Middle East Journal of Agriculture Research
Volume: 12 | Issue: 04| Oct. – Dec.| 2023

EISSN: 2706-7955 ISSN: 2077-4605
DOI: 10.36632/mejar/2023.12.4.37
Journal homepage: www.curresweb.com
Pages: 556-586

The Sharing Economy in Developing Countries: The Case of Agricultural Mechanization Hire Service Enterprises

Martin Hilmi

Governance Consultant, Food and Agriculture Organization of the United Nations (FAO), Viale delle Terme di Caracalla, Rome, Italy.

Received: 20 August 2023 **Accepted:** 30 Sept. 2023 **Published:** 15 Oct. 2023

ABSTRACT

The aim of the research was to attempt to better understand the sharing economy practice in developing countries using as a case, agricultural mechanization hire service enterprises (AMHSEs). The research was based on literature and sources of secondary data and information. The research identified 35 characteristics of the sharing economy and used these as criteria. The criteria were set against evidence that emerged from the research based on nine countries (China, Ethiopia, Ghana, India, Iraq, Kenya, Myanmar, Nepal and Nigeria) and cases at regional level for Africa and Asia. The findings were then classified into five categories ranging from very low to very high relevance to the sharing economy. Interestingly, what emerged was that AMHSEs, even though having a general mixed relevance to the sharing economy, provided for a major tendency of low relevance to the sharing economy practice. Thus, what emerged mainly from the research was that AMHSEs have a low relevance to the sharing economy practice in developing countries. Thus, such a finding provides that within the context of the cases provided, the sharing economy practice in developing countries is somewhat minimal.

Keywords: Sharing economy; share economy; agriculture; agricultural mechanization; agricultural mechanization hire service enterprise.

Introduction

Sharing is commonly practiced across the most diverse cultures (Albinsson & Perera, 2018) globally, and according to Belk (2018) has enabled the survival of the human species. Sharing, as provided by Qureshi *et al*., (2021a) is 'an act and a social process of giving and receiving resources.' Cleary sharing occurs for utilitarian purposes, but also for relational purposes and a community sense of belonging, keeping communities together, via not only economic motives, but also via building social capital. Indeed, sharing is nothing new at all as it has been going on for millennia. For example, in terms of agricultural mechanization hire service enterprises (AMHSEs) in specific, there is evidence to suggest that sharing, occurred, for example, as prescribed by Postgate (1992), in early Mesopotamia were 'prescribed legal levels for the hire of carts and animals as well as farmers were found.' Hammurabi's code provided, for example, prices for such sharing (hiring) services (Black, 2004 & Postgate, 1992). These two examples, providing an economic side to sharing, also in those remote times.

The sharing economy, however, is not easily defined. For example, Slee (2017) provides that definitions do not make much sense as per the dynamic and fluid nature of the sharing economy. Further Codagnone & Martens (2016) provide that there is 'no 'shared' consensus on what activities comprise the sharing economy.' Görög, (2018), considers that there are many definitions of the sharing economy, which all mean much the same, more or less, and provides that in an essential and bare way the sharing economy is basically the 're-use of underutilised assets'. Hu (2019) provides that the 'sharing economy refers to a market model that enables and facilitates the sharing of access to goods and services,' while Basselier *et al*., (2018) provide that the sharing economy 'matches demand to the supply of under-used assets or skills via intermediaries, with the aid of digital technologies, and does so with speed and

Corresponding Author: Martin Hilmi, Governance Consultant, Food and Agriculture Organization of the United Nations (FAO), Viale delle Terme di Caracalla, Rome, Italy.
E-mail: martin.hilmi@fao.org

efficiency, and on a large scale, and in most cases, does not entail any change of ownership.' However, still Basselier *et al*., (2018) provide that the sharing economy is also called the 'collaborative economy, the digital economy, the circular economy, the peer-to-peer economy and the gig economy,' while Jiang & Tian (2019) add to this 'list' also collaborative consumption, Yaraghi & Ravi (2017) add in also access economy and platform economy, Sundararajan (2016) also adds in crowed-based capitalism, and Findlay (2018) suggests the cooperative economy. Thus, and indeed, not surprisingly, providing for an overall definition, within such a variegated set of terminologies for the sharing economy, is effectively not easy (Basselier *et al*., 2018).

In terms of the past decade or so, the sharing economy has found a 'new youth.' The increased diffusion and the relatively easy access, at lower costs, of the internet, along with other digital technologies, has profoundly altered peoples' lives and has 'had the most direct economic effect, which has generated one of the highest efficiency gains in enabling and facilitating the sharing economy' (Tunca, 2019). In fact, outside local community boundaries, the internet, along with other digital technologies, has enabled and facilitated sharing among strangers: 'one of the salient characteristics of contemporary online sharing economy platforms is trust building: to get both sides of a market on board has been a key challenge as well as a driver of success' (Codagnone & Martens, 2016). It has also enabled and facilitated consumers to become effectively micro-entrepreneurs and to contact one another, thus resulting in the 'disintermediation of many traditional activities, and in most cases, such transactions do not entail any change of ownership' (Basselier *et al*., 2018). This has enabled and facilitated consumers to become entrepreneurs, providing them a dual role of consumers as well as sellers[1]. Such has also resulted because of the organization, coordination, speed, efficiency, cheaper information and lower logistic costs, which sharing can now entail (Basselier *et al*., 2018). The World Bank (2016) provides that effectively what is being shared are: 'physical assets, time, and access' and this being enabled and facilitated by the relatively easier, more effective and efficient matching of demand and supply for sharing products and services. However, and paramount, the key is people's willingness to share (World Bank, 2016). Indeed, this is one of the main factors that has enabled the sharing economy to expand at such a large scale, but what has also contributed have been 'digitalization, urbanization, values, eco-citizenship, and financial motives' (Basselier *et al*., 2018).

Indeed, the sharing economy has considerable ways in which it can create and provide value, efficiently and effectively: it provides a more efficient use of resources; provides a network of small and scattered dormant resources that are incorporated effectively into economies; provides for better logistics; greater improvement in the matching of demand and supply; better allocation of people's time; and operational efficiencies (Tunca, 2019). In fact, the 'utilization of sunk and fixed costs is one of the most impactful ways the sharing economy unlocks value that would have been otherwise lost' (Tunca, 2019). However, in developing countries there are several barriers to the sharing economy in terms of: a lack of trust; social and cultural norms regarding ownership; inadequate technology; a lack of electronic payment systems; a lack of assets and skills; a lack of appropriate regulations; and a lack of public sector facilitation and promotion (Retamal & Dominish, 2017). As such governments in developing countries have started to foster and stimulate 'rental markets by either subsidizing new capital purchases or by subsidizing set up costs for the creation of these markets through public-private partnerships' (Caunedo *et al*., 2022).

The sharing economy, in its modern form, though, is a relatively 'young field' (Dowling, 2019) and in particular in terms of developing countries, such research is somewhat scarce (Retamal & Dominish, 2017). In fact, 'much more research is needed to understand impacts, and to identify appropriate sectors, business models and conditions to enable a pro-poor sharing economy' (Retamal & Dominish, 2017). Interestingly, in such contexts, for example, the supposed benefits provided by the sharing economy, in terms of economic, environmental and social benefits, still require research confirmation (Retamal & Dominish, 2017). Also, Qureshi *et al*. (2021) call for more research to be conducted in developing countries as most research is devoted to developed countries.

[1] Indeed, the sharing economy provides support to 'previously powerless individuals taking more control of their lives by becoming micro-entrepreneurs, via, for example, each exchange helping someone make a little money and helping someone save a little time' (Slee, 2017). This duality, interestingly, is found in many subsistence markets (SMs) at the bottom of the pyramid (BOP) where consumers are also entrepreneurs, what Viswanathan (2020) terms the 'duality of the consumer-entrepreneur.'

Within this background, and responding, to the various calls for further research in the realm of the sharing economy practice in developing countries, this research, in specific, uses as a 'case' AMHSEs in an attempt to further and better understand its relevance to the sharing economy and its practical realities in developing countries.

Research aim

The main aim of the research was to attempt to further and better understand the sharing economy practice in developing countries, via, using the case of AMHSEs.

Methodology

The research on the sharing economy in developing countries and AMHSEs, initially started in 2015, in the research process connected to the preparation of a conference paper (see Sims & Hilmi, 2015) and was continued providing for a technical publication (see Sims & Hilmi, 2016). These initial research processes were then followed up, by another research process, which also considered the sharing economy and AMHSEs in Iraq (see Hilmi, 2021a). These previous research processes conducted, provided for a basis for this research, but also enabled and facilitated the continuation of the research process on the sharing economy and AMHSEs.

The current research was primarily qualitative and abductive in nature and took mainly a systematic exploratory and descriptive approach. The research was constituted by three distinct phases. The first phase was devoted to searching for key search terms. The first phase used four online search engines: CORE; Google Scholar; ResearchGate; and Semantic Scholar. The key search terms used within this research were in part based on the initial research phase provided back in 2015 and 2021 but were augmented considerably with the initial exploratory research of literature and sources of secondary data and information.[2] This enabled the identification of a number of key search terms with regard to the sharing economy on the one side and AMHSEs on the other side.

In terms of the sharing economy, the key search terms found were six: share economy; sharing economy; collaborative economy; collaborative consumption; cooperative consumption; and cooperative economy. These search terms were initially used to search within literature and sources of secondary data and information in an attempt to identify characteristics of the sharing economy. In terms of AMHSEs, the key search terms were also based on those found in 2015 and were further augmented by the exploratory research phase.[3] This generated the following 27 key search terms: agricultural mechanization hire service enterprise; agricultural mechanization hire enterprise; mechanization hire service enterprise; hire service enterprise; hire service; machinery hire service; machinery hire service center; custom hire service enterprise; custom hire service; custom hire service center; custom hiring farm machinery; custom hire; farm equipment service; tractor hire service; tractor service; draught animal hire service; draught animal service; cooperative hire service; agricultural equipment hire service enterprise; agricultural equipment hire; agricultural contracting service; agricultural machinery service provision; agri-hire; agricultural hire; mechanization service provider; tillage service provider; farm hire service.

The two sets of key search terms were then combined. In particular from the six-sharing economy key search words, two key search terms were chosen: share economy and sharing economy,[4] while from the 27 key search terms for AMHSEs all were used. This provided for the following 54 key search terms being identified[5]: agricultural mechanization hire service enterprise share economy; agricultural mechanization hire service enterprise sharing economy; agricultural mechanization hire enterprise share

[2] This first exploratory research was conducted over a three-month period circa between October and December 2021.

[3] As per the iterative nature of the research, some of the key search terms were also found during the analysis of the findings. These were included in the key search terms and used within the research to further and deepen the research.

[4] These two terms were chosen as they were found to be the most frequently used terms in the literature and sources of secondary data and information.

[5] Each key search term identified was also used by adding the word 'and.' For example, agricultural mechanization hire service enterprise *and* share economy; agricultural mechanization hire service enterprise *and* sharing economy, etc.

economy; agricultural mechanization hire enterprise sharing economy; mechanization hire service enterprise share economy; mechanization hire service enterprise share economy; hire service enterprise share economy; hire service enterprise sharing economy; hire service share economy; hire service sharing economy; machinery hire service share economy; machinery hire service sharing economy; machinery hire service center share economy; machinery hire service center sharing economy; custom hire service enterprise share economy; custom hire service enterprise sharing economy; custom hire service center share economy; custom hire service center sharing economy; custom hiring farm machinery share economy; custom hiring farm machinery sharing economy; custom hire share economy; custom hire sharing economy; farm equipment service share economy; farm equipment service sharing economy; farm equipment service share economy; farm equipment service sharing economy; tractor hire service share economy; tractor hire service sharing economy; tractor service share economy; tractor service sharing economy; draught animal hire service share economy; draught animal hire service sharing economy; draught animal service share economy; draught animal service sharing economy; cooperative hire service share economy; cooperative hire service sharing economy; mechanization service provider share economy; mechanization service provider sharing economy; agricultural equipment hire service enterprise share economy; agricultural equipment hire service enterprise sharing economy; agricultural equipment hire share economy; agricultural equipment hire sharing economy; agricultural contracting service share economy; agricultural contracting service sharing economy; agricultural machinery service provision share economy; agricultural machinery service provision sharing economy; agricultural hire share economy; agricultural hire sharing economy; agri-hire share economy; agri-hire sharing economy; tillage service provider share economy; tillage service provider sharing economy; farm hire service share economy; farm hire service sharing economy.

The second phase of the research was systemic and exploratory in nature, was based on literature and secondary sources of data and information and involved using the 54 key search terms. [6] It used six online search engines: CORE; Google; RefSeek; ResearchGate; ScienceGate; and Semantic Scholar. The publications were selected based on defined quality criteria, derived from Fisher (2010), Adams *et al*., (2014) and Saunders *et al*., (2016): the direct as well as indirect relevance to the research subject matter; value (methodological rigour, quality of the reasoning or arguments, references, etc.,); research evidence in terms of either or both primary source-based (credibility; reliability; ecological validity)and secondary source –based; location; derived from an identified and reliable source (author(s), scientific journal publisher, reputation of publisher, etc.,); date of publication (not older than 70 years); references used; and peer review conducted. The publications generated were mainly books, journal articles and technical reports. The literature and sources of secondary data and information found addressed, as per the selection criteria, the sharing economy and AMHSEs either directly or indirectly. The analysis of the literature and sources of secondary data and information was provided on a continuous basis, which was iterative. This enabled, facilitated and guided the exploratory research, as for example other key search terms were also found in the process.

The analysis of the literature and sources of secondary data and information, was provided via thematic analysis and used the identified sharing economy characteristics (see Table 2). The identified characteristics of the sharing economy (see Table 2)[7] were used as 'criteria' to attempt to ascertain AMHSEs' degree of relevance[8] to the sharing economy in developing countries. In terms of categorization the following parameters were set: if from the cases on AMHSEs 19 percent (7 criteria or less) were found to be relevant, it would be considered as of very low relevance to the sharing economy; if between 20 percent to 39 percent of the criteria (14 criteria or less, but above 7 criteria) were found from the cases on AMHSEs, it would be considered as of low relevance to the sharing economy; if between 40 percent to 59 percent of the criteria (21 criteria or less, but above 14 criteria) were found from the cases on AMHSEs, it would be considered as moderately relevant to the sharing economy; if between 60 percent to 79 percent of the criteria (28 criteria or less, but above 21 criteria) were found from the cases on AMHSEs, it would be considered as of high relevance to the sharing economy; if between 80 to 100 percent of the criteria (35 criteria or less, but above 21 criteria) were

[6] This second phase of the research lasted circa for six months, between March to August 2022.

[7] The characteristics that emerged from the literature and sources of secondary data and information were considered to be reliable and valid, only if they were identified at least three times (triangulation).

[8] Relevance was considered on a comparative basis to the criteria that was both direct and indirect.

found from the cases on AMHSEs, it would be considered as of very high relevance to the sharing economy. This provided for five categories of relevance as shown in Table 1 below.

Table 1: The sharing economy relevance categories

Percentage	Number of matching criteria	Relevance category
0-19	7 or less	Very low
20-39	14 or less, but above 7	Low
40-59	21 or less, but above 14	Moderate
60-79	28 or less, but above 21	High
80-100	35 or less, but above 28	Very high

The identified characteristics (see Table 2) were also used in the third phase of the research to 'sift' through the literature and sources of secondary data and information and provide for the relevance of AMHSEs cases[9] to the sharing economy. The findings were quality assessed via a qualitative approach, as per Bryman & Bell (2011) in terms of the criteria of trustworthiness (truth value, applicability, consistency, neutrality) and credibility (good research practice, peer review of findings).

The third phase of the research was guided, in part, by the findings from the second phase of the research. The third phase of the research was systematic, exploratory and descriptive in nature, was based on literature and sources of secondary data and information and used the same 54 key search terms[10] as those used in the second phase of the research.[11] It used seven online search engines: Business Source Complete (EBSCO); JSTOR business Collection; ProQuest One Business; Science Direct; Taylor & Francis Online; Web of Science; Wiley Online Library. The publications were selected based on the same quality criteria used in the second phase of the research. The publications generated were mainly journal articles and technical reports. The analysis of the literature and sources of secondary data and information was provided via thematic analysis and was iterative. The findings, like in the second phase of the research, used the identified sharing economy characteristics (see Table 2) to 'sift' through the literature and sources of secondary data and information and attempt to verify for the relevance of AMHSEs to the sharing economy. The findings were also quality assessed via a qualitative approach, as per Bryman & Bell (2011) in terms of the criteria of trustworthiness (truth value, applicability, consistency, neutrality) and credibility (good research practice, peer review of findings).

Findings

Context

A number of intense and mutually reinforcing shocks struck the world economy in 2022 (UN DESA, 2023a). These were provided by the effects of the pandemic, conflict, inflation, recession, food insecurity and related increasing malnutrition as well as climate change,[12] which all impacted on poverty reduction efforts (D.I., 2023, UN DESA, 2023a). Estimates provide that in 2022, '1.85 billion people (26 percent of the global population) lived below the threshold of US$3.65 a day and 3.71 billion (46 percent of the global population) lived below the threshold of US$6.85 a day' (D.I., 2023). Such poverty

[9] In terms of the AMHSEs cases per country, at least three cases were provided for each country. This requirement provided for triangulation of the cases, which provided for reliability and validity. The cases were mainly focused on AMHSEs directly, but indirect and implied cases on AMHSEs were also considered. Countries were selected on what emerged from the research via the literature and sources of secondary data and information as well as familiarity of the author with the countries in question. The specific country analysis of the findings were based on the single cases provided, which were then aggregated, and then averaged (weighted average) to provide for a final result per country.

[10] Just like in the second phase of the research, even here, each key search term identified was also used by adding the word 'and.' For example, agricultural mechanization hire service enterprise *and* share economy; agricultural mechanization hire service enterprise *and* sharing economy, etc.

[11] The third phase of the research lasted circa eight months from October 2022 to May 2023.

[12] The WTO (2022) provides that 'climate change represents a severe, pervasive and potentially irreversible threat to people, ecosystems, public health, infrastructure and the global economy as if it left unabated, it could undo much of the progress made over recent decades in development, poverty reduction and prosperity creation.'

provides for those living within such contexts, for far more vulnerability, not only as per the lack of resources, for example, but as per lower education levels, increasing infant mortality, malnutrition, hunger, and far less resilience to climate change (D.I., 2023).

Poverty and inequality are closely interlinked as poverty reduction can only be reduced if inequalities can be reduced (D.I., 2023b). Globally inequality is on the rise and this not only in terms of income and wealth, but also on social, political and moral grounds (Blanchard & Rodrik, 2021). This rise of inequality, though, is mainly found within countries, as inequalities between countries have been decreasing (Chancel *et al*., 2022). But D.I. (2023b) and Chancel *et al*., (2022) provide that the global richest 10 percent accumulates 52 percent of income, and the most vulnerable account for only a meagre 8.5 percent of income and in terms of wealth possess circa only 2 percent of global wealth.

According to FAO *et al*., (2023), the percentage of the global population that was in chronic hunger in 2022 was circa 9.2 percent and affected between 691 million and 783 million people. Further and still according to FAO *et al*., (2023), 3.2 billion people globally were unbale to afford a healthy diet as the costs related to healthy diets 'increased by more than 5 percent between 2020 and 2021 in Africa, Asia, Latin America and the Caribbean, and Oceania, but only marginally in Northern America and Europe' (FAO *et al*., 2023). Food price rises have been a major cause of the unaffordability of healthy diets as per the various price hikes since 2007 and their cyclical reoccurrences over time, the last two in 2020 and in 2022 only aggravating matters even more (Headey & Hirvonen, 2023). Further, the global population is ageing: 'the number of persons aged 65 years or older worldwide is expected to double over the next three decades, reaching 1.6 billion in 2050, when older people will account for more than 16 percent of the global population' (UN DESA, 2023b). In fact, this demographical change will inevitably affect the labour force, productive capacity and the structures of many economies (UN DESA, 2023b)

Over the past two centuries, based on the industrial revolution, which effectively was an energy revolution, enabled not only industrialization, but also increased mobility (WTO, 2022). This indeed has brought benefits, for example, in terms of the rise of living standards, but has been mainly based on non-renewable resources and such have also provided for considerable emissions (greenhouse gasses)[13] (WTO, 2022). In fact, and for example, in terms of economic growth, the level of emissions over the past years have not been decoupled (Chancel *et al*., 2023). Further, there is evidence to suggest that the impact of emissions is not shared equally, as what is termed 'the Global South' is 'disproportionately affected by temperature change and its impact on soils, by extreme weather events, and by the spread of disease and that within each country, in the Global South and the Global North, individuals contribute differently to carbon emissions, and are not equally equipped to tackle its effects' (Chancel *et al*., 2023). Indeed, there are historical differences in emissions that provide for inequalities, as 'virtually all low-income countries have emitted negligible shares of carbon throughout the past century compared with rich countries' (Chancel *et al*., 2023). In fact, globally emissions are concentrated in a defined and small population of the globe, where 'the top 10 percent of emitters are responsible for almost half of all global carbon emissions' (Chancel *et al*., 2023). This provides that 'the emissions caused by the bottom 90 percent of the global population are only marginally larger than those generated by the top 10 percent' (Chancel *et al*., 2023).

Advances in technology have indeed provided for numerous improvements for many people globally (UNDP, 2022; UNCTAD, 2021). A case in point is ICTs and related digital technologies. The diffusion and uptake of ICTs and digital technologies globally, what is commonly called the Industrial Revolution 4.0, has been quite rapid and in many developing economies, for example, about 70 percent of households have mobile phones, which have been more accessible than clean water and electricity (World Bank, 2016). Such have been a good enabler for economic growth, have linked people globally, enabled rapid spreading of information and increased considerably social interactions and relations (UNDP, 2022). Digital technology uptake has been also increasing in business enterprises within developing countries. This rapid diffusion is interesting as ICTs and digital technologies have reached

[13] In terms of global greenhouse gas emissions, circa 75 percent derive from 'energy consumption; another 18.4 percent from agriculture, forestry and land use; 5.2 percent from industrial processes; and 3.2 percent from waste' (WTO, 2022). Indeed 'as long as the world remains dependent on high-carbon technologies, increasing economic production will almost inevitably lead to increasing greenhouse gas emissions' (WTO, 2022).

developing countries far faster than other technology innovations,[14] but the intensity in use is low, as within countries digital technologies have not spread as fast, providing for a digital divide within many developing countries (World Bank, 2016).

The diffusion of digital technologies has enabled and facilitated the lowering of costs related to information, has effectively created informational products, has increased greater collaboration and organization among business enterprises, for example, and has furthered social interactions among people and people with institutions (World Bank, 2016) and has also, and importantly, overall reduced transaction costs (Deichmann *et al*., 2016). It has also affected many sectors of the economy, for example agriculture, where, farmers, can have more access to information on market prices, simply via a mobile phone (FAO, 2019a). But even though there has been a rapid diffusion of ICTs and digital technologies, circa 60 percent of the global population is not online, which means that they have remained somewhat secluded from the digital economy (World Bank, 2016).

Indeed, the divide in digitalization is seemingly not related to rural and remote areas and overall poverty, but between early adopters and 'reluctants'[15] of digital technologies, gender, differing economic sectors,[16] and degrees of urbanization[17] (FAO, 2019a). In fact, ICTs, like mobile phones, for example, are considered as an essential for general rural development and in specific for agricultural development (Hanson & Heeks, 2020). Thus, it is becoming increasingly clear that ICTs are now a mainstream and integral element within development efforts.

Indeed, the next major uptake of digital technologies is estimated to derive from rural areas and communities, of which the main activities, in developing countries are devoted to agriculture (FAO, 2019a). Further such an estimated change in rural areas, and not only, is expected to have an impact on agri-food systems as per such technologies as, for example, blockchain, Internet of Things (IoT), Artificial Intelligence (AI), Immersive Reality, etc, (FAO, 2019a). But this all requires skills in literacy and digital technologies and also ease of access to the internet (FAO, 2019b). In fact, income and education are the major determinants of if and how people use the internet, and both, in rural areas, tend to be lower, than for example in urban areas (FAO, 2019b). Further the lack of standardization and related compatibility of diverse technologies hampers information exchanges, for example, which are non-verbal (FAO, 2019b). However, 'information and communication have always mattered in agriculture as ever since people have grown crops, raised livestock, and caught fish, they have sought information from one another' (World Bank, 2011). Further 'communication has long been recognized as a major driver for innovation and social change in rural development across the world' (FAO, 2017). In fact, many enterprises that operate in the agri-food sector have already shown a good up-take of ICTs, ranging from farmers, to wholesalers, to retailers, including services, for example, financial services, extension and regulation services, which support the agri-food sector (FAO *et al*., 2017).

However, and in terms of 'frontier' technologies, like Robotics and Artificial Intelligence (AI), for example, there is rising fear not only of job substitution, but job loss, and thus an overall reduction in employment. This may be the case, but commonly this does not occur, as new technologies tend to be new job creators, which require differing sets of know-how and skills, unless the speed of frontier technologies implementation surpasses societal response capacity (UNCTAD, 2021). Such new technology deployment, and especially in terms of frontier technology deployment, in terms of employment does provide for upheavals and job relocations and changes, which consequently and

[14] However, 'it is also important to consider not just what technologies are needed, but how they are used' (WTO, 2022).

[15] In terms of innovative ICTs, usually, a small part of a population will have the ability to access it, as per, for example, more income, better educational standing, etc. Such adoption of innovative ICTs will then increase and then will slowly start to decrease as adoption saturation is reached (UNDP, 2022). However, this diffusion will provide betterments to a few, but overall, will leave many others behind and excluded (UNDP, 2022).

[16] Digital technologies have impacted many sectors and have provided for a 'disruptive' basis for such sectors' transformations (FAO, 2019b).

[17] Estimates provide that by 2050 circa 66 percent of the world population will be urbanized (FAO, 2019a). Further urban areas tend to be far better connected to 'digital ecosystems (resources, skills, networks)' (FAO, 2019b) and as such the rate of urbanization and the urban and rural divide in terms of digitization may further enhance inequality (FAO, 2019b).

inevitably create those who can adapt and those who cannot. Within this, it can foster inequality as per how new wealth is created and distributed as changes in technology not only impact wealth but also salaries (UNCTAD, 2021). However, and overall, the actual and 'likely impact of rapid technological change on inequality is uncertain' (UNCTAD, 2021).

The sharing economy

The sharing economy is fundamentally an 'economic system in which assets or services are shared between peers, groups or organizations for free or for a fee' (Qureshi *et al*., 2021a): indeed, it is flexible as it enables various forms of 'trade': rent, swap, barter, lend, and gift (Albinsson & Perera, 2018). The sharing economy has two sides to it that may seem irreconcilable, on the one side there is the sharing, which is more of a social and 'moral' economy, and on the other side, simply, the market economy (Belk *et al*., 2019). However, Arvidsson (2019) provides that the sharing economy is de facto a combination of the two: a 'commons based sharing and capitalist profit-seeking'. In fact, the sharing economy does have a deeper significance in terms of how economies are changing: to have economic returns on enterprise activities depends more and more on commons-based markets,[18] which are, seemingly, providing an alternative economic system than the traditional market-based only economies, for example (Arvidsson, 2019).

Indeed, one of the main elements that is crucial to the sharing economy is what Corten (2019) provides as trust, which is a fundamental element for many local communities and societies the world over. Further, Qureshi *et al*., (2021a) point to another important factor about the sharing economy that is moving from a 'philosophy' of ownership in consumption to one of non-ownership. This also providing for, and seemingly, positive outcomes in terms of the reduction in the use of natural resources and in emissions. Still Qureshi *et al*., (2021a) point to yet another important factor of the sharing economy in terms of bringing people together, creating social cohesion and thus fostering and strengthening of social capital which is 'the glue and grease of collaboration'. Belk (2018) provides further that the sharing economy has implied new ways of thinking about usage and ownership, of products, for example, implied more sustainable use of not only resources, but how resources are distributed and has provided impetus to cooperation over competition. Further, Munger (2021) provides also that both consumers and sellers are both actively looking for each other in seeking ways to transact. However, in its modern form, the sharing economy, is fundamentally, anchored to technology (internet, mobile phones, etc.,) (Albinsson & Perera (2018). Indeed, sharing online platforms have only but augmented the sharing economy, especially as per the internet and the increase in the diffusion of mobile communications, applications and handheld devices, for example, which not only reduce transactions costs, but enable a better matching of demand and supply (Dowling, 2019).

The cost-saving and utilization of idle assets may be one of the main drivers for the rise of the sharing economy, but many users of the sharing economy's products and services are also motivated by their belief that the sharing economy helps reduce their emissions footprint. The, presupposed, positive environmental benefits of the sharing economy have been based on the use of idle assets, instead of producing more assets. Thus, the more assets that are used currently by different users, provide a consequential reduction in resource usage and emissions. The important implication of the sharing of goods and effective utilization of idle assets is that the traditional thinking about ownership of the resources is being increasingly challenged. However, a common challenge is that sharing reduces the demand for new assets, but the more facilitated, enabled and easier access to shared assets, via renting, for example, may actually increase overall consumption, which can more than offset, for example, emission reductions and other matters related to the natural environment (Qureshi *et al*., 2021a).

Munger (2021) provides that the sharing economy's rise is owed also to time and location: what is required really from durable products, for example, is not the hammer per se, but the nails it can potentially hammer when and where desired. Thus, owning a hammer, for example, will imply that not all the time and in all places will it be used, hence there will be residual usage time that can be put to use, via renting, for example. Further, and still according to Munger (2021), owning a hammer, is yes

[18] However, and as provided by the WTO (2022), the global commons are under considerable threat from climate change. This is because, in part, 'markets do not suffice to address the threats from greenhouse gas accumulation in the atmosphere as firms and consumers often do not directly face the costs of the emissions they cause' (WTO, 2022).

convenient, as it can be accessed easily when and where needed, but it also implies having to store it somewhere. This effectively means paying three times for the hammer: capital sunk into the hammer; the cost of space and storage to keep it; and the hammer's value depreciation over time. Thus, it is not a choice between 'make or buy,' but between 'buy or share' on the consumer side of matters and on the suppliers' side of matters, it is 'store or share' (Munger, 2021). In fact, for example, 'digital platform markets make excess capacity economically relevant by increasing the opportunity cost of idleness as each unused minute involves both storage costs and the opportunity cost rate of return that the durable asset's owner could be earning on excess capacity' (Munger, 2021). However, this can only occur, if transaction costs are not excessive: digital platforms that 'reduce the transaction costs of such market participants enable peer-to-peer exchanges that are immediate and dynamic' (Munger, 2021). Thus, and to a good degree, the sharing economy provides for commodifying excess capacity and reducing transaction costs (Munger, 2021). However, what also needs to be considered in the sharing economy is 'space' (distance) to the service and product that is to be shared. For example, the further away and more remote are sharing goods and services, the more transport costs will increase to access such services and products, and thus possibly reducing the price incentives and costs incentives of sharing. This is very much the same for the supplier side of the sharing economy, where for physical product delivery, for example, may become uneconomic as per the distance it needs to travel for consumption to occur.

In countries that are developing, hardship is a common norm. In such circumstances cooperation is commonly sought as per the sharing implied, but such cooperation is also part of many cultures and societies, as there is not the primary focus only on economic activities (Findlay, 2018). Indeed, differing societies demonstrate, in the face of poverty and its related scarcities, numerous forms of resilience, which are not only economic based, but social and cultural as well as ecological based (Hellwig *et al*., 2018). Cooperation and its related sharing economy are provided primarily as the willingness of people to participate in such and also, of course, for example, for saving purposes, income generation, life necessities as well as ideological choices. But overall 'the usage of idle capacity by sharing existing private or pooled resources is without doubt smart and efficient' (Hellwig *et al*., 2018).

In fact, the sharing economy has moved ownership from being 'asset heavy to asset light access' (Retamal, 2017). This is far more efficient and effective as when an asset is needed, consumers do not have to the purchase the asset, which then may lay idle, and thus create 'asset waste', but instead can rent an asset, use it for the needed time and then return it. This is commonly found in many economies globally, but in particular in low-income economies, the sharing economy effectively enables access as commonly, asset acquisition is out of the reach of many consumers. As such the sharing economy enables primarily access to assets which would be out of reach and thus enhancing a more sustainable pathway to development (Retamal, 2017). Indeed, facilitating and enabling rental market development is an important mechanism, for small-scale farmers, for example, to access capital and technology and its related equipment (Caunedo *et al*., 2022). This, potentially, contributes to consumption, that is sustainable, seemingly lowers the impacts of consumption both in environmental and climatic terms, reduces waste, can foster trust, assists in regulation, via formalising[19] service transactions, for example, fosters entrepreneurship, contributes to growth, even in times of slack economic activities, and as an example of this, can reduce material consumption of tools, by 90 percent, via simple tool rental (Retamal & Dominish, 2017). Further the sharing economy creates jobs for the unemployed and underemployed, supports micro and small-scale enterprises and can effectively provide support to reducing poverty (Retamal & Dominish, 2017). UN DESA (2020) finds much the same sort of opportunities of the sharing economy in developing countries ranging from, for example, more equality to increased women participation in labour markets to enterprise formalization.

[19] Regulation and formalisation stimuluses of the sharing economy are provided to contribute to increasing regulation, governance and funding which are commonly lacking in many developing countries. For example, in terms of regulation, via easy customer feedback systems provided by digital sharing platforms, can provide for self-regulation of sharing enterprises that supply services (Retamal & Dominish, 2017). In terms of enterprise formalisation, the sharing economy can, for example, via digital platforms, bring informal micro and small-scale enterprises into the open, and thus provide for economic incentives to some typology of enterprise formalisation.

Indeed, the sharing economy does provide for many opportunities in resource scare environments. In Bottom of the pyramid (BOP) contexts in low-income countries, resources are already scarce, but the sharing economy can release residual idle use of such resources and bring them to local community usage (Qureshi *et al*., 2021a). According to Retamal & Dominish (2017), the sharing economy can actually thrive in times of slow economic growth. Further, and seemingly, the sharing economy fits in, to a degree, to commonly found social and cultural norms in BOP settings, where dire conditions, for example, imply supporting community members reciprocally and thus being, fundamentally, inclusive. The sharing economy also fosters and encourages, by its very nature, more community interactions and thus enhancing social capital (Qureshi *et al*., 2021a). The sharing economy is flexible as it enables to 'trade': rent, but also to swap, barter, lend, and gift (Albinsson & Perera, 2018). The sharing economy is also, to a degree, transformative, as it challenges economic systems to be far more social and moral. It makes what is commonly regarded as private, for example, such as assets, to become more public community assets. It facilitates and eases transaction costs. It can provide rent for the asset, but also other forms of payment, as provided previously. It also provides for intermediaries of sharing exchanges to be more socially inclined then only commercially inclined. There is also the environmental and climatic advantages of sharing, even though some caution is required here, as per the possibility, for example, as per more intensity of use of idle assets, which can possibility provide for far more emissions.

In fact, caution is required, as provided by Retamal & Dominish, (2017), as there is some evidence to suggest that not all sharing economy activities can contribute to a sustainable development pathway. There are a number of factors to consider in that: not all sharing is efficient; not all enterprises have green and climate sensitive objectives; some sharing can actually increase use of assets beyond sustainable levels; and waste may also occur (Retamal, 2017). In fact, Dowling (2019) adds that services provided via sharing can be thought to be environmentally friendly depending on 'what mode of consumption they replace'. Further, the sharing economy has expanded considerably over the past 10 years and more, but there is some evidence to suggest that it does not deliver welfare that is fair and equitable to all those who are active in the sharing economy (UN DESA, 2020). Indeed, Caunedo *et al*., (2022) further provide that if legal systems are weak for contract enforcements and incomes are low, rental markets may not emerge and if they do may 'oversight' small-scale producers. UNCTAD (2022) provides that the effects on income inequality are not well-established, but that much will be based on if people are unemployed and thus be provided with a job and in terms of already employed people who seek more income. However, 'inequality will also rise if these jobs replace better-paid ones or full-time jobs with part-time ones, or if profits grow faster than salaries' (UNCTAD, 2021). Moreover, there are concrete barriers in developing countries to the sharing economy: lack of internet availability and access; some lack of mobile payment systems; lack of financial resources; lack of complementary institutions and infrastructure (UN DESA, 2020). Qureshi *et al*., (2021a) further such matters in that the sharing economy assumes that would be participants have the affluence to participate, thus potentially providing for exclusion of the lower income segments of societies. Further the sharing economy, seemingly, brings market-based principles to social capital, providing commodification of such a capital, and setting in opportunistic behaviour, for example, as well as the growth of social intermediation entrepreneurs and can, as such, potentially provide for the accumulation of capital by a few enterprising individuals, for example, over the many, which fosters exclusion and inequality[20] (Qureshi *et al*., 2021a). Still Qureshi *et al*., (2021b) suggest that seeing the characteristics of BOP contexts, the sharing economy 'requires a reconceptualization of several aspects of the existing models and that the broad implications of sharing economy models on addressing the challenges of the marginalized groups are yet to be understood well.'

In its modern form, the sharing economy characteristics identified by this research are provided in Table 2. Table 2 shows the characteristics of the sharing economy, 35 characteristics in all, identified by the research, considering its boundaries and thus also its implied limitations.

[20] As an example, Attri & Bapuji (2021) provide that in the case of online digital platforms 'discrimination is based on age, caste, gender, physical disability, race, religion, sexual orientation, socio-economic status, and spatial location.'

Table 2: The characteristics of the sharing economy

Transformative
Social and market-based
Community building and strengthening
Partnership focused
New consumer needs
New consumption needs
On demand consumption
Consumer attitude change
Ownership attitude change
Consumer propensity to share
Environmental and climate sensitive consumption
Convenience
Trust
Reputation
Increase personal utility
Increase social utility
Risk reduction (ownership, financial, storage, maintenance, depreciation, disposal)
Costs reduction (ownership, financial, storage, maintenance, depreciation, disposal)
Technology-based (internet, mobile phones, networks)
Underutilized asset (time, space, labour)
Durable asset sharing
Value per usage
Utilization planning
Exchange flexibility (renting, swapping, gifting, bartering, lending)
From private to public ownership
Entrepreneurial behaviour
Enterprise development
Increased investment capability
Increased saving capacity
Labour market access
Earning a salary (financial returns)
Full time and part time employment
Autonomy
Formalization
Regulation

(Source: Qureshi *et al*., 2021a; Huang & Kuo, 2020; Dowling, 2019; Jiang & Tian, 2019; Albinsson & Perera, 2018; Retamal & Dominish, 2017; Sundararajan, 2016; PWC, 2015).

The sharing economy and agricultural mechanization hire service enterprises in developing countries

In terms of agricultural mechanization hire services as an enterprise, these come in numerous typologies. They can be large and small-scale, formal and informal, and can share from a minimal to a large number of equipment (Gilbert, 2018). In terms of AMHSEs typologies in specific, Hilmi (2021b) found the most prevalent type of enterprise to be a micro-scale AMHSE. This is commonly farm-based, rural, privately owned, indirectly public sector supported, non-growth and in part growth-oriented. In terms of medium to large-scale AMHSEs, these are typically also farm-based, mainly rural, but also peri-urban, are growth oriented, and can be itinerant. In terms of group AMHSEs, these are commonly, but not always, growth oriented, small to medium sized enterprises, but can also be large-scale, formally registered, mostly privately owned, but can also be private-public partnerships or public-private partnerships. In terms of itinerant AMHSEs, these are commonly informal, but can also be formally

registered, privately owned, by an individual or a group of individuals who may be farmers themselves, but can also be non-farmer-based, offer mainly motorized services, but can also offer draft animal services, are typically micro, small and medium sized, but can also be large sized and prevalently growth oriented. Agricultural equipment dealerships that commonly sell farm equipment, spare parts and provide repair services can also be AMHSEs. Such enterprises are small, medium and large-sized, in most cases privately owned, formally registered, offer motorized services and are growth oriented as an enterprise. Local area physical brokerage enterprise services can own an AMHSE but can also be considered as a AMHSEs even if no AMHSE is owned directly.[21] These enterprises, being commonly micro-sized, privately owned, informal, growth oriented and with a transformational stance. The public sector is involved in terms of those brokerage enterprises that operate an AMHSE directly and do not operate an AMHSE, via for example, subsidies on equipment. Digital brokerage enterprises can own a AMHSEs and can also be considered as an AMHSEs, even though services are not owned. Such enterprises range from being small to medium to large-scale, commonly registered, privately owned, and growth oriented. Non-governmental organizations (NGOs) operate AMHSEs and these tend to be small and medium in size, usually privately owned, non-growth oriented, and socially and community-based focused. Publicly owned AMHSEs can range from small, to medium to large-sized enterprises, typically located with multiple AMHSEs throughout a country, for example, in the forms of custom hire centres, village hire centres and tractor hire units, but not focused on business growth, and do not have a business growth stance and often subsidize service prices so as to enable easier access to services for small-scale farmers.

According to Lewis *et al*., (2022) 'agricultural mechanization is the shift from human labour to other sources of energy in the agricultural value chain, along with the production and utilization of equipment that can enable this shift.' This definition in fact points to taking a far broader view on agricultural mechanization, well beyond the farm gate, as for example, what such technology implications may provide along the agri-food value chain, especially in rural areas. This is much in line with that found by Hilmi (2023; 2021b; 2018) in that, for example, in the case of AMHSEs, such resemble far more rural service enterprises that provide services, for example, to food processors, but also to local communities, via transport, and as such can potentially contribute, for example, to rural industrialization.[22] Interestingly though, and as still provided by Lewis *et al*., (2022), such developments should not only be market-based, in terms of being private sector led, but have a far more partnership-based approach, including, for example, the public and NGO perspectives on development, that potentially can enable a more equitable development path way for agricultural mechanization and its related services (Lewis *et al*., 2022). Indeed, for example, Hilmi (2021b) found that the public sector, in terms of AMHSEs as a business, plays a role directly and indirectly in such market-focused AMHSEs: 'the public economy intervention seemingly works as an incetiviser, facilitator and 'jump starter' for the private sector, but also as private-public and public-private partnership for AMHSEs.' Reinsch (2021) also provides for evidence on partnerships, for example 'TROTRO (a digital service broker) in collaboration with AGRO Africa in Ghana, and Hello Tractor (a digital service broker) in Kenya, experimented with a range of partnerships: digital platforms and solutions that bring together banks, farm equipment owners and operators, smallholder farmers, maintenance providers and other value chain actors to align their interests and facilitate mechanization service provision.'

In terms of technologies and mechanization and farming, Zhang & Karkee (2021) provide that technologies related to farming have always been evolving in history. As such the latest technology advancements, such as ICT, digitalization and automation, for example, are part of a centuries long

[21] Local physical brokerage services can be considered as an AMHSE per se as they typically aggregate in a local area not only demand for mechanization services, but also supply of mechanization services. Thus, by offering such services, even though, not owning such services, can provide to be an enterprise per se that is based on agricultural mechanization hire services. Much the same is valid for digital brokerage services. This provides that such enterprises are not only involved in marketing services of AMHSEs (see Hilmi, 2021c) but can be considered as being an AMHSE per se.

[22] Rural industrialization is defined by Lewis *et al.*, (2022) as the 'value-added commodity production that utilizes productivity-increasing technologies, enabling rural workers to retain surpluses that would otherwise flow to urban areas.'

continuum of innovation. Interestingly, still Reinsch (2021) in terms of digitalization and its use in enhancing access to AMHSE services, contributes that digital technologies can provide a good deal of opportunities as 'the 'digital sharing economy' and the 'Internet of things' (IoT) hold tremendous promise for creating the efficient linkages and transparency necessary to reinforce the ecosystem for sustainable agricultural mechanization.' Anidi *et al*., (2020) for the African region in general, for example, also provide that ICT can effectively provide for: increased access to AMHSE services; the matching of demand for AMHSE services and the supply of such services; can enable the monitoring of such services; services can be provided on demand; and the reduction of transaction costs that occur.

However, even though digital sharing of AMHSEs services has been increasing, there are still challenges in place, as for example: lack of literacy; lack of ICT literacy; lack of trust; seasonality of usage; common barriers found in rural agricultural markets; the need for physical booking agents to be in place to collect and aggregate demand in an area and then pass it on to the supplier; size of farms being small; distances for services to reach farms (high transport cost); lack of usage of agricultural mechanization and their related services (Adebola *et al*., 2022; Daum *et al*., 2020). Further, and for example, in sub-Saharan Africa, only circa 13 percent, have registered for mechanized service use via mobile phones (Adebola *et al*., 2022). Also, Daum *et al*., (2020) provide that ICTs and digitization, for example, have had a mixed impact on both smallholders and owners of AMHSEs. In fact, and still according to Daum *et al*., (2020) agricultural mechanization digitalization is only 'one valuable piece of the puzzle, but not the long awaited 'silver bullet' for smallholder mechanization….as agriculture will never depend on software alone.' Hilmi (2018) finds also that 'there is some evidence to suggest that awareness creation is important, but providing a better understanding of the service technologies of hire services, their outcomes and how these can be beneficial both from an economic as well as a social point of view for small-scale actors in agri-food value chains requires more attention and investigation.' Moreover, and still Hilmi (2018) found that 'personal, entrepreneurial, social and brokerage services factors are to be considered alongside the financial-commercial aspects for a better understanding of the how and why of access and use of mechanized services by small-scale actors.'

Still according to Anidi *et al*., (2020) the service market, from another example on Africa, for mechanization, is mainly hindered by information barriers and costs between demanders of services and the suppliers of services and thus making transaction costs high. This results in poor interconnectivity between the two sides, which produces market failure for mechanized services. But with the application of ICT, such costs and barriers, can potentially dispel matters for both demanders and suppliers as: demand can be aggregated and information of what is needed specifically can be provided; access to such services can be improved; equipment assets can be used more effectively with less waste of idle time; intensity and coverage of services can be improved; better access to credit services can be enabled; monitoring and tracking equipment can take place when in usage and when idle; and can enable for land measurement of service tasks, which can be stored and thus optimize equipment use (Anidi *et al*., 2020). However, even with all these potentials, challenges remain, as for example: language barriers; lack of literacy and ICT literacy; lack of internet coverage and related access; lack of smart phones; and process complexity and rigidity (Anidi *et al*., 2020).

In terms of the Asia region, for example, and in particular in South and Southeast Asia, FAO (2021) provides that for many millennia, even in the rural and remote areas, there have been some form of mechanized and non-mechanized services provided. Within this realm, the typology of informal AMHSE that is based on a locality of a farmer-to-farmer service provision is the most commonly found. It is estimated that such AMHSEs are in their hundreds of thousands, supplying services to millions of farmers, both large and small, all in the context of shrinking land holdings and their fragmentation of farm sizes of half a hectare, but still managing to provide timely services (FAO, 2021). But FAO (2021) also reports for the growing number of custom hire centres (CHCs) that are generally based around the group typology of AMHSEs. Such AMHSE CHCs can be based around various cooperative modes, be they public, private and NGO based or a mixture of such of these modes (FAO, 2021). Still, further and for yet another example from Africa, Diao *et al*., (2016) also consider the basic farmer to farmer sharing provisions, which is the most common form of AMHSE and provide that such typologies of enterprise have advantages such as for example, no administrative needs and costs, service delivery is fairly on demand and immediate and both service demander and the service supplier are commonly within the same community.

UN DESA (2020) provides that the sharing economy potentially offers opportunities for growth, as per the access possibilities to productive assets. In considering one typology of AMHSE, the group and community type AMHSE Gilbert (2018) provides for the following advantages: lower ownership and operating costs; less debt and thus the ability to invest capital elsewhere; newer equipment and specialized equipment and access to them; overall lower costs; and social cooperation. But such a typology of sharing requires a defined attitude and perspective, motivation, effort, and good community behaviour as well as good planning and timing (Gilber, 2018). Kenkel & Long (2007) within this realm consider a cooperative typology of AMHSE with its advantages of: lower investment costs in machinery; access to better, newer and more specialized equipment; more efficient equipment as per easier access and ability to obtain spare parts, repairs and buying new equipment to replace old equipment; and expand the scope of the cooperative to go beyond only the sharing of equipment.

In a case of a digital broker for mechanization services, AgriShare provides a mobile phone enabled platform (application based) to converge private sector suppliers of agricultural machinery rentals with machinery rental demanders. It is basically an online broker that facilitates the matching of demand with supply for agricultural machinery services, offers a blog with the latest news and updates and currently, at the time of writing has 77770 users (AgriShare, 2023). It offers a GPS service for location of hirers and buyers, prices and what equipment is available in local areas (AgriShare, 2023). Interestingly, AgriShare is provided by an NGO (Welthungerhilfe). Further, and still in terms of a digital brokerage service, but this based on the private sector, Retamal & Dominish (2017) provide for a case, Hello Tractor, that operates in Africa, based on a peer-to-peer sharing economy mode that uses a GPS location system, so as to enable demanders for services to find suppliers of services that are both in close proximity to each other. However, not all have access to the internet, smart phones and may shy away from using mobile phones for booking tractor services, as such these can create considerable challenges. Moreover, still further in terms of private based enterprise digital brokerage service, Qui *et al*., (2021) provide an interesting case from China, regarding NSB, for example that is basically a machinery sharing platform that provides sharing of farm equipment, the quick matching of resources, improving utilization rates and cost reduction. However, there are challenges for NSB, as its customer base in terms of numbers needs to be high, internet penetration in rural chain is low, and farmers are reluctant to change farming methods, including not feeling at ease using mobile phones.

-China[23]

Liu *et al*., (2022) provide that in the past years machinery services have increased considerably, even though, in small-scale farmer environments, such tend to be characterized by rental market failures. The nature of farms being small and fragmentated, along with economic constraints based on asset heavy investments, tend to discourage small-scale farmers owning their machinery. As such mechanization services for basic farm operations have grown in demand, but also the use of drones is emerging. Yang *et al*., (2013) consider AMHSEs that are based on farmer clusters, are itinerant and move from province to province seasonally for harvesting. Zhang *et al*., (2020) consider clusters of cooperatives that provide for mechanization services that are seasonally itinerant from province to province. Sang *et al*., (2023) consider AMHSEs and how farmers jointly use services, and how the intervention of the public sector within AMHSEs markets has helped the expansion of such in China. In fact, with a series of policy and institutional support measures, the rental market for AMHSEs increasingly developed and in 2020, the national agricultural mechanization service organizations reached 194,800 in number (Sang *et al*., 2023). Yang & Jiang (2023) consider private- led AMHSEs and public-private partnerships and how these have not only facilitated the diffusion of mechanized technologies, but also how these contributed to more sustainable practices in agricultural modernization and reinforcing agri-food supply chains. In China, AMHSEs have developed continuously via '74000 agricultural mechanization cooperatives and nearly 200000 agricultural mechanization hire service organizations, together with 4.24 million specialized mechanization service providers as well as 40 million agricultural households with machinery providing the basis for farming activities' (Yang & Jiang, 2023). The case also reports on ongoing building of agricultural service centres that include

[23] The findings of the country cases as reported here are consolidated and summarized. As per the methodology section, country analysis of the findings was based on the single cases provided, the results being then aggregated, and then averaged (weighted average) for the overall result per country.

mechanization services and in 2020, such stood at 110 centres. From the case it seems that private and public AMHSEs complement each other as one is focused on AMHSE as a business, thus attempting to develop the rental market, while the public AMHSEs focus more on the social and welfare side of matters, thus filling the 'gaps' that private rental markets cannot fill. Lu *et al*., (2022) provide on how AMHSEs have supported rural areas which lack labour as per China's rapid industrialization, which is mainly conglomerated in urban areas. The case also considers how the public sector has supported, enabled and facilitated the growth of rental markets and AMHSE as a business per se. Qui *et al*., (2021) as also provided previously, as per NSB, a machinery sharing platform, which provides sharing of farm equipment, the quick matching of resources, improving utilization rates and cost reduction. However, there are challenges for NSB, as its customer base in term of numbers needs to be high, internet penetration in rural areas is low, and farmers are reluctant to change farming methods, including not feeling at ease using mobile phones.

-Ethiopia

Deribe *et al*., (2021) provide that there is an overall lack of agricultural mechanization in Ethiopia. The main constraints are traditional farming practices, farm-size, the unavailability of services at peak agricultural times and the costs of services. Typically, the most prevalent services derive from private-owned AMHSEs, in the form of private enterprises, more commercially minded small-scale and medium-scale farmers, the public sector-led AMHSEs and cooperative typologies of AMHSEs. The public sector has set up a strategy for agricultural mechanization. In this regard Ayele (2022) provides that the public sector is piloting mechanization service centres with the aim of setting up 10 centres in four major regions. Each centre provides not only services, but repairs, maintenance and training. However, the intention is to have the centres run by cooperatives and private individuals. Berhane *et al*., (2020) provide that AMHSE services are growing within country, but that this has provided for an oversupply, in a market where there is already little uptake of mechanization overall, even though demand for mechanization services is growing. Interestingly AMHSEs are also involved in other trading matters, such as, for example, trading cereals and flour, as mechanized services are seasonal. Tesema *et al*., (2023) provide that access to services is a major challenge for many small-scale farmers and that overall, there is a lack of use of mechanization in country. Brokerage services have arisen to support the diffusion of services, but the rental market still remains limited.

-Ghana

Diao & Takeshima (2020) provide that the two main suppliers of AMHSE services is via individual farmers, mainly medium-scale farmers, on a by farmer-to-farmer services and the public sector with the Agricultural Mechanization Services Enterprise Center (AMSEC) programme, which basically selects private enterprises to implement such centres. This provides that services are available in areas of the country where there are medium and large-scale farmers. Amanor & Iddrisu (2022) provide that mechanization up take and related service provision has been fostered by liberalization policies that have created production expansion, which in turn has provided farmers with more capital and thus the possibility to invest in equipment, not just for own farm concerns, but also for hiring out services. Diao *et al*., (2019) report that about one third of all Ghanaian farmers have used either mechanized or animal services, but Houssou *et al*., (2015) provide that tractor ownership is not very high and animal traction is used in districts where tractors are scarce. Reinsch (2021) provides for the case of a digital broker, TROTRO Tractor Limited, which in 2020 was serving 27500 farmers with 591 tractors. The enterprise basically connects demand with supply via a platform, with SMSs and an application, enables digital payments, the monitoring of tractor operations and is providing also for physical brokers, which are community lead farmers. Anidi *et al*., (2020) still in terms of TROTRO Tractor Limited, add that sometimes the enterprise works alongside the public sector so as to raise awareness and sensitize farmers about services, via extension officers. It also promotes it services via radio and community centres.

-India

Naushad & Prasad (2023) in a case devoted to CHC, consider such centres for four to five villages, at a distance from the centre of five to seven kilometres so as to avert excessive transport costs to carry out services. Such centres are provided by the private sector, and also involve farming advisory

services, hence providing for a form of rural service centres. Bhattarai *et al*., (2020) also consider CHCs, also run by the private sector to facilitate demand meeting supply. Over the years differing typologies of CHCs have emerged: small-scale famer owners; large-scale farmer owners; cooperatives; join-ownership; rural entrepreneurs renting out machinery; corporate rental services; and public-private partnerships; and public CHCs. Overall, there has been a wide diffusion of mechanization services and related use. In the majority of cases such enterprises are informal. NABARD (2018) in fact provides for the promotion of CHCs as a AMHSE model. Rawat *et al*., (2020) consider CHCs as critical in diffusing technologies to the smallest-scale farmers in rural and remote areas and enabling them to access such. Consideration is given to pre-harvest and harvest operations. Kamboj *et al*., (2012) also consider CHCs, but from a cooperative perspective. Chahal *et al*., (2014) also provide for CHCs at cooperative and village enterprise level (Cooperative agri-service centres) and consider that such provide the latest machinery to small-scale and marginal famers, enabling them to access such new technologies. Priyanka *et al*., (2022) also consider CHCs and the public sector intervention into such centres. Services are available within a distance radius of 5 to 50 kilometres. Interestingly a CHC application is being provided, publicly funded and in 12 languages. Chinnappa *et al*., (2018) consider public-private partnerships in terms of an NGO in setting up CHCs. Caunedo *et al*., (2022) consider ICT and deregulation in mechanization services markets. FASAR *et al*., (2016) consider the increasing land fragmentation of small-scale and marginal farmers and how CHCs enable access to machinery services even to such small-scale farm sizes. However, and most interestingly, what is also considered are cases on: EM3, a networking enterprise for mechanized services that uses ICT, including related advisory farm services, and provided via a CHC system; Zamindara Farm Solutions Pvt. Ltd. (ZFS) provides mechanized services, via call centres as well as extension services; and OLAM India is running CHCs so as to enable better backward linkages with farmers for their sugar milling operations. Daum *et al*., (2020) also cover the case of EM3. WEF (2023) consider Carnot technologies, which is facilitating and enabling start-up rural entrepreneurs, who are growing their tractor fleets. Interestingly it considers what is called 'Krish-e Smart Kit' which is an 'AI and IoT-based telematics system that goes on any tractor in the world and helps improve productivity in the tractor rental business, provided via three features: live tracking, farm and haulage work identification, and fuel monitoring' (WEF, 2023).

-Iraq

Hilmi (2021a) provides that AMHSEs, over many decades, have been run prevalently by the public sector, with informal private sector AMHSEs operating also. Commonly AMHSEs are: informal; work mainly on by farmer for farmer service mode; use outdated machinery as well as using low quality spare parts; and have overall low usage rates per unit of machinery. Low usage rates are attributable to the continued use of cultivation practices which are not suitable for using machinery, the lack of expertise in the maintenance and operation of machines, the lack of skills to manage machines, the irregular distribution of agricultural holdings, the lack of optimal utilization, the lack of scientific research and studies related to the agricultural mechanization in Iraq and the general and overall lack of interest in developing a machinery industry. In terms of farmers using services, uncertainty, frequency, measurability of the services concerned and the desire to make use of agricultural machinery are important determinants of hiring decision. These can also be influenced by socioeconomic factors such as age, years of experience, farm income, farm size, education level. Kahdim, (2018a) provides for the period between 2000 to 2017 and found that 'despite the numerical increase in tractors and combine harvesters, Iraq still suffered from a shortage of machinery services.' Estimates provided indicate that only '30 percent of farmers operate their own equipment, whereas 70 percent hire to undertake harvesting and seedbed preparation' (Kahdim, 2018a). Al Khanfous (2012) provides that in terms of challenges, the main issues were that farmers used machinery inappropriately as they were not familiar with modern technology, had little experience with it and did not have good skills in its use. Further maintenance was not carried out and if breakdowns did occur, farmers could not seem to identify the malfunctions.

-Kenya

De Groote *et al*., (2020) provides that in country mechanization is mainly based on animal traction. Reinsch (2021) considers a private enterprise, Hello Tractor, that also operates in Kenya, which

via a digital platform, registers services suppliers and service users. It offers tracking devices for tractors, travel routing to servicing areas, and thus enables to improve usage efficiency and also reduce time for travel to farms as well as the time taken for services on farm. Payments are made in cash, as digital payment fees for using the digital payment system were found to be too high. In 2021 Hello Tractor in Kenya had 300 registered tractors providing services to 41000 registered farmers. Anidi *et al*., (2020) consider another private enterprise, the Tinga Rental Store, which is a subsidiary of the main business of the enterprise, mainly a machinery leasing business, called Vehicle and Equipment Leasing Limited. Tinga uses a mobile application called 'TingA' that enables access to machinery services and is present in several counties within Kenya. However, the adoption rate of the application is slow, and most service booking requests are delivered via SMS. MALFC (2021) provides for a national mechanization strategy and within the 'rejuvenation' of mechanization stations, being operated by county governments. Such centres also offer infrastructure services, such as for example access roads, dams, and opening up of new land for farming.

-Myanmar

Win *et al*., (2020) provide that the rental market is well developed and since 2008 ownership of machinery has risen considerably. The rental market is in the majority of cases private-led, but there is also public sector involvement via the Agricultural Mechanization Department (AMD). Large farmers are the main providers of AMHSE services. Belton *et al*., (2018) provide that AMHSE services have been important in the spread of mechanization in country. Coverage of such services has gone beyond the rural community local market and brokerage services have also emerged. Other services, like transport, have also played a part in the services provided by AMHSEs. However, IFPRI (2023) provides that AMHSEs operate mostly locally within their communities and find challenges in moving further away from such communities. One of the major challenges though, for AMHSEs, is late payments made to AMHSEs for services provided. This is provided as per cash shortages faced by farmers and thus has provided for a lower demand for mechanized services. However, and overall, as a result of political, social and economic instability have all affected AMHSEs considerably in operating as a business.

-Nepal

Takeshima & Justice (2020) provide that AMHSEs are private individual-led, cooperative-led and specialized-enterprise-led. These represent the main components of the rental market in country. The AMHSEs do not only provide farm services, but also other services, such as for example transport. Sigdel *et al*., (2022) provides that AMHSEs and related ICT usage for accessing services is low. Further there seems to be a lack of uptake of both machinery services and related ICT as per a decrease in small-scale land holding and also per the lack of understanding, awareness and training. FAO (2021) provides that the public sector has been involved in CHC since 2006, and CHCs have evolved into partnerships with private, group and cooperative-led initiatives.

-Nigeria

Takeshima & Lawal (2020) provide that AMHSEs are provided by both the public and private sector, but have emerged mainly within country only in areas where there was a sufficient and effective demand for such services. This, consequently, providing for low adoption of tractors, for example. Differing typologies of AMHSEs have been promoted, such as for example, cooperatives and joint ownership, but the main typology is the informal individually owned AMHSE that provides the common by farmer to other farmers services. The public sector has been promoting AMHSEs, but implemented by the private sector, called the Agricultural Equipment Hiring Enterprises (AEHEs). Anidi *et al*., (2020) provide for another case on the private enterprise Hello Tractor, which is basically a booking platform to match demand for services with supply for services. The enterprise provides for an application for booking as well as physical brokers and provides tractors with tracking devices. However, for the operation to be implemented in an area there must be sufficient demand for services. Alabadan & Yusuf (2013) provide that in a case, the high cost of providing services by AMHSs, excessive repair times as a result of inappropriate management of equipment and lack of skills in using such equipment have not made mechanization services feasible. Takeshima *et al*., (2015) provide that state governments have been encouraging private sector AMHSEs to provide services, via the provision

of subsidized tractors. However, there are also other private sector operators that provide for services with tractors coming from private markets. Daum *et al*., (2020) provide that the penetration of smartphones is low and there is a lack of trust in using mobile applications and phones to book services. This lack of trust, as provided previously, has provided the need for physical booking agents that aggregate demand for services in a locality, but such demand needs to be sufficient to enable services to be provided in an area.

Discussion

From the initial, and not country specific findings, the analysis provided for mixed results, in terms of AMHSEs relevance to the sharing economy referring to the 35 characteristics as provided in Table 2 and the resulting categories in Table 1. In terms of agricultural mechanization in general, and AMHSEs in specific, moving beyond the farm gate, as per Lewis *et al*., (2022), Hilmi (2023; 2021b; 2018) and Reinsch (2021), in which services are offered that support communities in rural areas, but also strengthen them, for example, (community building and strengthening [see Table 2]), the more AMHSEs seemingly contribute and thus become more relevant to the sharing economy. In terms of AMHSEs seemingly being more like rural service enterprises was initially and preliminarily found by Hilmi (2023; 2021b), but also by the services which AMHSEs could provide along the agri-food value chain by AMHSEs as evidenced by Hilmi (2018). This was also found in Crossley *et al*., (2009) in terms of AMHSEs, providing transport services, for example, and Sims *et al*., (2012) in providing, for example, marketing services for agri-food products. Thus, from the current findings of this research, AMHSEs that go beyond farm gate, provided for a moderate ranking, as based on Table 1, in their relevance to the sharing economy, this being based on 15 characteristic criteria found as per Table 2.[24]

In terms of the African region as per Reinsch (2021) in terms of partnership fostered (partnership focused [see table 2]) by the cases of TROTRO in Ghana and Hello Tractor in Kenya, and also per the digitized brokerage services per se, scored, interestingly, a low relevance to the sharing economy. Indeed such enterprises have numerous potentials as provided by Anidi *et al*., (2020), however, the prevalent focus is on the digital side of matters, but the numerous challenges faced, as those provided by Adebola *et al*., 2022, Daum *et al*., 2020 and Anidi *et al*., (2020), made the relevance of such AMHSEs to the sharing economy as low based on 13 characteristics criteria found as per Table 2. Such digital brokerage services offer potentially considerable opportunities for spreading agricultural mechanization within the African region, but as still are mainly potentials and as such contribute lowly to the sharing economy. Indeed, this is much in line with that provided by Daum *et al*., (2020), for example, in that agricultural mechanization digitalization is only 'one valuable piece of the puzzle, but not the long awaited 'silver bullet' for smallholder mechanization….as agriculture will never depend on software alone.'

Interestingly, and still from the African region, Diao *et al*., (2016) provide for the most commonly found AMHSE, the micro-scale enterprise, that most often than not provides services by farmer to farmers and to other members in the local community. Such a typology of enterprise does provide for a series of advantages, for example, no administrative needs and costs (cost savings [see Table 2]), service delivery is fairly on demand and immediate (on demand consumption [see Table 2]), and both service demander and supplier are commonly within the same community (local community strengthening [see Table 2]) (Diao *et al*., 2016). But also taking into consideration other services which such enterprises can provide beyond the farm gate, and do provide, for example such as transport (see Crossly *et al*., 2009) and contributions to infrastructure work and waste collection (community support [see Table 2]) (see Hilmi, 2018), make the relevance of such micro-scale AMHSEs to the sharing economy as moderate based on 15 characteristics criteria found as per Table 2, even though such enterprises, for example, may not be digitalized, but may use mobile phones, for example.

Still on the African region, interestingly, Retamal & Dominish (2017) consider still the case of Hello Tractor, but from a regional level. The potentials are all there, and some have been effectively realised, but the numerous challenges also pertain, such as, for example, lack of access to the internet and smart phones and many still shy away from using mobile phones for booking tractor services. This

[24] As per reasons of length and space, it was not possible to provide all the characteristic criteria for each of the cases covered in terms of categorization. Thus, in this section of the article what is provided is just some example characteristic criteria from Table 2 related to each case.

providing, still, also at regional level for Hello Tractor, a low relevance of such AMHSE to the sharing economy based on 12 characteristic criteria found as per Table 2. In an interesting case, provided by AgriShare, (2023) with regards to a digital application provided by an NGO (Welthungerhilfe), this also provided for a low relevance to the sharing economy as per its 13 characteristic criteria found as per Table 2. This is so, in that, even though Agrisahre digital application is a local level community aggregator (community building and strengthening [see Table 2]), for example, it still, like other digital brokers, confronts many challenges, common to other digital brokerage applications.

In terms of the Asia region, with a focus on South and Southeast Asia, as provided by FAO (2021), the relevance of AMHSEs to the sharing economy is high. This, not only from the long documented history of sharing and of AMHSEs within the region, but also for example of CHC that are based prevalently around group enterprises at local community level (community strengthening [see Table 2]), CHCs which can also be partnerships between public, private and NGOs (partnership focused [see Table 2]) and the overall growing number of CHCs in the region, including the advantages of such 'cooperative' forms of organization, as for example provided by Gilbert (2018) and Kenkel & Long (2007), make the relevance of such AMHSEs as high based on 22 characteristic criteria found as per Table 2.

The summary of the above findings of the relevance of AMHSEs to the sharing economy and related categorization can be found in Table 3.

Table 3: Relevance of AMHSEs to the sharing economy at regional level

Region	Cases	Relevance category
General	Lewis *et al*., (2022)'Hilmi (2023; 2021b; 2018); Reinsch (2021); Sims *et al*., (2012); Crossly *et al*., (2009)	Moderate
Africa	Reinsch (2021); Adebola *et al*., (2022); Daum *et al*., (2020); Anidi *et al*., (2020)	Low
Africa	Diao *et al*., (2016); Hilmi (2018); Crossly *et al*., (2009)	Moderate
Africa	Retamal & Dominish (2017)	Low
Africa	AgriShare (2023)	Low
Asia	FAO (2021); Gilbert (2018); Kenkel & Long (2007)	High

In terms of Table 3, and on a preliminary basis, what is found is that AMHSEs have a mixed relevance to the sharing economy. In the majority of African regional cases there is a low relevance of AMHSES to the sharing economy, save for one, which is moderate. In terms of the Asian region, it is categorized as high. In terms of the more general case to the relevance of AMHSEs to the sharing economy it was found to be moderate. Hence, from the findings what emerges is, as provided previously, a mixed set of results overall, but with a fair tendency for AMHSEs to have low to moderate relevance to the sharing economy, thus matching between 8 to 21 characteristics of the sharing economy as per Table 2. This in terms of percentages, providing that AMHSEs have between 20 to 59 precent relevance to the sharing economy.

In terms of the country specific cases, the following resulted from the analysis of the findings:

- China as per the cases provided, Liu *et al*., (2022), Yang *et al*., (2013), Zhang *et al*., (2020), Sang *et al*., (2023), Yang & Jiang, (2023), Lu *et al*., (2022) and Qui *et al*., (2021), provide for a moderate level of AMHSE relevance to the sharing economy. This is interesting as China has a strong social sense in setting up AMHSEs, via for example, group AMHSEs and cooperative based, intermingled also with private based AMHSEs, (partnership focus; community building; social market [see Table 2]) and the emergence of digital AMHSEs, like, NSB for example, (technology based [see Table 2]). However, there are still numerous challenges. These for example, range from the lack of ICT penetration and internet availability in rural areas, to lack of digital literacy to traditional farming methods. In fact, the cases devoted to China, provided for, just a moderate level of AMHSEs relevance to the sharing economy as per the 15 characteristics criteria found as per Table 2;
- In terms of Ethiopia and the cases provided, Deribe *et al*., (2021), Ayele (2022), Berhane *et al*., (2020) and Tesema *et al*., (2023), provide for a very low level of AMHSE relevance to the sharing economy. This is a result, not only of a general lack of agricultural mechanization in

country, but as, for example, per farm-sizes, traditional farming practices, lack of service availability and related costs of such services. Even though, the public sector is involved in setting up AMHSE centres (community building [see Table 2]) and there is to a degree an increase in services provided from the private sector (underutilized assets [see Table 2]), for example, this creates an oversupply in an already small and fragmented market for rental services. In fact, the cases devoted to Ethiopia, provided for a very low level of AMHSEs relevance to the sharing economy as per the 5 characteristics criteria found as per Table 2;

- In terms of Ghana and the cases provided, Diao & Takeshima (2020), Amanor & Iddrisu (2022), Diao *et al*., (2019), Houssou *et al*., (2015), Reinsch (2021) and Anidi *et al*., (2020), provide for a low relevance of AMHSE to the sharing economy. Even though there is duality in the supply of services, coming from both the public and private sector, and partnerships within (partnership focus [see Table 2]), and growing and potential effects of a digital AMHSE (technology based [see Table 2]), but the uptake is still limited and in some rural areas, for example, digitalization is absent or nascent, there is resistance to use such services, services are not fully available cross country and where they are present tend to be dominated by medium to large-scale farmers. In fact, the cases devoted to Ghana, provided for a low level of AMHSEs relevance to the sharing economy as per the 9 characteristics criteria found as per Table 2;
- In terms of India and the cases provided, Naushad & Prasad (2023), Bhattarai *et al*., (2020), NABARD (2018), Rawat *et al*., (2020), Kamboj *et al*., (2012), Chahal *et al*., (2014), Priyanka *et al*., (2022), Chinnappa *et al*., (2018), Caunedo *et al*., (2022), FASAR *et al*., (2016), Daum *et al*., (2020) and WEF (2023), provide for a high relevance of AMHSEs to the sharing economy. This is owed, for example, to the emphasis, not only on the private sector, but on the social economy, working together, as provided by CHC (partnership focus; community building; social market [see Table 2]). These are fairly diffused throughout the country, and for example, strengthening community sense at village level, a social economy at such level as well as the possibility of such CHC offering multiple services related to farming. Further the penetration of the internet, ICT and digitalization (technology based; consumer attitude change [see Table 2]), for example, in rural areas, is high and increasing. In fact, the cases devoted to India, provided for a high level of AMHSEs relevance to the sharing economy as per the 24 characteristics criteria found as per Table 2;
- In terms of Iraq and the cases provided, Hilmi (2021a), (Kahdim, 2018a) and Al Khanfous (2012), provide for a low relevance of AMHSEs to the sharing economy. This is interesting as Iraq in general, tends to have a focus on a more social economy, especially at the local level and hence a fairly strong community sense, however AMHSE services are limited, as per, for example, traditional farming practices, aging machinery, mishandling of machinery, lack of maintenance and lack of ICT and digital usage know-how. This providing for in reality a limited supply of services, which counters a somewhat limited growing demand for services. In fact, the cases devoted to Iraq, provided for a low level of AMHSEs relevance to the sharing economy as per the 7 characteristics criteria found as per Table 2;
- In terms of Kenya and the cases provided, De Groote *et al*., (2020), Reinsch (2021), Anidi *et al*., (2020) and MALFC (2021), provide for a low relevance of AMHSEs to the sharing economy. Interestingly similar to Ghana, Kenya has low levels of mechanization, which are not country wide, the public sector is fostering mechanization stations (partnerships; community building [see Table 2]), and there are digital brokerage services (technology based [see Table 2]) which provide for good potentials, but face challenges. Indeed, the adoption rate of smartphones, for example, is low, even though increasing and payments still need to be done physically in cash, in the majority of cases. In fact, the cases devoted to Kenya, provided for a low level of AMHSEs relevance to the sharing economy as per the 9 characteristics criteria found as per Table 2;
- In terms of Myanmar and the cases provided, Win *et al*., (2020), Belton *et al*., (2018) and IFPRI (2023), provide for a low relevance of AMHSEs to the sharing economy. This is interesting, as commonly in Southeast Asia, as per FAO (2021), have a long historical trajectory of sharing. The rental market is mainly private led AMHSEs, with some public involvement, AMHSEs, tend to attempt to go beyond the farm gate, offering various non-farm services and tend to be localized within community areas (community strengthening [see Table 2]). However, one of the major

issues is late payments, thus cash shortfalls for AMHSEs and thus jeopardize enterprise economic sustainability. There is also, like in the previous cases, a seemingly lack of sustainability of AMHSEs from a natural environmental and climate impacting perspective (environmental and climate sensitive consumption [see Table 2]), for example. In fact, the cases devoted to Myanmar, provided for a low level of AMHSEs relevance to the sharing economy as per the 11 characteristics criteria found as per Table 2;

- In terms of Nepal and the cases provided, Takeshima & Justice (2020), Sigdel *et al*., (2022) and FAO (2021), provide for a low relevance of AMHSEs to the sharing economy. This is interesting, as Nepal, like Myanmar, is an Asian country, and as such has a long sharing history as per its social economy connotations. Even though AMHSEs are provided from the private sector and cooperative sector and public sector, via a growing CHC partnership typology (partnership focus [see Table 2]), the uptake of services is low, even though services are also offered beyond the farm gate and ICT and digital literacy are lacking. Further and also here, there is seemingly a lack of AMHSE sustainability from a perspective of the impacts on the natural environmental and climate (environmental and climate sensitive consumption [see Table 2]), for example. In fact, the cases devoted to Nepal, provided for a low level of AMHSEs relevance to the sharing economy as per the 8 characteristics criteria found as per Table 2;
- In terms of Nigeria and the cases provided, Takeshima & Lawal (2020), Anidi *et al*., (2020), Alabadan & Yusuf (2013), Takeshima *et al*., (2015) and Daum *et al*., (2020), provide for a low relevance of AMHSEs to the sharing economy. This is much like the cases that pertain to Kenya and Ghana, interestingly, as also in Nigeria AMHSEs, surface only in areas, where there is a viable market for them, even though state governments have been promoting the setting up of private AMHSEs (community building [see Table 2]) and not only. The AMHSEs are provided via both public and private sector and there is an emerging digital brokage service sector with considerable potential, but with the common challenges like those faced in Kenya and Ghana. The main challenges for AMHSEs though are the high costs incurred in their running, long repair times, lack of maintenance and lack of skills in using equipment appropriately. Further, the lack of internet penetration and lack of digital skills have added further challenges. Moreover, there is seemingly a lack of focus on sustainability by AMHSEs from a perspective of the impacts on the natural environmental and climate, for example. In fact, the cases devoted to Nigeria, provided for a low level of AMHSEs relevance to the sharing economy as per the 10 characteristics criteria found as per Table 2.

The summary of the above findings of the relevance of AMHSEs to the sharing economy and related categorization can be found in Table 4.

Table 4: Relevance of AMHSEs to the sharing economy at country level

Country	Cases	Relevance category
China	Liu *et al*., (2022), Yang *et al*., (2013), Zhang *et al*., (2020), Sang *et al*., (2023), Yang & Jiang, (2023), Lu *et al*., (2022), Qui *et al*., (2021)	Moderate
Ethiopia	Deribe *et al*., (2021), Ayele (2022), Berhane *et al*., (2020), Tesema *et al*., (2023)	Very low
Ghana	Diao & Takeshima (2020), Amanor & Iddrisu (2022), Diao *et al*., (2019), Houssou *et al*., (2015), Reinsch (2021), Anidi *et al*., (2020)	Low
India	Naushad & Prasad (2023), Bhattarai *et al*., (2020), NABARD (2018), Rawat *et al*., (2020), Kamboj *et al*., (2012), Chahal *et al*., (2014), Priyanka *et al*., (2022), Chinnappa *et al*., (2018), Caunedo *et al*., (2022), FASAR *et al*., (2016), Daum *et al*., (2020), WEF (2023)	High
Iraq	Hilmi (2021a), (Kahdim, 2018a), Al Khanfous (2012)	Low
Kenya	De Groote *et al*., (2020), Reinsch (2021), Anidi *et al*., (2020), MALFC (2021)	Low
Myanmar	Win *et al*., (2020), Belton *et al*., (2018), IFPRI (2023)	Low
Nepal	Takeshima & Justice (2020), Sigdel *et al*., (2022), FAO (2021)	Low
Nigeria	Takeshima & Lawal (2020), Anidi *et al*., (2020), Alabadan & Yusuf (2013), Takeshima *et al*., (2015), Daum *et al*., (2020),	Low

As per the above results from the regional cases in Table 3 and also from the country cases, as per Table 4, provide for a mix of relevance of AMHSEs to the sharing economy, but with an emphasis, in the majority of cases, of low relevance. Of the nine countries considered six countries (Ghana, Iraq, Kenya, Myanmar, Nepal, Nigeria) provide for a low relevance of AMHSEs to the sharing economy and one country (Ethiopia), provides to be of very low relevance. For the two other countries remaining, China provides to have AMHSEs that have a moderate relevance to the sharing economy, while India provides to have a high relevance of AMHSEs toward the sharing economy. Interestingly Table 3 and Table 4 show a similar trend, where there is a low relevance of AMHSEs to the sharing economy, save for being slightly more moderate in AMHSEs relevance to the sharing economy in Table 3. However, and overall, there is a clear tendency of a low relevance to the sharing economy, thus matching between 7 to 14 characteristics of the sharing economy as per Table 2. This in terms of percentages, providing that AMHSEs have between 20 to 39 precent relevance to the sharing economy.

Conclusions

Overall, and from the analysis of the findings, what emerges from this research is that, even though AMHSEs have an overall mixed relevance to the sharing economy, there is a clear tendency that AMHSEs have a low relevance to the sharing economy. This comes out quite clearly from both the regional and country-based cases. But there are two cases out of nine, for example, China and India, where AMHSEs have a moderate relevance to the sharing economy (China) and a high relevance to the sharing economy (India). This is interesting, especially in the case of India, where effectively the sharing economy is at work and is seemingly working well. This, derived, from among the many characteristic criteria provided in Table 2, to be based, for example, on partnership fostering, working at local community level, budling and supporting local communities and also focusing on a far more social economy. These are all seemingly embedded in the various CHC 'models' provided within country, for example.

In terms of percentages, (see Table 1) the major tendency found of low relevance of AMHSEs to the sharing economy provides thus to be between 20 to 39 precent. In terms of the minor trend found, that of moderate relevance of AMHSEs to the sharing economy provides to be between 40 to 59 percent. In terms of the only case found, India, which provided for a high relevance of AMHSEs to the sharing economy provided to be between 60 to 79 percent. Interestingly there is no regional case and no country case that provides for a very high relevance to the sharing economy, which in percentage terms ranges from 80 to 100 percent. Thus, and overall, what has resulted from the analysis of the findings is that AMHSEs have a low relevance of between 20 to 39 percent to the sharing economy.

The above provides that the common adage of AMHSEs contributing to the sharing economy practice in a substantive way, does not really hold as per the findings of this research. This, clearly, being considered within the boundaries of the research,[25] its limitations[26] and thus its implied limited inferences to a wider universe. However, such findings, do provide for a clear 'indication' that AMHSEs, overall, have a low relevance to the sharing economy practice. Digital AMHSEs, for example, do in fact contribute to the sharing economy, but their overall impact, even though potentially promising, do not seemingly contribute as expected to the sharing economy. In fact, Adebola *et al*., (2022), as also provided previously, for example, find that only circa 13 percent, in sub-Saharan Africa, have registered for mechanized service use, via mobile phones. Further, the natural environment and climate impact of AMHSEs, as per that implied by the sharing economy, for example, does not really provide for the expected as hardly any cases per se, both for the regional as well as for the country cases, cover such matters in great detail. Moreover, the expected transformative economic system, the mixing of the social and market economies, commonly thought to be provided by AMHSEs, and clearly implied by the sharing economy does emerge, but, yet again, with not the expected emphasis and impact.

This all implies that in terms of the sharing economy practice in developing countries there is seemingly a low 'implementation'. This provides that more research is needed on the sharing economy practice in developing countries. This further research, however, should consider, among the others, the

[25] The research was based on literature and sources of secondary data and information.

[26] The research covered two regions, Africa and Asia, and nine countries out of a recognized 195 countries in the world (Worldometer, 2023), of which 152 are considered to be in development (WorldData.info, 2023). Of these, 46 countries are considered to be least developed (UNCTAD, 2023).

call by Qureshi *et al*., (2021b), for the sharing economy in developing countries to be reconceptualized on many aspects, as for example, the challenges provided by marginalized groups. Thus, such research seemingly needs to consider differing perspectives on the sharing economy and its practice, which could possibly enable a far better understanding of the sharing economy within developing country contexts.

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