SMEs Going Circular: Decarbonisation of the agri-food systems in Asia and Europe

Background Paper

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FINAL DRAFT

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1. Introduction – Agri-food Decarbonisation: A Global Outlook

Introduction

The future of business is circular, and SMEs have a pivotal role to play in this systemic transformation. The COP26 conference put the carbon-negative food system firmly back at the top of the global agenda. Therefore, this year's Asia-Europe Environment Forum will spark an exchange of ideas and solutions focusing on the decarbonisation of the agri-food system in ASEM, which will be crucial to achieving Net Zero and limiting the planet's warming to 1.5 degrees.

Agri-food systems encompass the production and storage, post-harvest handling, transportation, processing, distribution, marketing, consumption and disposal of food[1]. The system encompasses the crop, livestock, forestry, aquaculture, and fisheries subsectors[2].

According to the Intergovernmental Panel on Climate Change (IPCC), the global agri-food system is responsible for up to 19Gt CO_2-equivalent (CO_2e) emissions per year, some 37% of overall anthropogenic emissions[3]. These emissions are generated throughout the life cycle of food. Most of these emissions (71%) occur on-farm[4], pointing to low-carbon agricultural practices as essential to reducing climate impacts. About 35% of global agri-food emissions occur in Asia, while 9% originate in Europe.

Due to its large population and land area, climate-induced changes in crop yields in Asia will affect the most people, while in Europe, fields further south are expected to become increasingly dry, affecting production and food prices. Changes in invasive pest species will affect both regions, with areas of both decreasing or increasing abundance, and a turnover of different crop pests. Therefore, agri-food is not just a key driver, but will be adversely affected by climate change.

All of this signals the need to develop and implement new agritech and foodtech solutions, together with a shift in diets for lower climate impact.

SMEs have an important role to play. Due to their essential role in contributing to local communities' livelihood and food self-sufficiency, and their interest to include more environmentally sustainable agricultural practices, agri-food SMEs can lead the decarbonisation of the sector while adapting to the changing needs of food production and consumption. This

[1] FAO, 2021: State of Food and Agriculture 2021. Making agrifood systems more resilient to shocks and stresses. Rome: FAO. 2021. doi:10.4060/cb4476en. ISBN 978-92-5-134329-6. S2CID 244548456.

[2] Chapter 33 - Agrifood Systems, Editor(s): Clayton Campanhola, Shivaji Pandey, Sustainable Food and Agriculture, Academic Press, 2019, Pages 305-330, ISBN 9780128121344, https://doi.org/10.1016/B978-0-12-812134-4.00033-9.

[3] Mbow, C. et al. Food Security in Climate Change and Land: an IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems (IPCC, 2019).

[4] (Crippa et al., 2021)

report will begin by identifying key sources of emissions from the agri-food sector in ASEM. From there, it will explore the significant role SMEs will play in reducing these emissions.

The Agri-Food System in Europe

With over 38% of its land farmed, the agri-food system has shaped and continues to shape European landscapes and lifestyles. In the EU-28, agri-food employs about 30 million people (including 22 million in the agricultural sector), generating about 3.5% of the region's GDP. Europe is one of the world's leading exporters of food, and the third-largest importer after the US and China.

Europe´s agri-food production is dominated by livestock products (including dairy) but grains, vegetables, wine, fruits, and sugar are also major products. Livestock production is higher in Western Europe (10.4 million tonnes of protein produced) compared to Eastern Europe (2.7), and is dominated by cattle milk and pork[5]. Significant exports include grains (wheat and barley), dairy products, poultry, pork, fruit, vegetables, olive oil, and wine. Over two-thirds of agri-food production in Europe occurs in just seven countries, making the agri-food system in the region highly sensitive to yield changes in these areas.

While food production has been generally increasing in Europe, the number of farms is decreasing and there is a consistent shift from small and local farms towards bigger, and often corporate-owned, farms[6], with very large farms (over 100 ha) responsible for over half of the agricultural area in the EU-28. This trend is linked with the growth of monocultures which tend to generate high environmental impacts through the use of high volumes of pesticides, fertilizers and antibiotics[7].

Despite the increase in intensive agriculture and larger farms, small farms still represent 69% of the farms in the EU. As agriculture intensification is one of the main causes of biodiversity loss and ecosystem degradation, small farms which employ less intensive land use are playing a crucial role in maintaining biodiversity and a range of fundamental ecosystem services, including regulation of soil and water quality. About 9% of agricultural land in the EU is part of Natura 2000 protected areas, and over 8% is under organic farming.

In terms of emerging technologies and practices, precision agriculture and regenerative agriculture show the highest potential for transforming agri-food systems in Europe. Precision agriculture can increase agricultural outputs and reduce the carbon footprint of food production by using digital technologies for tailoring resource use and practices to specific contexts and variables. Initial implementations of precision agriculture in Europe have mostly focused on vegetable and dairy farming, while a broader adoption of precision agriculture is under

[5] FAO, 2022. Global Livestock Environmental Assessment Model (GLEAM). https://www.fao.org/gleam/results/en/
[6] (Eurostat, 2016)
[7] (EEA, 2017)

development through specific investment and policy strategies[8].

Regenerative agriculture is a set of practices that increase biodiversity, enriches soils, improve watersheds, and enhance ecosystem services[9]. In Europe, regenerative agricultural practices are showing high potential for mitigating climate change and other negative environmental impacts of agri-food. For this reason, an increasing number of dedicated supporting actions are being and will be implemented at the European and national levels.

On the consumption side, for its production, the food consumed by European citizens each year requires a total area of land of about 185 million hectares, of which around 20% is located outside Europe. Animal-based food products account for 72% of this land use. The high production and consumption of animal products in Europe´s agri-food system reflect the global increase in meat consumption and require high volumes of animal feed imports from outside the region.

The Agri-Food System in Asia

The agri-food system in Asia is dominated by small farms and businesses. The vast bulk of food is grown on family-owned farms[10]. However, right across the value chain small businesses play roles as traders, market stallholders, trucking companies and lenders.

Asia stands out globally due to the high number of people who live in rural areas; some 2.2B of the 4.5B people living in the region rely on agriculture for their livelihood. Agriculture plays a much larger role in the economy of Asia than in Europe, delivering nearly 10% of the region's GDP.

While much of the intensification and monocropping we have seen in Europe has also played out in Asia, consolidation has been much slower. Asian farms have their origins in a long history of isolated subsistence systems where food was largely grown and consumed within a village setting. Today, typical farms are still less than 1ha in size. For example, the average size of a smallholder farm in Bangladesh is 0.24ha and in Vietnam 0.32ha[11]. Small farm sizes and other challenges limit productivity, which is very low by global (and European) standards. An estimated four of five people living below the poverty line live in rural areas[12].

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[8] Precision agriculture and the future of farming in Europe Scientific Foresight Study IP/G/STOA/FWC/2013-1/Lot 7/SC5 December 2016 - https://www.europarl.europa.eu/RegData/etudes/STUD/2016/581892/EPRS_STU(2016)581892_EN.pdf

[9] https://www.eitfood.eu/projects/regenag-revolution/what-is-regenerative-agriculture

[10] For number of farms see Lowder, et al. “The Number, Size, and Distribution of Farms. Smallholder Farms, and Family Worldwide.” United Nations. 2016. (Supplementary Data. Table 1: Number of agricultural holdings, by country, most recent census).

[11] https://www.fao.org/3/i5251e/i5251e.pdf

[12] https://www.adb.org/sites/default/files/publication/726556/ado2021-update-theme-chapter.pdf

Rice is the dominant crop, with 90% of the world's production and consumption occurring in Asia[13]; rice is grown on some 140 million hectares of land. Other significant crops by area planted are wheat, maize and soybeans[14].

Two important trends are changing the nature of Asian agriculture and both have implications for how we decarbonise. The first is at the consumption end of the agri-food system, the second on the supply side:

- The first is rapidly growing food consumption, particularly of meat. As the Asian economy has grown rapidly over the last 30 years, wealthier consumers are eating less rice and more meat. Food and feed crop demand in Asia are expected to nearly double in the coming 50 years[15].

- The second major trend is the mass migration of people (and therefore labor) out of rural Asia and into cities. Although agriculture remains a major employer in many of the developing economies in Asia, the overall share has declined. Higher-paying jobs in manufacturing and services in urban areas have attracted workers, causing a steady decline in the share of the rural population of developing Asia from 80% in 1970 to 52% in 2020. As the outmigration of male workers continues, the sector is increasingly reliant on women and elderly workers to provide farm labor[16].

Labor-saving agricultural machinery is filling the gap left by a shrinking, aging, and feminising rural population[17]. Of particular importance has been the expansion of tractors for the labor-intensive tasks of tilling, harvesting and weeding.

[13] (Source: ADB. 2010. Regional Trade Opportunities for Agriculture)

[14] (FAOStat)

[15] *(Source: International Water Management Institute. Water for Food, Water for Life). https://www.adb.org/sites/default/files/publication/726556/ado2021-update-theme-chapter.pdf*

[16] *(this section is more or less a direct copy a report)*

[17] https://www.adb.org/sites/default/files/publication/726556/ado2021-update-theme-chapter.pdf

Table 1: Agri-food SMEs in Asia and Europe – a comparison

What is common?	What is different?
Climate-induced changes in food production and prices.	Agri-food production in Europe is dominated by livestock products while agri-food production in Asia is dominated by rice.
The long-term trend toward intensive, monoculture cropping.	In Asia, the agri-food sector contributes a larger share of GDP.
SMEs in rural areas are struggling from lack of digitalization and difficult access to the markets, a gap that can be fulfilled by Service and Innovator SMEs with high potential for reducing carbon emissions.	Small farms characterize the agri-food sector in Asia, while in Europe farms are typically much larger.
An increasing trend in the number of young people (under 40) operating agri-food SMEs.	Asia has a population 3.5 times that of Europe.

Recent Global Shocks

The scale of agri-food and its high dependence makes the system vulnerable to global and regional economic performance and changes in energy supply.

In 2021, the recovery in food demand from the recession caused by COVID-19 caused a surge in food prices, raising concerns for a global food crisis. The situation was exacerbated (in part) by trade restrictions and more importantly by a rise in fertilizer prices and international freight costs.

In 2022, trade bans and the closure of trade routes, as well as the disruption of the Ukrainian agricultural economy, are generating a scarcity of crucial food commodities both in Europe and Asia.

In February 2022, the FAO food price index reached a record high. Between 2020 and 2021, the cost of importing food has risen by 22% in Asia and 12% in Europe. Due to the sharp increase in fertilizer prices, farmers in South Asia are expected to face challenges in securing their fertilizer supplies as early as October 2022.

In a recent report on the impacts of the war in Ukraine, the UN Global Crisis Response Group analysis estimated that about 40% of countries in Eastern Europe, East Asia, and the Pacific will be severely exposed to the impacts of rising food prices. In South Asia, the percentage is much higher, with 67% of countries severely exposed. In these countries, rising food prices will particularly affect lower-income groups, which allocate over 50% of their expenditure to food.

In ASEM, the war in Ukraine and the global environmental and societal changes are shifting agri-food companies towards solutions less dependent on the use of fossil fuels, and productions that do not rely on imported feed[18]. Due to their tendency to focus on local supply chains, agri-food SMEs will become increasingly important for food sovereignty as well as employment and economic output.

2.The role of Agri-food SMEs

Traditional SMEs

SMEs, including small farms have a particularly important role in the agri-food system in ASEM. In Europe, agri-food SMEs are central to economic development and employment in rural areas, where they account for about 75% of total employment[19], of which only a minor fraction (under 30%) is women or under 40 (11%).

Agricultural processors, retailers and traders offer contracts to farmers with advance pricing, technical assistance, and access to markets, which benefit both farmers and traders[20]. On the supply side, they ensure farms have access to inputs such as fertilizer, crop protection products and labor. On the consumption side, wet markets, trucking companies and retailers provide access to markets for the farms' produce. The remote location of both farms and so many rural consumers results in a huge number of small and dispersed transactions across the system, which has given smaller companies the edge in providing these services.

Particularly in Asia, finance is a critical service along the agri-food value chain. Small lenders provide over $50B[21] in finance, including crop cycle finance to farmers to cover the cost of inputs until they receive payment at the end of the season. Small traders also finance crops from the farm gate to markets. In the area of finance, SMEs again have had a strong advantage over larger lenders (such as banks) who view farmers as unattractive clients due to high transaction costs and the reality that farms and other small businesses often lack both documentation and sufficient collateral[22].

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[18] Robert Schuman Foundation “Global food crisis: Europe must choose between retreat and responsibility” - https://www.robert-schuman.eu/en/european-issues/0627-global-food-crisis-europe-must-choose-between-retreat-and-responsibility

[19] European Spatial Planning Observation Network (ESPON) report of 31 January 2018 on small and mediumsized enterprises in European regions and cities

[20] https://www.adb.org/sites/default/files/publication/27531/building-climate-resilience-agriculture-sector

[21] file:///C:/Users/jemim/Downloads/2019_RAF-State-of-the-Sector.pdf

[22]https://www.ifc.org/wps/wcm/connect/647f85fc-6ad7-4315-aad8-4967075a304b/Handbook+-+Working+with+Smallholders.pdf?MOD=AJPERES&CVID=ka-TX8j

Service and Innovator SMEs

In considering the role of SMEs in decarbonisation we can start with these traditional SMEs such as crop traders, wet market stall holders, truck drivers and fertilizer salespeople. These small companies make up the bulk of the SME actors. However, two small categories of SMEs are emerging which could have a more significant role in decarbonisation in ASEM. The first we will call farm Service SMEs and the second Innovator SMEs.

Service and Innovator SMEs in Asia

In Asia, as discussed in the general overview, farmers are faced with an exodus of labor to cities. We also highlighted the role of technologies such as mechanization, irrigation and digital tools. To fill this labor gap and deliver technologies, a cadre of farm service companies is emerging to provide efficient delivery of crop management services. One example is tractor hire companies that drive tractors between farmers at the start of the season to deliver tilling services. Another is drone operators delivering spray services to multiple farmers each day. In both cases, the use of equipment is cutting labor costs by an order of magnitude.

The second type of SME is the Innovator SME, an emerging group of technology firms developing and promoting innovations such as robots, biotech crops, precision irrigation, digital finance and online marketplaces. These companies are typically funded by VC companies and universities to undertake research. They face significant risk in bringing a range of innovations to the sector.

Service and Innovator SMEs in Europe

In Europe, the increasing globalization of food markets, while presenting potential benefits, has generated further barriers to SMEs in rural areas. These, similarly to what is observed in Asia, face challenges such as long distances to major markets, fewer transport connections, poor digital connectivity and fewer training opportunities. In light of that, there is a need to strengthen and diversify local agri-food systems and short supply chains in Europe´s agri-food sector.

The low rate of digitalisation in Europe´s agri-food SMEs is also hampering the implementation of innovative production methods such as precision farming and other technologies that could reduce the negative impacts of the unstable demand for labor that characterizes agricultural production in Europe. At the same time, available technologies are enabling new agri-food businesses increasingly started by young people.

From a broader perspective, the role of young people as agents of change in agri-food is expected to increase, also due to an increase in environmentally conscious consumption among the youth, with the emergence of new youth movements within the food, climate and health space. In fact, according to EIT Food, between 2021 and 2022, food sustainability has become more important for two-thirds (64%) of 18–24-year-olds in Europe.

All of this calls for institutions and businesses to adapt their value creation models and products to the food needs of the new generations. An interesting trend in this vein is the rapid development

of the European market for alternative proteins, which is also seeing meat companies investing in alternative meat and seafood options.

3. Mitigating Agri-food Emissions

Emissions

The agri-food system in ASEM has significant potential to reduce emissions, and even sequester emissions from other sectors. Any exploration of this opportunity to decarbonise must begin with mapping current emissions.

Emissions in ASEM stem from several sources. Leading causes are food waste, agricultural soils, livestock, manure burning of agricultural residues and savanna for land clearing and rice cultivation[23]. For some of us, this list requires us to consider a significant shift in how we normally think about decarbonisation, which has conventionally focused on reducing fossil fuel usage[24]. Furthermore, these emissions are not static. As food production grows to feed a larger, wealthier population[25] these emissions will grow, particularly as a result of any increase in demand for meat.

	Asia			**Europe**		
	% of Region's Emissions	Emissions Gt CO2-equivalent (CO2e)	Emissions kg CO2-equivalent per capita	% of Region's Emissions	Emissions Gt CO2-equivalent (CO2e)	Emissions kg CO2-equivalent per capita
Agricultural Soils	19%	1374	310	24%	449	600
Food Waste	25%	1851	410	21%	399	530
Animals	14%	1059	240	15%	291	390
Manure	8%	569	130	14%	264	350
Transport	6%	432	100	13%	235	310
On-Farm Energy	6%	472	100	12%	219	290
Burning	13%	950	210	1%	19	30
Rice Production	8%	608	140	0%	8	10
		7,316	**1,640**		**1,884**	**2,510**

[23] Figure 5.3 presents the share and pollutants from each of these sources.

[24] Only 5% of emissions need to be addressed via fuel switch for more carbon-efficient transport means. https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf

[25] https://www.adb.org/sites/default/files/publication/27531/building-climate-resilience-agriculture-sector.pdf

Source FAOSTAT 2019

Agricultural Soils emit nitrous oxide naturally through the natural processes of nitrification and denitrification[26]. However, these emissions are driven upward when farmers use nitrogen fertilizer, apply livestock manure and retain crop residues. Conventional cultivation practices with exhaustive tillage and removal of crop residues by burning or for other uses have resulted in nutrient and carbon losses[27].

In Europe, emissions from soils are 600kg per person, and in Asia 300kg. The higher rate in Europe stems from most land-based farming emissions derived from top feed-producing crops including maize, wheat, and soybean. The higher rate for Europe is caused in large part by higher meat consumption in the region.

Food Waste releases emissions when it is incinerated, composted or utilized as an input to biogas production. In most countries, however, the majority of solid food waste ends up in landfills and open dumps where the anaerobic decomposition of organic material releases methane gas[28]. In both regions, emissions from food waste are approximately 500kg per person.

Animals such as pigs, poultry, and cattle, also emit methane, a by-product of digesting feed.[29] Increasing disposable incomes are projected to drive strong annual growth of meat consultation in Asia. Production of beef, (the most emission-intensive meat) is projected to grow in Vietnam and Indonesia by 24% and 34% respectively between 2015 and 2025.[30]

Emissions in Europe are 400kg per person, in Asia 240kg, again stemming from higher meat consumption.

Manure emissions occur during the handling, storage, and treatment of manure. CH4 is produced from the anaerobic breakdown of manure, whereas N2 O results from handling the manure aerobically and then anaerobically. Emissions from manure accounts for 350kg per person in Europe, and 130kg in Asia, also related to higher meat consumption in Europe.

Burning agricultural residues such as rice straw and savanna for land clearing generates carbon dioxide emissions. Burning accounts for 210kg per person in Asia, but is negligible in Europe.
Rice Production systems that employ extended periods of flooding emit methane through the anaerobic decomposition of organic matter[31] and account for 25-33% of Southeast Asia's methane emissions[32]. Rice production produces 140kg per person in Asia, but is negligible in Europe.

[26] https://www.adb.org/sites/default/files/publication/27531/building-climate-resilience-agriculture-sector.pdf

[27] https://www.sciencedirect.com/science/article/pii/S2773126X22000053

[28] https://www.fao.org/3/cb7028en/cb7028en.pdf

[29] Source: OECD/FAO (2021), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-dataen.

[30] https://www.mla.com.au/prices-markets/market-news/2020/consumption-growth-in-asia-to-fuel-meat-consumption/

[31] Mosier et al. 1998

[32] https://blogs.worldbank.org/eastasiapacific/greening-rice-we-eat

Decarbonisation Strategies

Global mitigation potential in the agriculture sector is high—estimated at between 5.5 and 6.0 gigatons (Gt) of carbon dioxide equivalent per year by 2030—with a potential for Asia to contribute up to 50% of theoretical reductions, and Europe about 25%.[33]

There are four strategies that can play an important role in decarbonisation in ASEM. While not an exhaustive list, they are selected for their impact and economic viability.

Reducing Food Waste

The causes of food waste vary across ASEM. Post-consumer losses are considerable in Europe and the developed countries of Asia, and represent 47% of all food wastage globally. In developing countries, most losses occur before food reaches the retailer.

The solutions are therefore different. Post-consumer losses are best addressed by changing consumer behavior. On the other hand, food losses in developing Asia are better addressed through improved roads, logistics, trading, storage, and food handling.

Reducing Animal Protein Consumption

Both regions are responsible for significant and rising emissions from the production and consumption of animal-based foods. Transitioning to plant-based food and low-carbon protein alternatives to meat will bring about major emission reductions, followed by improving efficiency in food production and reducing food loss along the value chain.

Reducing per capita meat consumption in favor of plant-based food and low-carbon protein alternatives to meat accounts for about 70% of total emission reduction potential considering the entire life-cycle of food in Europe.

Capturing More Carbon in Soils

Both regions also have significant opportunities to sequester carbon in soils, and to reduce soil emissions. Globally, soils hold 2.3 times more carbon than atmospheric CO2 and 3.5 times more than terrestrial plants[34]. A range of circular and regenerative agriculture practices capture more carbon in soil. For example, no-till agriculture or adding biochar to soils. Alternatively, strategies that slow the amount of stored carbon released into the atmosphere through burning, tillage, and soil erosion also sequester carbon. Soil carbon sequestration is estimated to account for 89% of the technical mitigation potential in agriculture. This strategy is included here because of its significant potential to not only capture carbon but to create high yields, and new income streams for farmers.

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[33] Smith et al. 2007a, calculated from Figure 5.1

[34] Lal, R. Soil carbon sequestration impacts on global climate change and food security. *Science* 304, 1623–1627 (2004).

Empowering farmers to use fertilizers more efficiently drives down costs and reduces emissions from soils. Strategies include the use of organic fertilizers and better targeting traditional fertilizers to the specific needs of the soil so nutrients are not wasted.

Better Managing Rice

Emissions from Rice can be reduced by improving water management in high-emitting, irrigated rice systems through mid-season drainage or alternate wetting and drying[35]. New rice varieties and practices that allow "dry seed" rather than flooded rice are critical.

Table 3: Carbon Emissions in Asia and Europe - a comparison

What is common?	What is different?
Agri-food contributes to a significant share of carbon emissions.	Asia has twice the potential for mitigating emissions from agri-food.
Consumer Decisions around waste and animal proteins are critical to emission reductions.	Emissions from transport and on-farm energy use are higher in Europe.
	Emissions from rice production and residue burning are higher in Asia.

4. Agri-food SMEs: Their role in Decarbonisation

It is helpful to return to our framework of traditional SMEs, Service SMEs and Innovator SMEs. Most traditional SMEs including farms are themselves marginal businesses with little to gain from the required practice changes, and in any case little control. They are generally reactive rather than opportunistic. For example, a retailer might choose to stock a soil test kit that reduces fertilizer waste, but they are unlikely to be the reason such kits become commonplace. Rather, it is the Innovator SMEs and the Service SMEs that stand to both benefit from, and even drive decarbonisation.

The role of the Innovator SME is initially the most important. There are hundreds, if not thousands of technologies that will enable these changes in practice. Laser graders for rice flatten the land, reducing methane emissions, seed drills reduce the need to disturb soils while stubble shredders allow crop residue to be recycled into soils rather than burnt. On the consumption side, meat and dairy alternatives have an important role.

[35] https://agledx.ccafs.cgiar.org/emissions-led-options/production-systems/flooded-rice/

Innovator SMEs have a critical role here, designing and commercializing appropriate and accessible smallholder technologies. In Asia, over the last fifty years, we have seen countless solutions repackaged by Innovator SMEs for the Asian smallholder sector including solar rice mills, two-wheel tractors, and treadle pumps. In Europe, precision and regenerative agriculture are becoming a solution and are increasingly adopted at small and large scale. These practices make use of nature-based solutions as well as innovations in technologies of satellite monitoring and connected agro analytics.

In the case of on-farm technologies the next step that brings an innovation to the farm is the Service SME. As we saw in the background, farmers in ASEM operate in a highly labor-constrained setting. Service SMEs are the most promising means of filling this gap. The growth of the itinerant tractor service in Asia for plowing is perhaps the best example. One SME in a village can plow dozens of farms with a tractor in less than a tenth of the time the farmer takes to do this by hand. The same is true of motorized sprayings, laser graders and rice harvesters.

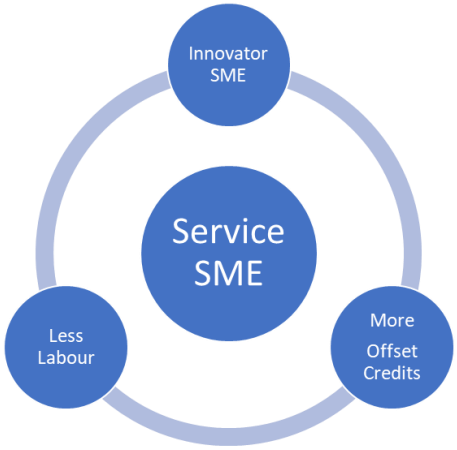
The Service SME has a number of advantages in bringing mitigation practices to farmers. Take for example soil testing, laser grading and seed drilling. These technologies require a modest capital investment best delivered on not one but dozens or even hundreds of farms. The pathway to adoption by a service provider is straighter and smoother than an individual farm adapting in isolation.

In Europe, service SMEs can play a crucial role in implementing product-as-a-service business models in line with the Circular Economy Action Plan.

5. Agri-food SMEs in ASEM: Innovation and Collaboration

Future trends and leveraging innovation and collaboration to decarbonise the sector.

Service SMEs sit at the center of three virtuous trends in ASEM which will position them as central to decarbonisation: Innovation (led by Innovator SMEs), reducing labor availability and more carbon offset credits.



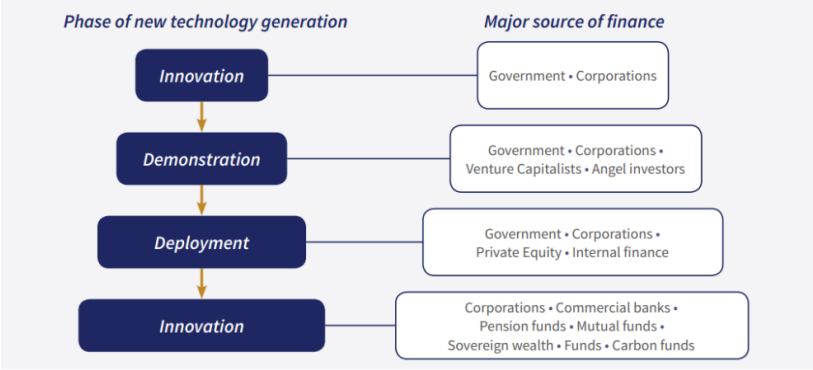
In conclusion, the SME is a vital agent in collaboration toward decarbonisation. There is a new generation of passionate, values-driven, innovative entrepreneurs in the ascendency, many of them women and youth[36]. In the first instance, decarbonisation is the business of Innovator SMEs to build technologies that are fit-for-purpose, low cost and reliable. But, we also need Service SMEs that can finance these tools and enable these innovations to be delivered to dozens or even hundreds of labor-constrained farms.

Empowering Innovator and Service SMEs is at the heart of decarbonising agriculture, particularly on-farm. Fortunately, significant resources are available to meet this challenge. The carbon offset market is growing rapidly. The Institute of International Finance (IIF) estimates that demand for carbon credits could increase by a factor of 15 by 2030 and by a factor of up to 100 by 2050. Over $50 billion per annum will likely be available each year by 2030.

The Service SMEs that deliver mitigation practices on farms are an ideal conduit for these funds. This is particularly true in Asia where costs are lower, and emissions are higher (than Europe) resulting in a lower cost per tonne of emission reduction.

What remains to be done in order for Innovator and Service SMEs to step up to this challenge? Perhaps the most important missing piece in both Asia and Europe is finance. The availability of offset credits is only one side of the equation; up-front finance remains vital. While the availability of offsets is growing; access to finance is a major barrier for climate entrepreneurs, particularly in developing economies[37]. The UNFCCC has developed a compelling framework that demonstrates the role of various sources of SME finance during the development and scaling up of climate solutions:

[36] https://www.un.org/sites/un2.un.org/files/2021/07/unfss-small_business_agenda.pdf
[37] https://www.andeglobal.org/?action=tracking&file=2021/03/Climate-Entrepreneurship-in-Developing-Economies.pdf



Source: UNFCCC. (2018). Climate Technology Incubators and Accelerators.

6. Conclusion

A seismic shift is needed in ASEM's agrifood system to limit climate change. The millions of SMEs in the system are important agents of this change, particularly in their capacity for innovation and the provision of farm services.

First, we need Innovator SMEs to take the risk of building new technologies, and in the face of a warming planet we need them to act quickly. However, getting these technologies on-farm is not just about farmers changing practices. Service SMEs will be vital in taking many of these tools to farms, particularly in Asia where farmers often lack access to financing to adopt these new tools. In Europe, service SMEs can significantly contribute to realize a more circular economy and enable a transition towards diets with lower impact on the climate and biodiversity.

Governments, Donors, NGOs and farmer groups need to acknowledge the important role of Innovator and Service climate-focused SMEs, and then move to ensure they have the financing they need to grow.