenges facing our food systems are intimately connected to biodiversity, to our climate and to our natural assets.

We need a new economic paradigm for valuing natural capital and securing natural assets. This valuation is a must, to pave the way for social inclusion - to build resilient food systems and to build resilience against new zoonotic disease emergence. Without this valuation, we will continue to spend good resources against bad and deplete the natural world's ability to regenerate and support us. To drive this we need:

- Valuation of Natural Assets across our farms and food systems - understand the total impact and use of natural capital across our food production system and measure how much value is returned to natural capital, through sustainable farming practices
- An integrated, harmonized system for grading natural capital across farms - incentivizing support to growers & producers with positive natural impacts on land and biodiversity in their farms
- Invest in biodiversity friendly farming practices - this means investing in creating biodiversity across our food production systems, both by increasing crop diversity, as well as genetic and seed diversity, and by using farming practices that support habitats for key pollinator species

Real nutrition comes from Rural Futures. Our biodiversity, our rural communities and our natural assets are the key to rejuvenating and revitalizing how we grow our food, how we nourish the vulnerable and how we build our resilience to zoonotic diseases like COVID-19. The time for a revolution in ecology and economy is here. Let us invest in the new natural wealth of nations.

147 million hectares of cultivable land in India annually, causing rising deterioration annually - that is 92% of our total agricultural land. We cannot afford to continue destroying our natural capital, which includes our soil, which is the key to our food security.

FORESTS FOR HEALTH

60%

Of diseases are zoonotically transmitted

$ 8.1 Trillion

The cost of COVID - 19 on the global economy

$ 31.2 Billion

The total cost of natural prevention measures

PREVENTION NOT CURES

Tropical forests are disease hotspots

31% of emerging diseases are linked to deforestation

Forests are the key to life on earth today, providing clean air, food and water security, fuel, medicines and livelihoods to billions globally. 25% of the world's population depends on forests for liveslihoods. Yet, tropical forests face increasing deforestation risks. Between 2015 – 2020, the world lost 10 million hectares of forest annually and since 1990, a total of 420 million hectares of forest have been lost to other land uses.

An estimated 1.7 million viruses live in mammals and birds. In tropical countries, still home to intact forests, 25% loss of intact forest increases contact between people and wildlife, exponentially increasing risks of transmission. Of the biggest outbreaks of the past decade, nearly all of them began in tropical countries: Zika (Brazil, Nipah (Malaysia), Ebola (Guinea), MERS (Saudi Arabia), COVID-19 (China).

Natural capital investment reduces pandemic risks

40% of transmission risks can be reduced by halting deforestation

The costs of the COVID-19 pandemic are projected to run into trillions of dollars. By comparison, a few natural solutions could significantly reduce zoonotic disease transmission and cost a few billion dollars. Reducing deforestation will cost $9.6 billion and reduce risks by 40%. Monitoring and halting the wildlife trade would cost $22 billion to the global economy. Reducing spillover through comprehensive health plans for cattle is one of the simplest and most easy to control solutions, costing $1.2 billion. Implementing these solutions for a decade would still amount to only 2% of the costs incurred by the COVID-19 pandemic.

Protecting forests costs only $9.6 billion annually

Monitoring the wildlife trade costs less than $1 billion

RECLAIMING THE EARTH
TRIBAL WOMEN
LED SUSTAINABLE AGRICULTURE

– Rahul Banerjee

The Scheduled Tribes constitute about 8% of the population of India. They are at the bottom of the pile as far as human development indicators are concerned. Especially deprived and oppressed are tribal women who have to bear the double burden of poverty and patriarchy. Therefore, a programme of development to address this problem based on a detailed analysis of it is very essential.

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The Problem

- Tribal Development in India has been problematical from the time of independence. This is due to a conflicting situation arising from the opposition between the traditional community based subsistence economy of the tribes people and the modern market based growth oriented thrust of the mainstream economy. The challenge has been to integrate the tribes people into the modern economy in a manner that is beneficial to them. This has generally not been possible because the tribes people have lacked the requisite skills for this and the government system for equipping them with these skills has malfunctioned (Rahul, 1997).
- Consequently, The Scheduled Tribes in India score the lowest on human development with low values for income, health and education indicators. Their extreme deprivation results in them having to migrate seasonally and also in further destroying their immediate habitat leading to even more poverty and deprivation (Banerjee, 2003). Thus, tribal development that is sensitive to the needs and aspirations of the tribes people is beneficial to society not only by making the tribe more self reliant but also by conserving the environment which has become important due to the looming problem of climate change (Banerjee, 2010). Well designed development interventions can not only help the tribes people to improve their lives in a sustainable manner but will also enable them to provide essential eco-system services which will mitigate the harmful effects of the carbon emissions resulting from cities and industries.
- Tribal societies are patriarchal and as a consequence like for other underprivileged communities, the burden of this mal development falls disproportionately on women due to the feminisation of poverty (UN Women, 2020).

Alleviating Measures

Scholars and practitioners of tribal and communitarian development have suggested the following measures to alleviate these problems –

- Decentralised and local community controlled development has been acknowledged as a major desideratum for tackling tribal deprivation (Sharma, 2001).
- With the award of the Nobel Memorial Prize in Economic Sciences to Elinor Ostrom in 2009, it has come to be acknowledged that collective action is the best option for the management of common pool resources (Ostrom, 1990).
- Communitarian natural resource management and sustainable agriculture not only enhances the livelihoods of tribes people but also the benefits accruing in terms of mitigation of climate change compensates for the emissions from the urban and industrial areas (International Institute of Sustainable Development et al. 2003).
- The income and time poverty faced by women can be effectively tackled by increasing the agency of women in designing and implementing development programmes and this also results in more equitable and sustainable development (UN, 2019)

Unsustainability of Agriculture

Tribes people in India are mostly engaged in agriculture and animal husbandry and so any programme of tribal development must address the problems of agriculture. In recent years a major environmental issue is that of global warming. Therefore, the problems of agriculture with regard to aggravation of global warming are discussed first (CGIAR, 2020) -

- Carbon dioxide emissions from the heavy use of gasoline-powered agricultural machinery that modern techniques require.
- Carbon dioxide emissions from the deforestation and burning of land to convert it for intensive agriculture.
- Loss of soil and forests as carbon sinks. Natural vegetation acts as a huge reservoir, soaking up atmospheric carbon, as does the soil. Destruction of the plants and the disruption of the soil that occurs when land is converted to agriculture decrease the available of these sinks, meaning more carbon is left in the atmosphere.

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Conventional farming techniques also increase soil erosion and the leaching of soil nutrients, which decrease the use of soil as a sink. Rough estimates are that man-made changes in land-use have produced a cumulative global loss of carbon from the land of about 200 thousand million tonnes.

- The use of synthetic fertilizer releases huge amounts of N_2O – it is the single largest source of N_2O emissions in the world. The application of fertilizers accounts for 36% of the total emissions of N_2O. According to the IPCC, if fertilizer applications are doubled, N_2O emissions will double, all other factors being equal. Since regular applications of fertilizer are an integral part of modern farming, and as the developing countries adopt more of these industrialized agricultural practices, this is a realistic situation. Remembering that N_2O has over 300 times the warming potential of CO_2 and can stay in the atmosphere for about 120 years, the effect on global warming could be devastating.
- Methane released from animals and manure piles. Manure storage and treatment systems equal 9% of total CH_4 emissions and 31% CH_4 emissions from the agricultural sector.

Apart from this the indirect contributions of modern farming to global warming are even greater. The manufacture of synthetic fertilizer is one of the most intensive energy processes in the chemical industry, which itself is a primary energy user globally. Add into this the need for the fertilizer to be transported to the farmer, and we find that synthetic fertilizer is the largest producer of CO_2 emissions in the agricultural industry – even considering all the tractors and equipment belching out exhaust fumes.

The use of synthetic fertilizer tends to acidify the soil, which then requires the application of lime to balance the pH; manufacture of lime also produces CO_2 emissions. Finally, synthetic fertilizers suppress the soil's natural micro-organisms that break down methane in the atmosphere, which leads to higher levels of methane than otherwise. The soil micro-organisms are largely responsible for controlling soil temperature and water run-off, production of vitamins, minerals and a host of plant hormones, not to mention that soil micro-organisms provide much of a plant's immune system

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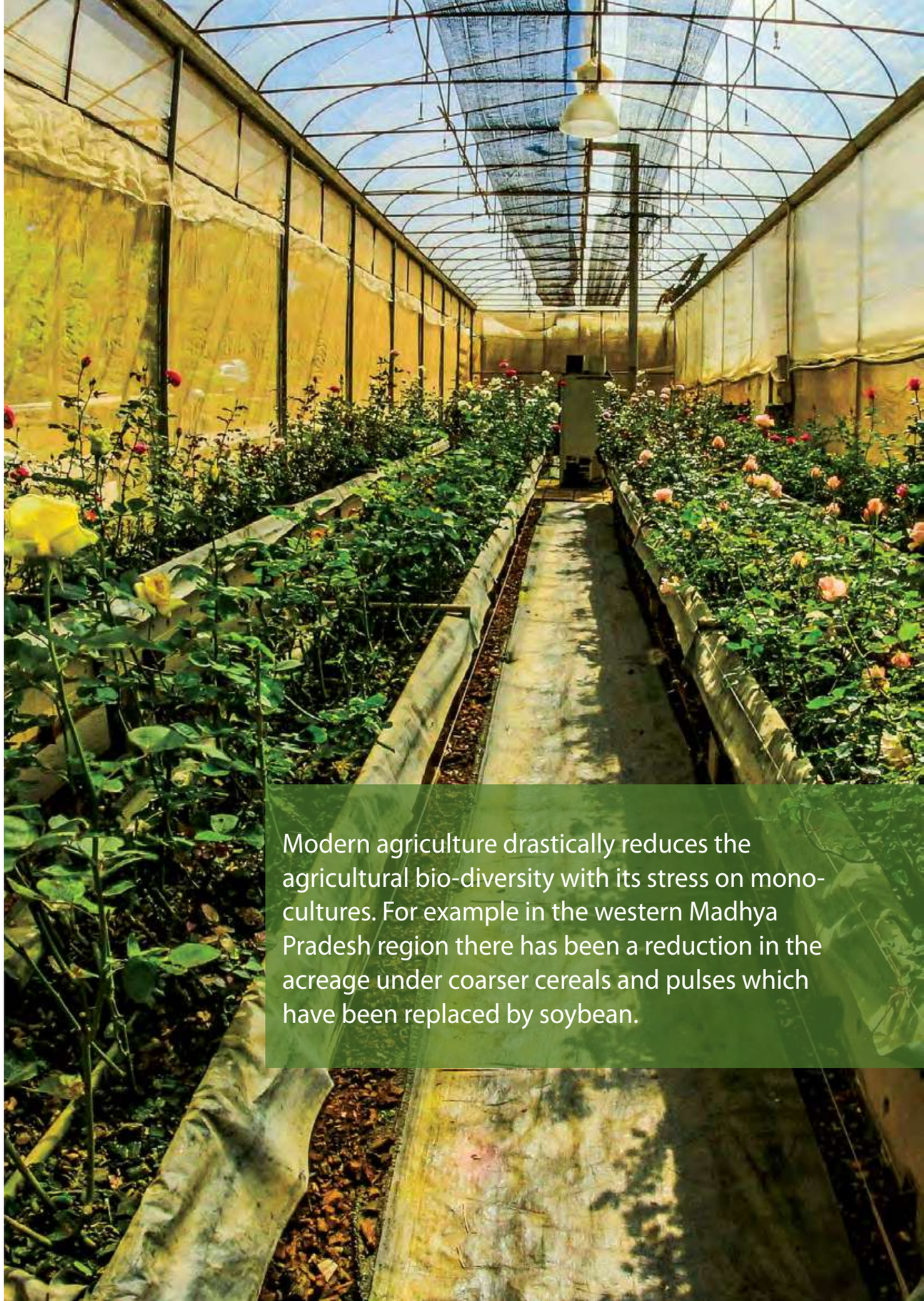
so reducing their population is harmful. Thus modern agriculture is unsustainable from the point of view of its harmful contribution to reduction of biodiversity and organic soil fertility as well (Shiva, 1992).

Simultaneously economically too this modern agriculture is proving to be unviable. The main problem with modern artificial input agriculture is that there is a natural limit to the artificial inputs that the soil can take and so the amount of fertilisers, pesticides and water to be applied goes on increasing while the yields go on falling and sometimes the crop fails altogether. Consequently the economic costs of providing the inputs go on increasing while the realisation of the value of agricultural products in the market does not keep pace with this rise in input costs. Inevitably this leads to farmers falling into the clutches of moneylenders and becoming enmeshed in spiralling debt. Matters have been compounded by the reduction in the availability of cheap institutionalised credit and various kinds of government subsidies for fertilisers, water, diesel and electricity, credit and research which even now amount to about Rs 5 lakh crores annually in India while it is as much as $ 20 billion annually in the USA. The economic crisis in agriculture has now assumed serious proportions with thousands upon thousands of farmers having committed suicides, sold their lands, houses and even their kidneys (NSSO, 2005).

Another problem arising from the adoption of modern agriculture has been that of the increasing scarcity of water. Most of the water needed for irrigation in India is being provided by groundwater extraction and this has led to a situation of "water mining" wherein water collected in the deep confined aquifers over hundreds of thousands of years were used up in the space of a decade and large parts of the country have been facing a ground water drought from the nineteen nineties onwards. Since then there has been less and less ground water available for not only irrigation but also for drinking and the cost of its extraction is continually going up. Big dams, however, are the environmentally and socially most harmful component of modern agriculture. The World Commission on Dams reviewing the performance of big dams brought out the fact that the benefits gained from big dam construction have



Modern agriculture drastically reduces the agricultural bio-diversity with its stress on mono-cultures. For example in the western Madhya Pradesh region there has been a reduction in the acreage under coarser cereals and pulses which have been replaced by soybean.

been at an unacceptable and unnecessary higher cost in terms of environmental destruction and human displacement (Dharmadhikari, 2005). There has been lack of equity in both the distribution of benefits and costs with the poor having lost out on both counts. According to the Falkenmark Indicator of water stress, India is a water stressed country as the water availablity is only 1400 m^3/year/person whereas it should be 1700 m^3/year/person. In fact many areas in India are water scarce as the water availability there is less than 1000 m^3/year/person (Niti Ayog, 2019).

Additionally, modern agriculture drastically reduces the agricultural bio-diversity with its stress on mono-cultures. For example in the western Madhya Pradesh region there has been a reduction in the acreage under coarser cereals and pulses which have been replaced by soyabean.This combined with the greater monetisation of the rural economy has forced the marginal adivasi farmers to buy their food from the market instead of getting it cheaply from their farms and this has reduced their nutritional levels well below healthy standards. Thus, they too have become sufferers of the problem of chronic hunger that today engulfs the poor in much of the developing world and even in the developed countries because the shrinking of livelihood opportunities has meant that they are not able to earn enough to buy wholesome and adequate food (Dreze & Sen, 2013).

Tragically, this march of modern chemical agriculture has marginalised women completely. Settled agriculture began after the neolithic revolution about 10000 years ago most probably due to the selection of seeds of edible cereals done by women from the wild grasses (Lerner, 1986). However, once surpluses accumulated thereafter women were gradually pushed into a secondary status in society by men without rights to land and other means of production. With the advent of mechanised chemical agriculture this marginalisation of women assumed greater proportions and their say in the conduct of agriculture reached rock bottom (Agarwal, 1994).

The Solution to Unsustainability of Agriculture

Research has shown that organic arable production is about 35% more energy efficient, and organic dairy production about 74% more efficient per unit of output than non-organic production (Smith et al, 2015). Organic farming, by definition, prohibits the use of synthetic fertilizer, using instead a limited amount per hectare of organic matter and knowledge of soil biology. Since the pH of the soil is not disrupted by organic

MANAGING WATeR & FeRTILIze R FOR Su STAINAbLe AGRICu LTu RAL

Water and nutrients are both essential for agricultural production

3,000 LITRES OF WATER PER DAY

The amount required to grow food for 1 person

70%

of water withdrawls atributed to agriculture

50% OF FOOD GROW

Amount of todays food grown thanks to fertilizer use

180 MILLION TONNES

Amount of fertilizer nutrients used each year

How can we optimize and synchronize water and nutrient management to contribute to food security and nutrition, farmer profitability and protection of ecosystems?

TEACHING '4R' NUTRIENT STEWARDSHIP

Applying nutrients from the right source, at the right rate, time & place

OPTIMIZING WATER MANAGEMENT

To improve water productivity and reduce nutrient losses

STEWARDING OUR SOULS

To maintain healthy soils that can supply the water and nutrients crops need

IMPROVING CROPS

To create pant varieties with higher capability to use water and nutrients efficiently

What will help us achieve this?

INTEGRATED RESEARCH

Integrated research on the management of soil water and soil fertility can achieve the SDGs of ending hunger and improving water use efficiency

ADOPTING BEST MANAGEMENT PRACTICES

Build capacity in water, soil and nutrient management and technologies like fertigation, precision farming and conservation agriculture

POLICY REFORMS & INCENTIVES

Farmer need to be enabled and encouraged to use water and fertilizer most efficiently

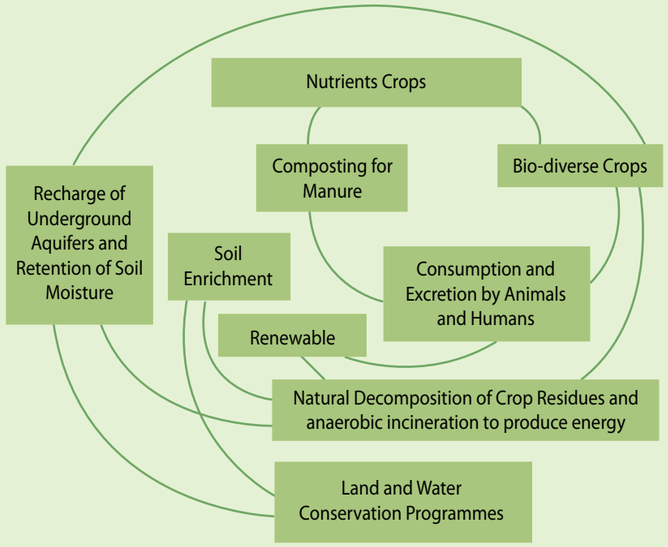
Organic agriculture with indigenous seeds is, moreover, less water intensive. Thus, the virtual water embedded in these crops is less (Hoekstra & Chapagain, 2007). Consequently, this kind of agriculture also greatly reduces water use and relieves water stress.

farming techniques, the use of energy–intensive lime is also minimal or non-existent; again contributing to lower CH_4 and CO_2 emissions compared to modern external input farming techniques. The use of organic matter also increases carbon content in the soil, storing up to 75 kgs of carbon per hectare per year. Organic farming uses nitrogen-fixing plants as cover crops and during crop rotation, which help to fix nitrogen in the soil rather than releasing it into the atmosphere. Also through bio-gas plants the methane generated can be channelised for cooking and generation of electricity instead of being released into the environment. And finally, organic farming techniques maintain soil micro-organisms and so help in oxidizing atmospheric methane. The combined effect of all the different benefits of organic farming produces a Global Warming Potential that is only 36% that of modern external input farming.

Organic agriculture with indigenous seeds is, moreover, less water intensive. Thus, the virtual water embedded in these crops is less (Hoekstra & Chapagain, 2007). Consequently, this kind of agriculture also greatly reduces water use and relieves water stress.

Therefore, sustainable internal input agriculture is more energy, water and nutrient efficient and results in lower greenhouse gas emissions than modern external input agriculture per unit of crop produced, which is a crucial parameter, given the need for food production to feed the world's population. It is also community dependent rather than market dependent and so will revitalise the local economy.

Last but not the least it opens up huge possibilities for women to play a decisive role in agriculture and so in society. The schematic diagram of sustainable agriculture is shown in the figure below.



A Tribal Development Programme

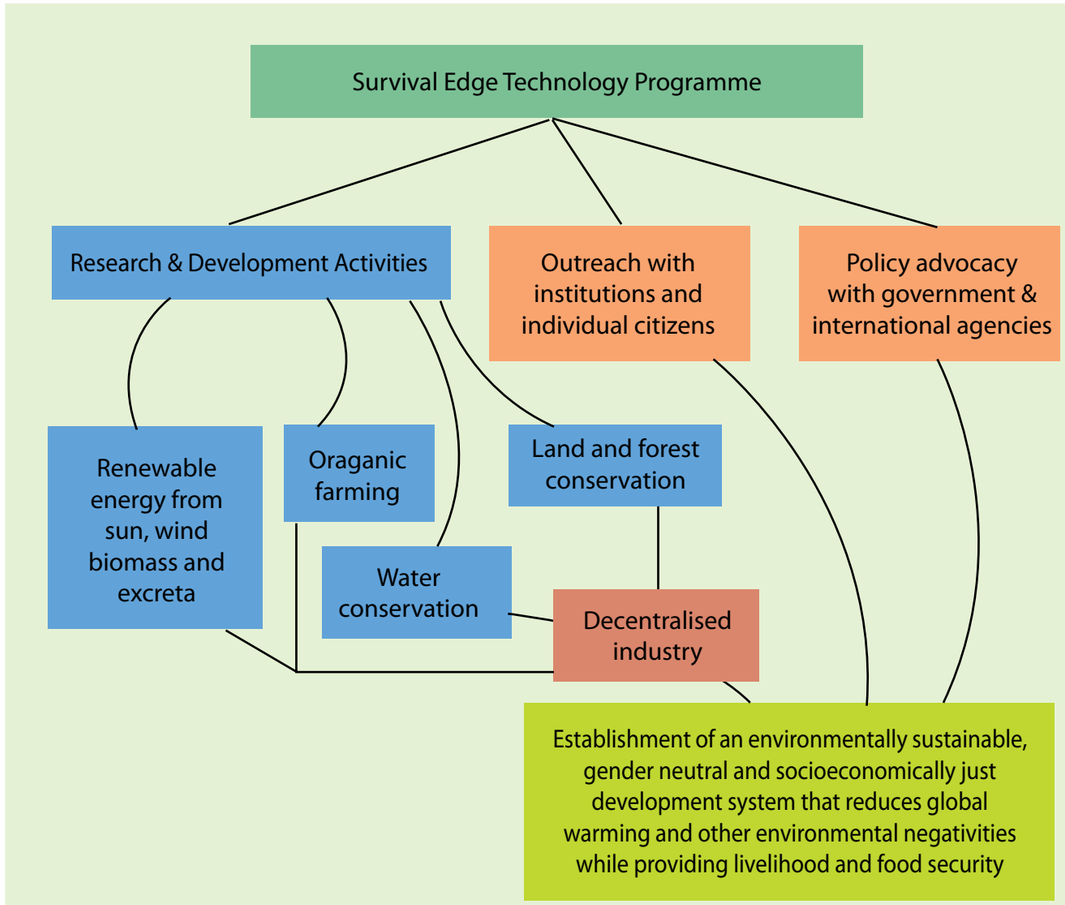
A Tribal development programme based on these principles is proposed to be systematically carried out in a remote rural area from the next Kharif cropping season in April 2021 around Bisali village, in Udainagar Tehsil of Dewas district of Madhya Pradesh whose location is shown below. This area has been chosen because there has been tribal community mobilisation for sustainable development here for more than two decades by several civil society organisations. Especially of importance is the fact that there is in the area an independent Bhil Tribal women's organisation Kansari Nu Vadavno (KNV) that has done path breaking work for establishing gender equity. Thus, there is a vibrant community based on trust in the area which is very essential for implementing a communitarian sustainable development project against the tide of the dominant chemical agriculture.

- The overall framework for the development intervention is that of achieving sustainability and equity for the Tribes people through organic agriculture and natural resource management which will also mitigate climate change at the global level with the use of Survival Edge Technology (https://www.rahulbanerjeeactivist.in/survival-edge-technology.html). This is an assortment of simple technologies that can be implemented by communities through collective action to mitigate the agriculture, water, energy and climate crises that face humanity and with the agency of women in its planning and implementation (Banerjee, 2020).
- Farmers will provide part of their land for conversion from

chemical to organic agriculture. The parameters on the basis of which the farmers will be selected are as follows –

- The farmer household is inclined to try out sustainable agriculture
- The woman of the household is active in the Kansari Nu Vadavno so as to ensure that she has agency in the implementation of the project.
- The household has enough irrigated land so that they can spare 1 acre for the project.
- These farmers will be provided with financial support to make this switch that will compensate them for the capex required for implementing soil and water conservation measures on their farms and also the possible initial loss in production. The average Indian production yield for the crop is taken and the lesser yield is initially compensated pro-rata at market rates. The extra labour cost of adopting organic manuring is also compensated.
- The crop choices are made keeping in mind both the need to provide proper nutrition to the farmers and also enable them to earn a good income in the long run once the farms are organically certified and their produce can be sold at a premium in urban and foreign markets.
- Free ranging homestead poultry and goat rearing are profitable occupations for tribes people due to a ready market for chicken and goats. However, they are plagued with the problem of diseases which wipe out the birds and goats from time to time. So a programme of vaccination and medical care will be provided to improve the productivity of these practices.
- The need for making the project self sustainable eventually has been taken into account and so the tribal farmers will be trained to take on the responsibility of the operations from farming to documentation and marketing.

This development project, while putting the livelihoods of the tribes people on a more environmentally and economically sustainable footing and establishing gender equity in the community, will also enable them to provide eco-system services which will benefit the whole of society through the mitigation of climate change. The most important aspect of this project is that it is designed to make the tribes people self sufficient over a period of time and does not envisage providing them with doles indefinitely. It will provide evidence for large scale development planning. Thus, in the long term the project will lead to a wider implementation programme as shown below –



Marketing Strategy

There is a farmer consumer network organised by the Organic Farming Association of India (OFAI- https://ofai.org/) which depends on trust to ensure that products sold have been produced without the use of chemicals. Therefore, the produce of the farmers in this project will be sold at a premium through the OFAI network. Thus, the farmers will get a better price than the local market and also some of the investment of the project will be recovered. Eventually, official certification will be obtained and this will result in better ability to tap niche clientele in India and abroad.

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FOOD SECURITY AND NUTRITION

and its correlation with environment-Soil fertility and nutritional value of land

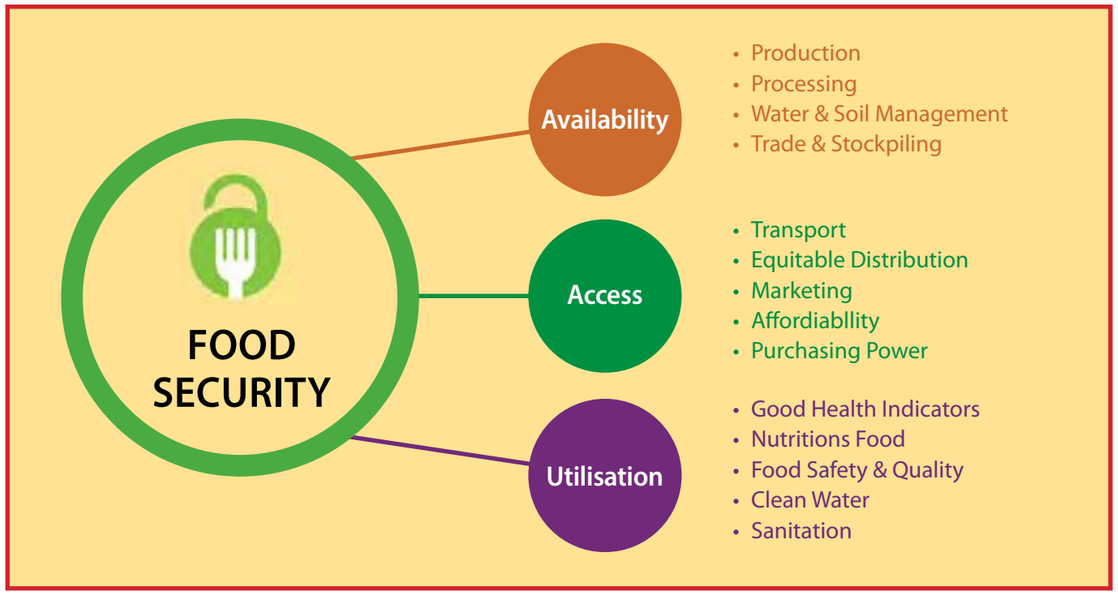
– Arvind Awasthi

Food Security for India

The Government enacted the National Food Security Act (NFSA) on September 12, 2013. The NFSA aims to provide subsidized food grains to approximately two third of India's population. The legislation is perhaps the largest food security program in the world. The result shows that the food grain sector has to grow by 3.75 % annually to match provision of food grains accord to the act . Overall the country needs to gear up in terms of food grain productivity, otherwise, NFSA must be supplemented by import of foodgrains, which would entail a financial burden to country's exchequer. But the impact on the environment is also not favourable. The economy is likely to generate additional Green House Gases (GHG) emissions of 10.39 million metric tonne of CO_2 equivalent due to the NFSA act. A significant generation of water pollution is also expected. In the context of Indian sub-continent, we find a perfect synergy between the basic objective of NFSA and Millennium Sustainability Development Goal. Overall, NFSA impact will enhance the growth of the economy. However, additional pressure on environment and land cannot be ignored. For sustainable food grains production in the economy, the nation should consider the improvement of agriculture productivity as well as to minimize the environmental effect by introducing more sustainable farming practice which I have mentioned below.

Food is the first among many basic human needs, and it is for this reason that "the human right to food is recognised in several instruments under international law (UN -1999)." Food security is said to exist when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life, (Food and Agriculture Organisation (FAO)- 2009. The International Covenant on Economic, Social and Cultural Rights recognises "the fundamental right to freedom from hunger and malnutrition." The situation worsened by the incidence of high poverty rate in the country. India is the second

most populous country in the world with an estimated 1.2 billion people and the 5th largest economy by GDP. Thanks to steady economic growth over the past decade, India was classified as a (lower) middle-income country by the World Bank in 2012. An estimated 32.7 % of the Indian population lives on less than US$ 1.25 per day while 68.7% on less than US$ 2 per day (World Bank 2010). According to a different estimate made by erstwhile Planning Commission, a total 21.92 % population still lives below the poverty line. The country is home to a quarter of all undernourished people worldwide. India ranks 135 out of 187 countries in the 2014 UNDP Human Development Index and 55 out of 76 countries in the Global Hunger Index (World Food Programme - 2015). Any further increase in food grain prices would push the poor people to even more vulnerable situation. With nearly 195 million undernourished people, India shares a quarter of the global hunger burden. Nearly 47 million or 4 out of 10 children in India are not meeting their full human potential because of chronic undernutrition or stunting. Stunting has consequences such as diminished learning capacity, poor school performance, reduced earnings and increased risks of chronic diseases. The impacts are multi-generational as malnourished girls and women often give birth to low birth-weight infants. On the other side in many urban areas, There has also been an increase in the prevalence of overweight



and obesity in children and adolescents in India, which has life-long consequences of diabetes and heart related problems. Though The Indian government has large food security and anti-poverty programmes but there are critical gaps in terms of inclusion. Women and girls are particularly disadvantaged as due to social reasons they are the ones that get the least nutrition in the family. Despite the achievement of national food self-sufficiency, new challenges have emerged for India:

- Slowing agriculture growth after the 1st Green Revolution pioneered by Dr M. S. Swaminathan from 1966 onwards under the 3rd Prime minister – Smt Indira Gandhi
- Adverse climate change
- Land degradation in many parts of India and shrinking bio-diversity.
- Large tracts of farmlands in many states of India have become barren due to imbalanced fertilizer use and excessive use of a single fertilizer called urea.

The green revolution in India saw the widespread use of fertilisers that increased agricultural productivity at the cost of soil quality. The overuse of fertiliser is a major determinant of land degradation, and reducing its use would improve the situation, but lobbying and political pressure from farming groups prevents India from reducing subsidies that encourage fertiliser use.

With a five-fold increase in food grain production from 50 million tons in 1950-51 to about 290 million tons in 2019 -20, India has moved away from dependence on food aid to become a net food exporter. In 2016, the government launched a number of programs to double farmers' incomes by 2022. These seek to remove bottlenecks for greater agricultural productivity, especially in rain-fed areas. They include:

- National Food Security Mission
- Rashtriya Krishi Vikas Yojana (RKVY), the Integrated Schemes on oilseeds, pulses, palm oil and maize (ISOPOM), Pradhan Mantri Fasal Bima Yojana, the e-marketplace. This has been accompanied by a large scale irrigation and soil and water harvesting programs in an attempt to increase the country's gross irrigated area from 90 million hectares to 103 million hectares.

The government has also taken steps to combat under nutrition and malnutrition over the past two decades, such as introduction

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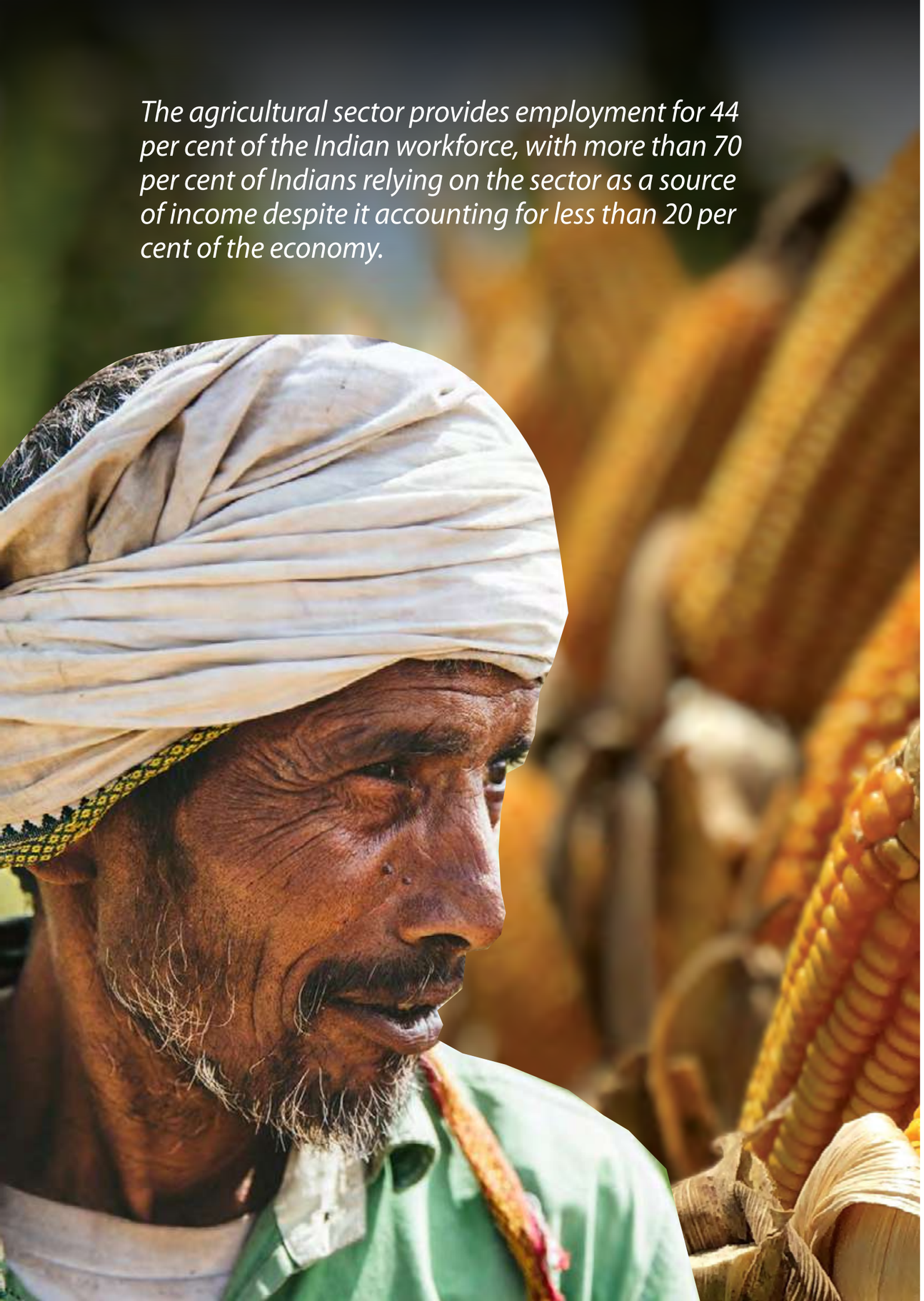

The agricultural sector provides employment for 44 per cent of the Indian workforce, with more than 70 per cent of Indians relying on the sector as a source of income despite it accounting for less than 20 per cent of the economy.

of mid-day meals at schools, Anganwadi (For 2-6 year old Children) systems to provide rations to pregnant and lactating mothers, and subsidized grain for those living below the poverty line through a public distribution system. The NFSA of 2013, aims to ensure food and nutrition security for the most vulnerable in an attempt to making access to food a legal right.

India supports 18% of the global population on only 2.4% of the world's land mass, a situation that heightens implications of land degradation that it faces. Land degradation affects about 30% of all land in India. Climate change is one of the main drivers of land degradation in India.

The erosion of topsoil, mainly due to heavy rainfall washing it away, remains the main cause of land degradation in India. It reduces the land's ability to act as a carbon sink and natural water store while undermines food security. With water sources already at risk from extreme weather conditions, scarcity and the progressive contamination of groundwater reserves, the loss of the water retention qualities of soil would further weaken Indian agriculture.

The bonn challenge is an international afforestation commitment under which India has pledged to restore 13 million hectares of degraded and deforested land by 2020 and a further eight million by 2030.

The agricultural sector provides employment for 44% of the Indian workforce, with more than 70% of Indians relying on the sector as a source of income despite it accounting for less than 20% of the economy. Other than during the green revolution, overall growth in the sector has been at a consistent low of two per cent per annum since the 1950s, with chronic underemployment plaguing the highly migratory and majority female labour force in agriculture.

It is estimated that India's demand for food will grow at a rate of two to three per cent until 2025, with demand outpacing supply by 2035 – even if productivity increases at its current rate. Factors that contribute to the increasing demand for food are reflected in trends similar to those in other developing countries: a shift in consumption habits is due to rising consumerism and a growing middle class that has increased demand for products such as proteins, fruits, dairy, packaged goods and high-end products.

The surprising fact about india is that our granary's are full, yet our people are undernourished? How India can move from food security to nutrition security in the future. Despite 50% increase in the countries GDP since 2013 ($ 1.86 Trillion Dollars) to 2019 ($ 2.94 Trillion Dollars) more than 30% of the worlds malnourished children live in India among these 50% of the children are under 3 years of age and are underweight. one of

FOOD WASTE

FROM FIELD TO MARKET

Field & at harvest
20%
average losses

Reasons for losses
- Inadequate nutrition
- Disease ant rot
- Insect damage
- Poor weather
- Over-ripe
- Poor harvest technique
- Lack of labour

Farm storage
20%
average losses

Reasons for losses
- Rot and mould
- No cold storage
- Rodents
- Unbalanced nutrition
- Bruising

Processing
5-20%
average losses

Reasons for losses
- Off-spec sugar content
- Off-spec colour
- Off-spec size
- Off--spec shape
- Skin blemishes

Transport
5-15%
average losses

Reasons for losses
- Poor handling
- Long transport time
- Poor roads
- No refrigeration
- Unbalanced nutrition

At market
10-15%
average losses

Reasons for losses
- Poor stock management
- No refrigeration
- Unbalanced nutrition
- Poor physical handling

the major causes of malnutrition is economic inequality.

But the impact of poor nutrition goes far beyond productivity numbers. The recently published Comprehensive National Nutrition Survey (2016-18) highlights that 35% of Indian children under five years of age, and 22% of children between five to nine years of age suffer from stunting. Additionally, the report found that 33% of children under five, and 10% of children between five and nine were underweight. Even among adolescents between 10 to 19 years of age, 24% were found to be thin for their age. These statistics are further supported by the National Family Health Survey report of 2015-16. With long-running programs like the Public Distribution System working to improve marginalized people's access to food grains, a cause of worry is that why are these nutrition issues so persistent?

India has been a food-sufficient country for more than 30 years – but it hasn't always been that way. Though the nation now produces enough food for its entire population, recurring famines plagued it for decades. In response, the government strengthened the distribution system to prevent the large-scale loss of lives from starvation. Controlled and systematic distribution of food grains began in India under British rule during the Second World War. Then, after the country gained independence, the government modified the system of distributing essential food grains – known as the PDS –multiple times to address the challenges associated with food security: targeting, procurement, storage and the transportation of grains to different parts of the country.

India is estimated to waste or lose 30% of the food produced annually through losses that mainly occur during the production, transport and storage stages of the supply chain.

While Indian food security is challenged by more than land degradation, it is the land that is most likely to be affected by climate change. The dependency on land makes the Indian economy susceptible to changes in climate.

Presently, the NFSA governs the PDS, guaranteeing supplementary food grains to 50% of urban households and 75% of rural households in India, and reaching almost 800 million people. Under NFSA, the PDS has considerably improved people's access to food grains by covering a substantial part of the food grain requirement for most marginalized households. However, improving access to food is not the same as ensuring optimal nutrition to its people .

- One of the obvious and primary reasons for undernourishment is a lack of dietary diversity. Ironically, PDS, which primarily supplies rice or wheat (or both) seems to be partially responsible for instilling dietary habits that lack in diversity: It sets the norms, and the staples it distributes are often exactly the same grains that the beneficiary households already grow on their farms. Further, current PDS practices are so deeply entrenched in the beneficiaries' psyches, that they are reluctant to accept modifications to the food baskets the program provides.
- the PDS food baskets should include more dietary diversity, featuring local millets such as ragi and jowar, which are cheaper than wheat or rice. The program could then use the money saved to provide subsidized lentils to beneficiaries. This variety of food would ensure adequate dietary diversity among recipients.
- the least expensive and easiest to implement initiative is food fortification, which should be carried out using WHO guidelines to inform the appropriate selection of safe fortification levels and modes of delivery which is being done along with help from Tata Trusts and the Gates Foundation of USA.
- Many studies indicate that giving beneficiaries choice – example: by transferring cash to recipients, so they can buy food items of their choice and preferred quality – improves the nutritional outcomes of food security schemes

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What role can the private sector play in food nutrition security?

Public-Private Partnerships can play a big role in the transition towards nutrition security, by bringing together experts, institutions and organizations that can help the government implement various nutrition-focused programs in different ways like the Tata Trusts and the Gates Foundation are

doing in Uttar Pradesh. These collaborations can focus on:

- Implementation support partnerships: Private sector players can provide support to the government as it rolls out the program at a large scale – as is the case with many other large public safety net programs run by the government.
- Supply chain and procurement: There could be additional possibilities for engaging with the private sector to procure micronutrients and manage the fortification process.
- Nutrition literacy: This has been one of the major drivers of persistent malnutrition levels in the country. We need to look for alternatives to ineffective approaches, and private sector players could provide new options for expanding nutrition literacy among the populace.

India's economic growth projections are predicated on the assumption that, as a young country, its economy is likely to continue its rapid growth. But India will be hard-pressed to realize such growth if its population lacks appropriate nutrients and energy, and cannot contribute fully to society. That's why it is imperative that the country optimize its food policy going forward, so that India may begin the slow march from food security to nutrition security.

The benefits of conservation farming: we must treat the soil with respect

Conservation farming means a form of farming that is environmentally safe and has a conservation goal that is to grow enough crop without drawing

down natural capital too severely, This can be achieved by utilizing less fertiliser & pesticide, using less water and applying more natural means to conserve soil quality and quantity. Industrial agriculture is the opposite -it aims to grow more food cheaply and quickly by using expensive chemical inputs. It is very important to distinguish high "short run" yields which you get from pumping fields with fertilisers, pesticides and water which is itself growing scarce, and high "long run" yields. It is also very important to distinguish between a system that will give you more food (via high yields) versus another that will give you enough food, cleaner environment, high water tables, fewer health complications and other significant benefits.
Soil enables life and conservation farming restores soil while industrial agriculture damages it. The soil helps stabilize our climate. Healthy soil with plants flourishing on it sequester large amounts of carbon – if we leave our soil bare and continuously tilled, that leads to soil desertification, with regenerative agriculture farmers can actually be more productive with better yields and our food becomes more nutrient rich. Industrial agriculture is damaging the soil, it focuses mainly on the yield of a crop. It doesn't look at nature and whole systems of Life which help produce food long -term while supporting carbon drawdown. Instead industrial agriculture releases carbon into the atmosphere. But regenerative farming draws down atmospheric carbon - which is a solution to climate change.

Conservation Farming

- Plants absorb atmosphric carbon and deposit it in the Soil.
- Minimal tilling, less chemicals, growing cover crops, crop rotation, preserving pastures and afforestation - which keeps plants healthy.
- Increased microbial activity helps decomposing organic matter, storing soil carbon.

Industrial Agriculture

- Degrades soil with chemicals, monoculture and ploughing
- This damages plants and topsoil - while destroying habitats essential for biodiversity.

Staying Grounded

The ground below our feet the earth's soil in fact enables our existence, soil sustains vital biological and chemical cycles. Yet we are destroying this foundation of life felling trees which bind soil and infusing the earth with chemicals and degrading land.

Why the earth Counts

Soil is a dynamic habitat that gives plants nutrients, water and air, it also houses bacteria and fungi which recycle carbon and nitrogen. These chemical cycles help nutrients being taken up from the soil to the plants and organic material is decomposed by micro-organisms.
Soil contains 3 times as much carbon as land vegetation and land use change impacts carbon and moisture in the earth and air. With less soil moisture plant respiration reduces stopping microbial activity. Reduced plant growth means less Carbon-Dioxide (Co_2) is absorbed from the atmosphere.
Carbon stored in plants is the main source of food, fuel and fiber on earth. 61 billion tons of these are stored thus annually in forest. With continuing deforestation earth faces 6 billion metric tons less of carbon per annum. 35% of green house gases released into the atmosphere are due to land use changes like deforestation and Intensive agriculture along with burning of fossil fuels.
A worrying factor is that 75% of earth's land is now degraded and with the current trend 90% land could be degraded by 2050. This could reduce crop yields by 50% in many areas and could force millions of people to migrate as refugees to other areas where soil is fertile.

How can ordinary people help with restoring soil health

There are multiple ways we all can contribute. There are multiple certification for foods in the market (example: Rainforest Alliance Tustea, etc), so when buying a food product buy a certified product so that you whether the land has been used sustainably. Such certifications are important Because as consumers we can demand improved production standards. We all overbuy products and food gets wasted. we should minimize waste and compost our left overs, which adds nutrients to the soil and we can join tree planting initiatives which, these measures help protect the land. We must treat land with greater respect.

Growing Forests, Growing Food

– the Rural Futures story

In 2017, the Balipara Foundation launched its Rural Futures programme to answer the simple question: why not people and biodiversity, together? The premise of the Rural Futures framework is simple. Secure the lives and livelihoods of communities through habitat restoration - and the communities themselves will take the lead in driving restoration. However, security had to extend beyond income security: it had to include the assets that make socioeconomic mobility possible (universal basic assets) including, among assets like healthcare and education, food security. Sustainable businesses through agroforestry, bamboo, mushrooms and mindful tourism enhance natural capital values, enabling communities to become self-sufficient, accessing and delivering universal basic assets.

The food forest also creates greater nutritional self-sufficiency by minimizing the reliance on externally imported food crops for consumption.
Food forests offer other benefits too, including less intensive resource use, greater soil health and biodiversity protection.

Agroforestry is now a key component of all the Balipara Foundation's restoration programmes, enabling communities to both enhance incomes and food and nutritional security, while using ecologically sustainable techniques. Called the Ghor Bari programme, after the ubiquitous kitchen gardens in rural homes across the North East, the programme transforms kitchen gardens into miniature, organically-cultivated food forests that serve a wide variety of food and crop needs of households. Through these forests, communities have a more diversified portfolio of crops, ranging from food crops to commercial crops to medicinal plants. Together, they offer a broader range of livelihood opportunities, from traditional medicines to handicrafts to sales on local markets. The food forest also creates greater nutritional self-sufficiency by minimizing the reliance on externally imported food crops for consumption.
Food forests offer other benefits too, including less intensive resource use, greater soil health and biodiversity protection.
Their structure mimic the micro-climes of forests, minimizing the need for intensive water use, and the complementarity of crops cycles nutrients through the soil, reducing the need for fertilizer. Their diversity also mimics the diversity of forest ecosystems on a smaller scale, offering a home to all kinds of biodiversity, particularly birds and other key pollinator species.

Building rural youth leaders

The first of these programmes was launched in Baligaon Green village, with the indigenous Mising community. The people of Baligaon have long championed efforts at greater sustainability in their village and for many in the community, converting plots of land to agroforestry represented another step in this transition towards greater sustainability.
The community's traditional knowledge of plants and seeds play a critical role in developing these food forests, by leveraging traditionally cultivated plants and the unique local strains of these plants to build truly resilient crops.
From its beginnings in this village near Balipara, the programme has been rolled out in communities in Sikkom, with plans for expansion in Kaziranga and the Garo Hills.
In total, 185 households have installed agroforestry plots in their homesteads, directly impacting 925 people and raising incomes by 40% within a single year. Broader mobilization efforts have reached over 10,000 people, creating greater awareness about the need for greater sustainability in cultivation and how the agroecological principles of food forestry could make a difference.
Perhaps the greatest success of this programme has been the enthusiasm with which young people have taken up the cause of agroforestry - and transforming food production practices. Biman Mili, a nature enthusiast and an energetic young resident of Baligaon Miri Village (Baligaon RuFu lab) works tirelessly with Balipara Foundation in the Baligaon Rural Futures lab, using newfound photography, GPS and digital skills to drive change in his village.
"We are trying to set an example of agroforestry across land owned by our communities and also around land lying vacant in homesteads," he said. "I now have an earning

that I never had before and can support my family. Now with so many people coming back to the village after the corona crisis, we think Rural Futures and other projects like these will be the way forward to creating jobs for us in our own areas and our own lands"

A view to the future

The controlled environment of Baligaon Green village has been the best site with solid research case studies to architect the first RuFu lab with the support of the indigenous Mising. The RuFu lab aims to create monitored soil-water-air sustainable revenue models over thirty years. Through this pilot programme, the Balipara Foundation aims to test the Rural Futures hypothesis of Universal Basic Assets for the forest fringe communities, through the enhancement of our natural assets. In a region where smallholder farmers are the majority of all farmers, and where a majority of these farmers depend directly on forest ecosystems services for food cultivation, this experiment could be a template for reconciling human and biodiversity needs. The ongoing COVID-19 crisis has driven home the sheer scale of the damage ecological degradation will wreak in the future – not just future virulent pandemics, but droughts, water & food insecurity, desertification. By 2050, land degradation and climate change are predicted to reduce crop yields by 10% globally and up to 50% in certain regions. In India, scientists fear the disruption of the Indian monsoon, the lifeline of farmers across the country. Shrinking forests, disappearing biodiversity, deteriorating ecosystems: without these three, the fragile web of life that underpins our food production systems will collapse, risking global food security.
Through Rural Futures, the Balipara Foundation and rural indigenous communities have been strengthening local natural capital economies supported by sustainable businesses. The outcome is an alternative to exploitative and ecologically destructive growth: sustainable development that balances lives, livelihoods and land to build resilience - and greater food security - among communities and biodiversity on the frontlines of climate and ecological crises.

COVID-19 has been a stark reminder of human's dysfunctional relationship with nature, as the existing economic system has always acted as a great pressure on our natural environment, and the unfolding pandemic has shone a light on the domino effect that is triggered when one element in this interconnected system is destabilized. A shock to the global economy, COVID-19 lifted the lid on the need for an alternative: a socioeconomic system that reconciles people and planet and heals the damaged interconnected web that makes life on planet Earth possible today. Of these threats to this interconnected web, our industrial food production system is one of the most significant -

driving deforestation, depleting soils and water, threatening birds and insects and depleting overall biodiversity.

According to the World Economic Forum, transforming the food, land and ocean use systems towards greater sustainability has the potential to create business opportunities worth almost $3.6 trillion and 191 million new jobs over the next 10 years, if the right policies are put in place. Making this transition from industrial to regenerative agriculture not only is critical to preserve our ability to grow food for the future, but also our ability to manage the carbon crisis. Industrial agriculture is responsible for 16% of global emissions today, but making the switch to regenerative methods such as organic farming, zero till or agroforestry could turn farmlands into carbon sinks and reduce overall carbon emissions. Moreover, doing so would turn a profit, enhance economic and environmental resilience, create jobs, and improve wellbeing in the rural communities.

The 8th edition of the Eastern Himalayan Naturenomics™

World Economic Forum, transforming the food, land and ocean use systems towards greater sustainability has the potential to create business opportunities worth almost $3.6 trillion and 191 million new jobs over the next 10 years, if the right policies are put in place.

Forum 2020, the flagship annual event of the Balipara Foundation, tackled these questions, and explored the road the Eastern Himalayas must take to preserve its future - including the future of its food production systems. Zeroing in on the need for a green recovery and rebuilding, following COVID-19, the Forum approached these issues through the theme of "Ecology is Economy", bringing together over 110 speakers across business, government, the diplomatic community, academia and conservation across 23 countries.

Reaching a global audience, Balipara Foundation Founder, Ranjit Barthakur, opened the Forum by introducing a striking vision for the North East and the Eastern Himalayan countries for creating the natural wealth of nations. He called for the better valuation of nature, and the creation of an ecological budget across the Eastern Himalayan region - and for this to be the driver behind all financial budgets. "Using natural assets to create natural capital would create much more than the employment we're creating in cities," he said. "We had the agricultural revolution, industrial revolution, technology revolution and now it is time for the Naturenomics™ revolution - the interdependence between nature and economics. The time for a revolution in ecology and economy is here."

With experts and key public figures like Amitabh Kant (NITI-Aayog), Amb. Shyam Saran, Dr. Shashi Tharoor, N. G. Subramaniam (TCS), Paul Polman (IMAGINE), Her Excellency Razan Khalifa al Mubarak (Environmental Agency Abu Dhabi), Lord Nicholas Stern (LSE), Mark Gough (Capitals Coalition), Vivek Pathak (International Finance Corporation, World Bank), Her Excellency Shaikha Al Daheri (Environmental Agency Abu Dhabi), the Forum saw a lively conversation on the case for rethinking our fundamental economic principles for a transformative approach that reconciles ecological health and economic growth.

"The management of land and forests in the Himalayan region, is critical to the region itself and to the rivers that flow out of there, and to the future of our planet. The next 10 or 20 years will be absolutely decisive," said Lord Nicholas Stern.

Their calls for an interdependent relationship between nature and economy were echoed by Chief Ministers from across the eight states of India's North East, along with forest ministers from Assam & Arunachal Pradesh and key forest officials. Recognizing the role agriculture plays in the North East's economy and in livelihoods for rural communities, they zeroed in on the urgent need to transform and strengthen food production systems in the Eastern Himalayas through policy and practice. "It is imperative that we connect and partner with individuals, organisations, states and countries," said Conrad Sangma, Chief Minister of Meghalaya. "We have vast areas of enterprises to look at, from eco-tourism to value-addition of minor forest products, to replacing fossil fuels, with their debilitating carbon footprints."

Over 70% of the North East regions greatest responsiveness to ever-shifting contexts - thus driving employment and productivity. With case studies from snowline to sealine, the Forum explored critical issues, challenges and opportunities facing each of the states and countries of the Eastern Himalayan region from Nepal to Myanmar. Case studies touched on questions of immediate concern for ecology and food security in the region: shifting cultivation, livelihoods for rural and indigenous communities, traditional hunting practices, and the expansion of agricultural & plantation land into biodiversity rich ecosystems. Experts from across the region offered insights into the challenges posed to formulating truly sustainable agricultural and food security practices in a region with limited firsthand and original data that is critical for creating evidence-based action plans.

From Mizoram, experts highlighted the need for better data on jhum cultivation cycles and its effects, and the need to collaborate with local communities to develop context-specific solutions rather than

Over 70% of the North East region depends on agriculture, in one form or another, for employment and income. Outside of its rich forests, the largest concentration of natural capital resides both in its sprawling tea plantations and the smallholder farms that dot the region.

depends on agriculture, in one form or another, for employment and income. Outside of its rich forests, the largest concentration of natural capital resides both in its sprawling tea plantations and the smallholder farms that dot the region. In a special session dedicated to exploring the measurement of natural capital and its financing, speakers touched on immediate ways in which natural capital measurement across agricultural systems can help facilitate both greater productivity as well as just outcomes for both people and biodiversity.

Measuring this natural capital, however, requires a systematized framework that allows for expansion and scaling across multiple contexts. Touching on this, Adele Jones from the Sustainable Food Trust in the UK recommended not only the harmonizing of this measurement framework, but also its harmonization with policy to incentivize and support farmers incorporating natural capital enhancing practices on their farms. For a region which consists primarily of smallholder farmers, measuring natural capital could be done collectively, to distribute costs and aggregate gains, understand ecological health on farms - and with institutional training and support, take steps to enhance this health. However, for true sustainability, interventions have to extend beyond natural capital to social capital - people and biodiversity together. CEO of the Capitals Coalition, Mark Gough, observed the need to enhance social capital - for example through fair working conditions & compensation - is as important as enhancing biodiversity by nature and wildlife friendly farming practices. Together, they can deliver greater resilience and sustainability across farms, empowering workers across the food production value chain while protecting the web of biodiversity and ecosystems services that, in turn, facilitate healthy crop growth and greater productivity.

A special session on encouraging a regenerative green economy, coordinated along with the National Mission on Biodiversity & Human Wellbeing, touched again on the need for strategic collectivization. Though this is challenging with the specifics of the North East region, careful and planned moves towards collective action, could help vulnerable farmers and communities build networks that enhance their resilience, help them shoulder costs and maximize their income margins. The panelists recommended a flexible approach to sustainable agriculture initiatives, shifting dynamically between bottom-up and top-down approaches for encouraging a wholesale shift to settled cash crop cultivation.

Dr. John Zothanzama from Mizoram University pointed to the successes of a culturally specific approach to Sloping Agricultural Land Technology developed alongside local Mizo farmers - MISALT - as a possible way forward for other states and communities in the region.

Experts from Bhutan, Bangladesh and Nagaland touched on the question of traditional practices and livelihoods of indigenous and local communities. Many of these practices are intimately intertwined with traditional modes of food security, at risk today by the enclosure of forest land and species protection for conservation. Panelists in these sessions explored the alternatives for food security strategies: encouraging community management of natural resources, fostering access to markets for sustainable NTFP produce and better strategic environmental planning that includes strategies for culturally relevant alternate livelihoods to reduce dependence on natural resources. Turning to the growing tensions between agribusiness, small-scale farming and biodiversity protection, Gaurav Gupta from WWF-Myanmar drew attention to three key interventions to reconcile these tensions: a high biodiversity conservation value approach to guide strategic planning, integrated land management & planning for land concessions to infrastructure & agribusiness, and sustainable alternate livelihoods for communities with support for selling and marketing their produce across value chains.

From policy to case studies to practice: continuing to expand on the theme of “Ecology is Economy”, the Annual Balipara Foundation Awards celebrated the achievements of changemakers who have taken up the challenge of achieving food security sustainably. The Food for the Future Award, established in 2013, specifically focuses on innovators and grassroots entrepreneurs who have been working tirelessly to mainstream organic farming practices across the Eastern Himalayan region. This year’s award lauded the achievement of Parimal Das of Tripura, for organic dragon fruit plantation. Parimal Das has been growing several varieties of fruits including mango, lemon, sweet lime for 12 years, but but couldn’t take his eyes off the

> Land ownership among women in the region is higher on average compared to the rest of India, but for many women, incomes are supplemented through NTFP access and use - increasingly at risk. Social and natural capital are interdependent - and for truly sustainable agriculture, the equity in income and opportunities for women for gender parity is important.

dragon fruit when he saw it for the first time on YouTube. Parimal's growing fascination with the fruit, pushed him to try and grow them in India, at the heart of Tripura, with amazing results. It is no surprise that his achievements have even been lauded by Tripura Chief Minister Biplap Kumar Deb.

In the North East, women are the backbone of agriculture and farming systems, but this relationship is far more complex than meets the eye. Land ownership among women in the region is higher on average compared to the rest of India, but for many women, incomes are supplemented through NTFP access and use - increasingly at risk. Social and natural capital are interdependent - and for truly sustainable agriculture, the equity in income and opportunities for women for gender parity is important.

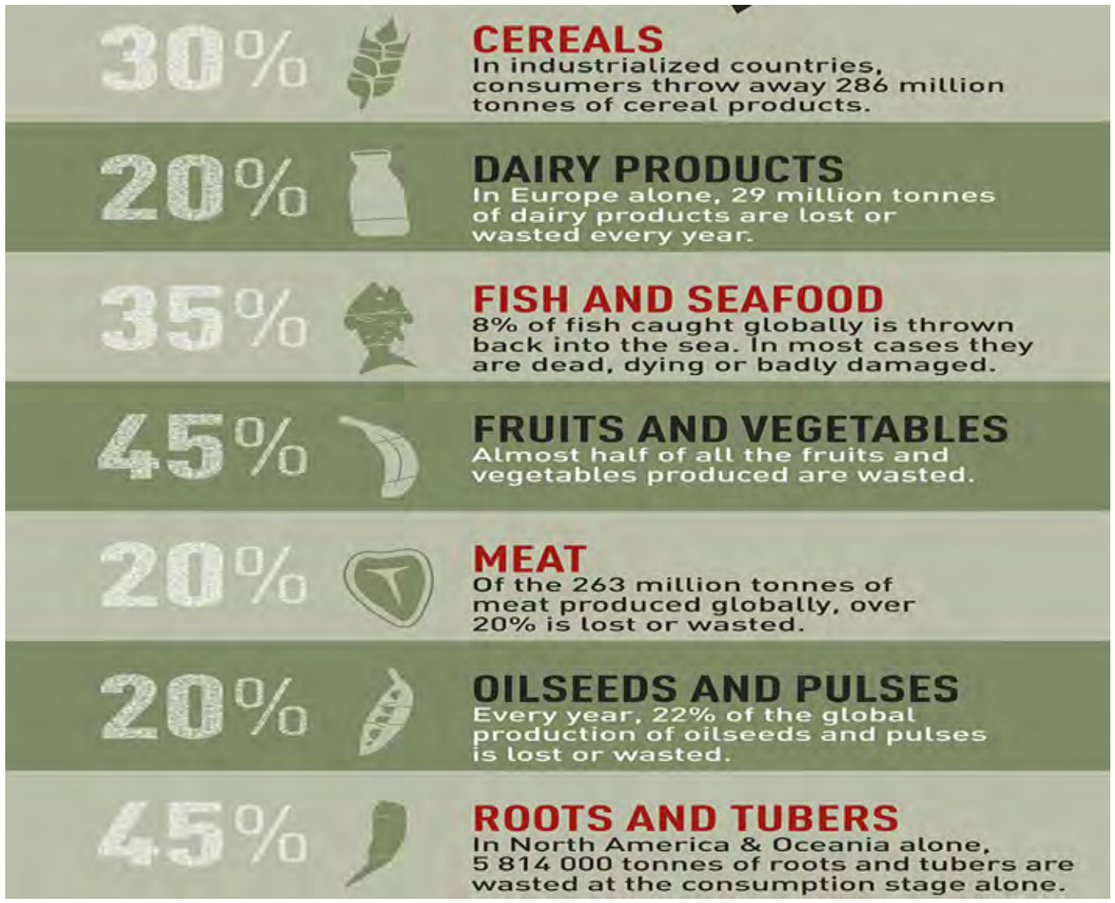
Recognizing this interdependence, the 8th Annual Balipara Foundation award was given to Trinity Saioo from Meghalaya. Hailing from a state renown for its matrilineal property rights, Trinity nevertheless recognized the multilayered issues facing women in the state when it came to overall community and income resilience. Trinity Saioo introduced organic farming to the women Lakadong turmeric farmers in Mulieh, encouraging them to incorporate sustainable practices for their livelihoods. The success of these , evident in new houses and better living conditions for the families, was enough to persuade women farmers in the neighbouring villages of Madankynsaw, Mynktung, Rtiang, Pyntei and Laskein to switch over to cultivating Lakadong turmeric organically as well. From these small beginnings in 2003, Saioo's SHG farmer collective has now grown to around 800 women farmers in Meghalaya.

The Eastern Himalayan capitals have an immense opportunity to tackle the ecological crisis in our farming systems - soil nutrient depletion, desertification, pollinator extinction, genetic extinction - and catalyze green growth in the region. Rough estimates by the Balipara Foundation using publicly available data reveal the sheer scale of this potential: maximizing the agroforestry potential of the North East could generate INR 190,000 crores in income over the next three decades. Change is possible, only if we can act courageously and swiftly – and with an eye on the future and its high-intensity risks, not just short-term profits and growth. Only coordinated cross-regional action by leaders, communities, business, academics with global, multi stakeholder cooperation – at an exceptional scale and speed – can mitigate the risks facing our food security and lead towards 'Ecology in the New Economy'.

FOOD LOSS & WASTE FACTS

Every year around the globe
1.3 billion tonnes of

FOOD is
LOST OR **WASTED** that is
1/3 **OF ALL FOOD** PRODUCED FOR HUMAN CONSUMPTION



FOOD for all

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