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Which perspectives for work in agriculture? Food for thought for a research agenda

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The 2nd International Symposium on Work in Agriculture (March 29–April 1 2021) was a moment for debate on the perspectives of work in agriculture. In this article, we propose to summarize the exchanges that outline the major issues from this event. We made a bibliometric analysis of all the contributions presented and a cross-cutting expert synthesis. Agricultural work and drivers of employment were the main topics of the presentations, with North and Global South countries facing different labor productivity dynamics. Some questions are continent specific: will OECD countries see agriculture without farmers? Will agriculture provide decent work to youth, notably in the Sub-Saharan Africa? With which models of agriculture? Some issues are common globally: the ability of the agroecological transition to improve working conditions and provide new jobs; the recognition of women and ethnic groups' contributions to work and to decisions. The digital revolution and the migration flows to and from rural areas and cities are also changing agricultural work substantially. Cross-cutting perspectives are introduced such as the potential of the decent work concept to foster the attractiveness of the agricultural professions, the effect of value chains and the potential of the territorial approach to work to foster interdisciplinary and transdisciplinary viewpoints in addressing problems in the domain.

KEYWORDS

agriculture, work, labour, farming, family, multidisciplinary

Introduction

An estimated 1.3 billion people work in agriculture (family farmers, salaried workers), representing 27% of the world's working population (World Bank, 2018). The percentage of these workers in the active population is in decline: it represented 46 % in 1996. However, the number of agricultural workers is expected to remain stable in the coming years with other sectors, especially the services sector, not developing fast enough to absorb the demographic growth of the population in rural areas. The percentage of

TABLE 1 Agriculture as a proportion of the total workforce in selected countries (2020).

Country	Agriculture (% of total workforce)	Country	Agriculture (% of total workforce)
Argentina	0.09	Iran	18
Canada	1	Egypt	23
Israel	1	Philippines	23
United Kingdom	1	China	25
United States	1	Indonesia	28
France	2	Fiji	36
Netherlands	2	Pakistan	36
Australia	3	Vietnam	36
Japan	3	Solomon Islands	37
South Africa	5	Bangladesh	38
New Zealand	6	India	41
Russia	6	Papua New Guinea	58
Brazil	9	Nepal	65
Chile	9	Ethiopia	66
Mexico	12	Niger	75
Ukraine	14	Somalia	83

Source: World Bank (2021).

agricultural workers in the total working population in OECD countries,¹ is around 3%, well below the world average, whereas in some countries in the Global South the majority of the working population are involved in agriculture (Table 1).

The issues and challenges associated with the agricultural workforce has caught the attention of national governments (e.g., Azarias et al., 2020) and international organizations (Losch, 2016) as they refer to policies, which span the agriculture, education, community and social domains. The scientific literature on the world of agricultural work is mainly framed in disciplinary domains (Malanski et al., 2021) (see Appendix). Given the importance of agricultural work and its ongoing changes, a consolidated outlook on its future at a global scale and inclusive of a multidisciplinary perspective is needed. This was the objective of the 2nd International Symposium on Work in Agriculture, which was held in virtual format from 29 March to 1 April 2021. The symposium's scientific objectives were:

- First, to foster dialogue between disciplines that make up the field. We used the definition of clusters proposed through bibliometric analysis (Malanski et al., 2021) to organize

1 Although both concepts are not perfectly overlapped, as a matter of simplification, in this paper we refer to OECD and Global North as: United States, Canada, Australia, New Zealand, United Kingdom, France, Spain, Italy, Ireland, Belgium, Luxemburg, the Netherlands, Denmark, Sweden, Norway, Finland, South Korea and Japan. The Global South refers to the other countries, including China and India.

the thematic workshops. Using other syntheses (e.g., Dedieu, 2019), we sought to build multidisciplinary exchanges *via* questions on the dynamics of agricultural and work models and on innovations impacting work (precision agriculture, agro-ecological transition) and, finally, through a collective participatory brainstorming on the future of work in agriculture;

- Second, to combine and reconcile views on work in the OECD and the Global South. Even though there are glaring differences, such as the percentage of agricultural workers in the total active population or the very low level of mechanization of agricultural work in the Global South (Mazoyer, 2008; Baudron et al., 2019), the essential questions arising in one setting decontextualize and encourage those in other settings, such as questions concerning attractiveness of agricultural jobs. What characterize it may be only partially common in different regions of the world but the weight of factors (e.g., remuneration, drudgery, working times, societal considerations of the profession...) may differ.

In this article, we propose to summarize the exchanges focussing on the Symposium redline that outline major issues surrounding the perspectives of work in agriculture. Our objective is to extract the major topics and ideas that were debated from OECD (Organisation for Economic Co-operation and Development) and Global South countries to consider the future of work and discuss implications to be explored more deeply in the future. This synthesis maintains the fundamentals of the ISWA: considering with equal interest the various declinations of what "work" means that are allowed by our multidisciplinary approaches. Work may be understood as a job, as an entity to be organized at the farm level, a profession with its standards, an interaction between male and female operators' intelligence and prescribed tasks (Leplat, 2008).

Materials and methods

The call and the participants

The topics for the call of papers are summarized in the Table 2. They cover a wide range of disciplinary domains (from economy to ergonomics, sociology, farming systems) and thematics, giving place for the various declinations of what work is.

As the Symposium was online, the scientific participants came from various countries. Europe represented 48 % of the 385 registered participants, coming notably from France (28 % of the total), Belgium and Switzerland (4 % each). USA, Canada and Australia represented 6 % of the total. South America represented 22% of the total-mainly from Brazil (18%). Africa and Asia had the same weight (12 % each) with Morocco (4%) and Uganda (3%) as big contributors for Africa and India (9%) for Asia. China had one participant.

TABLE 2 List of workshops.

Workshop	The workshop aims at investigating
Employment	The workshop aims at investigating: Data issues related to employment in agriculture, multi-activity, job migration Structural transformation, rural-urban migration; Labor type, organization and productivity at the farm level; Rural labor markets, cross-country labor markets. Agricultural labor in global value chains; Impact of alternative technologies on agricultural employment and work; Policies to support agricultural employment and/or income.
Health and work in agricultural activity	How to maintain a sustainable life at work by balancing personal life with work? What factors most impact the quality of life of rural workers? What are the main morbidity and mortality profiles involving the health of the worker who works in the agricultural activity? What are the main determinants and risk factors of this profile? What are the main actions and policies to promote and protect the health of rural workers? How effective or efficient are these actions? How can each discipline (ergonomics, agronomy, epidemiology etc.) help to elucidate risk factors? How can it propose new ways of organizing work in order to minimize the different overloads (physical, cognitive and mental) that may be present in the work with agriculture and livestock? How to keep agriculture a sustainable activity considering the health and socio-environmental aspects?
Rural development	The contribution of work in agriculture to local development from both an economic and social point of view. The interactions and relationships which emerge between farm labor and the employment opportunities which result from the emergence of multifunctional agriculture and from the wider rural economy. Reconfiguring labor in agriculture to enable resilience and sustainable rural livelihoods. How pluriactivity both inside and outside the farm gate impacts the viability of farms. Ways in which household food security and poverty reduction can be achieved through directing farm household labor toward rural development initiatives. How farmers, working collectively, provide opportunities for farm labor to engage in rural development activities.
Gender issues in agriculture	Agricultural work and empowerment of women, including decent employment or self-employment forms for women. Social security issues of women in agriculture, i.e., lack of it and its consequences in situations of risks such as divorce, invalidity or old-age. Women and agricultural entrepreneurship / agribusinesses, value addition and implications. Gender division of labor on farms and in the farm household, including gendered drudgery, unpaid care work, “time poverty,” among others, and implications for their engagement in, and

(Continued)

TABLE 2 (Continued)

Workshop	The workshop aims at investigating
	benefits from agricultural value chains. Changing gender roles in agriculture, i.e., women as farm operators vs. women as farmers' wives.
Wage earners	Statistical or empirical studies of the diversity and abundance of different types of wage earners. Prevalence and implications of precarious and informal employment conditions, including labor outsourcing; situation of migrant workers. Frameworks and methods to analyze changes in wage-earners' work. Human resource management strategies and practices (attracting, hiring and retaining people; farmers as employers. Agricultural Economics and wage-earners in farming systems. Political economy and its impact on wage-earners.
Forms of work organization	The diversity of forms of work organization in agriculture in the light of different challenges (productivity, labor flexibility, capacity to transform and adapt, etc.). Their contribution to the definition of different agricultural models. How these forms of organization are changing with the rise of industrial agriculture but also the renewal of family forms associated (often) with agroecology, without forgetting the community or cooperative forms (sharing labor and machinery, group farming) present in many countries. Methods and frameworks for analyzing work organization.
Farming models and professional identities	Workers categories, work organizations, working indicators that are associated to farming models (family, collective, agroecological, industrial etc.). The places for young people, women, the elderly, ethnic and racial minorities in farming models. The dynamics and changes that are affecting work within models Accompanying approaches of changes from one model to another and what dimension of work will be at stake (skills, organization, cooperation, standards etc.).
Innovations and adaptation to changes	Changes in work rhythms, workload, quality of working life, professional identities, social organization, careers and the skills required at farm level including farm staff, family labor and contractors. Processes of deskilling and reskilling, and local adaptation. Farming systems design related to work arrangements and novel responses to evolutions, including social innovations through collaborations and new partnerships. The changes in agricultural advisory work and services to support new ways of farming and farm work. The ways in which agricultural innovation system actors are reconfiguring and responding these disruptions. Ways in which capacity is built to respond to innovations disruption including through education and professional development.

Data analysis

To reach our objective, a corpus was built, consisting of:

- i) Plenary presentations highlighting the domains of interest and the points of view of international organizations: FAO-the Food and Agriculture Organization discussed “decent work.” IFAD-International Fund for Agricultural Development, World Bank and CIRAD (French Agricultural Research Centre for International Development referred more to the political economy of the agricultural work. The other plenary presentations gave overviews of the diversity of approaches of the scientific community gathered by the keywords work/labor in agriculture.
- ii) Scientific presentations ($n = 65$) within the 8 workshops (Table 2) on the basis of papers revised and accepted by the scientific committee.
- iii) The elaboration of the main lines of a multidisciplinary research agenda, and recommendations for training and extension structures and for public policies arrived from a sequence combining the scientific committee’s own reflections with the ideas of the symposium participants. The scientific committee gathered researchers from various disciplines: economics (3), management, sociology (4), farming systems (3), ergonomics (1), innovation studies (1), and met twice (virtual seminar) to elaborate the scientific roadmap.

All these data are available on the website <https://symposium.inrae.fr/workinagriculture-iswa/>.

In order to highlight the main ideas exchanged during the Symposium, a lexicometric analysis of the powerpoint’s texts corpus has been made according to the Reinert (1990) using the IRaMuTeQ software (v. 0.7), an interface of R software. Powerpoints cover all the presentations, including the plenaries and concluding discussions (that were not associated with papers). Reinert method statistically classifies frequent associations of terms in a sentence based on descending hierarchical classification. Results are displayed in a dendrogram indicating the classes, which represent the major issues surrounding the perspectives of work in agriculture discussed during the symposium. The significant ($p < 0.05$) textual content of each class is displayed in a wordcloud. The size of each term indicates the strength of the link between the term and the class.

The second way of analysis of the Symposium debates is the authors’ expert outlook of the ideas exchanged, providing a narrative transversal synthesis of the perspectives on work in agriculture. The process was iterative, starting with a short concept note proposed by the ISWA Chairman (first author) just after the Symposium and enriched by the textual analysis and by the contributions of the other authors. The authors all participated in the two scientific seminars devoted to

exchanges about the research agenda on work and agriculture. They also convened separate workshops (employment, wage earners, innovation, farming models and work organization). These disciplinary domains of interest cover economics and management, farming systems, and sociology.

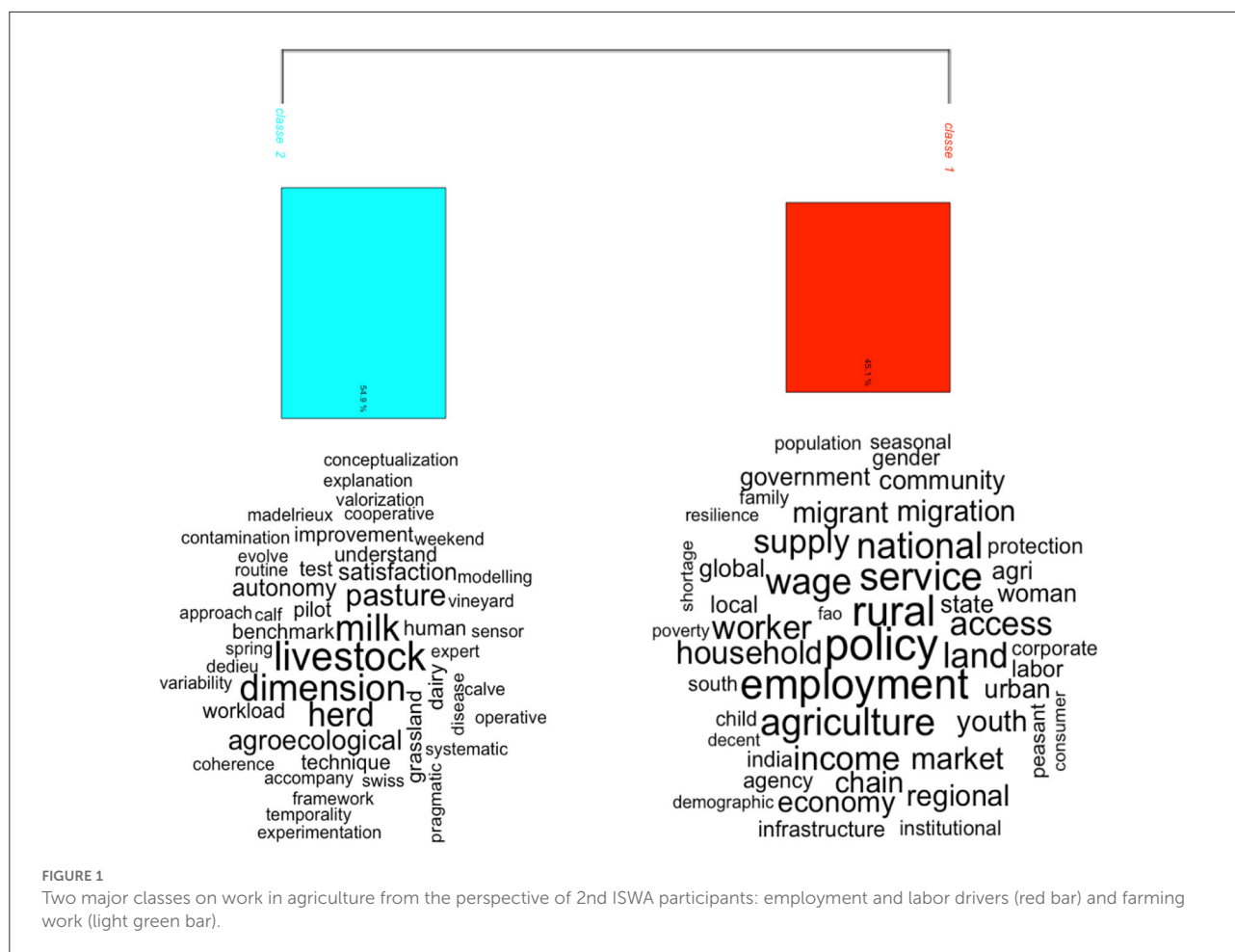
Results

Major issues on work in agriculture: The perspective of 2nd ISWA participants

We identified two classes of issues based on the descending hierarchical classification covering 82% of the corpus (Figure 1).

Cluster 1 covers 45.1% of the corpus, and represents the issues regarding drivers of employment and labor dynamics. The action of governments through rural policies frames the public institutional context of rural employment and labor (e.g., labor shortages, wages, social protection, employment policies focused on youth, child labor and gender), as well as the access to resources, such as land and labor, for example the regulation of national borders regarding migrant workers. The development of supply chains frames the private institutional context of rural employment and labor through governance of buyer-driven chains (e.g., corporate, consumer). When downstream lead firms and consumers define the conditions under which other actors in the chain operate, private standards and institutions play the role of coordinating the chain and guide relevant aspects, beyond product and information flows, such as extrinsic values linked to labor issues (e.g., upstream working conditions and social standards). Demographic dynamics, but also work requirements from production systems, jobs opportunities in cities, politics, socio-economic factors drive significant current employment and labor trends, such as national or international migration for labor—specifically seasonal workers (e.g., demographic, population, migrant, migration, seasonal). These drivers are considered in different geographical levels (e.g., global, national, regional, local; rural-urban), and levels of analysis (e.g., employment market, supply chain, institutional). The combined action of these main drivers are important to public and private initiatives to address employment, labor and their related issues, such as the compliance of decent work guidelines from ILO/FAO, regulation of labor shortages and mobility of workforce, attractive wages and income generation to maintain households and reduce poverty in rural communities.

Cluster 2 covers 54.9% of the corpus, and represents the issues regarding farming work. Farming work is considered under two dimensions: the objective dimension or technical factors; the subjective dimension or human factors. The objective dimension or technical factor is characterized by the analysis of measurable indicators of farming work, such as workload, temporalities, routine and variability of work, and



equipment. The subjective dimension refers to the perception by the worker, the individual. It is characterized by the analysis of qualified dimensions of farming work, such as the satisfaction of farmers regarding their working conditions, and autonomy to decide how to organize farming work. Researchers have developed conceptual models, frameworks, approaches and benchmarks to better understand and explain these two dimensions. Livestock farms—especially dairy farms—are the highlighted empirical studies, as well as the agroecological² farms.

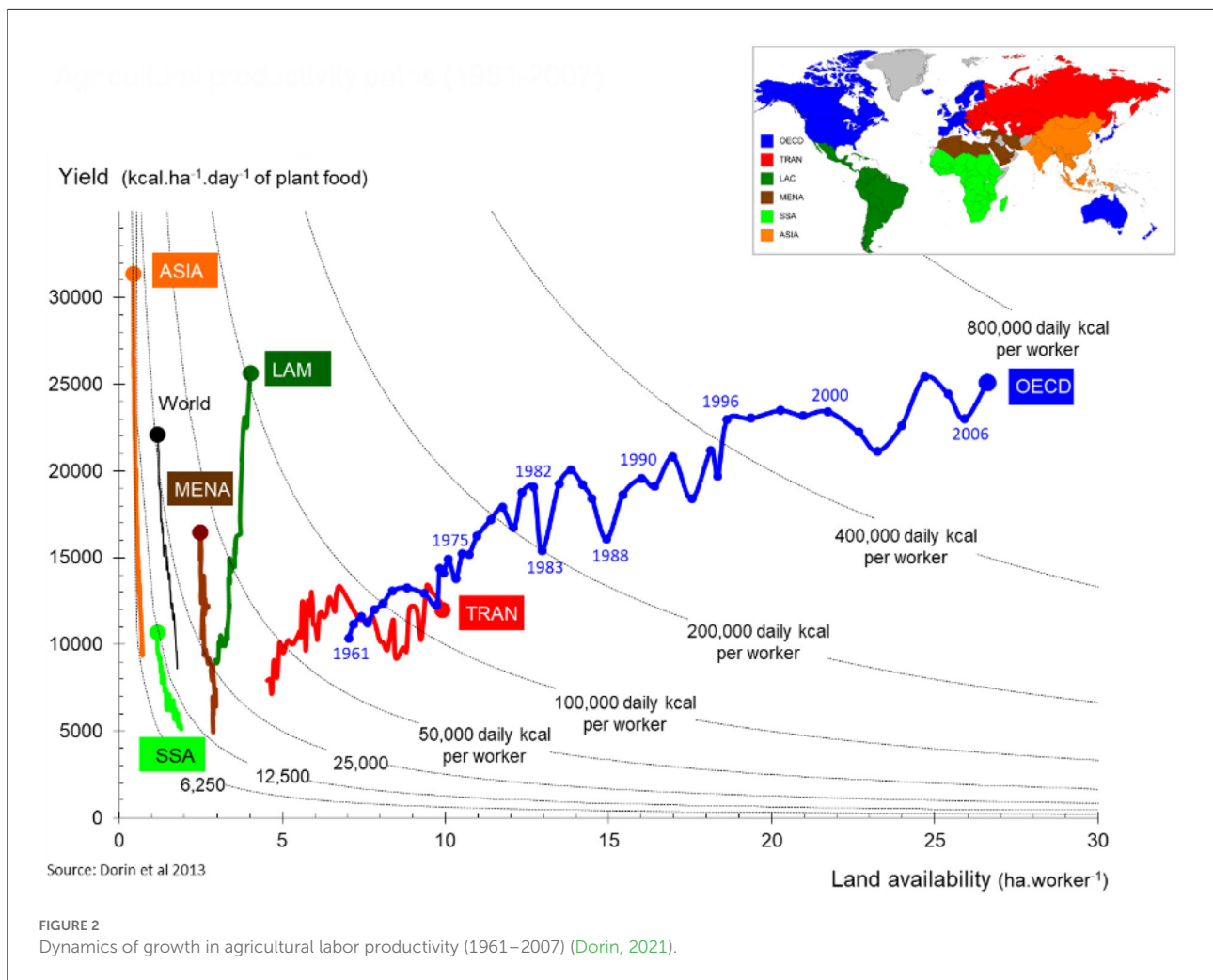
² “Agroecology” is defined, from a scientific and technical perspective, as the application of ecological concepts and principles (and notably ecosystem services) to farming systems, focusing on the interactions between plants, animals, humans and the environment. Agroecology is often opposed to “sustainable intensification” which is an approach using technological innovations to increase productivity on existing agricultural land with positive environmental impacts (HLPE, 2016).

Contrasting dynamics of agricultural development that distinguish OECD countries from the rest of the world

The trajectory of agricultural labor productivity growth (expressed in kcal produced per worker per day) varies widely between different regions of the globe (Figure 2) in particular in relation with increases in the area farmed per worker (X axis) and increases in yields per hectare (Y axis).

The OECD countries

The OECD countries have a very specific trajectory from those of their non-OECD counterparts. The former has relied on increasing agricultural labor productivity by combining, in roughly equal measure, the processes of increasing yields per hectare *and* of increasing the area farmed per worker, the latter process going hand in hand with a steady decline in the active agricultural population and a substitution of labor by capital. A consistent theme across developed countries has been the substantial decline in the agriculture workforce over



time. Increasingly, there are reported difficulties in meeting agricultural workforce needs. This is caused by a common set of social and demographic trends associated with long-term economic development, including a shift in the workforce toward higher paying, less physically demanding jobs in services and other industries, higher costs of living and rural-to-urban migration (Taylor and Chartlon, 2018; Zahniser et al., 2018). Historically, from the second half of the XIX century in OECD countries but since the late 1980s in China, the labor surplus from rural areas has found employment in industry and, more recently, in the services sector. The industrialization of agriculture, with the use of mechanization, external inputs, such as chemical fertilizers and pesticides, and the development of large-scale crops and livestock husbandry, has led to an increase in both metrics: yields per hectare or per livestock unit, and the area of land or quantity of livestock farmed per worker. It is then less expensive in terms of labor to spread inputs on a field (and this can easily be outsourced to a company) than to manage plant diseases and soil fertility

with complex rotations, intercropping cultivations and mix crop-livestock farming.

Several sets of questions emerged from symposium participants related to the future of work in OECD countries:

- If the trends of the last 50 years continue, to what extent are OECD countries heading toward a model of farming without farmers (Timmer, 2009), made up instead of holders of capital, hired workers and hyper-mechanization? Initial observations on the rise of contracting of tasks (Nye, 2018)–ranging up to complete outsourcing (Nguyen et al., 2021)–point to an increasing share of farm work being carried out by private contractors or machinery cooperatives. The general idea is that in a system with partial delegation, farmers only outsource the workers within the framework of their own logic. This logic combines a biotechnical programme (crops and livestock performances and inputs dependency objectives) and an organization of work that meets their economic expectations (e.g., through labor productivity) as well as their working conditions specifications (duration of their work, holidays

opportunities, adjustments with other off farm activities). Who defines the farming systems principles when these entire farming system operations are fully outsourced?

- What will be the work of the farmers and their relatives as well as that of wage-earners in the alternative farm models, alternative to the labor intensification dominant model? The alternative models cover agroecology and organic systems, community supported farms, i.e., farms constructed in frameworks of partnerships between farmers and citizen-consumers (Fomina et al., 2022), farms run by associations that buy land (Martin-Prevel et al., 2021), or farms managed by large collectives, linking production, processing and local crafts. What are the skills, work organization, employment profiles and working conditions associated to these models?

- What will attract farm managers and permanent or temporary salaried workers to farming professions? Indeed, there are relatively few studies on the quality of work as perceived by farmers, linking, for example the concept of work satisfaction (Besser and Mann, 2015) with points of view on income, working hours and drudgery, technical skills, meaning and, finally, recognition of work. This happens at a time when society is increasingly challenging intensive agricultural practices and directing criticism at the farming profession. Even fewer studies explore what employees think of their work in the various configurations of farm salaries, groups of employers with two or three farmers, replacement services, subcontracting and temporary-work companies. The issues of autonomy and specialization of their activities, working and living conditions, and the scope for advancement in the medium term will play a major role in determining the attractiveness of farming work for employees and their turnover (Malanski et al., 2019; Santhanam-Martin et al., 2021).

The countries of the global south

The countries of the Global South have not experienced an increase in labor productivity equivalent to the OECD countries. Figure 2 shows various intensities in the yield growths from one continent to another but—except former Soviet Union countries—a common pressure on the land area per worker which has slightly changed (Latin America) or even decreased (sub-Saharan countries). Rural population density has largely remained unchanged in the Global South, despite rural exodus, thus limiting opportunities for enlargement. Work in these areas is predominantly manual [2/3 of the world's workers just relying on basic tools (plow and sickle), with another 30% using animal traction and only 3% using tractors, Losch, 2016]. In sub-Saharan Africa, population growth is such that 250 million more young rural people are expected to join the labor market by 2050, a dynamic never experienced before in the world. This dynamic raises serious questions about agriculture's capacity to generate sufficient wealth and employment opportunities, as the industrial and service sectors are far from being able to absorb

the surplus labor force. Moreover, in many countries, working in agriculture means living in poverty, a lack of acknowledgment of women's contributions, an existence sometimes of child labor and, increasingly, migration. Work in agriculture might however be considered as a way of overcoming limits in capital, land and water (Sraïri and Ghabiye, 2017) (Box 1).

Further, the issue of development policies and actions specifically targeting young people has been raised as an important aspect of agricultural and rural development programs given the demographic trends to aging populations (Figure 3) and the importance of youth employment, notably in Africa, in the near future (Arslan et al., 2021; Girard, 2021). Further, there is increasing interest in the role of markets and opportunities for demarcation of agricultural products for better value sharing with workers through the value chain (Malanski et al., 2022). Despite the importance of public institutions, the typical institutional voids in developing countries (Trienekens, 2011) levers the importance of markets, certifications, and other private mechanisms. Certifications and private standards in agri-chains, either local or national and international (e.g., fair trade) are also the basis for concerns on working conditions and respect for social standards as well as the forms of agriculture (e.g., small-scale family farming) either in short or long-chains. Chain's agents—including consumers—and other private organizations play an important role in establishing requirements, monitoring and controlling labor issues, taken as value attributes, favoring more sustainable work in agriculture and agri-food chains. Through their specifications, there are opportunities to influence working conditions in the production

BOX 1 Work to overcome capital, land and water scarcity in Maghreb oasis (Sraïri et al., 2019).

In areas with significant capital, land and water scarcity, such as the oasis, maintaining diversity in agro-ecosystems (i.e., different animal species-cattle, goats, sheep, camels with multi-layered crops in the same plot including date palm trees, then orchards of figs, pomegranate or olive and then cereals and/or forage such as alfalfa), requires a significant amount of work, particularly devoted to routine tasks necessitated by the herd (e.g., cutting alfalfa daily and transporting it to the herd, feeding the animals, watering, milking females). Such agro-biodiversity is considered necessary to improve the resilience and increase performance of production systems (Dumont et al., 2020). More involvement of family members in the agricultural tasks within smallholder farms to ensure the crop/livestock integration and implementing circular economy principles raises questions about workers' remunerations which rarely exceeds 10 euros per day and tension with improving livelihoods by shifting to non-agricultural sectors, or migrating to large cities. Post COVID-19 economic crisis and inflationary pressures, family members still seek livelihoods in agriculture to strengthen social networks and to avoid the loss of family patrimony. Furthermore, frequent migration of young adults, mainly men, implies more work load on women and older people. Recently, there have been increased demands by women for a better recognition through the access to incomes generated by agricultural goods sales, such as dates (which necessitate important work durations to be collected and sorted), as these remain the pillar of the agricultural systems in the area.

sector. Finally, the capacity of large agricultural investment projects, often supported by States in order to secure national production, to generate employment raises many controversies (Mercandalli et al., 2021).

This respect for social standards is one of the constituents of the concept of ‘decent work’, which is a strong marker in the thinking about the future of agricultural work (Food and Agriculture Organization of the United Nations, 2017). “Decent” work is defined as productive, adequately remunerated, with security in the workplace and social protection for families, and equality between men and women. It offers people the ability to influence the future of their working lives (International Labour Organisation, 2020). While the concept of decent work can be easily examined to some extent in countries with highly regulated labor markets and legislated working conditions the concept is still a target point for many countries. For example, the work of children is still a focus point: following FAO (2021), 71% of the 152 million of children that are in child labor are found in the agricultural sector. Decent work is also more difficult to be understood in the context of family labor, with a combination of generations, especially young people and women. In both cases (family and salaried), decent work may constitute an entry point for analyzing the attractiveness of agricultural professions.

Several sets of questions emerged from symposium participants related to the future of agricultural work and the prospects for agricultural employment in the Global South. Key debates related to the nature of the aspirations or visions for agricultural work, such as whether the focus for policies and practices should be:

- Toward fewer but better paid jobs by increasing labor productivity through the extension of the “modernization paradigm” found in OECD countries, with the substitution of labor for capital, and to the promotion of “inclusive” value chains that respect the contribution of the production sector (Christiaensen et al., 2021) and, in the case of global value chain, the specifications that let the differentiation with commodities agri-food chains be clear. In such a scenario, employment opportunities for rural youth would specifically rely on a trio of factors: productivity (in relation with capacity building programs, as also their access to capital and resources), connectivity (with markets, social networks, information media), and agency (participation in associations and politics, training, empowerment) (Arslan et al., 2021);

- Toward developing agro-ecology, short chains, food sovereignty, i.e., an approach centered on the capacity of localized food systems to also create jobs without degradation of the environment. This approach takes the opposite view of the green modernization with inputs. It makes the local/territorial level an integral part of its combined perspective on agriculture, food, the environment and employment, and the basis for taking concrete action (Losch, 2016). However, the concept of “decent

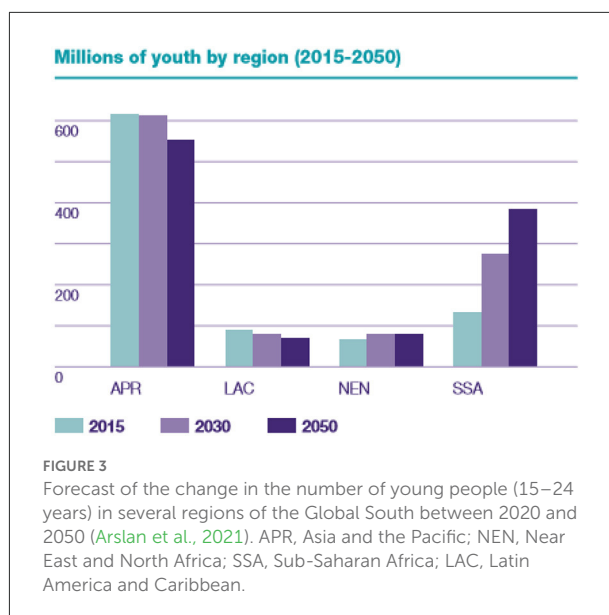


FIGURE 3
Forecast of the change in the number of young people (15–24 years) in several regions of the Global South between 2020 and 2050 (Arslan et al., 2021). APR, Asia and the Pacific; NEN, Near East and North Africa; SSA, Sub-Saharan Africa; LAC, Latin America and Caribbean.

work” has been criticized for being neutral with regards to the controversies of development models, thereby preventing progress to address structural issues (Losch, 2022).

OECD and global south common issues

Four common issues, which encompass both the OECD and Global South questions, were identified.

Firstly, the agroecological transition

What would be the impact of the agro-ecological transition on work (quantity, flexibility, working conditions), and could this presumed impact discourage farmers from committing to agro-ecology? How to support the transition to more agro-ecological systems, given that it involves a change in professional norms and values, practices and work (Coquil et al., 2017)? Which mechanisms have to be promoted by public policies to ensure the implementation of agro-ecological practices, which are often work consuming (for example, coupling crops and livestock in the same farm, which implies weed incorporation in dietary rations, manure systematic recycling, etc.).

In the OECD, this question of the impact of the agro-ecological transition on work is formulated with a strong emphasis on working conditions, not only to clarify what this notion encompasses (Duval et al., 2021; for livestock farming) but also to take into account the first results, which indicate an improved alignment between values and actions. Research on supporting the agro-ecological transition is focusing on how, and with what resources, can farmers progressively reduce, through experience and dialogue, the gap between what is

desirable and what is possible in terms of redefining values, norms and practices in order to achieve the professional transition. The role of peers, the profession of the advisor and the tools the advisors have at their disposal to assist in the step-by-step redesign of systems, and training are all also subject to debate (Coquil et al., 2018).

However, it seems more difficult to reach any statistically valid conclusions on the implications for working times either in OECD countries or Global South ones (Dalhin and Rusinamhodzi, 2019; Duval et al., 2021). It is mainly due to the fact that there are many factors that influence this metric (size of the farm, number of animals, size and composition of the workforce, mechanization and work organization strategies) that make it difficult to define and test comparable samples with low and high agroecological practices integration. Concerning work organization strategies, there is a variability in the way work is organized, including more or less simplified herd and crops management (adjusting the demand of work) and recourse to hired workers or contractors that impact not only the duration of work at the farm level, but also the duration of the farmer's work, considering the contribution of other categories of workers (Cournut et al., 2018). Mechanization is a controversial topic in relation with agroecology either in the OECD and the Global South. A marker of intensification and enlargement, of dependency to fossil fuels for some authors, a lever for more precise impact on soils and crops, for reduced drudgery for others (Baudron et al., 2019) and overall the impact on work durations. For the Global South, situations without mechanization mean that the work to be done depends primarily on the choice of the production system, and on the technical sequences for each crop / herd, whereas in OECD questions on the adapted mechanization are more explicit. Moreover, the agro-ecological transition in the South means either substitution from chemical inputs to organics ones or a redesign of the system from intensive to low external inputs based systems, with production diversity and crop livestock integration, whereas in OECD, agroecologization is more studied as a deep redesign (see above). Nevertheless, some research work point to the increasing amount of farming working times (e.g., Dumont et al., 2021 in Belgium; Montt and Luu, 2020 in Eastern Africa) without any additional worker employed, i.e., more work for the family, notably in the South for women and children. In addition to this focus on working duration, it is necessary to study the attitudes to work, job satisfaction, household incomes and food security (Bezner Kerr et al., 2021) for a more comprehensive analysis, from individuals to global / continental differences, of what is important for workers in their work.

Secondly, trans-boundary and domestic migration

The prominence of the seasonal aspects of agriculture has, for times, involved migrations between territories to

deal with peak transplanting or harvesting times. Further, the development of more industrial models is being accompanied, on the one hand, by a skilled salaried workforce, able to deal with new technologies and, on the other, using migrants to replace the local workforce in unattractive and often poorly paid jobs. The large number of studies on musculoskeletal disorders among Mexican workers on large dairy farms in the United States and on the work safety culture on Latin children in this country are illustrations of this phenomenon (Arcury et al., 2019; Arcury and Mora, 2020). Migrants also give flexibility on labor markets (Preibisch, 2010). In Western Europe, the importance to farms of the invisible labor force from Eastern Europe and the Maghreb was revealed through its scarcity during COVID-19 pandemic lockdowns during spring of 2020. Migration from the rural family to the cities is the main point studied in the Global South. Family migrants can contribute to the farm work occasionally, as they stay members of the family workforce (Laske, 2021) and contribute to the household income. In China, the phenomenon has become structural: the disappearance of generations of rural workers to cities has deep consequences of the staying elders and children and on the structural transformations of farms (Kwan et al., 2018). Migrants can also occupy neglected production niches, such as farmers of Bolivian origin in the Buenos Aires market garden belt (Parodi, 2018). All those aspects bring social, economic, cultural and structural aspects to the center of discussion.

Thirdly, the impact of the digital revolution

While some see this as a lever to further increase labor productivity on large farms in smarter or more intelligent ways, others see the possibility of using digital technology to help manage complex agro-ecological systems, and to facilitate exchanges between peers and with consumers. In any case, digital technology is already behind a radical transformation of actual day-to-day work. Robots, GPS, drones and sensors lighten the workload, increase physical human work capacity, and increase manifold the ability to observe the environment and animals (Kling-Eveillard et al., 2020). The managerial dimension of the farmer's job (new information, new decision support systems) is also transformed (Labour-Martin et al., 2021). This revolution raises questions about the meaning of work, relationships with animals, decision-making autonomy, new forms of organization of work, and relationships with others (Hostiou et al., 2017). At the end farming work, either in its objective or in its subjective - individual part is to be transformed.

Fourthly gender issues

Several questions are at stake such as (i) the gender division of labor on farms and in the farm household, including gendered drudgery, unpaid care work, "time poverty," among

others, and implications for their engagement in, and benefits from agricultural value chains; (ii) changing gender roles in agriculture, i.e., woman as agricultural entrepreneurs vs. women as farmers' wives (Ressia et al., 2022) and more generally the need to favor empowerment of women in agriculture (Rao, 2011), (iii) decent employment notably social security issues of women in agriculture, i.e., lack of it and its consequences in situations of risks such as divorce, invalidity or old-age.

Cross-cutting issues

Along with the identification of cross-cutting areas of focus in understanding the dynamics and trajectory of agricultural work, the symposium participants achieved a consensus identified on cross cutting issues for the future of research on work in agriculture:

- A need to bring agricultural work closer to the United Nations' Sustainable Development Goals (The United Nations, 2015), in particular *via* the notion of "decent employment" for all workers, both family members' workers (who constitute the majority) and salaried workers (permanent and temporary). SDG 8 is also closely related to others that are connected to agriculture (zero hunger, climate change, reduced inequalities). Indeed, this is a condition that must be met if agricultural jobs are to be more attractive to young people and women, in addition to other factors, such as providing meaning, autonomy, recognition by society and including forms of modernity (e.g., digital technology) and technicality (management of complex issues, with multiple determining variables including living plants and animals). While the attractiveness of farming occupations concerns people of all ages, young workers in the countries of the Global South require particular attention. Settlements (and its new emerging forms), pluriactivity and professional careers are all related subjects.

- The future of work will be marked by a double movement: on the one hand, changes in agricultural practices and their necessary evolution toward more ecological forms, and, on the other, sociological and structural changes (substitution of labor by capital, robotization, expansion, diversification, greater recourse to salaried workers, recognition of the place of women on farms, the need for parity in the working conditions of salaried workers, respect for farming professions by society). However, it is necessary to think about both movements together, simultaneously, from the micro scale of farm trajectories to the global-national political level. Notably the farm scale appears to be crucial to understand the way socio-structural changes (enlargement, changes in the family composition, development of an off farm activity) interact with agroecologization or sustainable intensification, when considering the work changes. It is rarely the case. This implies changes in the conception of agricultural jobs, either as a mean of subsistence, or as an "artisanal" relationship to utility and

to what makes work well done "beautiful" and as a way of connecting oneself to others (Arendt, 1983/1961). It also implies changes in skills, know-how, relationships with mechanization, forms of organization of work for different people, appreciation of what makes work efficient and, finally, changes in the content of real work concerning crops, animals and management. This double movement is moreover taking place in a context of climate change (i.e., more uncertainties and undoubtedly more health barriers to human mobility) and a digital revolution that remains largely to be mastered taking into account the balance between positive aspects (enhancing the information systems and helping decisions at the farm and chain scale) and the negative ones (a higher dependency on algorithms and a risk of loss in the autonomy of thought, and decision making). This requires innovative attitudes, where agricultural work and the social recognition of its vital roles (as it was witnessed during the COVID-19 lockdown) become political issues, endorsed by the global community.

- Agri-chains and value chains play a decisive role in the expression of work productivity objectives, in the expression of appropriate technical models, and even, in integrated commodity chains, in the expression of labor models since they combine labor, mechanization and technical ambitions. The long commodity chains are pushing for ever-increasing agricultural labor productivity to minimize costs. The long global agri-chains that are based on quality niches mandate specific agricultural practices, respect for the right to work in the producing countries, or particular agricultural models (family and agroecological/organic in particular) (Malanski et al., 2022). Short supply chains have requirements that encompass the diversity of what is marketed, the technical temporalities associated with them and the various "production lines." Work rhythms are affected by the intertwining of production, processing and marketing tasks. Weekly tasks have to be considered in addition to daily and seasonal schedules. This requires, on the one side, the consideration of value chain structure in studies on work in agriculture, taking into consideration not only what happens at farm level, but all the interactions with other agents and activities that affect the farm level. On the other side, it also demands innovative studies considering the territorial perspective of value chains (different degrees of local / global) and its relation to work in agriculture.

Discussion

The synthesis presented here does not cover exhaustively all the issues addressed in the detailed contributions of the plenary sessions, scientific workshops. For example, the issues of agricultural workers' health is poorly represented even though it is an important area which, according to the bibliometric analysis of Malanski et al. (2021), and is generating an ever-increasing volume of publications. There is also an inherent bias

in drawing from the contributions and to the group of experts' composition. Considering the contributions, three thematic were not as prevalent in the papers and by consequence, in our outlook: gender issues, occupational health at work and public policies. The research topics on gender and on health are wider than what was discussed in the Symposium. Political economy, and the role of the politics as a major driver of changes were represented in the scientific committee and in three plenary presentations (see the ISWA website), but not so in the papers. Policies influence labor regulations (Oya and Pontara, 2015), land occupation and property, food prices, health promotion, market integrations) that directly or indirectly influence the future of work. Our focus on farming models and controversies (Gasselin et al., 2021) and structural changes should be complemented in the future with deeper analysis of these domains.

Some themes, such as climate change, COVID-19 impacts and the Sustainable Development Goals (SDG) were noted in some presentations but did not feature strongly. These themes were not explicitly part of the calls and represent areas for additional focus on considerations for the future of work in agriculture. Family farming stays as the main feature for farming models in most presentations, as it is still largely dominant in the world (Belière et al., 2015). Nevertheless, other models with a high level of contracted activities or megafarms based on an industrial organization (either on the OECD or in the global South countries) question the future of the family model, notably the public policies aiming at securing the food systems (Hermans et al., 2017). At least, the attractiveness of family farms' work (including remuneration and autonomy) for the youth is also a key point for the future. Migration was an important cross-cutting topic debated during the Symposium and was considered to be of continued importance including (i) the various declinations in rural to rural; rural to urban, and transnational migration), (ii) its origins (i.e., the need to secure the household incomes, international conflicts and poverty) and (iii) its impacts on the labor market (i.e., for agriculture and other sectors of the economy).

The territorial level and the national / global dimensions of work would also be more clearly addressed within a meeting whereas this meeting focussed more on the farm-household level. The territory is a useful scale of analysis in an interdisciplinary perspective of the study of work, allowing for the multiple facets of the dynamics of work to be explored and understood together and whereby future scenarios of work and employment can be debated in a participatory manner. The territory brings together different agricultural and work models. It permits a circumscribed diagnosis of the active agricultural population's health problems. It provides a broad framework for off-farm pluriactivity opportunities and relations with the downstream or consumers. It also brings together different stakeholders (farmers, sectors, local authorities, associations)

who can align their thoughts on "territorial food plans" with "agricultural employment plans" at this scale. It is also important to consider the "degree of localization," since the territorial perspective helps to understand different dynamics of work in agriculture even when considering some global value chains. The national/global level is also important to consider for itself, either to study the role of politics on work or to understand the state of play of the confrontation of farming models, the structural dynamics of agriculture and the interaction between the agriculture sector and other sectors such as services (Berstein, 2017; Bottazzi et al., 2020; Losch, 2022).

Conclusion

The Symposium objectives were to foster dialogue between disciplines and gather different perspectives on work providing opportunity for multidisciplinary debate between researchers which builds a community that finds interests in the future of work, with equal considerations to the different understandings of what work means, and the value from engaging with different disciplinary communities. The ISWA community does not substitute for the necessary discipline-based communities but is a project that is confident that multidisciplinary debates and cross-cutting views is sound and useful to policy and practice in agricultural work. In this multidisciplinary endeavor, with a plurality of topics, this community also needs to be aware of both unfruitful lines of inquiry and emergent realities in agricultural work on one hand, while maintaining focus on the quality of research and implications on public policies, development programs and value chain operations on the other hand.

The future of work will be influenced by many factors: demographic trends, the attractiveness of the professions of farmer and employee, technological innovations, the relationship with production work in agri-chains, the organization of the labor market and the place of migrants, the ecologization of practices and systems, societal perceptions of agriculture, societal changes in gender relations, and climate change. All of this forms a complex whole with impacts on many dimensions of what makes up work: workers' activity and health, skills, the place of women and young people, models of work organization and allocation of work in households and debates about the nature and meaning of work itself. Therefore, in order to plan and support this future, it is necessary to have a broader view with multidisciplinary tools and thematic approaches to agricultural work: there is a need to transcend the disciplinary boundaries and the classical dichotomies of scales (local vs. global), of paths of development (agroecology vs. sustainable intensification), of continents (rich vs. poor countries), that currently feature in research. An ambitious agenda with much work to be done.

Author contributions

BD lead the paper's design process, the writing process, and was involved in all sections. PM contributed to the paper's design and implementation, made the lexicographic analysis, wrote the corresponding part, and made a general review (with written suggestions) of the paper. MTS, SS, and RN contributed to the paper's design and implementation, wrote paragraphs and made a general review (with written suggestions) of the paper. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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APPENDIX 1 The 5 thematic domains of the “labor/work” and “agriculture” bibliometric analysis in Scopus (Malanski et al., 2021).

- **Labor markets:** research is focused on the dynamics of agricultural labor markets and how they impact employment, wages and household pluriactivity. The drivers studied are mainly the substitution of labor by capital, productivity gains, and migration opportunities (inward and outward).

- **The social dimensions of work** are studied mainly in the Global South, through research on gender and poverty associated to work, and on attractive employment opportunities for young people. This domain has links to labor markets and educational levels, as well as to household food security and off-farm work.

- **Households strategies of allocation and division of work** between agricultural and other activities. This theme is addressed at the micro level in association with the implications of technical intensification and the processes that accompany it (mechanization, robotization, delegation of certain tasks), on the one hand, and rural exodus of some households' members, on the other. At the macro level, research is focused on the conditions of diversification of household income sources and on the opportunities for substitution between family work and salaried work.

- **Forms of and changes in the organization of work** on farms (who does what and when?) are a thematic domain that is very marked by the focus on livestock farming, and the French tradition of “farming systems” approaches (Cournut et al., 2018). The transformations underway concern the division of work between family and non-family workers (employees, contracted companies), the modalities of articulation between daily, weekly or seasonal tasks that are tied to technical systems and marketing methods (short supply chains), in a context of enlargement, agro-ecological transition and precision agriculture.

- **Occupational health** is a very specific domain, as it is little connected to the other domains, despite a focus in the literature on migrants, children and the elderly. It encompasses the study of risk factors for the deterioration of the mental and physical health of agricultural workers and explores more particularly work-related accidents, musculoskeletal disorders and, increasingly, stressful situations and chronic diseases linked to pesticide use.