



# RES4LIVE

ENERGY SMART LIVESTOCK FARMING  
TOWARDS ZERO FOSSIL FUEL CONSUMPTION

## **Social assessment report**

### **Deliverable D5.4**

### **WP5. Technical, socio-economic and environmental assessment**

#### **Project title**

RES4LIVE - Energy Smart Livestock Farming towards Zero Fossil Fuel Consumption

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## Approvals/ Document history

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## ABBREVIATIONS

<b>COP</b>	:	Coefficient of Performance
<b>HP</b>	:	Heat Pump
<b>E-LCA</b>	:	Environmental Life Cycle Assessment
<b>LCA</b>	:	Life Cycle Assessment
<b>PV</b>	:	Photovoltaics
<b>PVT</b>	:	Photovoltaic thermal
<b>RES</b>	:	Renewable Energy Sources
<b>SA</b>	:	Social Assessment
<b>UNEP</b>	:	United Nations Environmental Programme
<b>SETAC</b>	:	Society of Environmental Toxicology and Chemistry

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**EV ILVO** - RESEARCH INSTITUTE FOR AGRICULTURE, FISHERIES AND FOOD

**UGENT** - GHENT UNIVERSITY

**CERTH** - CENTRE FOR RESEARCH AND TECHNOLOGY-HELLAS

**AU** - AARHUS UNIVERSITY

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**TERRA** - TERRA ENERGY


**MG SUSTAINABLE** - MG SUSTAINABLE ENGINEERING AB

**CETRI** - CENTER FOR TECHNOLOGY RESEARCH & INNOVATION LTD

**GOLINELLI** - GOLINELLI GIULIO

**EAAP** - FEDERAZIONE EUROPEA PER LA ZOOTECNICA

**EUREC** - EUREC EESV

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## PUBLISHABLE SUMMARY


The use of fossil fuels in agriculture has detrimental effects, becoming a significant source of greenhouse gas (GHG) emissions and contributing notably to global climate change. Among the most energy-intensive sectors in agriculture is intensive livestock farming, which relies heavily on fossil fuels. However, promoting more sustainable livestock practices and reducing fossil fuel dependence in livestock operations are key priorities within the EU, especially as the costs of renewable energy technologies, such as solar panels, heat pumps, and biogas systems, decline and their performance improves. Thus farmers—particularly those in livestock production—have greater opportunities to adopt renewable energy sources (RES). New business models are also emerging in the market to support this transition.

RES4LIVE’s primary goal is to deliver advanced, cost-efficient technologies to the livestock sector that ensure farm sustainability and enhance animal thermal comfort, thereby boosting productivity while minimizing climate change impacts. The project’s strategic aim is to develop and introduce integrated, cost-effective, and case-sensitive RES solutions to achieve fossil-free livestock farming. RES4LIVE adapted and tested promising RES technologies in energy-intensive livestock sectors (i.e. swine, dairy, and poultry), significantly reducing the reliance on fossil fuels to meet energy demands. These solutions were implemented in four pilot farms, where they will be technically, economically, environmentally, and socially evaluated.

The goal of Task 5.4 is to carry out a Social Assessment (SA) to evaluate the social impacts resulting from the deployment of RES technologies in livestock operations across the 4 pilot cases which are involved in the project. This assessment follows the UNEP/SETAC Guidelines and addresses five key social impact categories: Community Infrastructure, Governance, Health and Safety, Human Rights, and Labor Rights. Conducting a Social Assessment is crucial for evaluating potential energy upgrades in livestock farms as it provides a comprehensive understanding of the project's social effects on various stakeholders. This ensures that the benefits extend beyond mere cost savings and environmental protection to include enhanced social outcomes, increased community acceptance, and greater sustainability.

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# 1 PILOT FARMS DESCRIPTION

## 1.1 Introduction

RES4LIVE covers a diverse array of farm types, including swine, dairy, and poultry operations, with experimental setups in three farms and one commercial swine farm located in different EU countries such as Germany, Belgium, Italy, and Greece, each representing unique climatic conditions. The project leverages the RES technologies to achieve its objectives, such as photovoltaic/thermal (PVT) systems, heat pumps (HP) etc. Key objectives include minimizing energy demand, reducing fossil fuel consumption, alleviating stress on animals, and enhancing overall productivity and welfare in livestock farms.

## 1.2 Pilot Farms

Demonstration activities were carried out on four pilot farms situated in Belgium, Italy, Germany, and Greece. These farms represented three types of livestock: swine, dairy, and poultry. Detailed information about each farm, the specific measures to be implemented, and the particular targets are presented in the following sections.

### 1.2.1 ILVO pilot farm (experimental) in Belgium (swine)

The "Varkenscampus" farm is collaboratively operated by EV ILVO, UGENT, and HoGent, serving both research and educational functions alongside its standard commercial activities. Functioning as a farrow-to-finish pig farm, it accommodates up to 105 sows, 600 piglets, and 750 fattening pigs simultaneously. The facility covers approximately 2,500 square meters, predominantly constructed with concrete and insulation. Polypropylene panels partition the different sections, and the floors above the manure pits are partially slatted concrete.


For year-round heating, the farm employs a 60 kW gas heater, which uses roughly 220 MWh of fossil gas annually. Both the mechanical ventilation and heating systems are regulated by temperature sensors installed in each room. The heating setup is tailored to meet the distinct requirements of various production phases. Within the RES4LIVE initiative, the farm integrated two PSYCTO modular heat pumps, to provide heating across various temperature settings and offer cooling when necessary. Furthermore, PVT collectors were installed to supply direct heating to the farm during summer months and to support the heat pumps in winter, thereby enhancing their Coefficient of Performance (COP) in a "solar-assisted" mode. A limited number of photovoltaic (PV) panels were also used to fine-tune the heat-to-electricity ratio as required.

Throughout the year, the electricity generated by the PV panels is expected to cover part of the heat pump's energy consumption. To efficiently manage energy distribution and align PV production with the heat pump's usage, a smart energy control system was implemented.

### 1.2.2 GOLINELLI pilot farm (commercial) in Italy (swine)

Located in the northern province of Modena, Italy, the Golinelli pig farm specializes in the rearing of 500 sows and 2.500 sucklings. The farm consists of four primary buildings: a farrowing barn, a nursery barn, a gestation barn, and a hog barn with an integrated gestation section. These structures are built using precast reinforced concrete and are largely equipped with thermal insulation, except for the hog barn. The entire farm spans approximately 2.600 square meters.

For heating purposes, the farm employs two heat pumps with capacities of 59.7 kW and 29.9 kW, complemented by thermal lamps in the farrowing barn. Additionally, a 34 kW LPG boiler is installed in the nursery barn, while a diesel boiler serves the further barn. Cooling needs in both the farrowing and

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gestation barns are met through evaporative cooling systems, which typically eliminate the necessity for heat pumps in these areas.

To eliminate the annual consumption of approximately 7.500 kg of fossil gas from the LPG boiler, a heat pump was installed in the nursery barn. Furthermore, a PVT system was deployed. This system provided electricity for the heat pump's operation, reduced the nursery barn's electrical demands, and supplied additional thermal energy.

To optimize the use of thermal energy, the farm installed a ground heat storage system featuring vertical coaxial boreholes. This geothermal controller enhanced the heat pump's efficiency. Additionally, retrofitting the livestock barn that lacked thermal insulation further reduced the external energy requirements.

For managing the indoor environment and overall energy usage, a smart control system equipped with sensors was integrated. These initiatives aimed to entirely replace both the nursery barn's electricity and LPG consumption with renewable energy sources and efficiency measures.

### **1.2.3 LVAT pilot farm (experimental) in Germany (dairy)**

This dairy farm consists of three barns dedicated to milk production, encompassing a total area of 3.950 square meters and housing 445 cows and calves. All barns rely on natural ventilation, supplemented by ventilators with fans that supply fresh air and provide cooling during hotter days. In the summer months, these fans consume approximately 170 kWh of electricity per day. During the winter, when temperatures drop, heating for the troughs requires about 118 kWh of electricity daily. Within the RES4LIVE project, a PVT system was implemented to act as a decentralized source for generating both electrical power and heat. This system was designed to meet the energy needs for electricity, heating, and air cooling, thereby reducing heat stress on animals during the summer. To manage heat and electricity consumption efficiently and regulate the indoor climate of the barns, a smart management and control system was employed.


The project also featured a developed biogas upgrading unit and a retrofitted tractor, specifically modified for biomethane use. By implementing these measures, the farm aims to reduce electrical and thermal energy demands for milk production through RES.

### **1.2.4 AUA pilot farm (experimental) in Greece (poultry)**

The farm spans an area of 90 square meters, comprising two separate rooms of 45 square meters each, designated for hen rearing and egg production. Housing 400 hens, the facility is located within the AUA campus. The farm operated without any heating or cooling systems, which means there is no fuel consumption. Instead, it utilizes forced ventilation to manage temperature variations during the summer months.

To improve thermal comfort, a 10 kW heat pump was installed. Additionally, standard PV panels with an 8 kWp capacity were installed on the rooftop to offset the farm's electricity consumption, including that of the heat pump. To maintain optimal indoor conditions, ensuring that temperature and humidity levels stay within comfortable ranges, a smart control system was integrated.

The RES4LIVE project at the AUA campus farm demonstrates a strategic approach to enhancing energy efficiency and sustainability in egg production facilities, by integrating advanced heat pump technology, photovoltaic energy systems, and smart energy management controls.

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## 2 SOCIAL IMPACT ASSESSMENT METHODOLOGY

### 2.1 Introduction

A Social Assessment is a systematic process used to evaluate the social effects and implications of a project (or policy) on stakeholders, communities, and individuals. It involves identifying the social impacts (both positive and negative) that a particular intervention may have on different groups of people, including their well-being, social structure, culture, and local economies. Social assessments gather feedback, perceptions, and expectations from stakeholders, offering a comprehensive understanding of how a project influences the social environment.

In the context of energy upgrades in animal farms, a Social Assessment offers several critical benefits. First of all, can help the project team to understand Stakeholder Perspectives. The implementation of energy upgrades affects various stakeholder groups, including farm owners, employees, local communities, and policymakers. A social assessment gathers feedback from those groups, providing insights into their views on the upgrades. It provides qualitative and quantitative information on whether stakeholders perceive the changes as beneficial, neutral, or negative, and captures their concerns or support. Moreover, through social assessment, Social Impacts can be identified. Energy upgrades may have wide-ranging social impacts beyond environmental and economic outcomes. For example, they can improve the quality of life for workers by reducing energy costs and operational inefficiencies or affect the local community by contributing to energy self-sufficiency or altering the local landscape.

By analyzing the social impact of energy upgrades, the project team can also ensure that the project aligns with the broader goals of social sustainability. This ensures that the upgrades not only provide environmental and economic benefits but also foster social cohesion, equity, and long-term acceptance by the community. Furthermore, a thorough social assessment can help identify potential risks—such as resistance from stakeholders, disruptions to community dynamics, or unforeseen social costs—that might hinder the success of energy upgrades. It also highlights opportunities to enhance positive social outcomes.

Finally, social assessments provide essential data for policymakers and farm operators to make informed decisions. By understanding how energy upgrades impact social factors, decision-makers can adjust strategies to maximize acceptance and success, ensuring that the energy upgrades meet not only technical and economic objectives but also social ones.


### 2.2 Impact categories

The UNEP/SETAC Guidelines for Social Life Cycle Assessment<sup>1</sup> provide a framework for evaluating the social impacts of products, processes, or services. This methodology, developed by the United Nations Environment Programme (UNEP) and the Society of Environmental Toxicology and Chemistry (SETAC), is intended to complement the Environmental Life Cycle Assessment (E-LCA). In our case, the basic principles will be adopted to perform the Social Assessment, taking into consideration proposed social impact categories/pillars. These pillars are the following:

**Community Infrastructure:** Refers to how the development, availability, and use of infrastructure (such as transportation, utilities, education, and healthcare) affect local communities. In SA, this pillar evaluates whether a project enhances or diminishes community resources, as well as its contribution to local socio-economic development.

<sup>1</sup> Source: [www.lifecycleinitiative.org/library/guidelines-for-social-life-cycle-assessment-of-products-and-organisations-2020/](http://www.lifecycleinitiative.org/library/guidelines-for-social-life-cycle-assessment-of-products-and-organisations-2020/)



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**Governance:** Focuses on the systems and processes that ensure accountability, transparency, ethical behavior, and the rule of law in the organizations or companies involved in the product. It examines aspects like corruption, compliance with legal requirements, and corporate governance structures.

**Health and Safety:** This pillar assesses the health and safety conditions of workers, communities, and consumers across the product life cycle. It includes occupational health risks, product safety, and the potential effects on public health.

**Human Rights:** Refers to the respect for and protection of basic human rights throughout the life cycle of a product. This includes the prevention of forced labor, child labor, discrimination, and ensuring freedom of association, fair treatment, and dignity in the workplace.

**Labor Rights:** Focuses on working conditions and the protection of workers' rights. This includes fair wages, working hours, job security, and access to benefits.

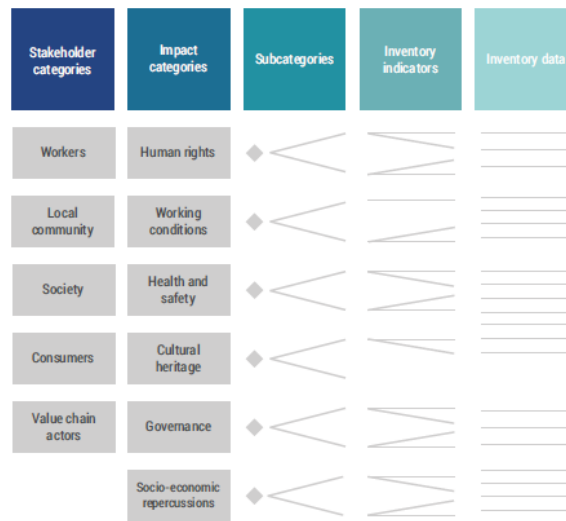


Figure 1. Assessment system from categories to inventory data (Adapted from UNEP/SETAC, 2020).

## 2.3 Questionnaire design

To effectively design a questionnaire that assesses the extent to which the five Social Impact pillars are impacted, the project team developed and pre-screened a series of questions. Initial screening questions were employed to identify the stakeholder category, ensuring that subsequent questions were pertinent to each group. Additionally, both analytical and numerical data from various measurements were collected. The questionnaire included clear instructions, explicitly specifying which questions were relevant to each stakeholder group. For each pillar, a comprehensive set of questions was created, detailing the following components.



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Table 1: Basic components of the developed questionnaires, with example questions.

Pillar	Theme	Indicator	Quantification	Stakeholder Category	Question	Alternative Answers
<b>Community Infrastructure</b>	Impact on Local Infrastructure	Number of Infrastructure Projects	Count of Initiated or Completed Projects	Local Community	1. Have you noticed any recent changes in roads or other local infrastructure in your area? (Improved/Deteriorated/No Change)	Improved / Deteriorated / No Change

The basic components of the first approach (set for prescreening) are presented in the following Table 2.

Table 2. The components of the first approach (set for pre-screening).

Pillars	Indicator	Required Data
<b>Community infrastructure</b>	Compensation	Salary
<b>Governance</b>	Workers' union	Question if there is a labor union
<b>Health and Safety</b>	Work - insurance	Question if employees are insured
	Working conditions (health and safety)	<ul style="list-style-type: none"> <li>Severity level of accidents</li> <li>Type of accident</li> <li>Hygiene conditions of the workplace (frequency of cleanliness)</li> <li>Air quality</li> <li>Levels of heating and cooling in the workplace</li> <li>Levels of illumination (lighting)</li> <li>Levels of noise</li> <li>Provision of work equipment</li> </ul>
<b>Human Rights</b>	Gender equality	Number of male and female employees
	Equal advancement opportunities	
<b>Labor Rights</b>	Age range of employees	Employees' age
	Nationalities of employees (workplace racism)	Employees' nationality
	Work - overtime	<ul style="list-style-type: none"> <li>Monthly overtime hours</li> <li>Overtime cost per hour</li> <li>Declared or undeclared overtime</li> </ul>
	Provision of work equipment	Status of provided work equipment (new or used)

After the pre-screening, and consultation phase, it is taken into consideration all the feedback and the final questionnaire that was used is developed.

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Table 3. Final components of the questionnaire.

Pillar	Theme	Indicator	Quantification	Stakeholder Category	
<b>Community Infrastructure</b>	Impact on local infrastructure	Number of infrastructure projects	Count of initiated or completed projects	Local Community	
	Effect on worker housing availability and quality	Housing availability and quality	Changes in availability and quality of worker housing	Workers/Local Community	
	Changes in access to utilities (e.g., energy, water)	Energy and water access	Measure changes in energy and water access	Local Community	
	Availability of community services (e.g., healthcare, education)	Accessibility to services	Impact on access to healthcare and education services	Local Community	
<b>Health and Safety</b>	Workplace safety measures and improvements	Occupational safety enhancements	Track improvements in occupational safety measures	Workers	
	Incidents related to energy efficiency and thermal comfort	Safety incident rate	Calculate the safety incident rate	Farm Management/Workers/Community	
	Training programs for energy efficiency and safety	Completion of safety training	Measure the percentage of workers completing training	Workers	
	Health and safety of workers and community	Community safety perception	Survey-based perception of safety improvements	Workers/Local Community	
	Working conditions	Comfort level	Survey-based perception of comfort level	Workers	
	<b>Human Rights</b>	Prevention of discrimination and harassment	Reports of discrimination and harassment	Track and report of incidents of discrimination	Workers/Local Community
		Protection of workers' human rights	Human rights protection measures	Assessment of measures to protect workers' rights	Workers
Fair and ethical treatment of stakeholders		Ethical treatment index	Assessment of fair and ethical treatment practices	Farm Management	
<b>Labor Rights</b>	Wage and compensation improvements	Wage increase rate	Percentage change in wages over time	Workers	

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Pillar	Theme	Indicator	Quantification	Stakeholder Category
	Compliance with working hour regulations	Overtime hours rate	Percentage of workers exceeding working hour limits	Workers
	Impact on employment	Workforce variation	Number of employees	Farm Management
	Improved worker living conditions (if applicable)	Living conditions assessment	Assessment score of worker housing conditions	Workers
	Prevention of child labor	Child labor incidents reported	Number of reported incidents of child labor	Workers
	Impact on workload	Working hours	Modification of working hours	Workers
	Gender equality	Gender equality	Percentage of male/female workers	Workers
<b>Governance</b>	Compliance with energy efficiency and emissions regulations	Regulatory compliance rating	Rate of compliance with relevant regulations	Farm Management/Regulators
	Transparency in energy efficiency and emissions reporting	Transparency and reporting score	Evaluation of transparency and reporting practices	Farm Management
	Engagement with local authorities for energy efficiency	Collaboration with local authorities	Count of instances of collaboration and engagement	Farm Management/Local Government
	Internal policies and practices for energy efficiency	Internal energy policies	Assessment of internal policies for energy efficiency	Farm Management
<b>Other</b>	Environmental Aspects	Replacement of Fossil Fuels by Renewable Energy Sources (RES)	Support of Replacement of Fossil Fuels by Renewable Energy Sources (RES)	Farm Management
	Economical Aspects	Build of environmentally friendly facilities	Support of environmentally friendly facilities	Local Community
	Economical Aspects	Willingness to pay	Willingness to pay higher prices	Local Community

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Pillar	Theme	Indicator	Quantification	Stakeholder Category
	Ethical Aspects	Build environmentally friendly facilities	Support of environmentally friendly facilities	Local Community

The main feedback from the consultation stage is presented below:

### A. Community Infrastructure

The first pillar, Community Infrastructure, focuses on assessing how RES projects affect the local infrastructure and resources. Next, the basic Themes are briefly presented:

#### - Theme: Impact on Local Infrastructure

Evaluating the impact on local infrastructure is crucial as RES projects often require significant changes or improvements to existing infrastructure. This includes the development of new roads, utilities, and community facilities to support RES installations. Potential Social Effects include:

- **Positive:** Enhanced infrastructure can improve accessibility, support local economies, and provide better services to the community.
- **Negative:** Construction activities might lead to temporary disruptions, increased traffic, or strain on existing infrastructure if not managed properly.

#### - Theme: Effect on Worker Housing Availability and Quality

RES projects may influence the demand for worker housing. Assessing changes in availability and quality ensures that housing provisions meet the needs of the workforce, which is essential for worker satisfaction and retention. Potential Social Effects include:

- **Positive:** Improved housing conditions can lead to better living standards, increased job satisfaction, and reduced turnover rates.
- **Negative:** Increased demand for housing might strain local resources or lead to higher housing costs if supply does not keep pace.

#### - Theme: Changes in Access to Utilities (e.g., Energy, Water)

RES implementation can alter the availability and reliability of essential utilities like energy and water. Monitoring these changes helps in understanding the broader community benefits or challenges arising from RES adoption. Potential Social Effects include:


- **Positive:** Enhanced access to reliable and sustainable energy and water sources can improve quality of life and support local businesses.
- **Negative:** Initial disruptions during installation phases might temporarily affect utility access.

#### - Theme: Availability of Community Services (e.g., Healthcare, Education)

The integration of RES technologies can influence the availability of community services by redirecting resources or enabling the development of new facilities. Assessing this impact ensures that community needs are met alongside RES deployment. Potential Social Effects include:

- **Positive:** Improved infrastructure and resource allocation can lead to better access to essential services, enhancing overall community well-being.
- **Negative:** Resource reallocation towards RES projects might inadvertently reduce funding or availability of existing services if not carefully balanced.

### B. Health and Safety

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The Health and Safety pillar addresses the well-being of workers and the surrounding community in the context of RES implementation. Next, the basic Themes are briefly presented:

- Theme: Workplace Safety Measures and Improvements

Ensuring the workplace is safe, especially when introducing new technologies. Monitoring safety enhancements helps in maintaining a secure working environment for employees. Potential Social Effects include:

- **Positive:** Enhanced safety measures can reduce workplace accidents, improve employee morale, and foster a culture of safety.
- **Negative:** Implementation of new safety protocols might require additional training and adjustments, potentially causing temporary disruptions.

- Theme: Incidents Related to Energy Efficiency and Thermal Comfort

Monitoring safety incidents related to energy efficiency and thermal comfort ensures that RES technologies do not inadvertently introduce new hazards. This is critical for maintaining the health and safety of both workers and the broader community. Potential Social Effects include:

- **Positive:** Proactive incident management can prevent accidents and promote a safe working and living environment.
- **Negative:** Any incidents that do occur can undermine trust in RES technologies and lead to increased scrutiny or resistance from stakeholders.

- Theme: Training Programs for Energy Efficiency and Safety

Effective training programs are essential for equipping workers with the knowledge and skills needed to safely operate and maintain RES technologies. Measuring training completion rates ensures that all employees are adequately prepared. Potential Social Effects include:

- **Positive:** Comprehensive training can enhance worker competence, reduce accidents, and increase overall productivity.
- **Negative:** Inadequate training coverage may leave gaps in safety knowledge, increasing the risk of accidents and reducing the effectiveness of safety measures.

- Theme: Health and Safety of Workers and Community

Understanding perceptions of safety among workers and the community provides valuable insights into the real-world effectiveness of safety measures. Potential Social Effects include:

- **Positive:** Positive perceptions can enhance community trust and worker satisfaction, fostering a supportive environment for RES initiatives.
- **Negative:** Negative perceptions may indicate underlying issues that need to be addressed to ensure safety and community support.


- Theme: Working Conditions

Assessing comfort levels in the workplace is important for ensuring that RES technologies contribute to a conducive working environment. This indicator helps in identifying areas where comfort can be improved. Potential Social Effects include:

- **Positive:** Enhanced comfort levels can lead to increased worker productivity and well-being.
- **Negative:** Poor working conditions may result in decreased morale and higher absenteeism rates.

### C. Human Rights

The Human Rights pillar focuses on ensuring that RES implementation respects and protects the fundamental rights of workers and the community. Next, the basic Themes are briefly presented:

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- Theme: Prevention of Discrimination and Harassment

Ensuring a discrimination-free workplace is fundamental to upholding human rights. Monitoring incidents helps in maintaining an inclusive and respectful working environment. Potential Social Effects include:

- **Positive:** A respectful and inclusive workplace can enhance worker satisfaction, reduce turnover, and promote equality.
- **Negative:** Failure to address discrimination can lead to a toxic work environment, legal repercussions, and damaged reputations.

- Theme: Protection of Workers' Human Rights

Implementing and evaluating measures that protect workers' human rights ensures compliance with ethical standards and fosters a fair working environment. Potential Social Effects include:

- **Positive:** Strong human rights protections can improve worker morale, attract talent, and enhance the farm's reputation.
- **Negative:** Inadequate protections may result in exploitation, legal issues, and loss of worker trust.

- Theme: Fair and Ethical Treatment of Stakeholders

Evaluating the fair and ethical treatment of stakeholders ensures that RES implementation aligns with ethical standards and promotes equitable practices across farm operations. Potential Social Effects include:

- **Positive:** Ethical treatment fosters trust, cooperation, and positive relationships among all stakeholders.
- **Negative:** Unethical practices can lead to conflicts, reduced stakeholder engagement, and potential legal consequences.

**D. Labor Rights**

The Labor Rights pillar addresses the economic and working conditions of the farm's workforce in the context of RES implementation. Next, the basic Themes are briefly presented:

- Theme: Wage and Compensation Improvements


Monitoring wage changes ensures that RES implementation contributes to fair compensation, which is essential for worker satisfaction and economic stability. Potential Social Effects include:

- **Positive:** Wage improvements can enhance worker morale, reduce turnover, and attract skilled labor.
- **Negative:** Wage stagnation or decreases can lead to dissatisfaction, increased turnover, and difficulty attracting talent.

- Theme: Compliance with Working Hour Regulations

Ensuring compliance with working hour regulations protects workers from excessive labor demands and promotes a healthy work-life balance. Potential Social Effects include:

- **Positive:** Compliance can reduce worker fatigue, increase job satisfaction, and improve overall productivity.
- **Negative:** Non-compliance may result in worker burnout, increased absenteeism, and legal penalties.

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- Theme: Impact on Employment

Assessing changes in employment levels helps understand how RES projects influence job creation or reduction, which is vital for economic stability and community support. Potential Social Effects include:

- **Positive:** Job creation can boost the local economy, reduce unemployment, and increase community support.
- **Negative:** Job reductions can lead to economic hardship, increased unemployment, and community dissatisfaction.

- Theme: Improved Worker Living Conditions

Enhancing worker living conditions is essential for ensuring the well-being and productivity of the workforce. This indicator measures improvements in housing quality and availability. Potential Social Effects include:

- **Positive:** Better living conditions can lead to improved health, higher job satisfaction, and increased worker retention.
- **Negative:** Inadequate living conditions can result in poor health outcomes, decreased job satisfaction, and higher turnover rates.

- Theme: Prevention of Child Labor

Preventing child labor is a fundamental human rights issue. This indicator ensures that RES projects do not inadvertently contribute to or fail to address child labor practices. Potential Social Effects include:

- **Positive:** Eliminating child labor promotes ethical practices and enhances the farm's reputation.
- **Negative:** Any instances of child labor can lead to legal consequences, damaged reputations, and loss of stakeholder trust.

- Theme: Impact on Workload

Monitoring changes in working hours helps assess how RES implementation affects the workload of employees, ensuring that labor demands remain fair and manageable. Potential Social Effects include:

- **Positive:** Balanced working hours can improve worker health, satisfaction, and productivity.
- **Negative:** Increased workload can lead to worker stress, burnout, and decreased job performance.


- Theme: Gender Equality

Promoting gender equality is crucial for fostering an inclusive and equitable workplace. This indicator measures the representation of different genders within the workforce. Potential Social Effects include:

- **Positive:** Gender equality can enhance workplace diversity, improve decision-making, and foster a more inclusive environment.
- **Negative:** Gender imbalances can lead to discrimination, reduced diversity, and potential legal issues.

**E. Governance**

The Governance pillar focuses on the farm's adherence to regulations, transparency, and engagement with local authorities in the context of RES implementation. Next, the basic Themes are briefly presented:

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- Theme: Compliance with Energy Efficiency and Emissions Regulations

Ensuring compliance with energy efficiency and emissions regulations is essential for legal adherence and environmental responsibility. This indicator assesses how well the farm meets regulatory standards. Potential Social Effects include:

- **Positive:** High compliance can enhance the farm's reputation, avoid legal penalties, and contribute to environmental sustainability.
- **Negative:** Non-compliance can result in fines, legal actions, and damage to the farm's reputation.

- Theme: Transparency in Energy Efficiency and Emissions Reporting

Transparency in reporting energy efficiency and emissions is vital for building trust with stakeholders and demonstrating accountability. This indicator measures the clarity and openness of the farm's reporting practices. Potential Social Effects include:

- **Positive:** Transparent reporting can build stakeholder trust, attract investment, and promote a positive public image.
- **Negative:** Lack of transparency can lead to distrust, reduced stakeholder engagement, and reputational harm.

- Theme: Engagement with Local Authorities for Energy Efficiency

Collaborating with local authorities ensures that RES projects align with regional policies and benefit from local support. This indicator tracks the extent of engagement and cooperation with governmental bodies. Potential Social Effects include:

- **Positive:** Strong collaboration can facilitate smoother project implementation, access to resources, and community support.
- **Negative:** Limited engagement may result in misalignment with local policies, reduced support, and potential project delays.

- Theme: Internal Policies and Practices for Energy Efficiency

Developing and implementing robust internal energy policies is essential for guiding RES initiatives and ensuring consistent practices. This indicator evaluates the comprehensiveness and effectiveness of these policies. Potential Social Effects include:

- **Positive:** Effective internal policies can enhance operational efficiency, ensure consistent energy management practices, and promote sustainability.
- **Negative:** Weak or non-existent policies may lead to inconsistent practices, inefficiencies, and missed opportunities for energy savings.

**F. Other**


Finally, from the consultation stage, the need to add a sixth Pillar emerged to cover environmental, economic and ethical aspects. Next, the basic Themes are briefly presented:

- Theme: Environmental Aspects

Replacing fossil fuels with RES is a primary objective of sustainability initiatives. This indicator measures the extent to which fossil fuel use is being supplanted by renewable alternatives. Potential Social Effects include:

- **Positive:** Reduction in fossil fuel use decreases environmental pollution, lowers operational costs, and enhances sustainability.
- **Negative:** Transitioning away from fossil fuels may require significant upfront investments and adjustments to existing systems.



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- Theme: Economical Aspects

Investing in environmentally friendly facilities can drive economic growth and create jobs while promoting sustainability. This indicator assesses the level of support for such investments within the local community. Potential Social Effects include:

- **Positive:** Development of green facilities can stimulate the local economy, create employment opportunities, and enhance community resilience.
- **Negative:** High initial costs may strain local budgets or lead to opposition if not perceived as beneficial.

- Theme: Economical Aspects

Understanding the community's willingness to pay higher prices for sustainably produced goods is essential for the economic viability of RES projects. This indicator gauges consumer support for green initiatives. Potential Social Effects include:

- **Positive:** High willingness to pay can ensure the financial sustainability of RES projects and encourage further investment in green technologies.
- **Negative:** Limited willingness to pay may hinder the adoption of RES technologies and limit the project's financial viability.

- Theme: Ethical Aspects

Promoting ethical practices through the development of environmentally friendly facilities aligns with broader sustainability goals and enhances the farm's ethical standing. This indicator measures community support for such ethical initiatives. Potential Social Effects include:

- **Positive:** Ethical practices can strengthen community trust, improve the farm's reputation, and foster long-term sustainability.
- **Negative:** Ethical initiatives may require substantial investments and ongoing commitment, which could be challenging to maintain without consistent support.


Finally, the meticulous design and pre-screening of the questionnaire, along with clear instructions and pillar-specific questions, ensured that the finally selected questions would help the Social Assessment to effectively measure the impact on all categories. The consultation stage also helped the selection of themes and indicators under each pillar to be strategically designed to comprehensively assess the social impacts of RES implementation in livestock farms. By focusing on these specific areas, the Social Assessment ensures a holistic evaluation that captures both the direct and indirect social effects of RES technologies on various stakeholder groups.

## 2.4 Analysis methodology

In order to evaluate the social impact comprehensively, a structured data analysis workflow is essential. This workflow ensures that the data collected from questionnaires is analysed and interpreted to provide meaningful insights. The inclusion of weighted scoring facilitates a rounded understanding of the overall social impact, while statistical and qualitative analyses add depth and rigor to the findings. To achieve this analysis, the project team followed the next methodological approach.

### 1. Data Preparation

First, the team coded the responses, assigning numerical values to facilitate quantitative analysis (e.g. "Worse" = -1, "Neutral" = 0, "Better" = 1). This process involves converting qualitative data into a numerical format that can be easily analysed statistically. Identifying and classifying stakeholders based on their roles (e.g., farm owners, local community, policymakers) to enable subgroup analysis

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was also performed. This categorization helps in understanding how different groups perceive the impact of RES technologies.

## 2. Descriptive Analysis

First, a frequency distribution was prepared counting how often each response appears for each question to identify common trends, by analysing Mean Scores. Mean Score is a straightforward way to summarize stakeholder responses and assess the overall sentiment regarding various social aspects. The score for each question and participant was also calculated, based on the following formula:

$$\text{Mean} = \frac{\sum(\text{response values})}{\text{number of responses}}$$

## 3. Weighted Scoring

Next, weights were assigned to aspects in order to determine the relative importance of each aspect based on project objectives or stakeholder priorities. The weighted score was calculated, based on the following formula:

$$\text{Weighted Score} = \sum(\text{weight}_i \times \text{score}_i)$$

## 4. Impact Index

Finally, the team created an overall measure of social impact by aggregating and normalizing scores across different aspects (e.g. impact categories and stakeholder groups). The index score was calculated, based on the following formula:

$$\text{Impact Index} = \left( \frac{\sum(\text{scores})}{\text{Maximum Possible Score}} \right) \times 100$$

## 5. Statistical Analysis

In order to enhance the rigor of the analysis, the project team explored relationships and tested the significance of findings, by performing the following statistical analysis:


### a. Correlation Analysis

Correlation analysis is a statistical technique used to measure and describe the strength and direction of a relationship between two variables. The result is typically expressed as a correlation coefficient, which is a numerical value ranging from -1 to 1. This value indicates both the strength and the direction of the relationship. The types of Correlation are:

- Positive Correlation: When an increase in one variable leads to an increase in another variable. The correlation coefficient is between 0 and +1.
- Negative Correlation: When an increase in one variable leads to a decrease in another variable. The correlation coefficient is between 0 and -1.
- No Correlation: When there is no apparent relationship between the two variables. The correlation coefficient is close to 0.

The usual magnitude interpretation is as follows:

- 0.0 – 0.19: Very weak
- 0.20 – 0.39: Weak
- 0.40 – 0.59: Moderate
- 0.60 – 0.79: Strong
- 0.80 – 1.0: Very strong

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### b. Significance Testing:

In Significance Testing the objective is to determine if observed differences in perceptions between groups are statistically significant. This can be achieved with tests such as the Chi-Square Test. It is primarily used in hypothesis testing to compare the observed frequency of events with the expected frequency under the assumption that the variables are independent. The type that will be used is the Chi-Square Test of Independence. This is used to test whether two categorical variables are independent or related. For example, a social assessment can be used to determine if there is an association between stakeholder type (e.g., farmers, local community, policymakers) and their perception of the social impacts of the project.

The following steps are taken:

#### 1. Formulation of the Hypotheses

- Null Hypothesis ( $H_0$ ): Assumes that the two categorical variables are independent (i.e., there is no relationship between them).
- Alternative Hypothesis ( $H_1$ ): Assumes that the two variables are not independent (i.e., there is a relationship between them).

#### 2. Construct a Contingency Table

The team organize the observed frequencies of the categorical variables into a contingency table. The rows represent the categories of one variable, and the columns represent the categories of the second variable.

#### 3. Calculate Expected Frequencies

The team calculated the expected frequency for each cell in the table based on the following formula:

$$\text{Expected Value} = \frac{(\text{Row Total}) \times (\text{Column Total})}{\text{Overall Total}}$$

#### 4. Computation of the Chi-Square Statistic

The team calculated the Chi-Square Statistic based on the following formula:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where:

- $O$  is the observed value
- $E$  is the expected value

#### 5. Determination of the Degrees of Freedom

The degrees of freedom for the Chi-Square Test of Independence are calculated based on the following formula:

$$df = (r - 1) \times (c - 1)$$


Where:

- $r$  = Number of rows
- $c$  = Number of columns

#### 6. Finding the Critical Value (or p-Value)

The team calculated the p-Value based on the following formula:

$$\text{p-value} = P(\chi^2 \geq \chi_{\text{observed}}^2 \mid df)$$

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## 7. Interpret the Results Interpretation

If the p-value is less than the chosen significance level (typically 0,05), you reject the null hypothesis and conclude that there is a statistically significant association between the variables. If the p-value is greater than 0,05, you fail to reject the null hypothesis, suggesting no significant association between the variables.

Finally, all the results were presented in a visually intuitive manner to facilitate understanding and communication of findings, using bar charts to display frequency distributions and compare responses across different aspects.

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## 3 SOCIAL IMPACT DATA ANALYSIS

### 3.1 Introduction

One of the main issues the project team faced, was handling misaligned responses in the social assessment questionnaire. In many cases, stakeholders have answered questions that were intended for other stakeholder categories. This required a balanced approach that maintains data integrity while capturing valuable insights. By systematically identifying, evaluating, and deciding on the inclusion of such responses, the project team ensured that the analysis remained robust and reflective of the true stakeholder perspectives.

Analysing the data, was observed that the responses provided by the unintended stakeholders offered valuable insight into the question (even if it wasn't directly aimed at them), and thus the team decided to include them. Furthermore, these responses were aligned with the broader goals of the social assessment. For example, a worker answering a question intended for the local community might provide a different but meaningful perspective on the social impact of the project.

Finally, it was concluded that two separate analyses should be conducted, i.e.

one to analyse all the responses from intended and unintended stakeholders (all answers) and one using only the questions intended for the participant (strict).

For transparency and clarity in the results, those two analyses are marked as “**All answers**” and “**Strict**”, respectively.

This approach allowed the project team to assess whether they added any valuable information or if they were significantly different from the targeted stakeholders' responses. It could also highlight perspectives that may warrant additional analysis in future assessments.

In the next sections, the data analysis for all four farms is presented. The raw data from the questionnaires is presented in the Annex.


### 3.2 AUA pilot farm

#### 3.2.1 Average Score per Participant & Question

In the next table and figures, the basic mean scores per participant are presented, for both analyses.

*Table 4. Basic mean scores per participant.*

Participant	Stakeholders Category	All Answers			Strict		
		No of Answers	out of	Average Score (all)	No of Answers	out of	Average Score (strict)
AUA 1	Worker / Local Community	22	28	0,30	17	20	0,24
AUA 2	Worker / Local Community	22	28	0,65	17	20	0,59
AUA 3	Worker / Local Community	22	28	0,65	17	20	0,59
AUA 4	Farm Management	24	28	0,58	9	9	1,56
AUA 5	Regulators	20	28	0,88	2	2	0,50
AUA 6	Regulators	20	28	0,88	2	2	0,50
AUA 7	Local Community	14	28	0,50	7	9	0,29
AUA 8	Local Community	27	28	0,70	9	9	0,56
AUA 9	Local Community	25	28	0,76	9	9	0,89

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<b>AUA 10</b>	Local Community	8	28	0,63	7	9	0,57
<b>AUA 11</b>	Local Community	8	28	0,63	6	9	0,67
<b>AUA 12</b>	Local Community	8	28	0,75	7	9	0,86
<b>AUA 13</b>	Local Community	9	28	0,56	7	9	0,57
<b>AUA 14</b>	Local Community	8	28	-0,13	7	9	-0,14
<b>AUA 15</b>	Local Community	6	28	0,33	5	9	0,20
<b>AUA 16</b>	Local Community	7	28	0,71	6	9	0,67
<b>AUA 17</b>	Local Community	8	28	0,63	7	9	0,57
<b>AUA 18</b>	Local Community	9	28	0,44	7	9	0,14
<b>AUA 19</b>	Local Community	8	28	0,38	7	9	0,43
<b>AUA 20</b>	Local Community	7	28	1,14	6	9	1,17
<b>AUA 21</b>	Local Community	8	28	0,63	7	9	0,43
<b>AUA 22</b>	Local Community	8	28	0,25	6	9	0,17

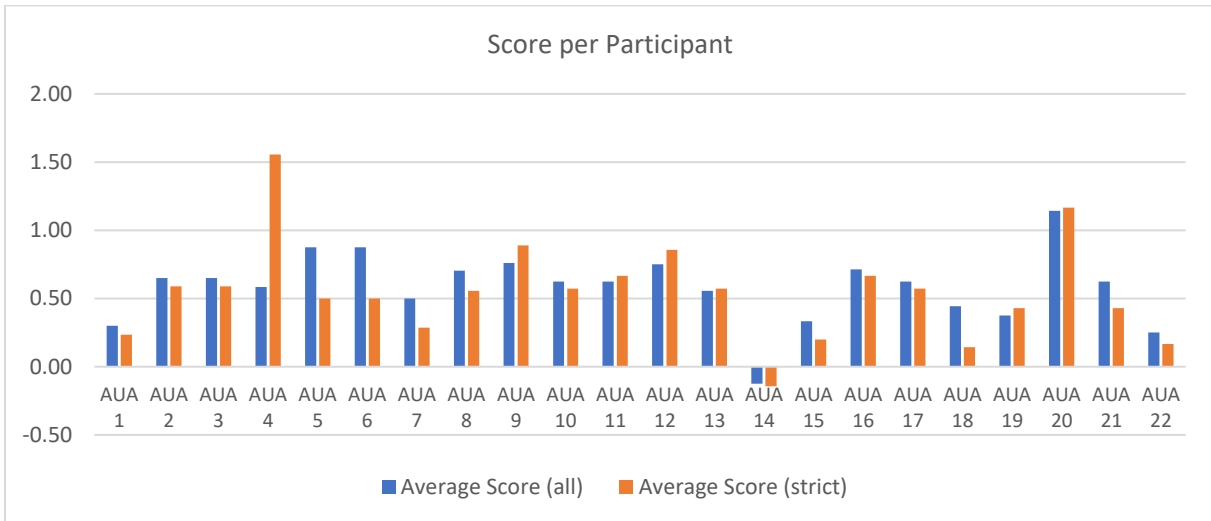


Figure 2. Basic mean scores per participant.

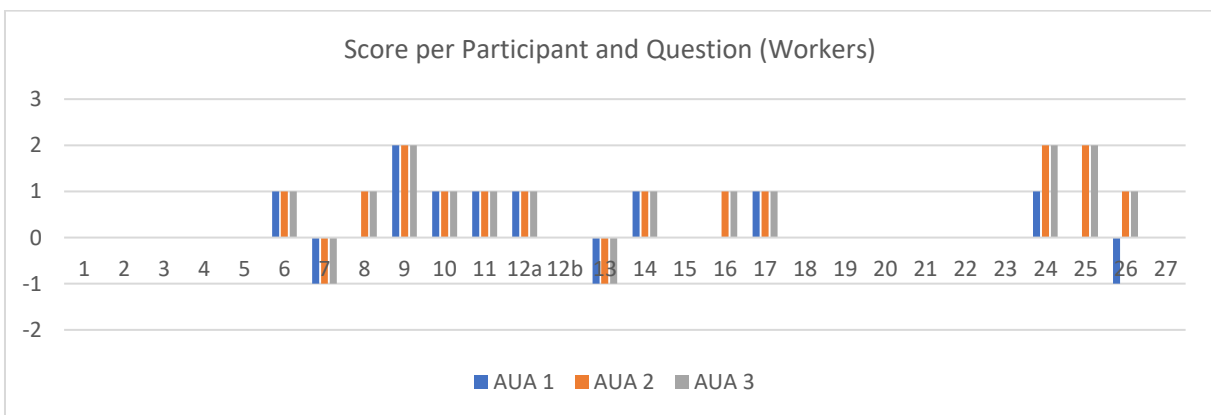


Figure 3. Mean scores per participant and question for Workers Group (All answers).

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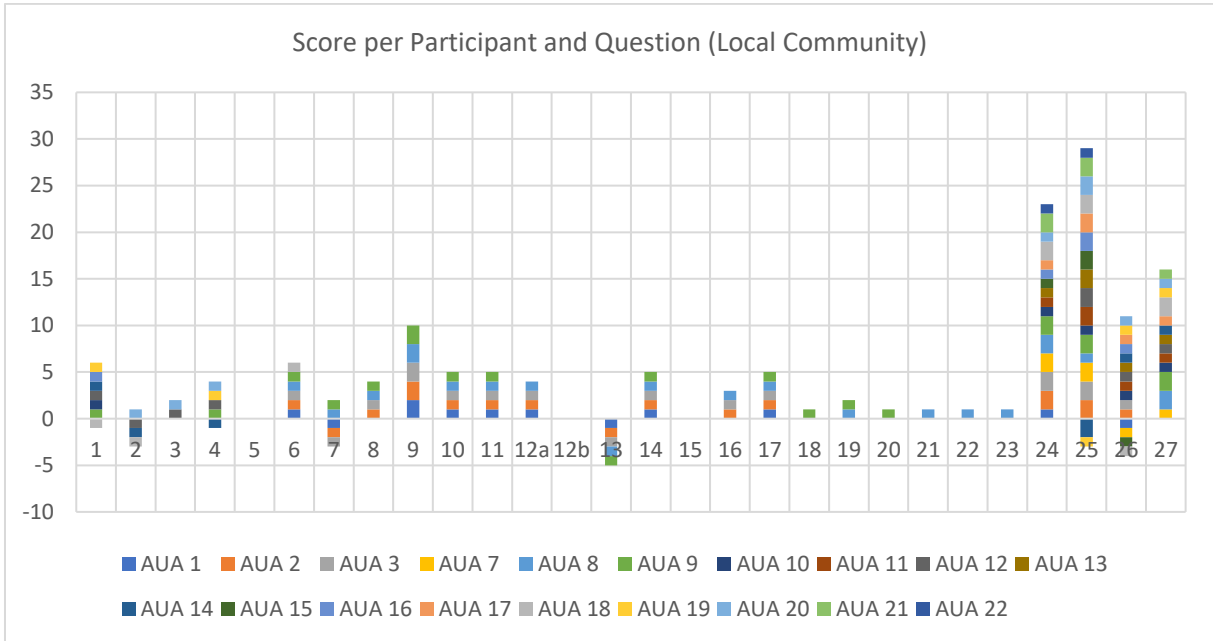


Figure 4. Mean scores per participant and question for Local Community Group (All answers).

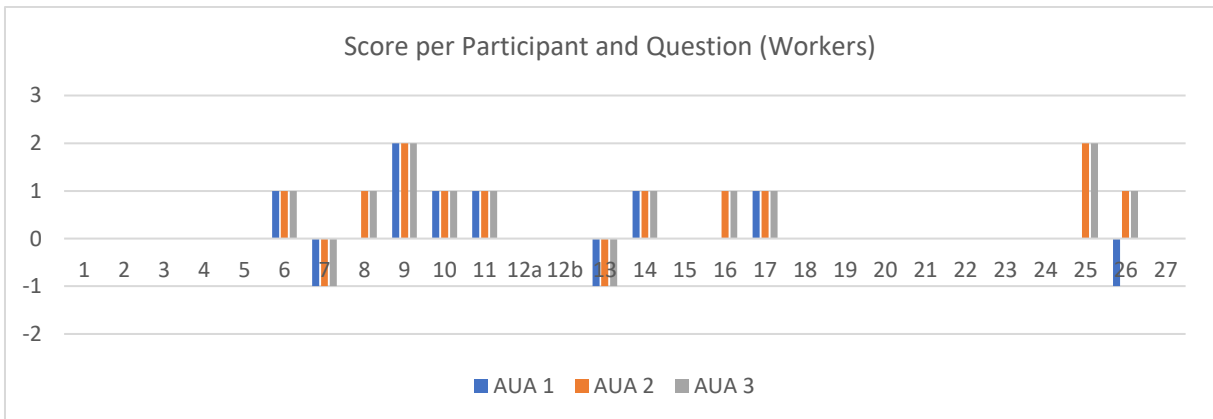


Figure 5. Mean scores per participant and question for Workers Group (Strict).

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	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

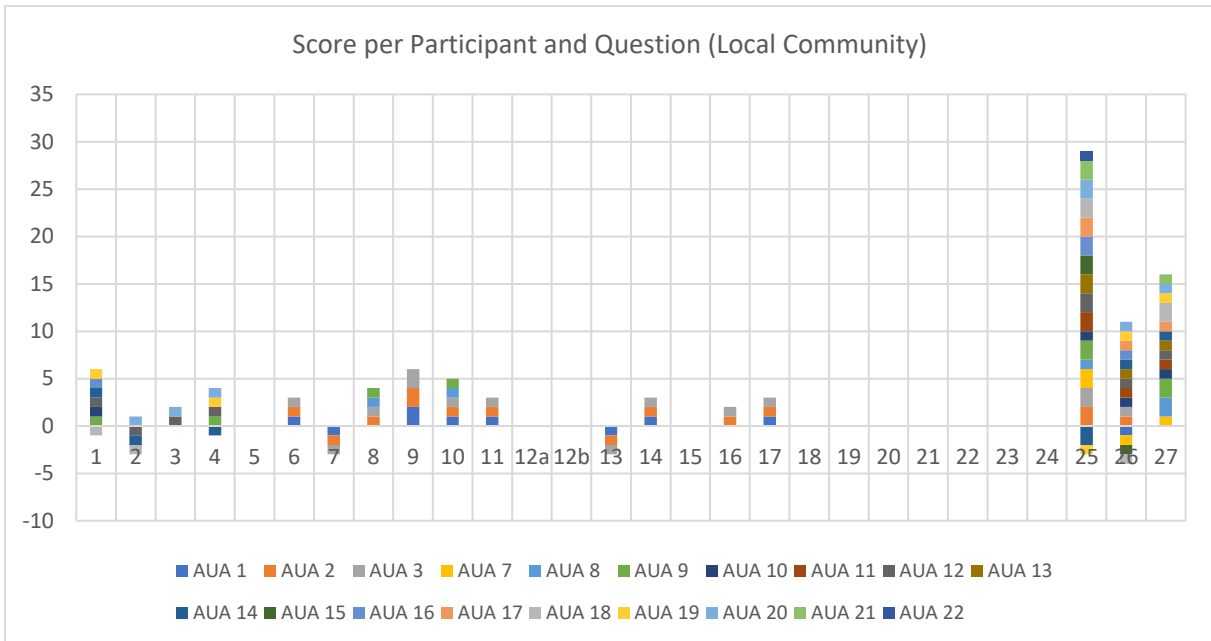


Figure 6. Mean scores per participant and question for Local Community Group (Strict).

Generally, we noticed that the perception of the participants regarding the social impact is positive. Most participants in the same group seem to be aligned, while there are no significant differences between the two analyses (all answers and strict). Furthermore, in the following, the average score per question for both analyses is presented.

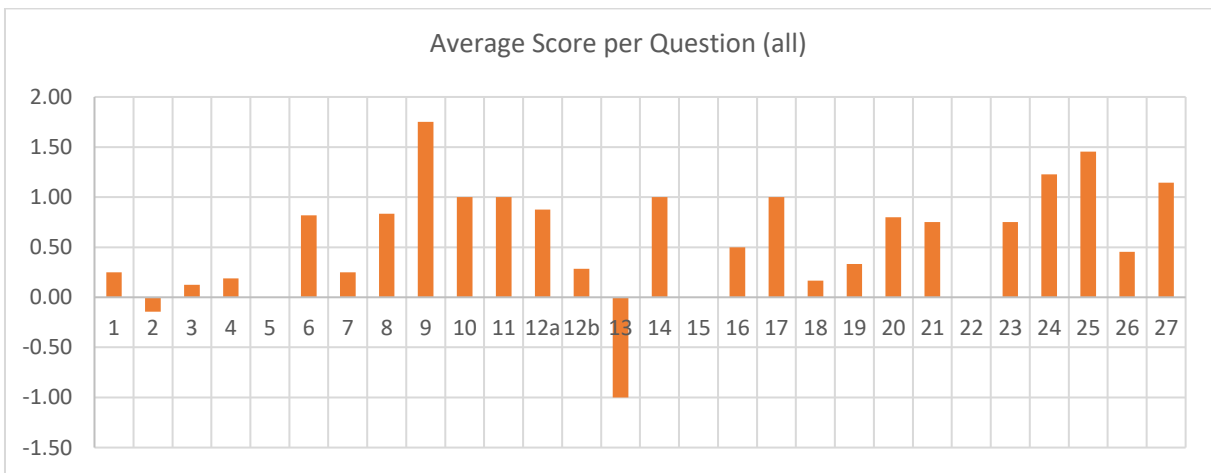



Figure 7. Mean scores per question (all answers).



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	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

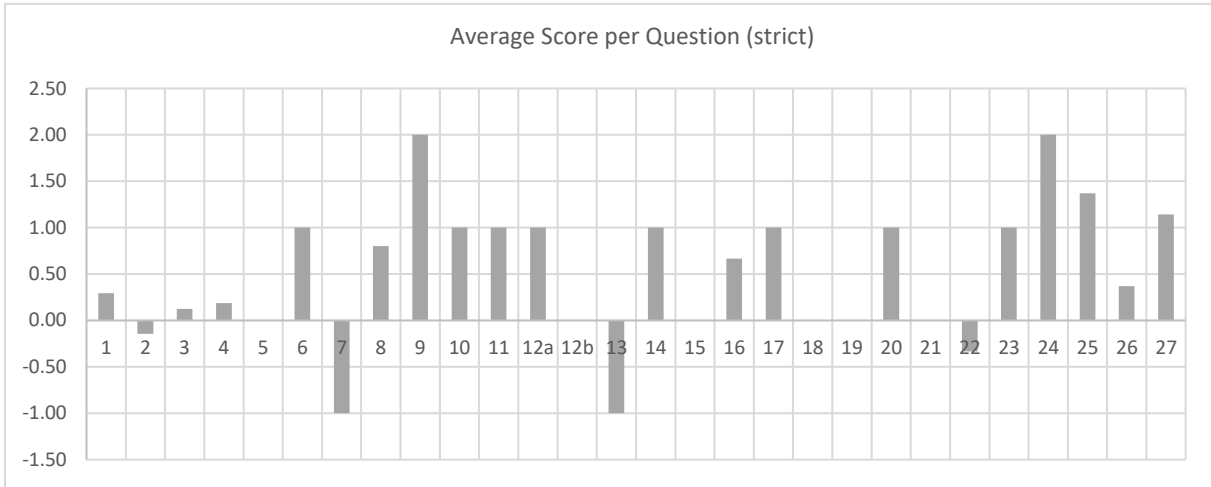


Figure 8. Mean scores per question (strict).

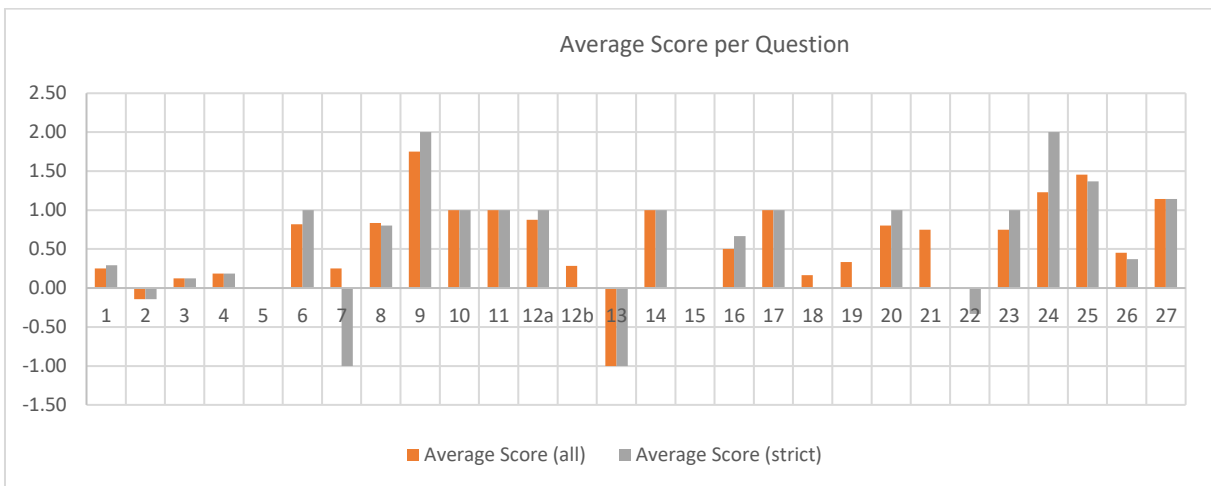



Figure 9. Mean scores per question (comparison).

Labor Rights, and in particular wage and compensation improvements seem to have a negative social perception, since in question 13, most workers did not experience improvements in wages and compensation as a result of the project.

Moreover, training programs for energy efficiency and safety and, in particular, completion of safety training seem to have a negative social perception. In question 7, the majority of workers answered that they did not receive sufficient training in those areas. This likely stems from the fact that the questionnaires were completed prior to the training session, which occurred after the fine-tuning of the heat pump system.

On the other hand, the participants have a very positive perception regarding the transparency of the farm's operations and reporting related to energy efficiency and emissions reduction (question 21).

Finally, in the following figures, the average index impact per category is presented, for both analyses.

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	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

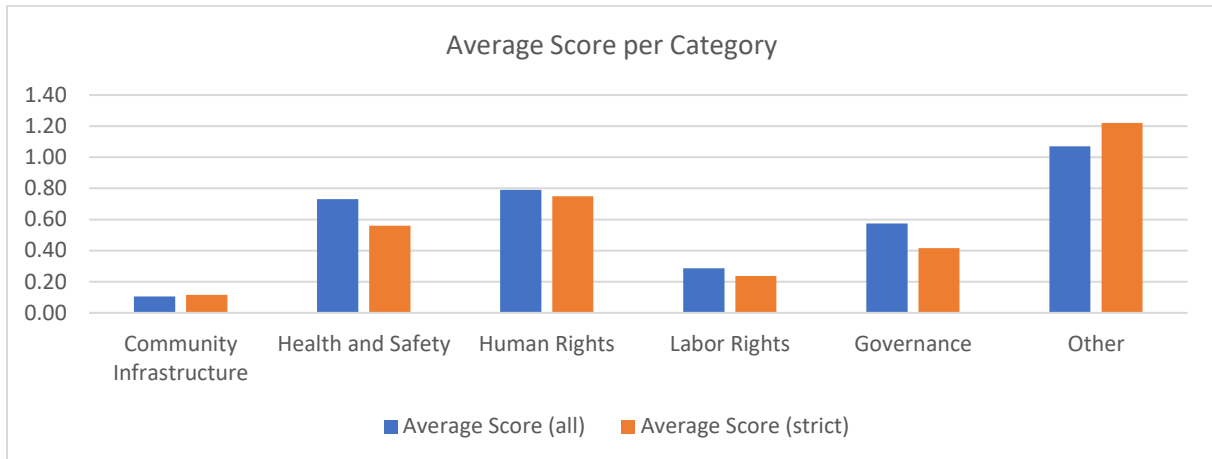


Figure 10. Average mean scores per impact category.


The most positive social impact perception appears to be the impact of Other (environment and ethical aspects), Health and Safety as well as Human Rights, while for community infrastructure the social impact tends to be neutral. Furthermore, we observed no significant differences between the two analyses.

### 3.2.2 Average Score per Stakeholder Group

In the following table and figures, the impact index per Stakeholder Group for both analyses is presented.

Table 5. Impact index per Stakeholder Group (All answers).

Question	Worker	Farm Management	Regulators	Local Community
1	0,00	0,00	0,00	0,29
2				-0,14
3				0,13
4				0,19
5	0,00	0,00	0,00	0,00
6	1,00	1,00	1,00	0,75
7	-1,00	1,00	1,00	-0,20
8	0,67	1,00		0,80
9	2,00	1,00	1,50	2,00
10	1,00	1,00	1,00	1,00
11	1,00	1,00	1,00	1,00
12a	1,00	1,00	1,00	0,80
12b	0,00	0,00	1,00	0,00
13	-1,00	-1,00		-1,00
14	1,00	1,00		1,00
15	0,00	0,00		0,00
16	0,67	0,00		0,60
17	1,00	1,00		1,00
18	0,00	0,00		0,20
19	0,00	0,00		0,40
20		1,00	1,00	0,50
21		0,00	1,00	1,00

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Question	Worker	Farm Management	Regulators	Local Community
22		-1,00	0,00	1,00
23		1,00	0,50	1,00
24	1,67	2,00	1,00	1,21
25	1,33	2,00	2,00	1,37
26	0,33	1,00	1,00	0,37
27				1,14
<b>Average</b>	<b>0,53</b>	<b>0,58</b>	<b>0,88</b>	<b>0,59</b>

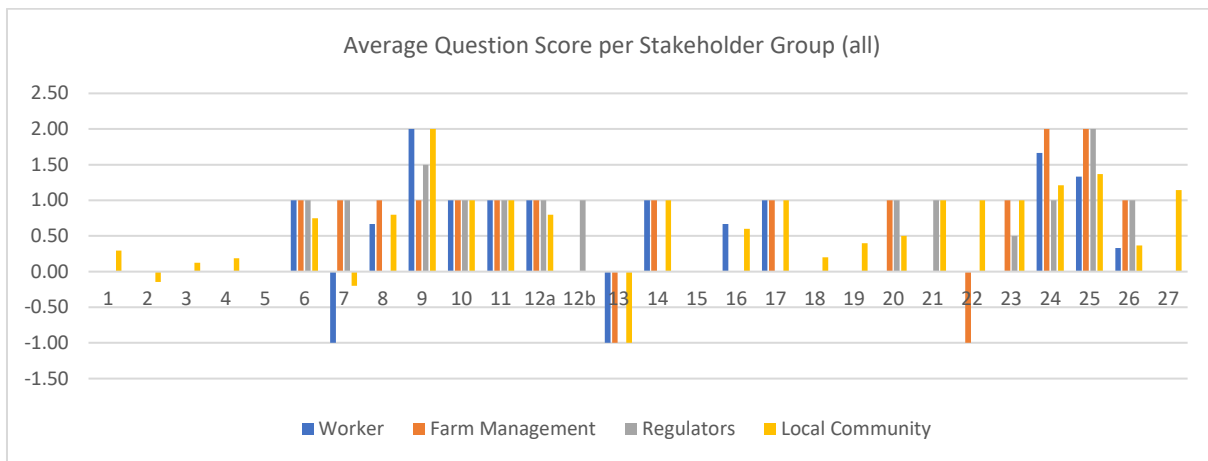


Figure 11. Average score per Stakeholder Group and Question – Cluster Bars (All answers).

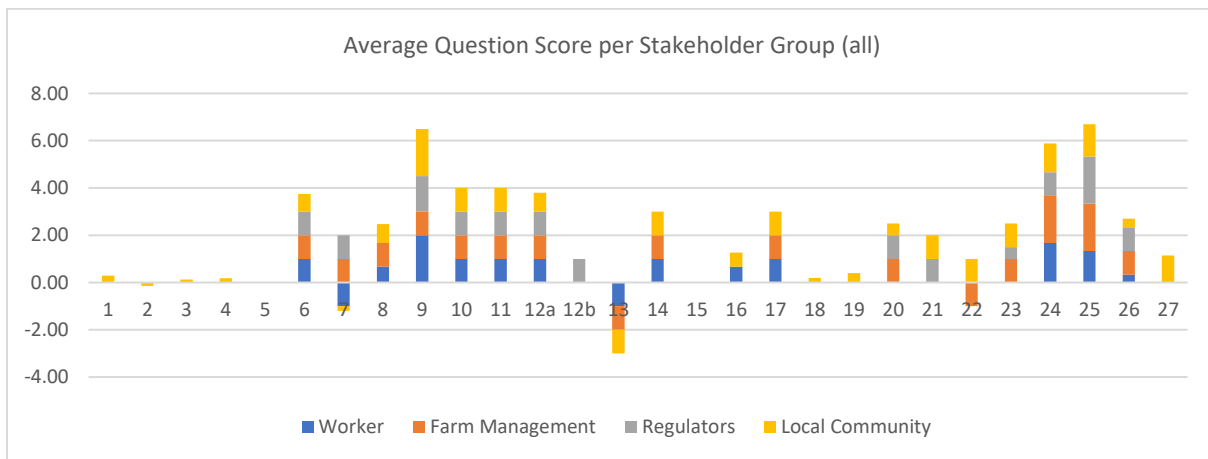



Figure 12. Average score per Stakeholder Group and Question – Stacked Bars (All answers).

Table 6. Impact index per Stakeholder Group (Strict).

Question	Worker	Farm Management	Regulators	Local Community
1	0,00			0,29
2				-0,14
3				0,13
4				0,19

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	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

Question	Worker	Farm Management	Regulators	Local Community
5	0,00			0,00
6	1,00	1,00		1,00
7	-1,00			-1,00
8	0,67			0,80
9	2,00			2,00
10	1,00			1,00
11	1,00			1,00
12a		1,00		
12b		0,00		
13	-1,00			-1,00
14	1,00			1,00
15	0,00	0,00		0,00
16	0,67			0,67
17	1,00			1,00
18	0,00			0,00
19	0,00			0,00
20		1,00	1,00	
21		0,00		
22		-1,00	0,00	
23		1,00		
24		2,00		
25	1,33			1,37
26	0,33			0,37
27				1,14
<b>Average</b>	<b>0,47</b>	<b>0,56</b>	<b>0,50</b>	<b>0,47</b>

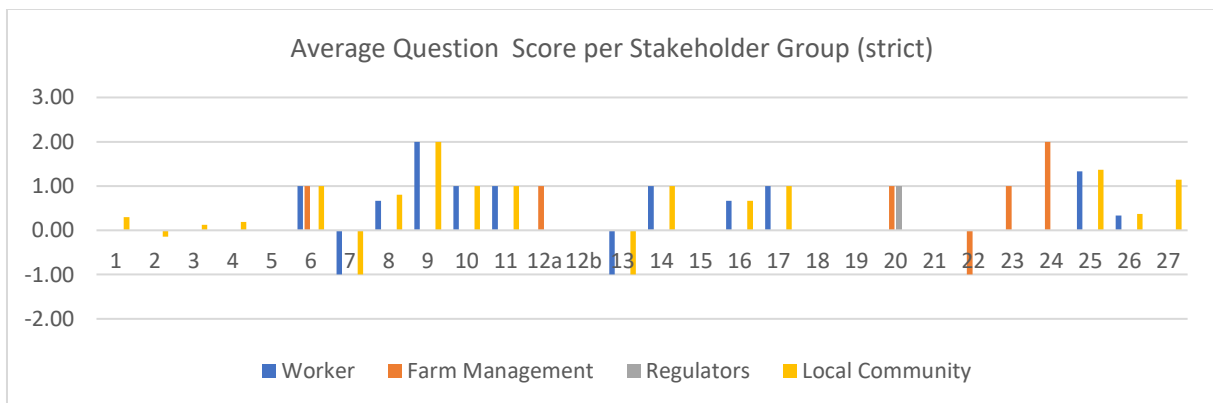



Figure 13. Average score per Stakeholder Group and Question – Cluster Bars (Strict).

	Document:	Deliverable D5.4 Social Assessment Report		
	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

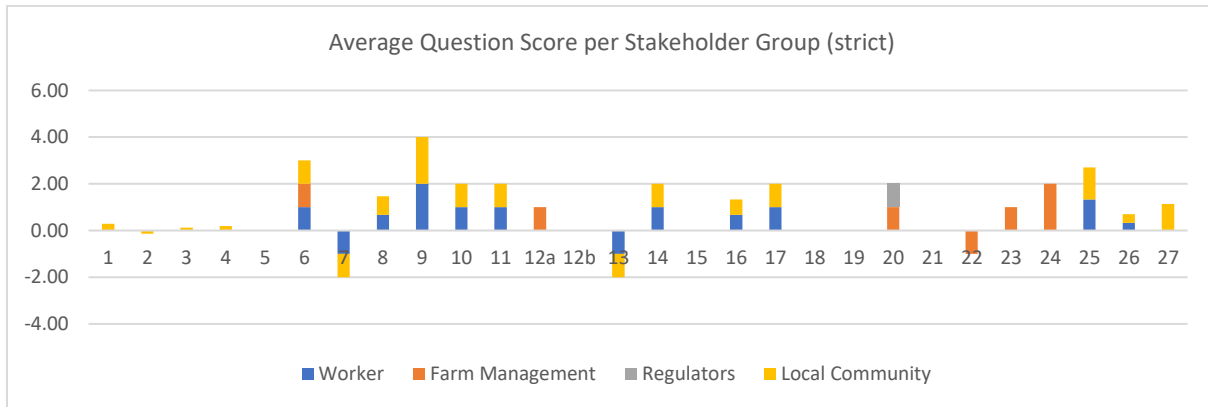


Figure 14. Average score per Stakeholder Group and Question – Stacked Bars (All answers).

In general, the results are consistent for all cases, showing alignment between participants of the same group and generally positive perception of social impacts. Furthermore, the project team prepared 3 different scenarios, in calculating the total Social Impact Index of each case. The results are presented in the following, for both analyses.

Table 7. Total SA Index for various weighting scenarios for stakeholders’ groups (All answers).

Scenario	Worker	Farm Management	Regulators	Local Community	Average (all)
<b>25,25,25,25</b>	25%	25%	25%	25%	0,644
<b>30,30,10,50</b>	30%	30%	10%	50%	0,715
<b>10,10,10,70</b>	10%	10%	10%	70%	0,609

Table 8. Total SA Index for various weighting scenarios for stakeholders’ groups (Strict).

Scenario	Worker	Farm Management	Regulators	Local Community	Average (strict)
<b>25,25,25,25</b>	25%	25%	25%	25%	0,498
<b>30,30,10,50</b>	30%	30%	10%	50%	0,591
<b>10,10,10,70</b>	10%	10%	10%	70%	0,480

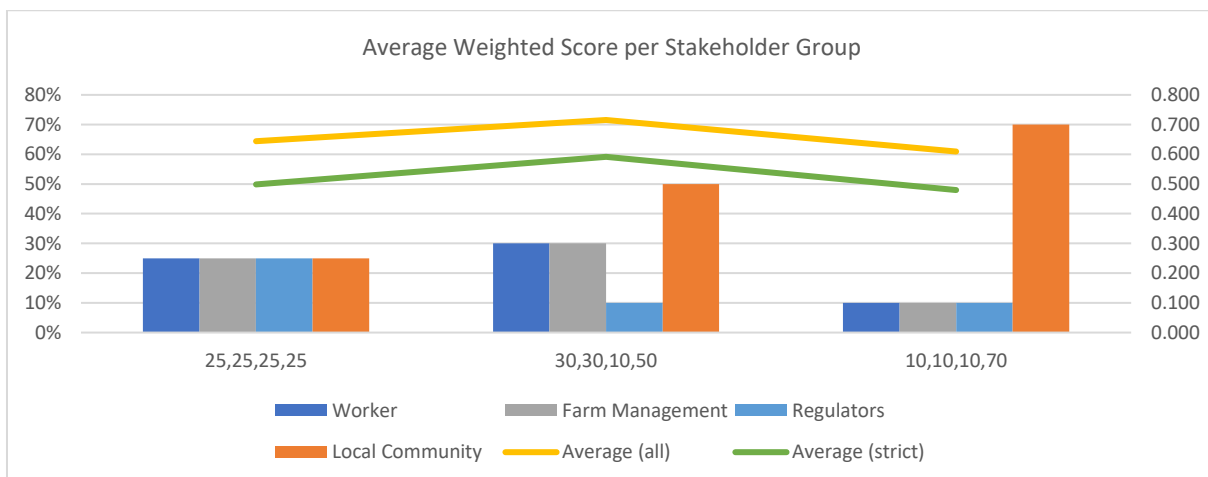


Figure 15. Comparison between the total SA Index for various weighting scenarios for stakeholder groups.

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As presented in Figure 15, the total SA Index remains positive for all scenarios. In the Strict approach, it is around 0,5, while in the All-answers approach, it is slightly higher. This clearly shows that stakeholders who answered questions outside their group have a slightly more positive perception of those aspects than those in the intended group.

### 3.2.3 Average Weighted Scores per Impact Category

Furthermore, the average weighted scores per impact category are presented. In total 3 scenarios were analysed, as presented in Table 10.

Table 9. Average Scores per Impact Category (not weighted).

Category	Question	Average Score (all)	Average Score (strict)	Average Score (all)	Average Score (strict)
<b>Community Infrastructure</b>	1	0,25	0,29	<b>0,10</b>	<b>0,12</b>
	2	-0,14	-0,14		
	3	0,13	0,13		
	4	0,19	0,19		
<b>Health and Safety</b>	5	0,00	0,00	<b>0,73</b>	<b>0,56</b>
	6	0,82	1,00		
	7	0,25	-1,00		
	8	0,83	0,80		
	9	1,75	2,00		
<b>Human Rights</b>	10	1,00	1,00	<b>0,79</b>	<b>0,75</b>
	11	1,00	1,00		
	12a	0,88	1,00		
	12b	0,29	0,00		
<b>Labor Rights</b>	13	-1,00	-1,00	<b>0,29</b>	<b>0,24</b>
	14	1,00	1,00		
	15	0,00	0,00		
	16	0,50	0,67		
	17	1,00	1,00		
	18	0,17	0,00		
	19	0,33	0,00		
	20	0,80	1,00		
<b>Governance</b>	21	0,75	0,00	<b>0,58</b>	<b>0,42</b>
	22	0,00	-0,33		
	23	0,75	1,00		
<b>Other</b>	24	1,23	2,00	<b>1,07</b>	<b>1,22</b>
	25	1,45	1,37		
	26	0,45	0,37		
	27	1,14	1,14		


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Table 10. Average SA Index per Impact Category for various weighting scenarios.

Scenarios	Community Infrastructure	Health and Safety	Human Rights	Labor Rights	Governance	Other	Average Score (all)	Average Score (strict)
Scenario 1	14,29%	17,86%	14,29%	25,00%	14,29%	14,29%	0,56	0,52
Scenario 2	15,00%	15,00%	15,00%	25,00%	15,00%	15,00%	0,56	0,52
Scenario 3	5,00%	30,00%	25,00%	30,00%	5,00%	5,00%	0,59	0,51

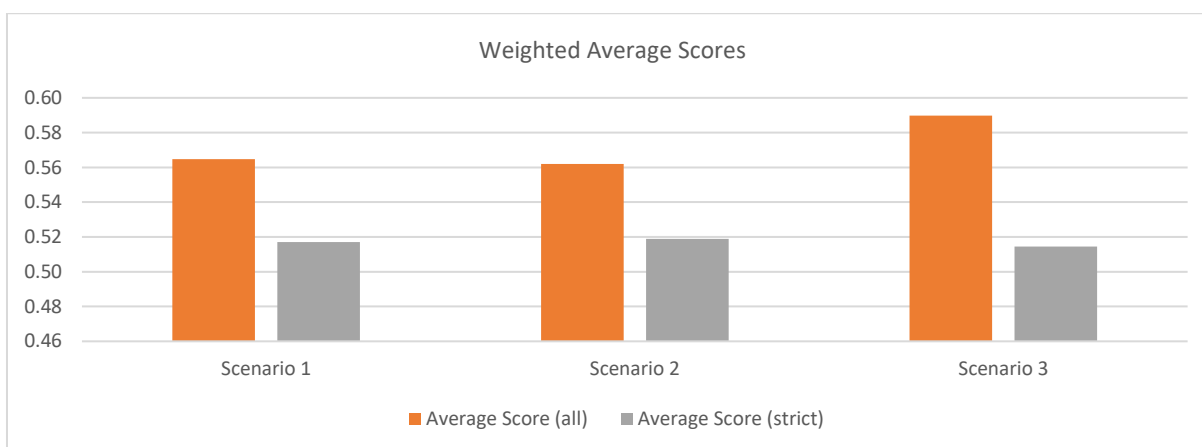


Figure 16. Average SA Index per Impact Category for various weighting scenarios for impact categories.

As presented in Figure 16, the total SA Index remains positive for all scenarios and analyses. In the Strict approach, it is around 0,48, while in the All-answers approach, it is obviously higher. This, again, clearly shows that participants (in general) who answered questions outside their targeted questions have a slightly more positive perception of those aspects than those in the intended group.

## 3.2.4 Statistical analysis

### 3.2.4.1 Correlation

After the above analysis, a correlation analysis is conducted, based on the methodology presented in Section 2.4.

Table 11. Correlation analysis between stakeholder groups (All answers).

Correlation	Worker	Farm Management	Regulators	Local Community
Worker		72%	53%	95%
Farm Management			73%	58%
Regulators				46%
Local Community				

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Table 12. Correlation analysis between stakeholder groups (Strict).

Correlation	Worker	Farm Management	Regulators	Local Community
Worker		100%	N/A	100%
Farm Management			100%	100%
Regulators				N/A
Local Community				

Positive correlation means as one variable increases, the other tends to increase, while negative correlation means as one increases, the other tends to decrease. A value close to 1 or -1 indicates a strong correlation, while a value near 0 indicates little to no correlation.

In the Strict approach, as expected the correlation where applicable, is 100%. In the All-answers approach, the social impact perception of Workers and the Local Community seems to have the strongest correlation, while the perception of Regulators and the Local Community is the weakest, which is an invaluable finding.

### 3.2.4.2 Chi-Square Test

After the correlation analysis, the chi-square test is conducted.

Table 13. Chi-Square Test | Observed Data (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	12	6	2	20
Farm Management	14	8	2	24
Regulators	13	3	0	16
Local Community	22	3	3	28
<b>Total</b>	<b>61</b>	<b>20</b>	<b>7</b>	<b>88</b>

Table 14. Chi-Square Test | Expected Values (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	13,86	4,55	1,59	20
Farm Management	16,64	5,45	1,91	24
Regulators	11,09	3,64	1,27	16
Local Community	19,41	6,36	2,23	28
<b>Total</b>	<b>61</b>	<b>20</b>	<b>7</b>	<b>88</b>

Table 15. Chi-Square Test | Contribution to the chi-square statistic (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	0,25	0,47	0,11	0,82
Farm Management	0,42	1,19	0,00	1,61
Regulators	0,33	0,11	1,27	1,71
Local Community	0,35	1,78	0,27	2,39
<b>Total</b>	<b>1,34</b>	<b>3,54</b>	<b>1,65</b>	<b>6,54</b>



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The Sum of the Chi-Square Contributions is 6,54, the degrees of freedom (df) is 6,00, and finally the (p-value is calculated to be 0,37.

Table 16. Chi-Square Test | Observed Data (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	10	5	2	<b>17</b>
<b>Farm Management</b>	5	3	1	<b>9</b>
<b>Regulators</b>	1	1	0	<b>2</b>
<b>Local Community</b>	14	4	3	<b>21</b>
<b>Total</b>	<b>30</b>	<b>13</b>	<b>6</b>	<b>49</b>

Table 17. Chi-Square Test | Expected Values (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	10,41	4,51	2,08	<b>17</b>
<b>Farm Management</b>	5,51	2,39	1,10	<b>9</b>
<b>Regulators</b>	1,22	0,53	0,24	<b>2</b>
<b>Local Community</b>	12,86	5,57	2,57	<b>21</b>
<b>Total</b>	<b>30</b>	<b>13</b>	<b>6</b>	<b>49</b>

Table 18. Chi-Square Test | Contribution to the chi-square statistic (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	0,02	0,05	0,00	<b>0,07</b>
<b>Farm Management</b>	0,05	0,16	0,01	<b>0,21</b>
<b>Regulators</b>	0,04	0,42	0,24	<b>0,70</b>
<b>Local Community</b>	0,10	0,44	0,07	<b>0,62</b>
<b>Total</b>	<b>0,21</b>	<b>1,07</b>	<b>0,33</b>	<b>1,60</b>

The Sum of the Chi-Square Contributions is 1,6, the degrees of freedom (df) are 6,00, and finally the (p-value is calculated to be 0,95.

In both cases, since the p-value is greater than 0,05, the results are statistically insignificant, and we can conclude that there is no association between the variables, i.e. stakeholder groups are not significantly associated with the perception of social impact.

## 3.3 GOLINELLI pilot farm

### 3.3.1 Average Score per Participant & Question

In the next table and figures, the basic mean scores per participant are presented, for both analyses.



	Document:	Deliverable D5.4 Social Assessment Report		
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Table 19. Basic mean scores per participant.

Participant	Stakeholders Category	All Answers			Strict		
		No of Answers	out of	Average Score (all)	No of Answers	out of	Average Score (strict)
GOLINELLI 1	Worker / Local Community	28	28	0,679	20	20	0,600
GOLINELLI 2	Worker / Local Community	28	28	0,679	20	20	0,600
GOLINELLI 3	Worker / Local Community	28	28	0,643	20	20	0,550
GOLINELLI 4	Worker / Local Community	28	28	0,679	20	20	0,550
GOLINELLI 5	Worker / Local Community	28	28	0,714	20	20	0,650
GOLINELLI 6	Worker / Local Community	28	28	0,643	20	20	0,500
GOLINELLI 7	Worker / Local Community	28	28	0,679	20	20	0,550
GOLINELLI 8	Worker / Local Community	28	28	0,679	20	20	0,600
GOLINELLI 9	Worker / Local Community	28	28	0,679	20	20	0,600
GOLINELLI 10	Worker / Local Community	28	28	0,679	20	20	0,600
GOLINELLI 11	Worker	28	28	0,643	11	11	0,455
GOLINELLI 12	Worker	28	28	0,679	11	11	0,455
GOLINELLI 13	Regulators	28	28	0,750	2	2	1,000
GOLINELLI 14	Farm Management	28	28	0,821	9	9	1,000
GOLINELLI 15	Farm Management	28	28	0,821	9	9	1,000
Uni 1	Worker	28	28	0,750	11	11	0,636
Uni 2	Worker	28	28	0,714	11	11	0,545
Uni 3	Worker	28	28	0,714	11	11	0,545
Uni 4	Regulators / Local Community	28	28	0,852	12	12	0,750
Uni 5	Regulators / Local Community	28	28	0,815	12	12	0,750
Uni 6	Local Community	28	28	0,675	10	10	0,556
Uni 7	Local Community	28	28	0,647	10	10	0,375
Uni 8	Local Community	28	28	0,765	10	10	0,625
Uni 9	Local Community	28	28	0,765	10	10	0,625
Uni 10	Local Community	28	28	0,647	10	10	0,500
Uni 11	Local Community	28	28	0,737	10	10	0,556

	Document:	Deliverable D5.4 Social Assessment Report		
	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

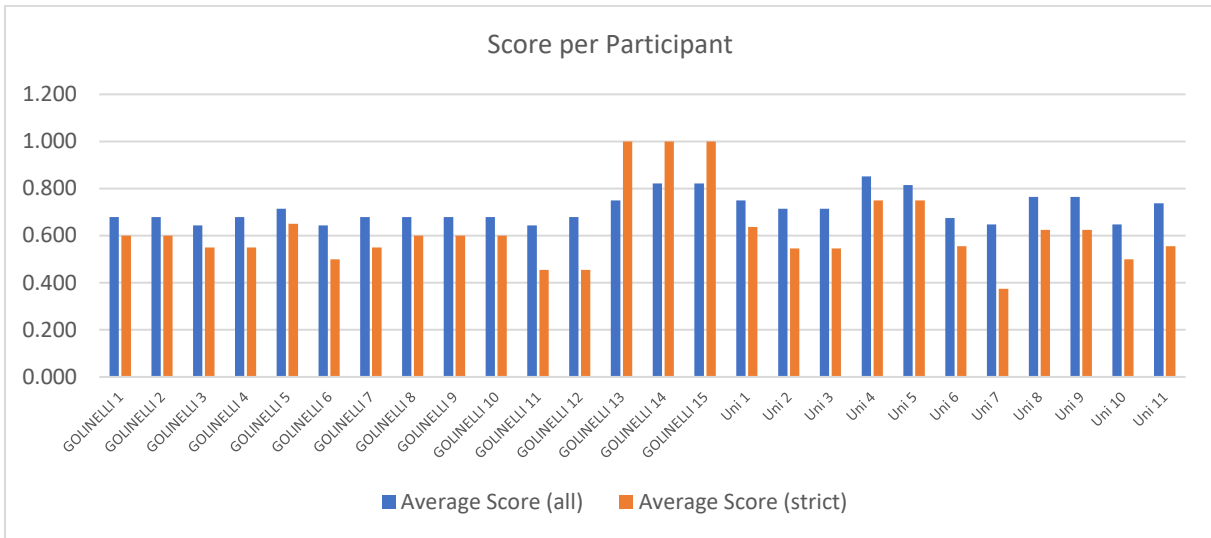


Figure 17. Basic mean scores per participant.

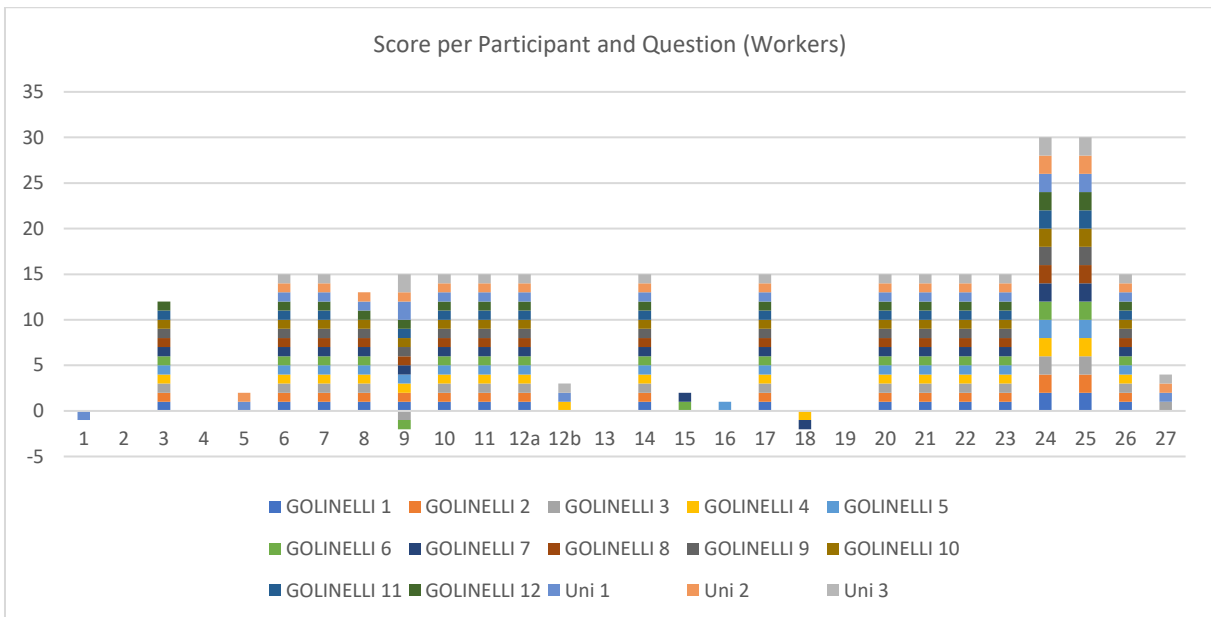



Figure 18. Mean scores per participant and question for Workers Group (All answers).

	Document:	Deliverable D5.4 Social Assessment Report		
	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

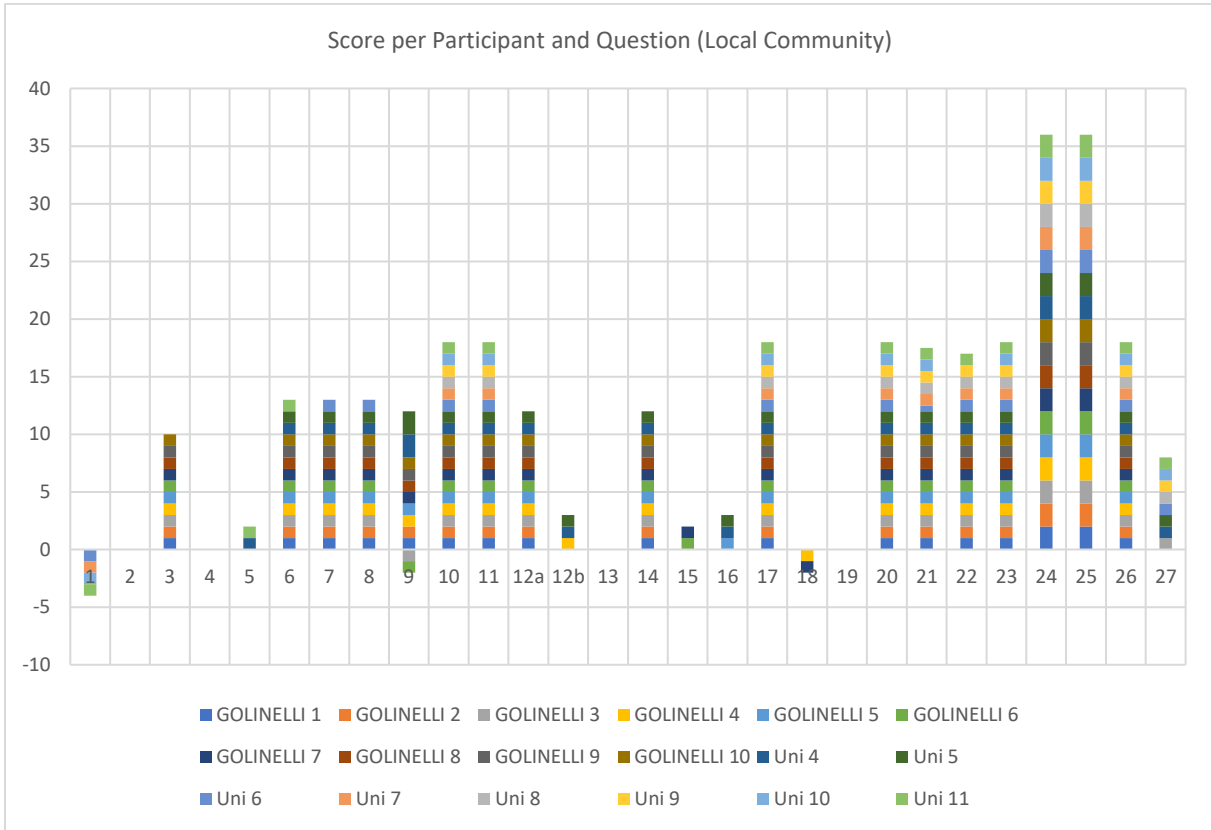


Figure 19. Mean scores per participant and question for Local Community Group (All answers).

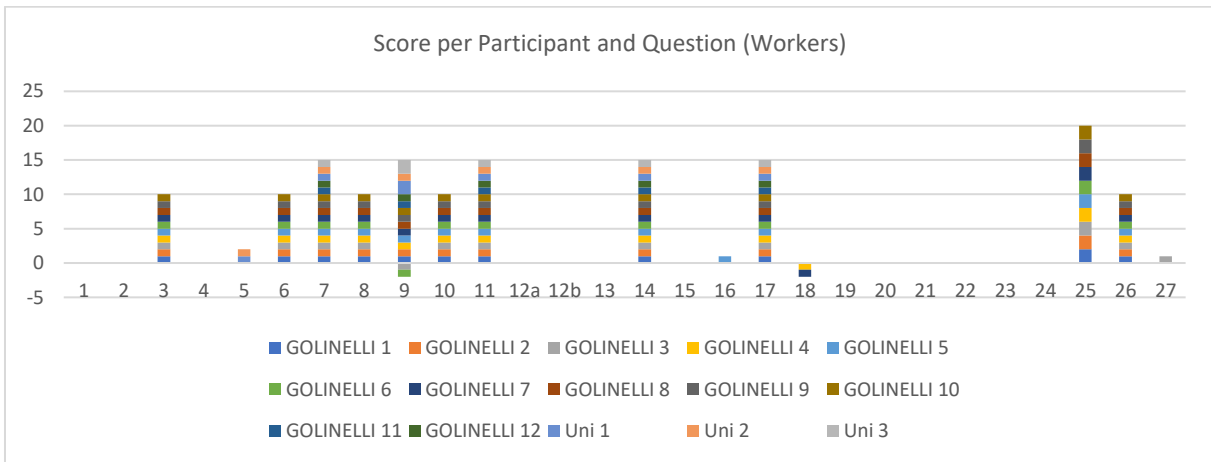



Figure 20. Mean scores per participant and question for Workers Group (Strict).

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	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

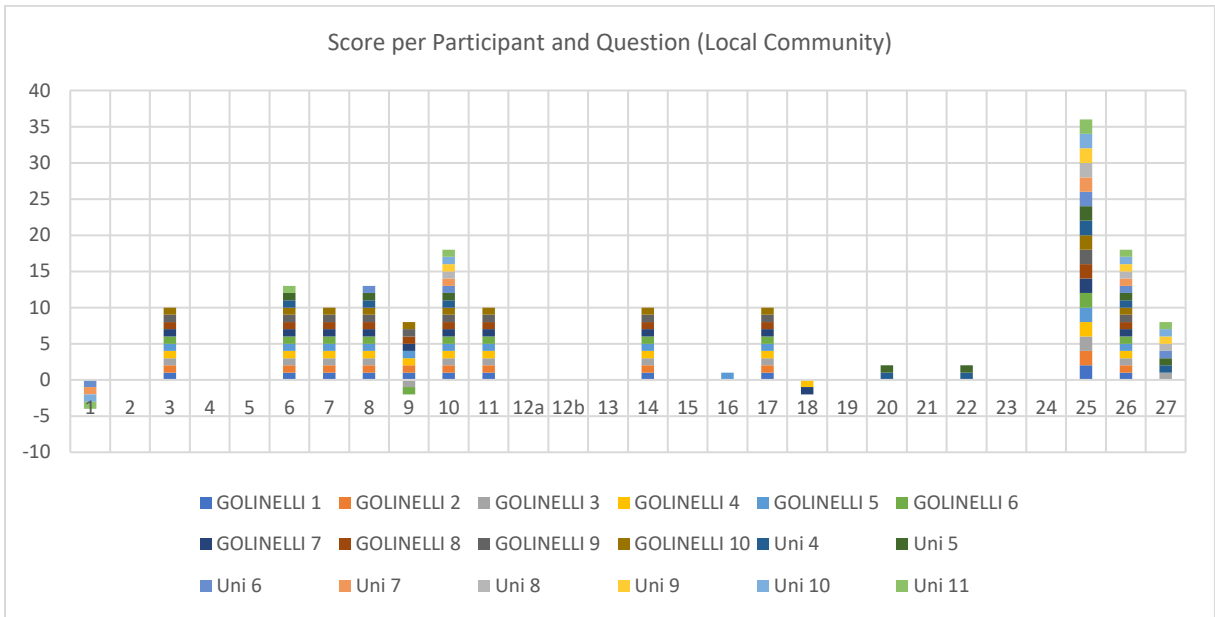


Figure 21. Mean scores per participant and question for Local Community Group (Strict).

Generally, we noticed that the perception of the participants regarding the social impact is positive. Most participants in the same group seem to be aligned, while there are no significant differences between the two analyses (all answers and strict). Furthermore, in the following, the average score per question for both analyses is presented.

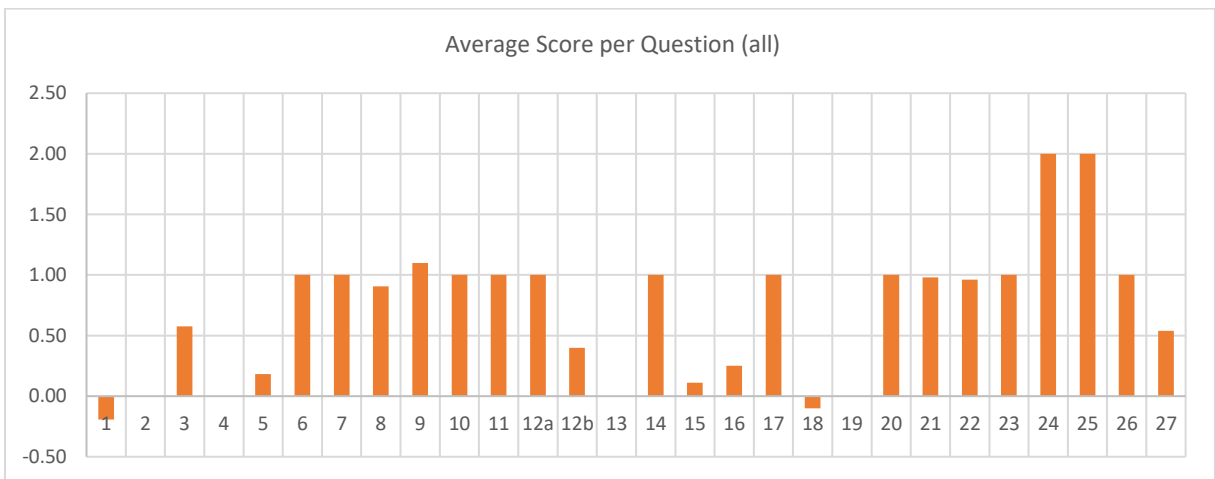



Figure 22. Mean scores per question (all answers).

	Document:	Deliverable D5.4 Social Assessment Report		
	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

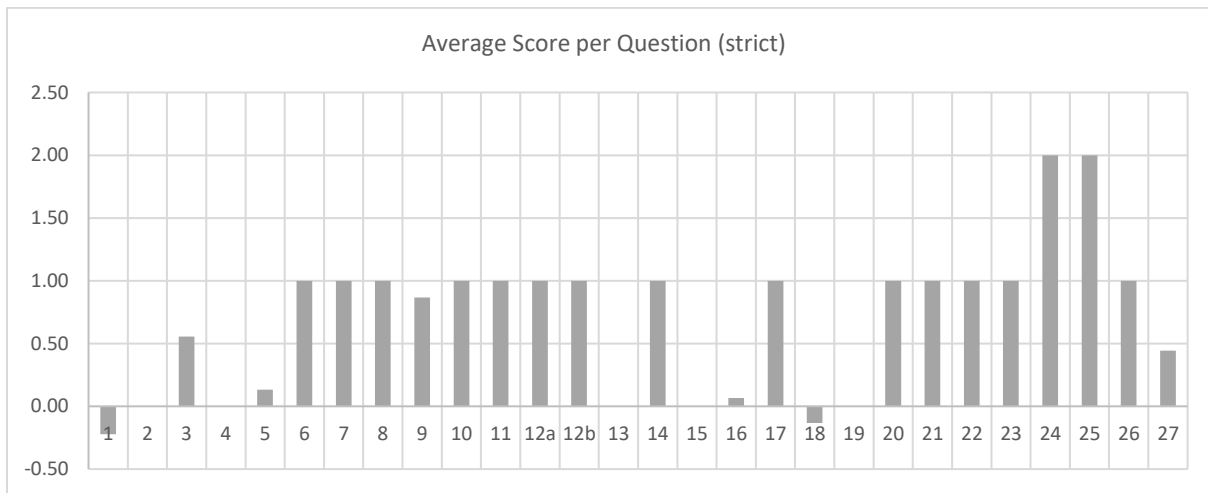


Figure 23. Mean scores per question (strict).

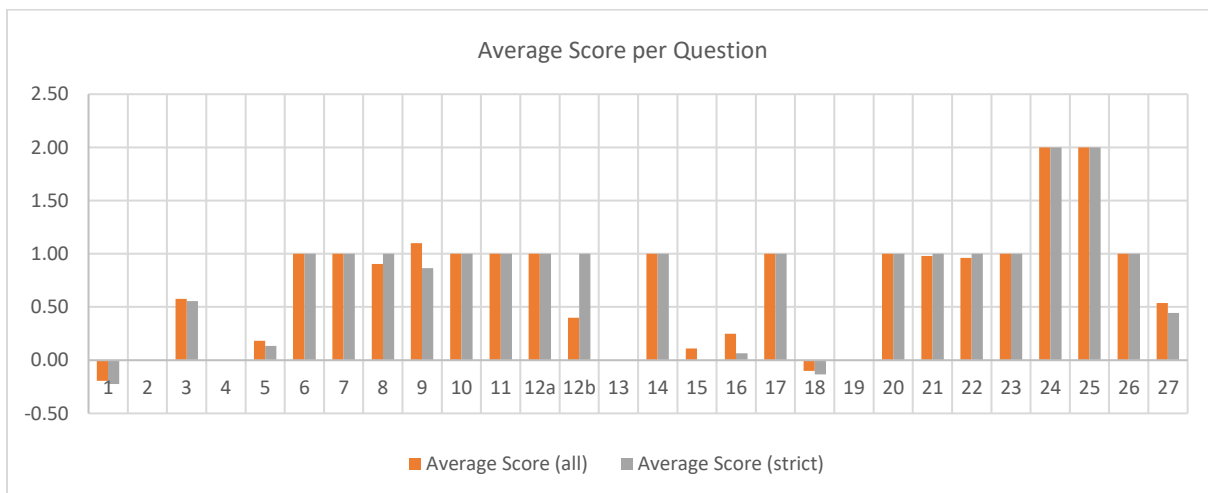



Figure 24. Mean scores per question (comparison).

Community Infrastructure, and in particular Impact on local infrastructure seems to have a negative social perception, since in question 1, most workers did not observe any changes in road or other local infrastructure in the area. Moreover, Labor Rights and more specifically the impact on the workload seems to have a negative social perception, since in question 18, most workers observed an increase of the working hours during the installation phase of the project. On the other hand, the participants have a very positive perception regarding the ethical and environmental issues on the social impact (questions 24 & 25).

Finally, in the following figures, the average index impact per category is presented, for both analyses.

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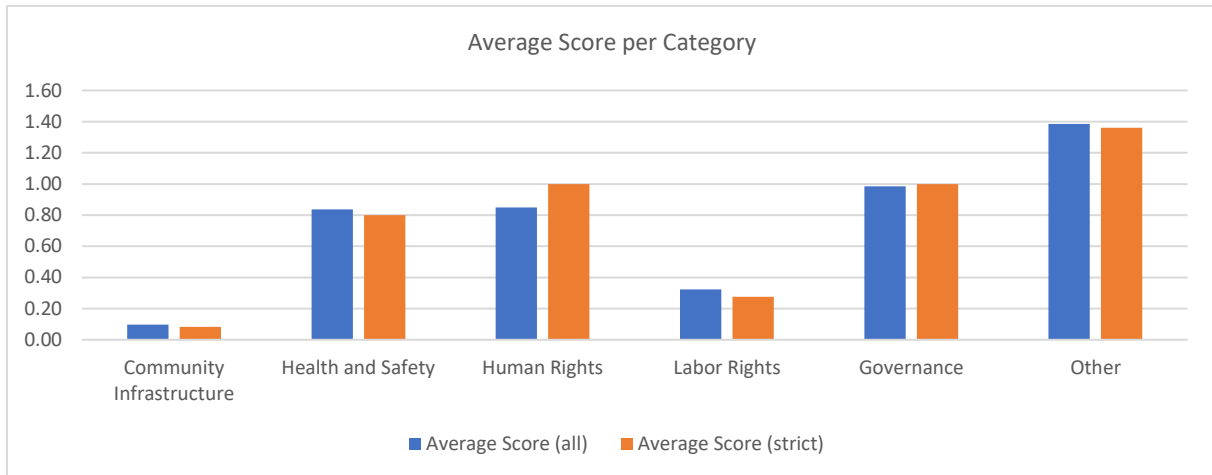


Figure 25. Average mean scores per impact category.


The most positive social impact perception appears to be the impact of Other (environment and ethical aspects), Health and Safety as well as Human Rights and Governance, while for community infrastructure the social impact tends to be neutral, as in the case of Greece. Furthermore, we observed no significant differences between the two analyses.

### 3.3.2 Average Score per Stakeholder Group

In the following table and figures, the impact index per Stakeholder Group for both analyses is presented.

Table 20. Impact index per Stakeholder Group (All answers).

Question	Worker	Farm Management	Regulators	Local Community
1	-0,07	0,00	0,00	-0,25
2	0,00	0,00	0,00	0,00
3	0,80	1,00	0,33	0,63
4	0,00	0,00	0,00	0,00
5	0,13	0,00	0,33	0,08
6	1,00	1,00	1,00	1,00
7	1,00	1,00	1,00	1,00
8	0,87	1,00	1,00	1,00
9	0,87	2,00	1,67	0,60
10	1,00	1,00	1,00	1,00
11	1,00	1,00	1,00	1,00
12a	1,00	1,00	1,00	1,00
12b	0,20	1,00	1,00	0,10
13	0,00	0,00	0,00	0,00
14	1,00	1,00	1,00	1,00
15	0,13	0,00	0,00	0,20
16	0,07	1,00	0,67	0,10
17	1,00	1,00	1,00	1,00
18	-0,13	0,00	0,00	-0,20
19	0,00	0,00	0,00	0,00
20	1,00	1,00	1,00	1,00

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Question	Worker	Farm Management	Regulators	Local Community
21	1,00	1,00	1,00	0,97
22	1,00	1,00	1,00	0,94
23	1,00	1,00	1,00	1,00
24	2,00	2,00	2,00	2,00
25	2,00	2,00	2,00	2,00
26	1,00	1,00	1,00	1,00
27	0,27	1,00	1,00	0,38
<b>Average</b>	<b>0,68</b>	<b>0,82</b>	<b>0,79</b>	<b>0,66</b>

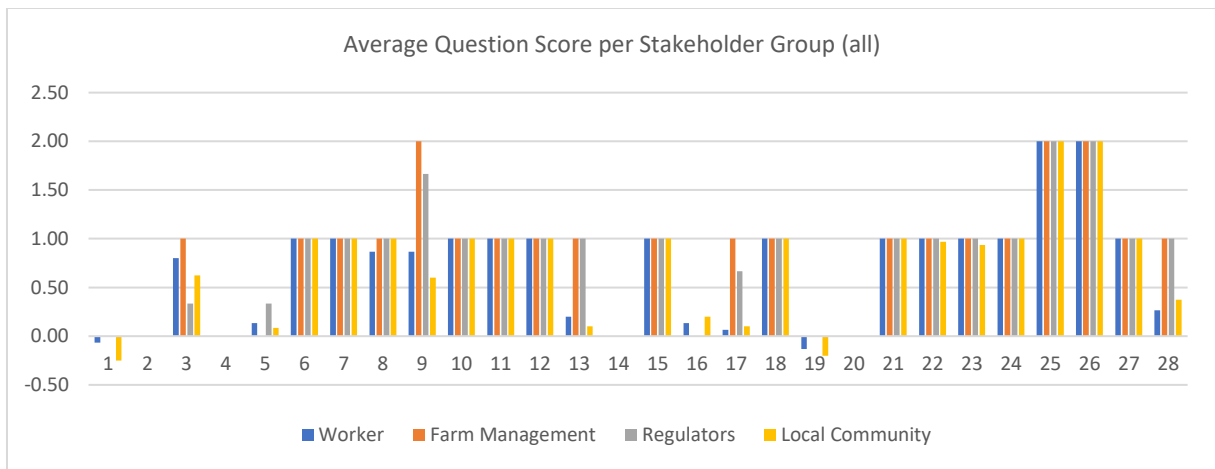


Figure 26. Average score per Stakeholder Group and Question – Cluster Bars (All answers).

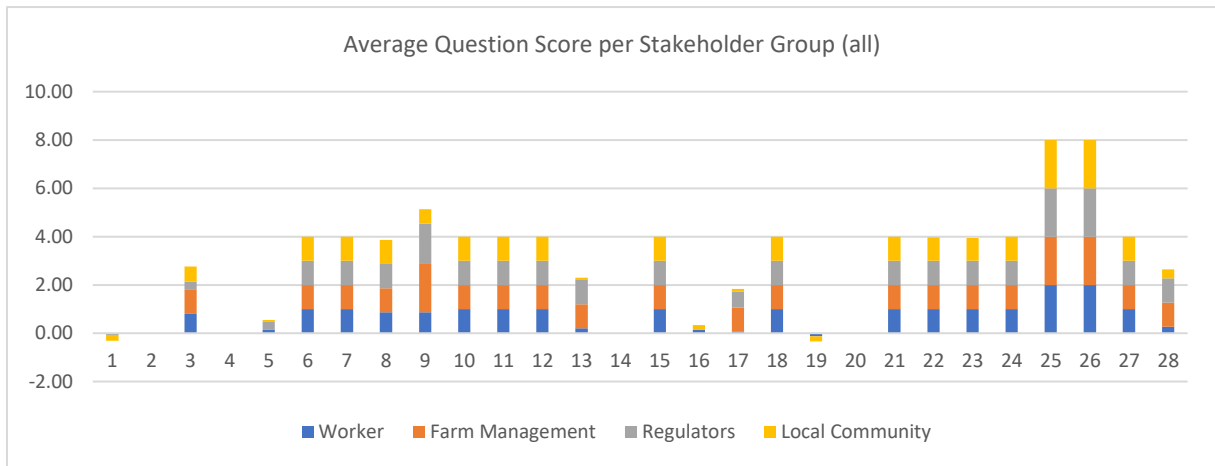



Figure 27. Average score per Stakeholder Group and Question – Stacked Bars (All answers).

Table 21. Impact index per Stakeholder Group (Strict).

Question	Worker	Farm Management	Regulators	Local Community
1	0,00		0,00	-0,25
2	0,00		0,00	0,00
3	1,00		0,00	0,63



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Question	Worker	Farm Management	Regulators	Local Community
4	0,00		0,00	0,00
5	0,13			0,00
6	1,00	1,00	1,00	1,00
7	1,00			1,00
8	1,00		1,00	1,00
9	0,87			0,60
10	1,00		1,00	1,00
11	1,00			1,00
12a		1,00		
12b		1,00		
13	0,00			0,00
14	1,00			1,00
15		0,00		
16	0,07			0,10
17	1,00			1,00
18	-0,13			-0,20
19	0,00			0,00
20	1,00	1,00	1,00	
21		1,00		
22	1,00	1,00	1,00	
23		1,00		
24		2,00		
25	2,00		2,00	2,00
26	1,00		1,00	1,00
27	0,10		1,00	0,38
<b>Average</b>	<b>0,64</b>	<b>1,00</b>	<b>0,75</b>	<b>0,56</b>

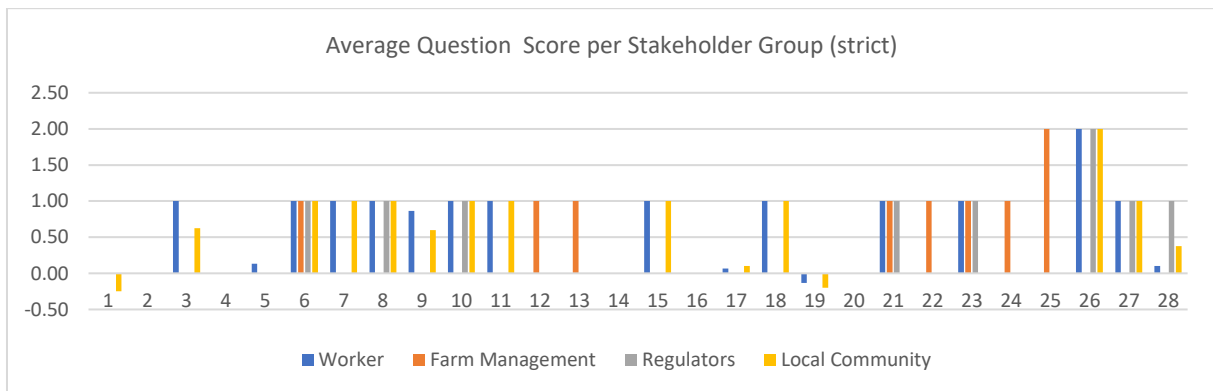



Figure 28. Average score per Stakeholder Group and Question – Cluster Bars (Strict).

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	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

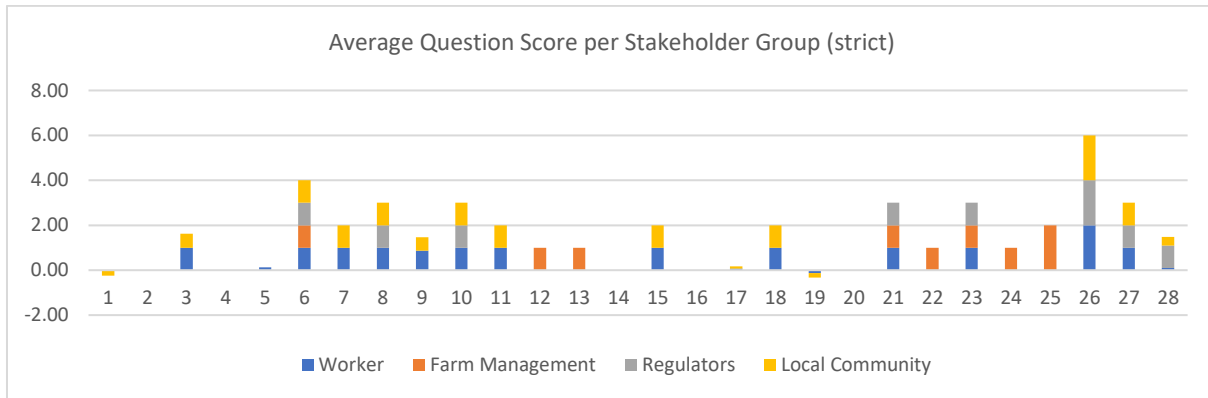


Figure 29. Average score per Stakeholder Group and Question – Stacked Bars (All answers).

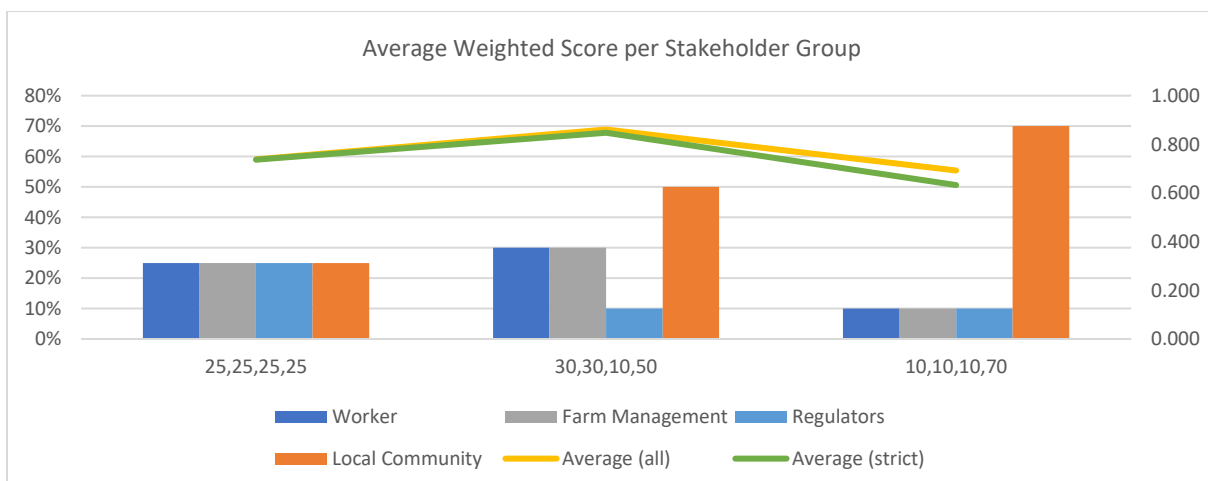
In general, the results are consistent for all cases, showing alignment between participants of the same group and generally positive perception of social impacts. Furthermore, 3 different scenarios were prepared to calculate the total Social Impact Index of each case. The results for both analyses are presented below.

Table 22. Total SA Index for various weighting scenarios for stakeholders' groups (All answers).

Scenario	Worker	Farm Management	Regulators	Local Community	Average (all)
<b>25,25,25,25</b>	25%	25%	25%	25%	0,738
<b>30,30,10,50</b>	30%	30%	10%	50%	0,861
<b>10,10,10,70</b>	10%	10%	10%	70%	0,693

Table 23. Total SA Index for various weighting scenarios for stakeholders' groups (Strict).

Scenario	Worker	Farm Management	Regulators	Local Community	Average (strict)
<b>25,25,25,25</b>	25%	25%	25%	25%	0,738
<b>30,30,10,50</b>	30%	30%	10%	50%	0,848
<b>10,10,10,70</b>	10%	10%	10%	70%	0,633



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Figure 30. Comparison between the total SA Index for various weighting scenarios for stakeholder groups.

As presented in Figure 30, the total SA Index remains positive for all scenarios. In the Strict approach, it is around 0,8, while in the All-answers approach, it is slightly higher in one scenario (Local Community-oriented). This shows that stakeholders from the local community who answered questions outside their group have a slightly more positive perception of those aspects than those in the intended group.


### 3.3.3 Average Weighted Scores per Impact Category

Furthermore, the average weighted scores per impact category are presented. In total 3 scenarios were analysed, as presented in Table 25.

Table 24. Average Scores per Impact Category (not weighted).

Category	Question	Average Score (all)	Average Score (strict)	Average Score (all)	Average Score (strict)
<b>Community Infrastructure</b>	1	-0,19	-0,22	<b>0,10</b>	<b>0,08</b>
	2	0,00	0,00		
	3	0,58	0,56		
	4	0,00	0,00		
<b>Health and Safety</b>	5	0,18	0,13	<b>0,84</b>	<b>0,80</b>
	6	1,00	1,00		
	7	1,00	1,00		
	8	0,90	1,00		
	9	1,10	0,87		
<b>Human Rights</b>	10	1,00	1,00	<b>0,85</b>	<b>1,00</b>
	11	1,00	1,00		
	12a	1,00	1,00		
	12b	0,40	1,00		
<b>Labor Rights</b>	13	0,00	0,00	<b>0,32</b>	<b>0,28</b>
	14	1,00	1,00		
	15	0,11	0,00		
	16	0,25	0,07		
	17	1,00	1,00		
	18	-0,10	-0,13		
	19	0,00	0,00		
	20	1,00	1,00		
<b>Governance</b>	21	0,98	1,00	<b>0,99</b>	<b>1,00</b>
	22	0,96	1,00		
	23	1,00	1,00		
<b>Other</b>	24	2,00	2,00	<b>1,38</b>	<b>1,36</b>
	25	2,00	2,00		
	26	1,00	1,00		
	27	0,54	0,44		

Table 25. Average SA Index per Impact Category for various weighting scenarios.

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Scenario	Community Infrastructure	Health and Safety	Human Rights	Labor Rights	Governance	Other	Average Score (all)	Average Score (strict)
Scenario 1	14,29%	17,86%	14,29%	25,00%	14,29%	14,29%	0,70	0,70
Scenario 2	15,00%	15,00%	15,00%	25,00%	15,00%	15,00%	0,70	0,71
Scenario 3	5,00%	30,00%	25,00%	30,00%	5,00%	5,00%	0,68	0,70

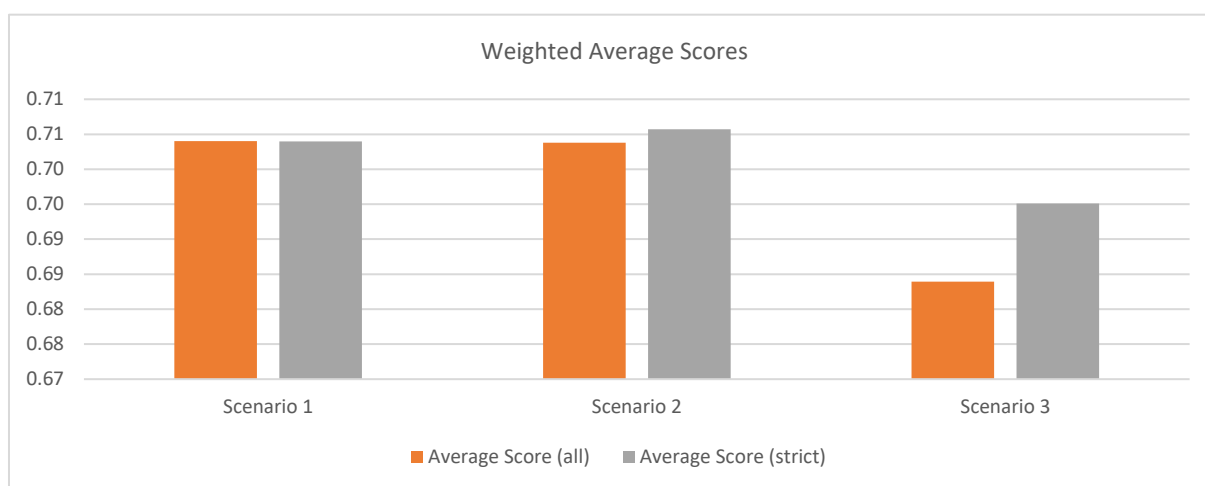


Figure 31. Average SA Index per Impact Category for various weighting scenarios for impact categories.

As presented in Figure 31, the total SA Index remains positive for all scenarios and analyses. In the Strict approach, it is around 0,7, while in the All-answers approach, it is slightly lower. This shows that opposite to the case of Greece, participants (in general) who answered questions outside their targeted questions have the same or slightly more negative perception of those aspects than those in the intended group.

### 3.3.4 Statistical analysis

#### 3.3.4.1 Correlation

After the above analysis, a correlation analysis is conducted, based on the methodology presented in Section 2.4.

Table 26. Correlation analysis between stakeholder groups (All answers).

Correlation	Worker	Farm Management	Regulators	Local Community
Worker		85%	88%	99%
Farm Management			96%	82%
Regulators				87%
Local Community				

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Table 27. Correlation analysis between stakeholder groups (Strict).

Correlation	Worker	Farm Management	Regulators	Local Community
Worker		N/A	78%	97%
Farm Management			N/A	N/A
Regulators				90%
Local Community				

In the Strict approach, the correlation where applicable, is not 100%, because some participants had been assigned to more than one stakeholder group, which, in general, is acceptable.

Nevertheless, in both approaches, the social impact perception of all groups seems to have a strong correlation, with the perception of Regulators and Workers being the weakest in the case of the Strict approach, and the perception of Farm Management and Local Community in the All-answers approach.

### 3.3.4.2 Chi-Square Test

After the correlation analysis, the chi-square test is conducted.

Table 28. Chi-Square Test | Observed Data (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	22	4	2	<b>28</b>
Farm Management	20	8	0	<b>28</b>
Regulators	21	7	0	<b>28</b>
Local Community	22	4	2	<b>28</b>
<b>Total</b>	<b>85</b>	<b>23</b>	<b>4</b>	<b>112</b>

Table 29. Chi-Square Test | Expected Values (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	21,25	5,75	1,00	<b>28</b>
Farm Management	21,25	5,75	1,00	<b>28</b>
Regulators	21,25	5,75	1,00	<b>28</b>
Local Community	21,25	5,75	1,00	<b>28</b>
<b>Total</b>	<b>85</b>	<b>23</b>	<b>4</b>	<b>112</b>

Table 30. Chi-Square Test | Contribution to the chi-square statistic (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	0,03	0,53	1,00	<b>1,56</b>
Farm Management	0,07	0,88	1,00	<b>1,95</b>
Regulators	0,00	0,27	1,00	<b>1,27</b>
Local Community	0,03	0,53	1,00	<b>1,56</b>
<b>Total</b>	<b>0,13</b>	<b>2,22</b>	<b>4,00</b>	<b>6,35</b>

The Sum of the Chi-Square Contributions is 6,35, the degrees of freedom (df) is 6,00, and finally the (p-value is calculated to be 0,39.

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Table 31. Chi-Square Test | Observed Data (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	16	5	1	22
Farm Management	8	1	0	9
Regulators	8	4	0	12
Local Community	13	5	2	20
<b>Total</b>	<b>45</b>	<b>15</b>	<b>3</b>	<b>63</b>

Table 32. Chi-Square Test | Expected Values (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	15,71	5,24	1,05	22
Farm Management	6,43	2,14	0,43	9
Regulators	8,57	2,86	0,57	12
Local Community	14,29	4,76	0,95	20
<b>Total</b>	<b>45</b>	<b>15</b>	<b>3</b>	<b>63</b>

Table 33. Chi-Square Test | Contribution to the chi-square statistic (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
Worker	0,01	0,01	0,00	0,02
Farm Management	0,38	0,61	0,43	1,42
Regulators	0,04	0,46	0,57	1,07
Local Community	0,12	0,01	1,15	1,28
<b>Total</b>	<b>0,54</b>	<b>1,09</b>	<b>2,15</b>	<b>3,79</b>

The Sum of the Chi-Square Contributions is 3,79, the degrees of freedom (df) is 6,00, and finally the (p-value is calculated to be 0,71.

In both cases, since the p-value is greater than 0,05, the results are statistically insignificant, and we can conclude that there is no association between the variables, i.e. stakeholder groups are not significantly associated with the perception of social impact.


## 3.4 LVAT pilot farm

### 3.4.1 Average Score per Participant & Question

In the next table and figures, the basic mean scores per participant are presented, for both analyses.

Table 34. Basic mean scores per participant.

Participant	Stakeholders Category	All Answers			Strict		
		No of Answers	out of	Average Score (all)	No of Answers	out of	Average Score (strict)
LVA 1	Local community - Local government	12	28	0,50	10	12	0,60
LVA 2	Local community - Worker	20	28	0,68	15	20	0,60
LVA 3	Local community - Worker	22	28	0,00	18	20	0,00

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<b>LVA 4</b>	Local community - Farm management	27	28	0,48	11	18	0,73
<b>LVA 5</b>	Worker	21	28	0,20	4	14	0,25
<b>LVA 6</b>	Worker	21	28	0,20	4	20	0,25
<b>LVA 7</b>	Local community - Worker	20	28	-0,30	12	20	0,08
<b>LVA 8</b>	Local community - Worker	18	28	-0,17	11	20	0,09
<b>LVA 9</b>	Local community - Worker	22	28	0,23	10	20	0,50
<b>LVA 10</b>	Local community - Worker	10	28	0,67	6	20	1,17
<b>LVA 11</b>	Local community - Worker	26	28	-0,08	13	20	-0,15
<b>LVA 12</b>	Local community - Worker	25	28	-0,02	11	20	0,09

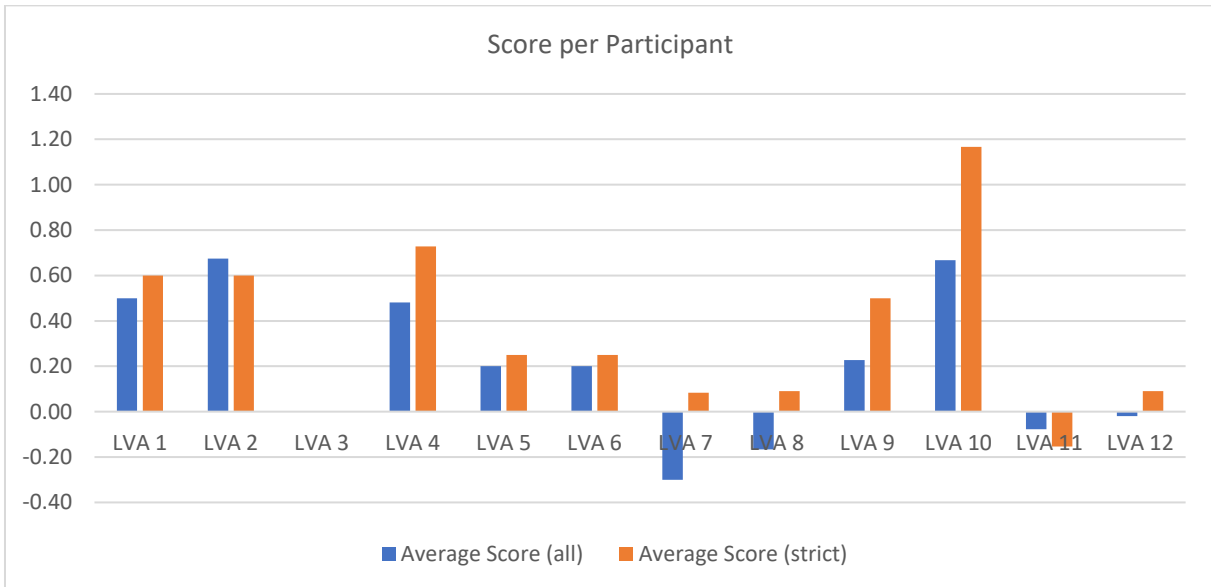



Figure 32. Basic mean scores per participant.

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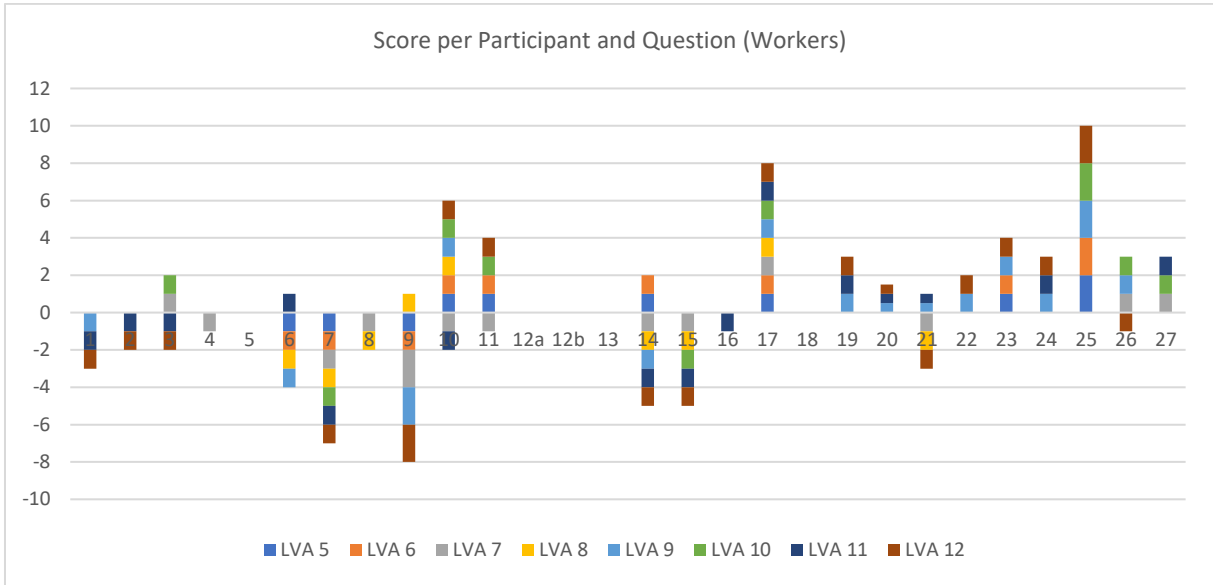


Figure 33. Mean scores per participant and question for Workers Group (All answers).

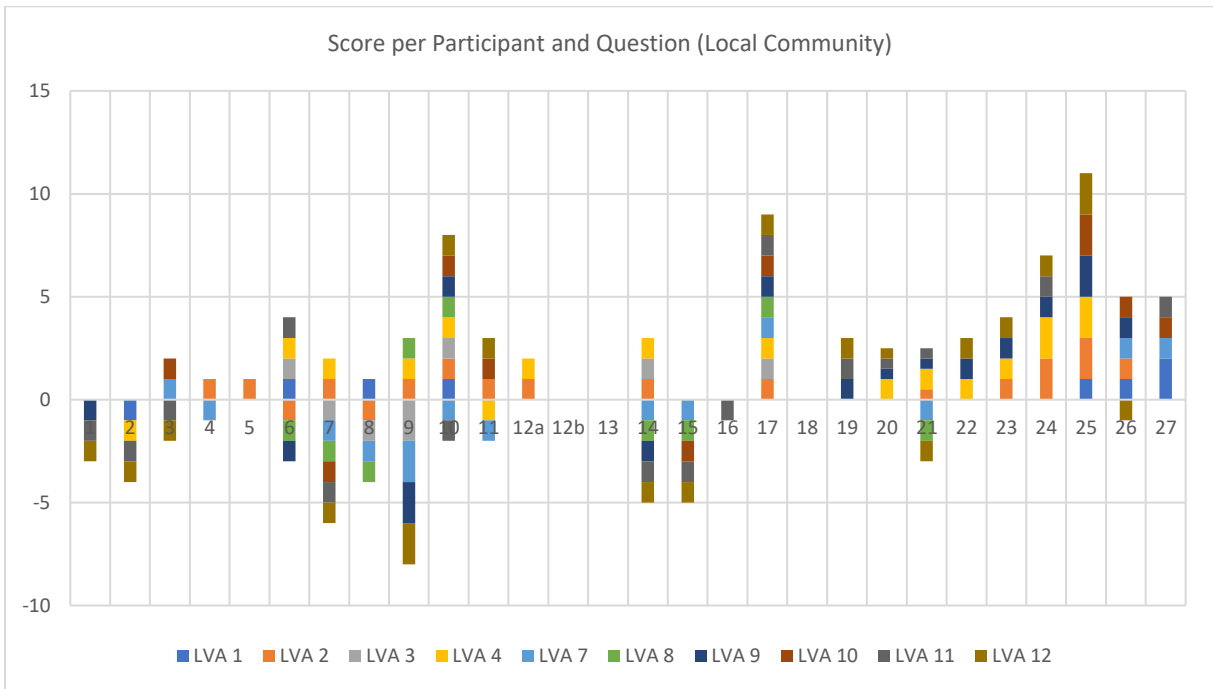



Figure 34. Mean scores per participant and question for Local Community Group (All answers).



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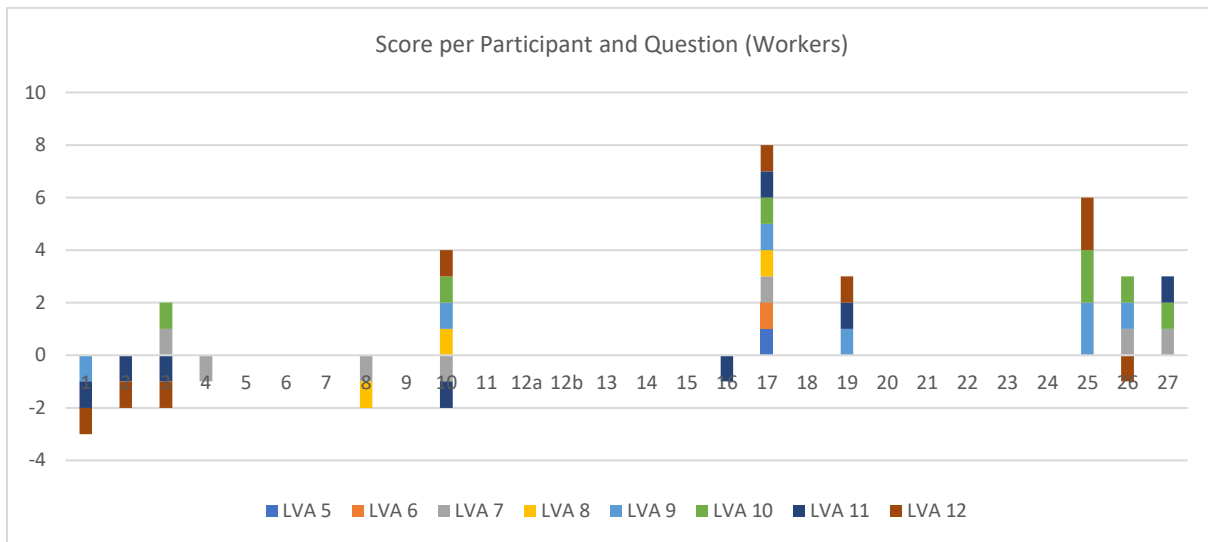


Figure 35. Mean scores per participant and question for Workers Group (Strict).

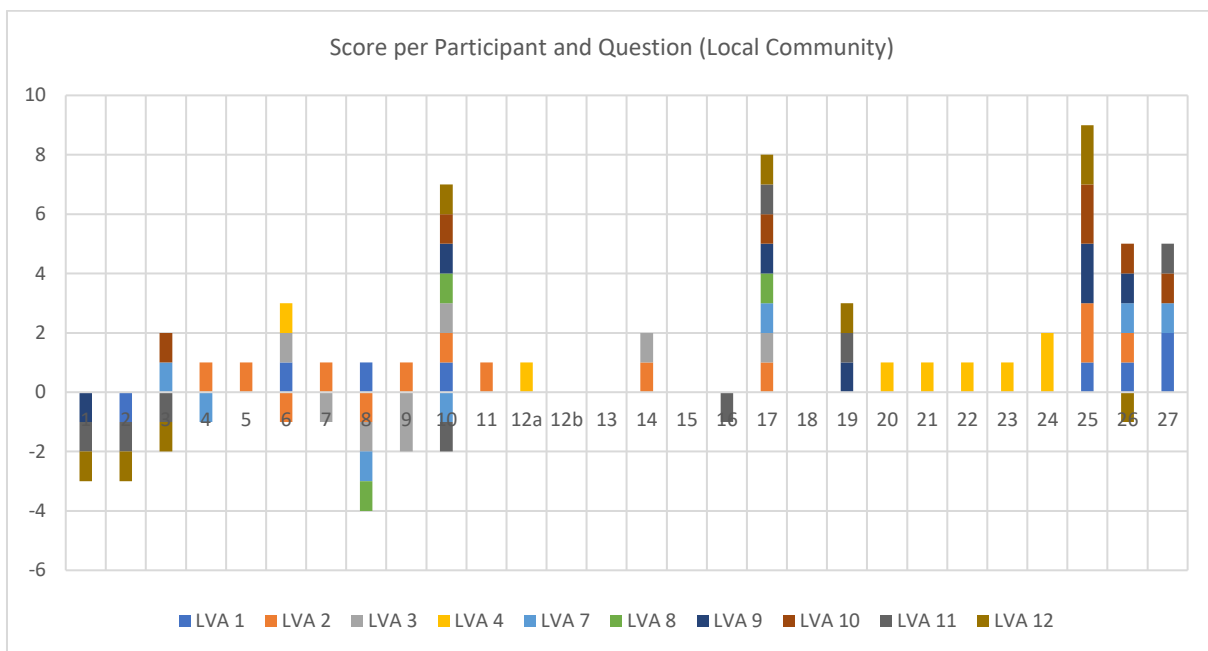



Figure 36. Mean scores per participant and question for Local Community Group (Strict).

Generally, we noticed that in the case of the All-answers approach, the perception of the participants regarding the social impact is mainly positive, with some of them having a slightly negative perception. However, in the Strict approach, the perception of almost all the participants is positive.

Most participants in the same group seem to be aligned in most questions but not always, especially in questions 6-9. Some of the participants mentioned that there were incidents related to energy efficiency and thermal comfort, lack of training programs and even issues regarding health and safety. During the training for the operation of the biomethane converted tractor only a limited part of LVAT's personnel was allowed to participate and thus, the rest have reported the lack of training. Furthermore, concerning the health and safety issues, this is more a perception from the personnel of the farm who fear that a potential leak from the biogas station might cause serious incidents. That perceptions can be also attributed to the training of a limited number of workers who will operate the

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station. Furthermore, in the following Figures, the average score per question for both analyses is presented.

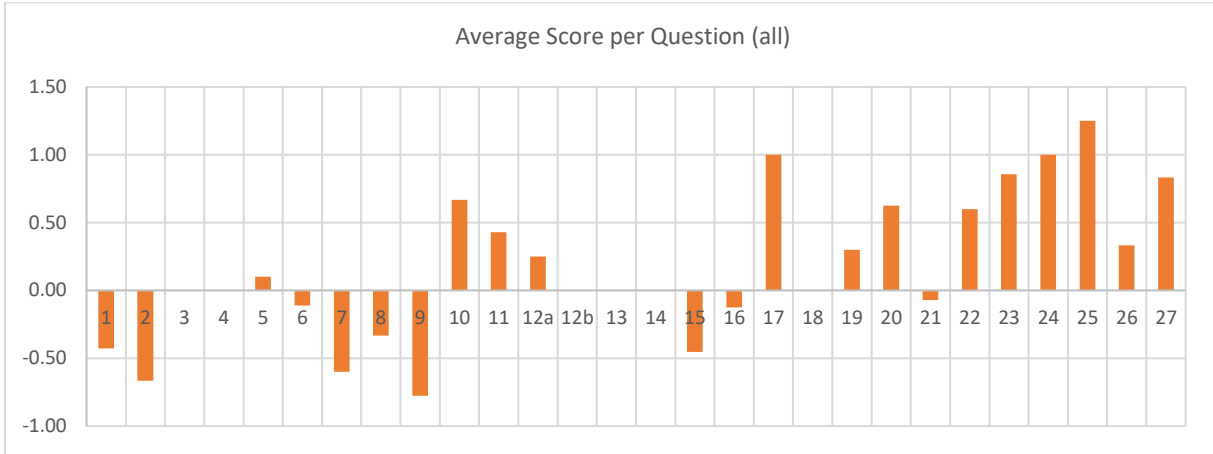


Figure 37. Mean scores per question (all answers).

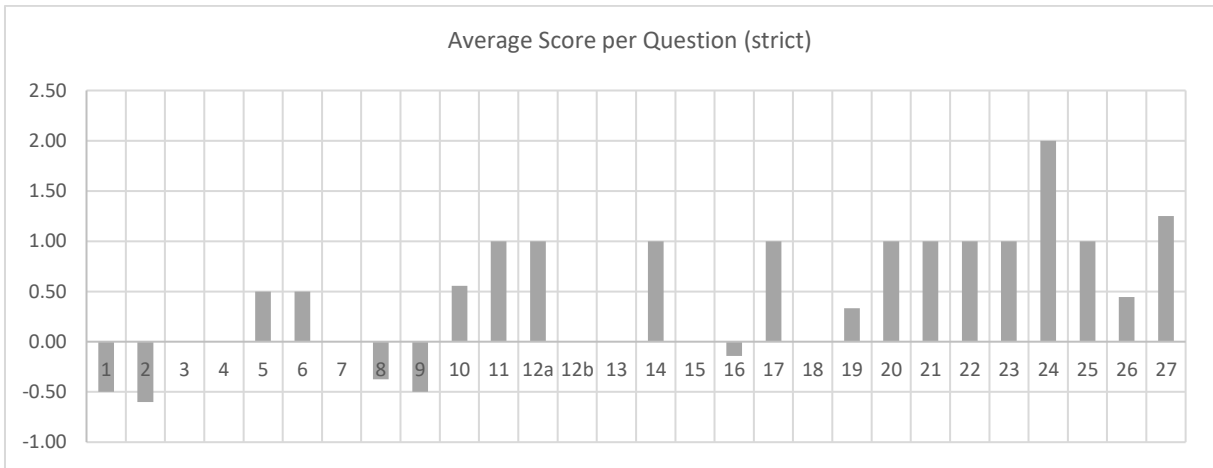


Figure 38. Mean scores per question (strict).

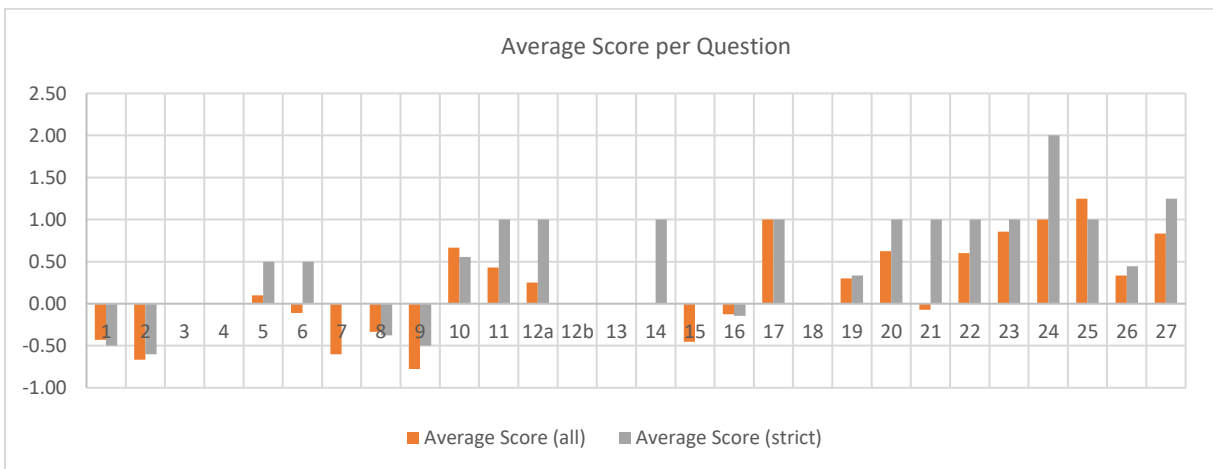



Figure 39. Mean scores per question (comparison).

Finally, in the following figures, the average index impact per category is presented, for both analyses.

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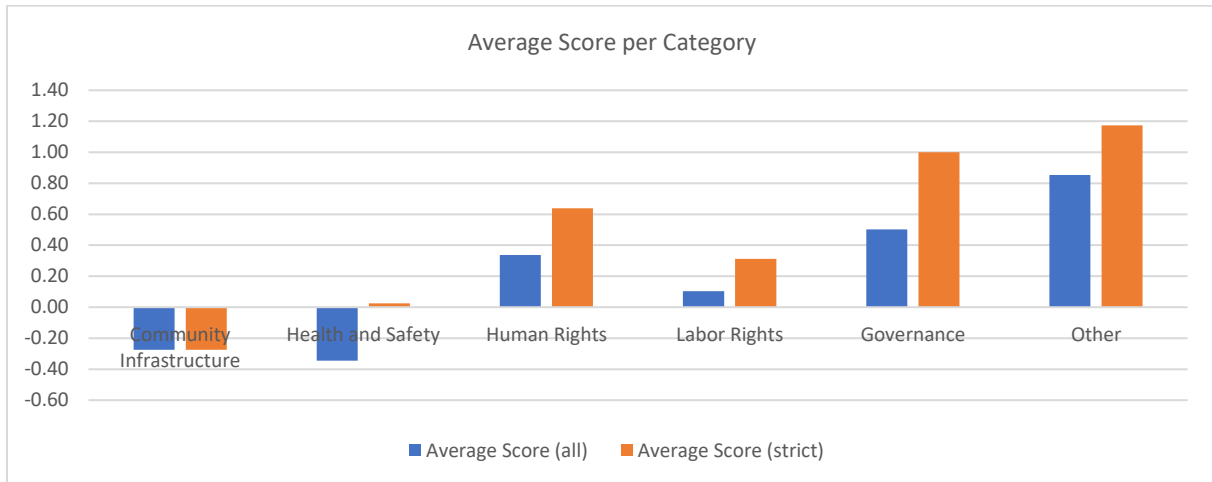


Figure 40. Average mean scores per impact category.


The most positive social impact perception appears to be the impact of Other (environment and ethical aspects), as well as Human Rights, while for the community infrastructure and Health and Safety, the social impact tends to be negative, especially in the All-answers approach. As mentioned above, the training of limited personnel concerning the operation of the retrofitted tractor as well as the biogas station contributes to the fear that particularly the biogas station might cause potential problems which is not the case. Still, the results from the analysis provide invaluable information showing that an efficient training procedure for new technologies is necessary to overcome negative opinions.

### 3.4.2 Average Score per Stakeholder Group

In the following table and figures, the impact index per Stakeholder Group for both analyses is presented.

Table 35. Impact index per Stakeholder Group (All answers).

Question	Worker	Farm Management	Regulators	Local Community
1	-0,60	0,00	0,00	-0,43
2	-0,50	-1,00	-1,00	-0,67
3	0,00	0,00	0,00	0,00
4	0,00	0,00	0,00	0,00
5	0,13	0,00	0,00	0,13
6	-0,43	1,00	1,00	0,14
7	-0,78	1,00		-0,50
8	-0,57	0,00	1,00	-0,33
9	-1,00	1,00		-0,71
10	0,60	1,00	1,00	0,60
11	0,67	-1,00		0,20
12a	0,14	1,00		0,33
12b	0,00	0,00		0,00
13	0,00	0,00		0,00
14	-0,11	1,00		-0,25
15	-0,50	0,00		-0,56
16	-0,14	0,00		-0,17

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Question	Worker	Farm Management	Regulators	Local Community
17	1,00	1,00		1,00
18	0,00	0,00		0,00
19	0,33	0,00		0,38
20	0,50	1,00		0,63
21	-0,25	1,00		-0,07
22	0,67	1,00	0,00	0,60
23	0,83	1,00		0,80
24	0,83	2,00		1,40
25	1,20	2,00	1,00	1,10
26	0,30	0,00	1,00	0,40
27	0,60		2,00	1,25
<b>Average</b>	<b>0,10</b>	<b>0,48</b>	<b>0,50</b>	<b>0,19</b>

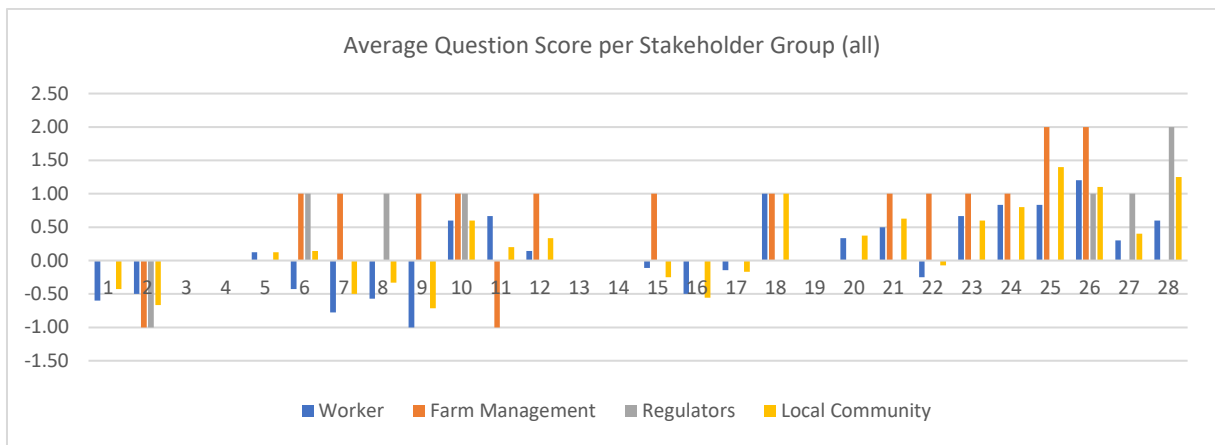


Figure 41. Average score per Stakeholder Group and Question – Cluster Bars (All answers).

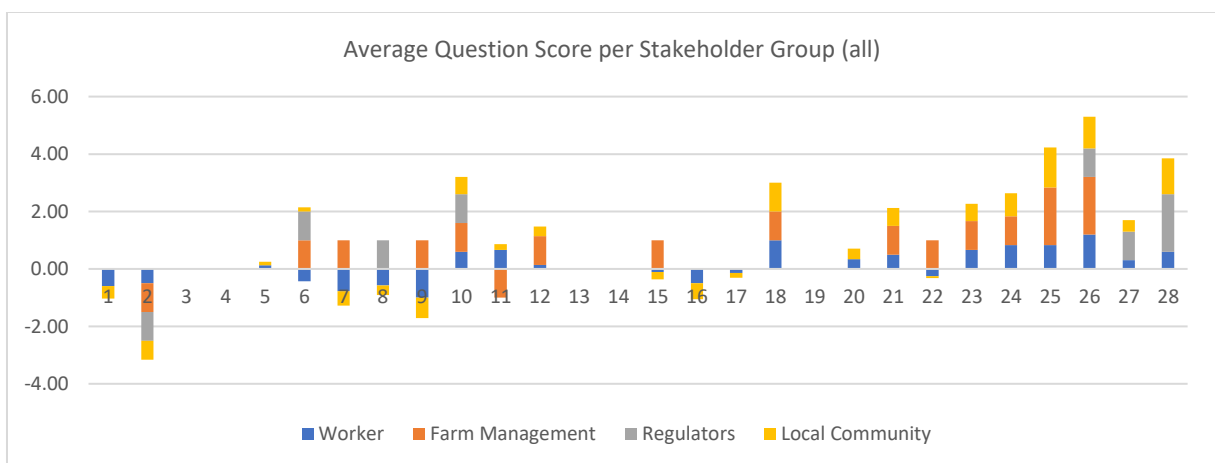



Figure 42. Average score per Stakeholder Group and Question – Stacked Bars (All answers).

Table 36. Impact index per Stakeholder Group (Strict).

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	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

Question	Worker	Farm Management	Regulators	Local Community
1	-0,60		0,00	-0,50
2	-0,50		-1,00	-0,60
3	0,00	0,00	0,00	0,00
4	0,00	0,00	0,00	0,00
5	0,50			0,50
6	0,00	1,00	1,00	0,50
7	0,00			0,00
8	-0,57		1,00	-0,38
9	-0,50			-0,50
10	0,50		1,00	0,56
11	1,00			1,00
12a		1,00		1,00
12b		0,00		0,00
13	0,00			0,00
14	1,00			1,00
15		0,00		0,00
16	-0,14			-0,20
17	1,00			1,00
18	0,00			0,00
19	0,33			0,43
20		1,00		1,00
21		1,00		1,00
22		1,00		1,00
23		1,00		1,00
24		2,00		2,00
25	1,00		1,00	1,00
26	0,38		1,00	0,44
27	1,00		2,00	1,25
<b>Average</b>	<b>0,22</b>	<b>0,73</b>	<b>0,60</b>	<b>0,45</b>

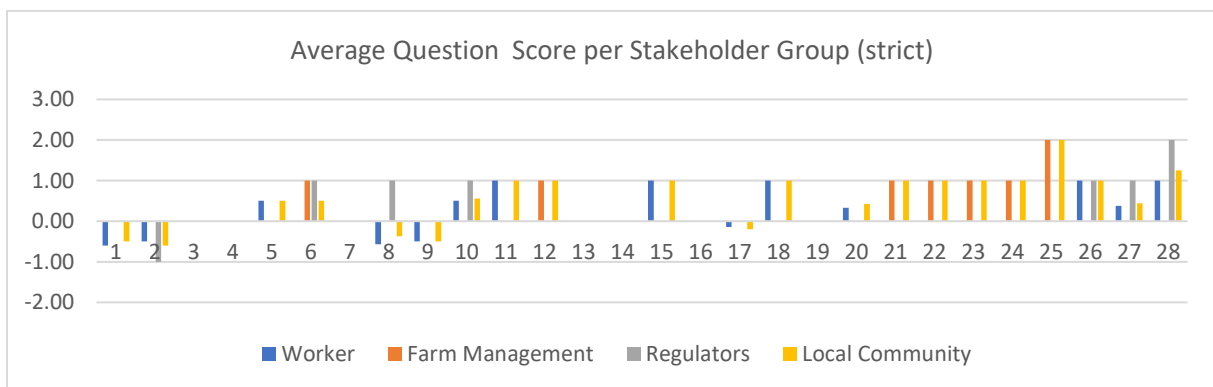



Figure 43. Average score per Stakeholder Group and Question – Cluster Bars (Strict).

	Document:	Deliverable D5.4 Social Assessment Report		
	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

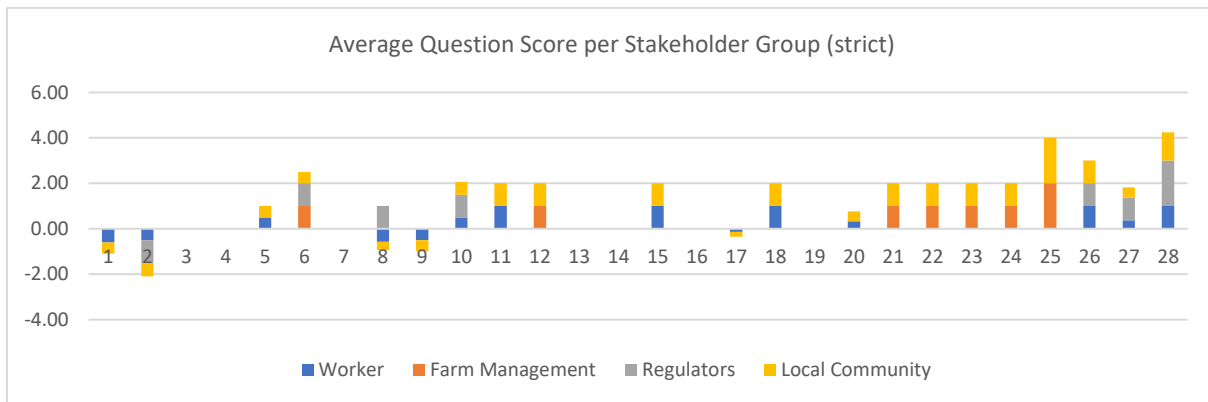


Figure 44. Average score per Stakeholder Group and Question – Stacked Bars (All answers).

In general, the results are consistent for all cases, showing general alignment between participants of the same group and generally neutral to positive perception of the total index of the social impact due to the negative opinions concerning the health and safety issues. Furthermore, 3 different scenarios were prepared to calculate the total Social Impact Index of each case. The results for both analyses are presented below.

Table 37. Total SA Index for various weighting scenarios for stakeholders' groups (All answers).

Scenario	Worker	Farm Management	Regulators	Local Community	Average (all)
<b>25,25,25,25</b>	25%	25%	25%	25%	0,318
<b>30,30,10,50</b>	30%	30%	10%	50%	0,320
<b>10,10,10,70</b>	10%	10%	10%	70%	0,240

Table 38. Total SA Index for various weighting scenarios for stakeholders' groups (Strict).

Scenario	Worker	Farm Management	Regulators	Local Community	Average (strict)
<b>25,25,25,25</b>	25%	25%	25%	25%	0,498
<b>30,30,10,50</b>	30%	30%	10%	50%	0,567
<b>10,10,10,70</b>	10%	10%	10%	70%	0,467

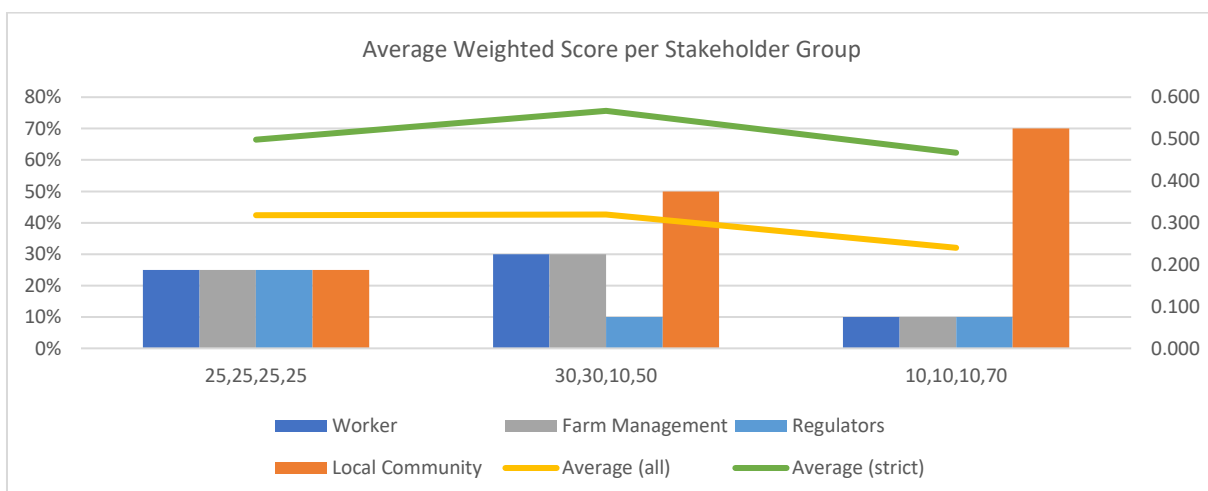



Figure 45. Comparison between the total SA Index for various weighting scenarios for stakeholder groups.

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	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

As presented in Figure 45, the total SA index remains positive for all scenarios. In the Strict approach, it is around 0,5, while in the All-answers approach, it is significantly lower. This clearly shows that stakeholders who answered questions outside their group have a slightly more negative perception of those aspects than those in the intended group.

### 3.4.3 Average Weighted Scores per Impact Category


Furthermore, the average weighted scores per impact category are presented. In total 3 scenarios were analysed, as presented in Table 40.

Table 39. Average Scores per Impact Category (not weighted).

Category	Question	Average Score (all)	Average Score (strict)	Average Score (all)	Average Score (strict)
<b>Community Infrastructure</b>	1	-0,43	-0,50	<b>-0,27</b>	<b>-0,28</b>
	2	-0,67	-0,60		
	3	0,00	0,00		
	4	0,00	0,00		
<b>Health and Safety</b>	5	0,10	0,50	<b>-0,34</b>	<b>0,03</b>
	6	-0,11	0,50		
	7	-0,60	0,00		
	8	-0,33	-0,38		
	9	-0,78	-0,50		
<b>Human Rights</b>	10	0,67	0,56	<b>0,34</b>	<b>0,64</b>
	11	0,43	1,00		
	12a	0,25	1,00		
	12b	0,00	0,00		
<b>Labor Rights</b>	13	0,00	0,00	<b>0,10</b>	<b>0,31</b>
	14	0,00	1,00		
	15	-0,45	0,00		
	16	-0,13	-0,14		
	17	1,00	1,00		
	18	0,00	0,00		
	19	0,30	0,33		
	20	0,63	1,00		
<b>Governance</b>	21	-0,07	1,00	<b>0,50</b>	<b>1,00</b>
	22	0,60	1,00		
	23	0,86	1,00		
	24	1,00	2,00		
	25	1,25	1,00		
<b>Other</b>	26	0,33	0,44	<b>0,85</b>	<b>1,17</b>
	27	0,83	1,25		

Table 40. Average SA Index per Impact Category for various weighting scenarios.

Scenarios	Community Infrastructure	Health and Safety	Human Rights	Labor Rights	Governance	Other	Average Score (all)	Average Score (strict)
<b>Scenario 1</b>	14,29%	17,86%	14,29%	25,00%	14,29%	14,29%	0,17	0,45

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<b>Scenario 2</b>	15,00%	15,00%	15,00%	25,00%	15,00%	15,00%	0,19	0,46
<b>Scenario 3</b>	5,00%	30,00%	25,00%	30,00%	5,00%	5,00%	0,07	0,36

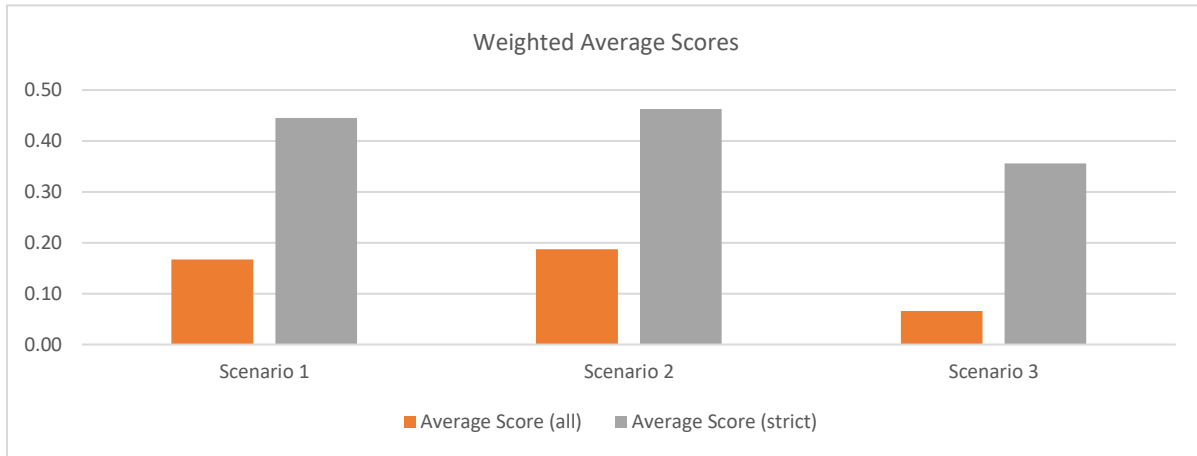


Figure 46. Average SA Index per Impact Category for various weighting scenarios for impact categories.

As presented in Figure 46, the total SA Index remains positive for all scenarios and analyses. In the Strict approach, it is around 0,40, while in the All-answers approach, it is visibly lower. This, again, clearly shows that participants (in general) who answered questions outside their targeted questions have a more negative perception of those aspects than those in the intended group.

### 3.4.4 Statistical analysis

#### 3.4.4.1 Correlation

After the above analysis, a correlation analysis is conducted, based on the methodology presented in Section 2.4.

Table 41. Correlation analysis between stakeholder groups (All answers).

Correlation	Worker	Farm Management	Regulators	Local Community
Worker		35%	42%	91%
Farm Management			65%	57%
Regulators				72%
Local Community				

Table 42. Correlation analysis between stakeholder groups (Strict).

Correlation	Worker	Farm Management	Regulators	Local Community
Worker		N/A	68%	97%
Farm Management			100%	97%
Regulators				81%
Local Community				



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In the Strict approach, the correlation where applicable, is not 100%, due to the fact that some participants had been assigned to more than one stakeholder group, which in general is acceptable. Nevertheless, in both approaches, the social impact perception of all groups seems to have a strong correlation, apart from the Workers / Farm Management & Regulators in the case of the All-answers approach.

### 3.4.4.2 Chi-Square Test

After the correlation analysis, the chi-square test is conducted.

Table 43. Chi-Square Test | Observed Data (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	13	5	10	<b>28</b>
<b>Farm Management</b>	13	12	2	<b>27</b>
<b>Regulators</b>	6	5	1	<b>12</b>
<b>Local Community</b>	14	5	9	<b>28</b>
<b>Total</b>	<b>46</b>	<b>27</b>	<b>22</b>	<b>95</b>

Table 44. Chi-Square Test | Expected Values (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	13,56	7,96	6,48	<b>28</b>
<b>Farm Management</b>	13,07	7,67	6,25	<b>27</b>
<b>Regulators</b>	5,81	3,41	2,78	<b>12</b>
<b>Local Community</b>	13,56	7,96	6,48	<b>28</b>
<b>Total</b>	<b>46</b>	<b>27</b>	<b>22</b>	<b>95</b>

Table 45. Chi-Square Test | Contribution to the chi-square statistic (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	0,02	1,10	1,91	<b>3,03</b>
<b>Farm Management</b>	0,00	2,44	2,89	<b>5,33</b>
<b>Regulators</b>	0,01	0,74	1,14	<b>1,89</b>
<b>Local Community</b>	0,01	1,10	0,98	<b>2,09</b>
<b>Total</b>	<b>0,04</b>	<b>5,38</b>	<b>6,91</b>	<b>12,34</b>

The Sum of the Chi-Square Contributions is 12,34, the degrees of freedom (df) is 6,00, and finally the (p-value is calculated to be 0,05.

Table 46. Chi-Square Test | Observed Data (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	9	6	5	<b>20</b>
<b>Farm Management</b>	7	4	0	<b>11</b>
<b>Regulators</b>	6	3	1	<b>10</b>
<b>Local Community</b>	16	7	5	<b>28</b>
<b>Total</b>	<b>38</b>	<b>20</b>	<b>11</b>	<b>69</b>

Table 47. Chi-Square Test | Expected Values (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	11,01	5,80	3,19	<b>20</b>

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<b>Farm Management</b>	6,06	3,19	1,75	<b>11</b>
<b>Regulators</b>	5,51	2,90	1,59	<b>10</b>
<b>Local Community</b>	15,42	8,12	4,46	<b>28</b>
<b>Total</b>	<b>38</b>	<b>20</b>	<b>11</b>	<b>69</b>

Table 48. Chi-Square Test | Contribution to the chi-square statistic (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	0,37	0,01	1,03	<b>1,40</b>
<b>Farm Management</b>	0,15	0,21	1,75	<b>2,11</b>
<b>Regulators</b>	0,04	0,00	0,22	<b>0,27</b>
<b>Local Community</b>	0,02	0,15	0,06	<b>0,24</b>
<b>Total</b>	<b>0,58</b>	<b>0,37</b>	<b>3,07</b>	<b>4,02</b>

The Sum of the Chi-Square Contributions is 4,02, the degrees of freedom (df) is 6,00, and finally the (p-value is calculated to be 0,67.

In All-answers, since the p-value is less than 0,05, the results are statistically significant, and we can conclude that there is an association between the variables, i.e. stakeholder groups are significantly associated with the perception of social impact. This, on the other hand, does not apply to the Strict approach where the p-value is 0,67 and thus, there is no association between the variables.

## 3.5 ILVO pilot farm

### 3.5.1 Average Score per Participant & Question

In the next table and figures, the basic mean scores per participant are presented, for both analyses.

Table 49. Basic mean scores per participant.

Participant	Stakeholders Category	All Answers			Strict		
		No of Answers	out of	Average Score (all)	No of Answers	out of	Average Score (strict)
<b>ILVO 1</b>	Workers	17	28	0,412	12	14	0,333
<b>ILVO 2</b>	Workers	22	28	0,318	14	14	0,214
<b>ILVO 3</b>	Workers	19	28	0,474	11	14	0,455
<b>ILVO 4</b>	Workers	9	28	0,667	4	14	0,500
<b>ILVO 5</b>	Workers	3	28	1,333	2	14	1,000
<b>ILVO 6</b>	Workers / Local Community	7	28	0,286	6	20	0,167
<b>ILVO 7</b>	Workers / Local Community	13	28	0,385	12	20	0,333
<b>ILVO 8</b>	Local Community	10	28	0,350	7	10	0,429
<b>ILVO 9</b>	Local Community	9	28	0,500	6	10	0,667
<b>ILVO 10</b>	Local Community	10	28	0,600	6	10	0,333
<b>ILVO 11</b>	Farm Management	4	28	1,250	3	9	1,333
<b>ILVO 12</b>	Farm Management	9	28	0,889	9	9	0,889
<b>ILVO 13</b>	Farm Management	9	28	0,889	9	9	0,889
<b>ILVO 14</b>	Farm Management	0	28	-	0	9	-
<b>ILVO 15</b>	Regulators	9	28	1,111	2	2	1,000
<b>ILVO 16</b>	Regulators	2	28	1,000	0	2	-

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	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

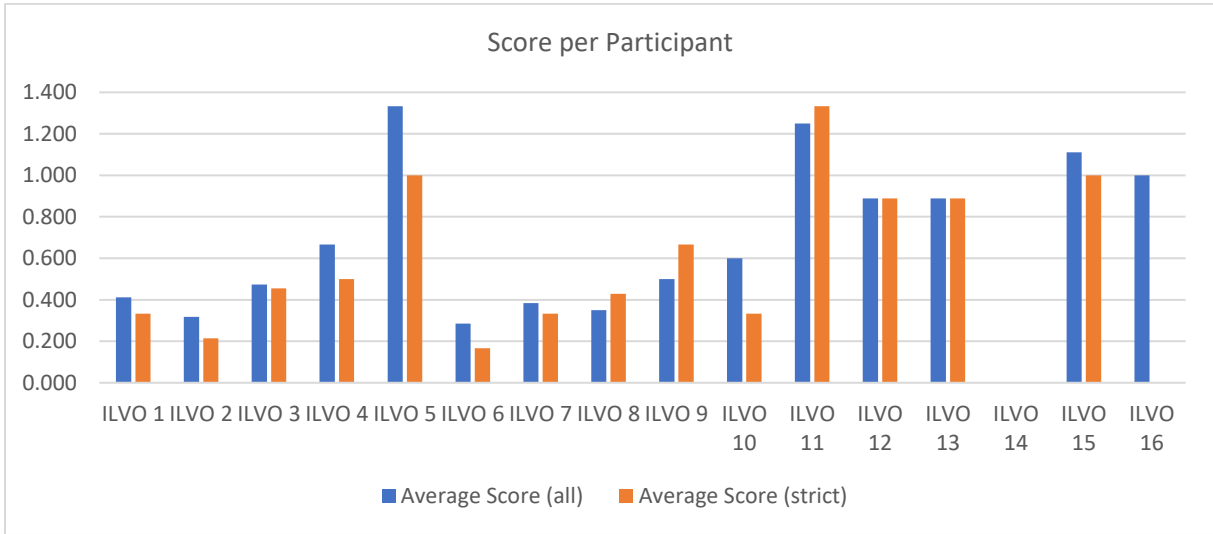


Figure 47. Basic mean scores per participant.

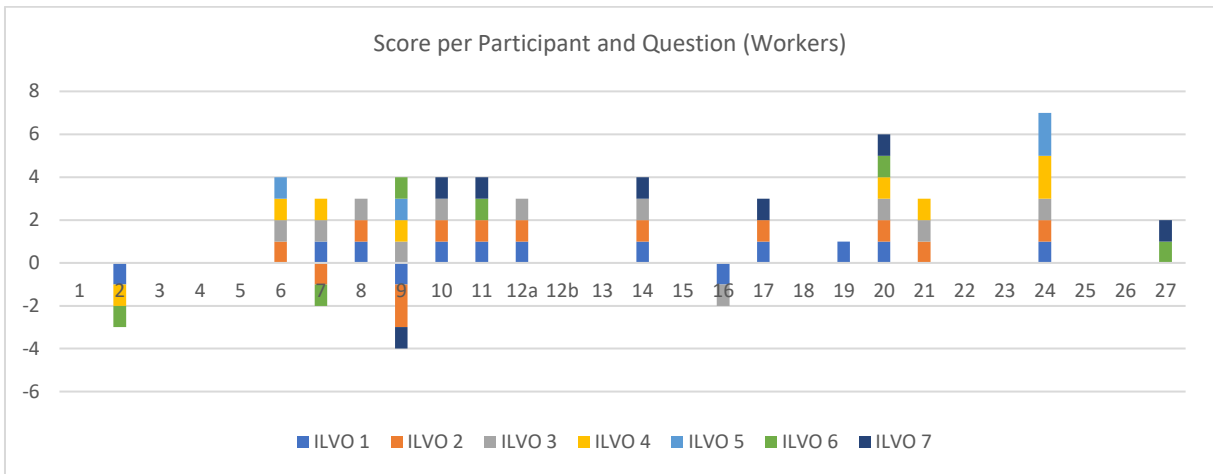


Figure 48. Mean scores per participant and question for Workers Group (All answers).

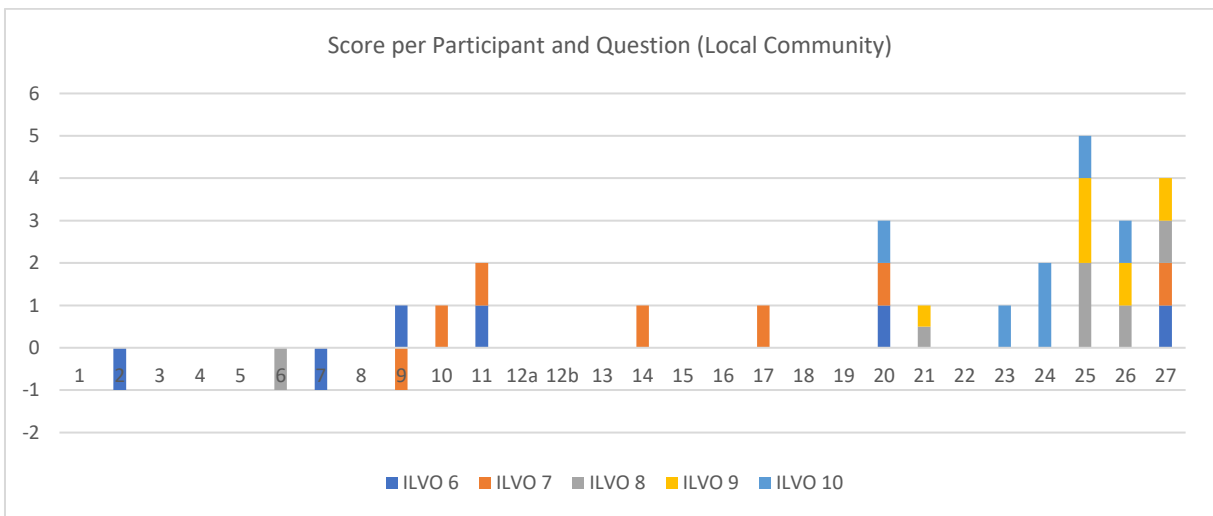



Figure 49. Mean scores per participant and question for Local Community Group (All answers).

	Document:	Deliverable D5.4 Social Assessment Report		
	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

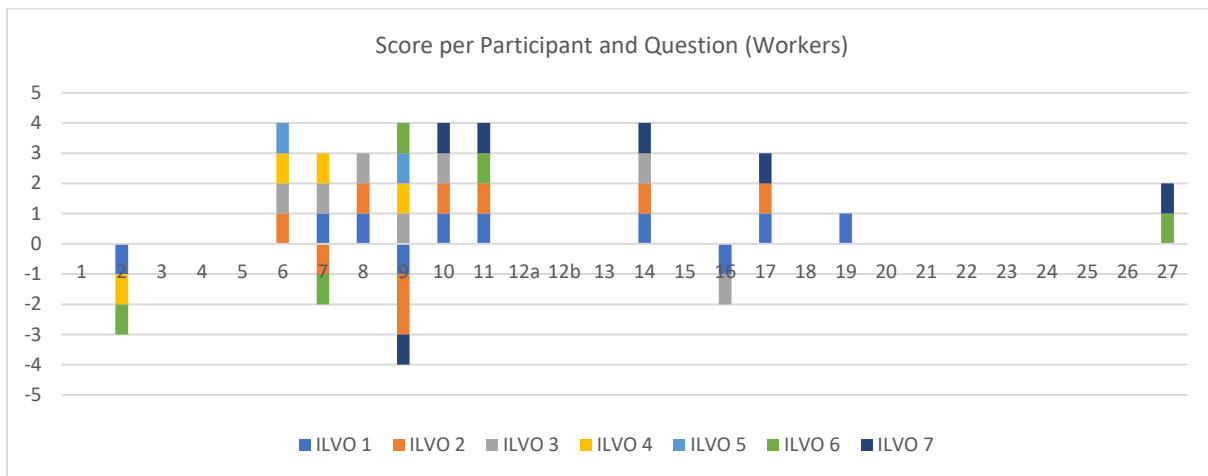


Figure 50. Mean scores per participant and question for Workers Group (Strict).

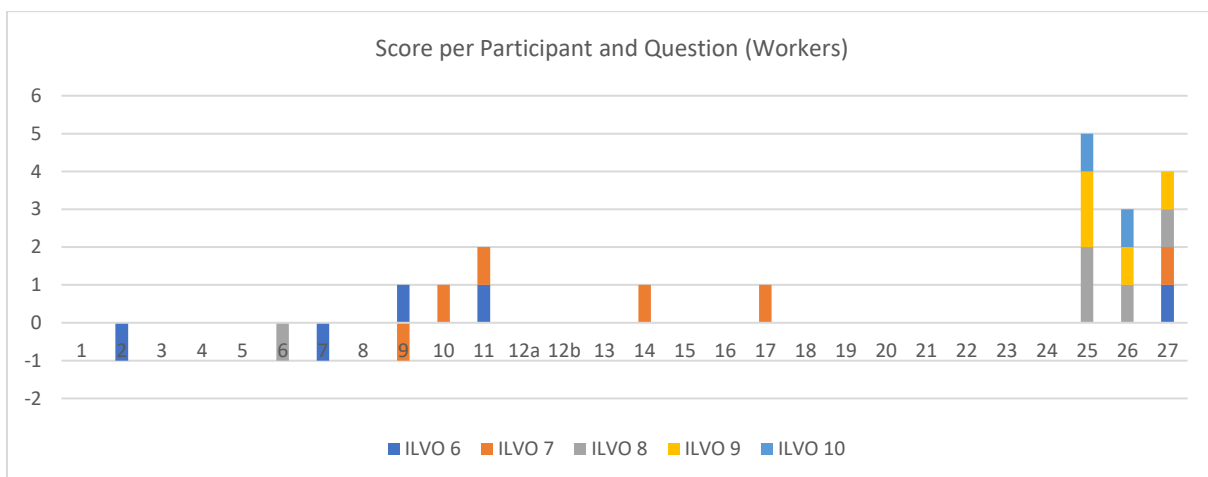



Figure 51. Mean scores per participant and question for Local Community Group (Strict).

Generally, we noticed that the perception of the participants regarding the social impact is positive. Moreover, most participants in the same group seem to be aligned apart from questions 7 (training) and 9 (working conditions), while there are no significant differences between the two analyses (all answers and strict). Furthermore, in the following Figures, the average score per question for both analyses is presented.

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	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

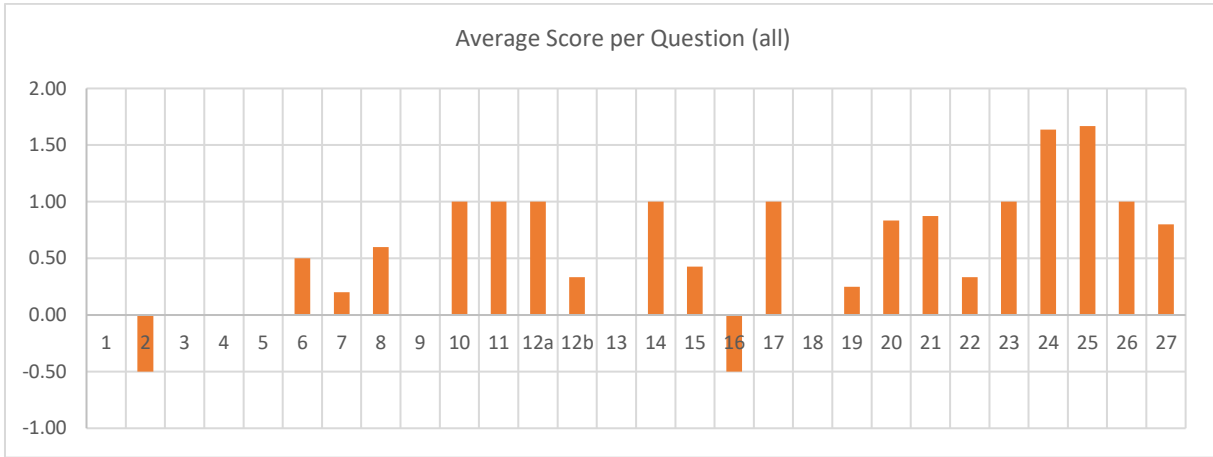


Figure 52. Mean scores per question (all answers).

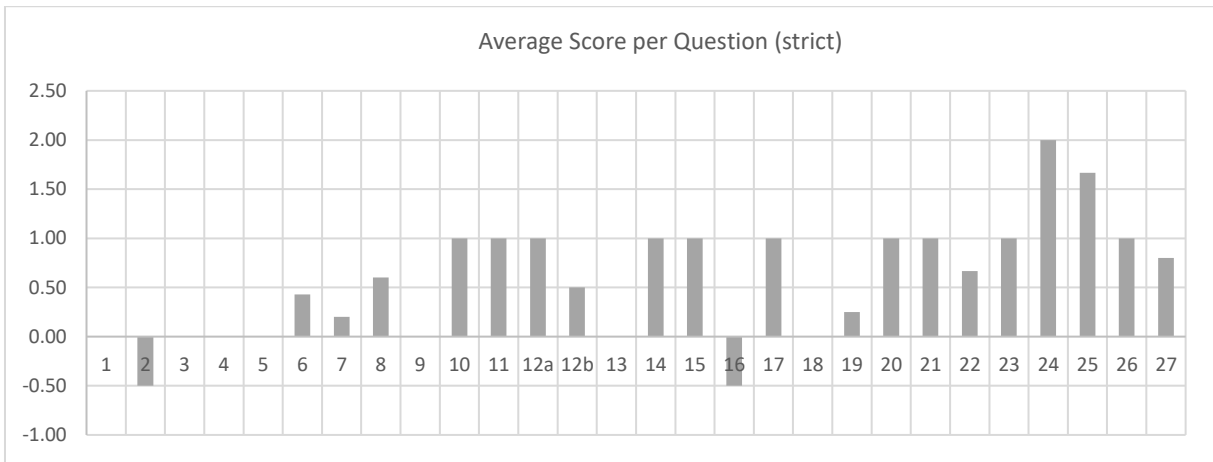


Figure 53. Mean scores per question (strict).

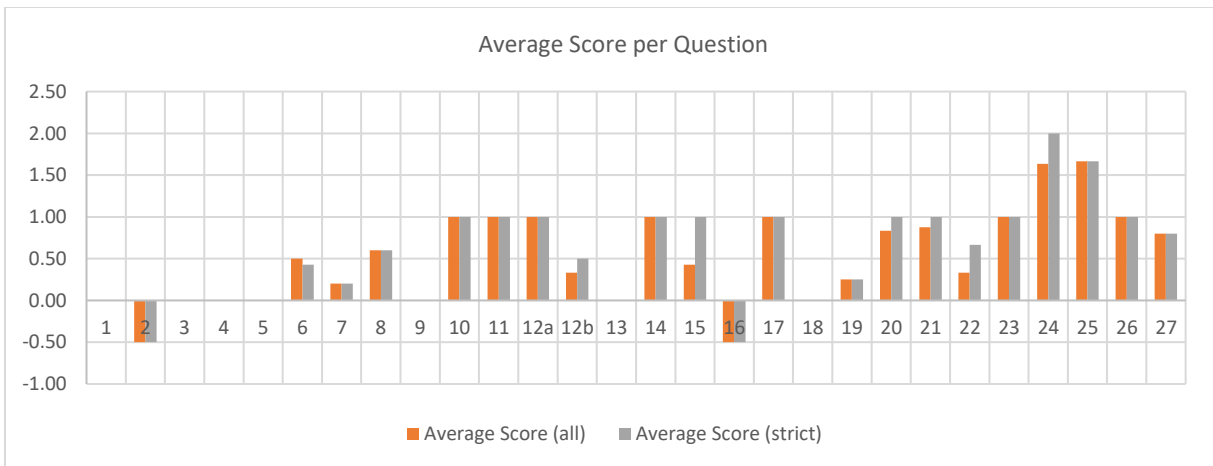



Figure 54. Mean scores per question (comparison).

In both approaches, the category Labor Rights, and in particular in “worker living conditions” seems to have a negative social perception, since in question 16, most workers did not experience

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improvements in their living conditions as a result of the project. In Community Infrastructure, and in particular in “Effect on worker housing availability and quality”, most workers experienced negative changes in the availability or quality of housing units in the facility. This could be attributed to the increased noise levels caused by the operation of the heat pumps, which were installed quite close to the area where workers rest during breaks. The issue was resolved shortly afterwards by installing soundproof insulation. On the other hand, the participants have a very positive perception regarding the ethical and environmental issues on the social impact (questions 24 & 25). Finally, in the following figures, the average index impact per category is presented, for both analyses.

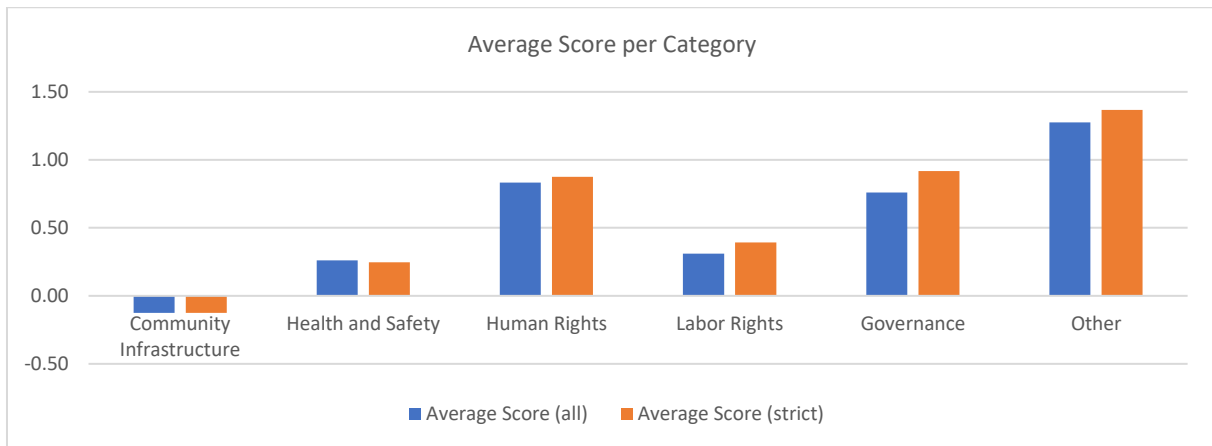


Figure 55. Average mean scores per impact category.


The most positive social impact perception appears to be the impact of Other (environment and ethical aspects), Governance as well as Human Rights, while for community infrastructure the social impact tends to be slightly negative. Furthermore, we observed no significant differences between the two analyses.

### 3.5.2 Average Score per Stakeholder Group

In the following table and figures, the impact index per Stakeholder Group for both analyses is presented.

Table 50. Impact index per Stakeholder Group (All answers).

Question	Worker	Farm Management	Regulators	Local Community
1	0,00			0,00
2	-0,50			-0,50
3	0,00			0,00
4	0,00			0,00
5	0,00			
6	1,00	0,00	1,00	-1,00
7	0,20			-1,00
8	0,60			0,00
9	0,00			0,00
10	1,00			1,00
11	1,00			1,00
12a	1,00	1,00	1,00	
12b	0,00	0,50	1,00	
13	0,00			0,00

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Question	Worker	Farm Management	Regulators	Local Community
14	1,00			1,00
15	0,00	1,00	1,00	
16	-0,50			0,00
17	1,00			1,00
18	0,00			0,00
19	0,25			0,00
20	1,00	1,00	1,00	0,60
21	1,00	1,00	1,00	0,50
22		0,50	1,00	0,00
23		1,00	1,00	1,00
24	1,40	2,00	1,50	2,00
25				1,67
26		1,00		1,00
27	1,00			0,80
<b>Average</b>	<b>0,44</b>	<b>0,90</b>	<b>1,06</b>	<b>0,38</b>

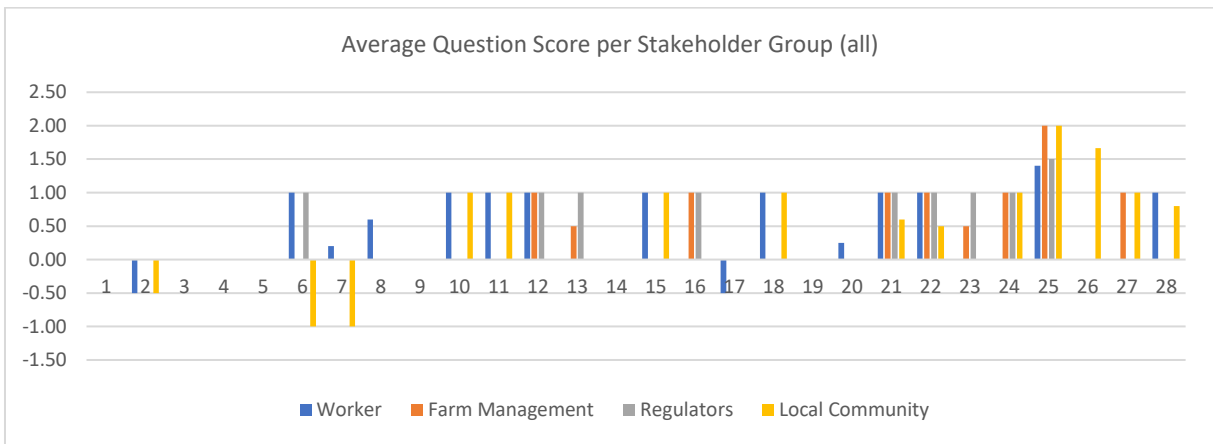


Figure 56. Average score per Stakeholder Group and Question – Cluster Bars (All answers).

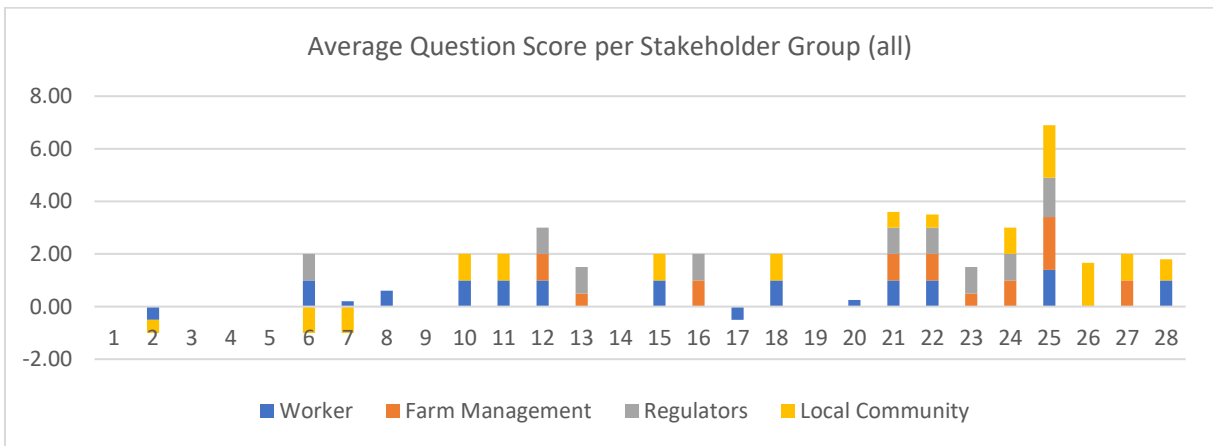


Figure 57. Average score per Stakeholder Group and Question – Stacked Bars (All answers).


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	Author:	CETRI	Version:	1.0
	Reference:	D5.4 RES4LIVE ID GA 101000785	Date:	30/09/2024

Table 51. Impact index per Stakeholder Group (Strict).

Question	Worker	Farm Management	Regulators	Local Community
1				0,00
2	-0,50			-0,50
3				0,00
4				0,00
5	0,00			
6	1,00	0,00		-1,00
7	0,20			-1,00
8	0,60			0,00
9	0,00			0,00
10	1,00			1,00
11	1,00			1,00
12a		1,00		
12b		0,50		
13	0,00			0,00
14	1,00			1,00
15		1,00		
16	-0,50			0,00
17	1,00			1,00
18	0,00			0,00
19	0,25			0,00
20		1,00	1,00	
21		1,00		
22		0,50	1,00	
23		1,00		
24		2,00		
25				1,67
26				1,00
27	1,00			0,80
<b>Average</b>	<b>0,40</b>	<b>0,89</b>	<b>1,00</b>	<b>0,26</b>

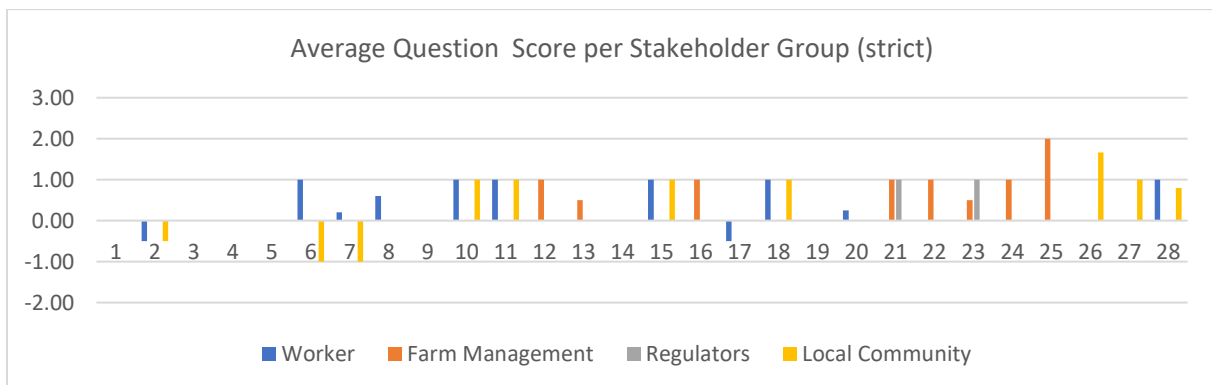



Figure 58. Average score per Stakeholder Group and Question – Cluster Bars (Strict).



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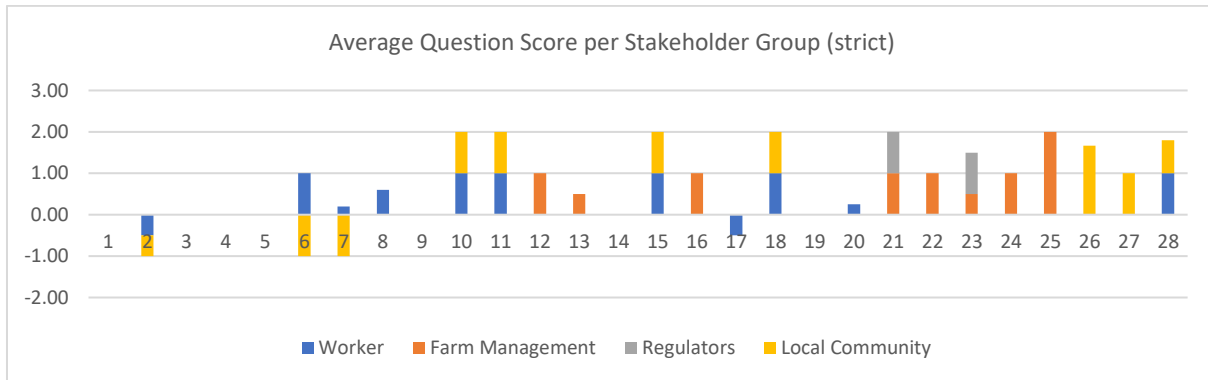


Figure 59. Average score per Stakeholder Group and Question – Stacked Bars (All answers).

In general, the results are consistent for all cases, showing alignment between participants of the same group and generally positive perception of social impacts, with rare exceptions. Furthermore, 3 different scenarios were prepared to calculate the total Social Impact Index of each case. The results for both analyses are presented below.

Table 52. Total SA Index for various weighting scenarios for stakeholders' groups (All answers).

Scenario	Worker	Farm Management	Regulators	Local Community	Average (all)
<b>25,25,25,25</b>	25%	25%	25%	25%	0,692
<b>30,30,10,50</b>	30%	30%	10%	50%	0,695
<b>10,10,10,70</b>	10%	10%	10%	70%	0,504

Table 53. Total SA Index for various weighting scenarios for stakeholders' groups (Strict).

Scenario	Worker	Farm Management	Regulators	Local Community	Average (strict)
<b>25,25,25,25</b>	25%	25%	25%	25%	0,638
<b>30,30,10,50</b>	30%	30%	10%	50%	0,618
<b>10,10,10,70</b>	10%	10%	10%	70%	0,412

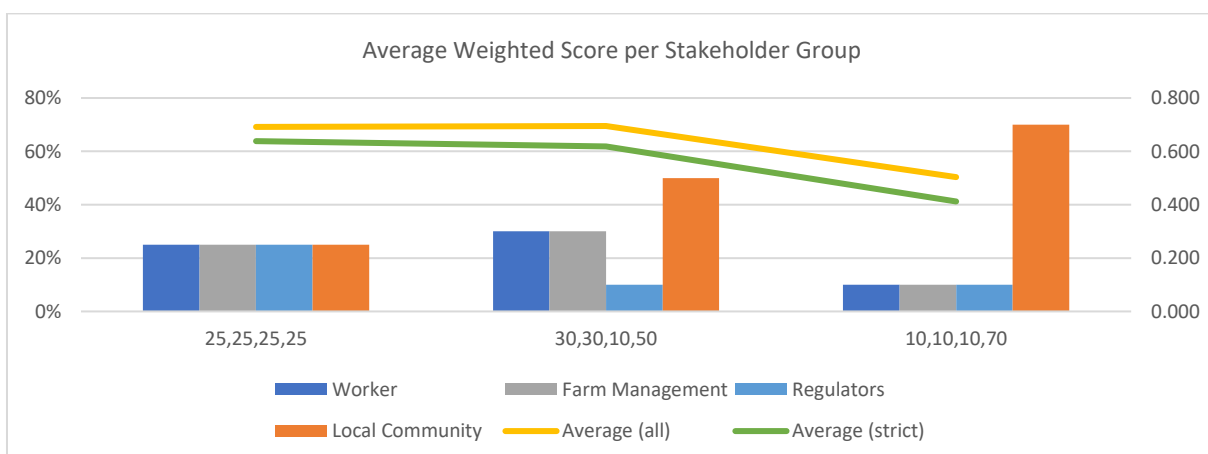



Figure 60. Comparison between the total SA Index for various weighting scenarios for stakeholder groups.

As presented in Figure 60, the total SA Index remains positive for all scenarios. In the Strict approach, it spans from 0,412 to 0,638, while in the All-answers approach, it is visibly higher. This clearly shows

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that stakeholders who answered questions outside their group have a slightly more positive perception of those aspects than those in the intended group.

### 3.5.3 Average Weighted Scores per Impact Category

Furthermore, the average weighted scores per impact category are presented. In total 3 scenarios were analysed, as presented in Table 55.

Table 54. Average Scores per Impact Category (not weighted).

Category	Question	Average Score (all)	Average Score (strict)	Average Score (all)	Average Score (strict)
<b>Community Infrastructure</b>	1	0,00	0,00	<b>-0,13</b>	<b>-0,13</b>
	2	-0,50	-0,50		
	3	0,00	0,00		
	4	0,00	0,00		
<b>Health and Safety</b>	5	0,00	0,00	<b>0,26</b>	<b>0,25</b>
	6	0,50	0,43		
	7	0,20	0,20		
	8	0,60	0,60		
	9	0,00	0,00		
<b>Human Rights</b>	10	1,00	1,00	<b>0,83</b>	<b>0,88</b>
	11	1,00	1,00		
	12a	1,00	1,00		
	12b	0,33	0,50		
<b>Labor Rights</b>	13	0,00	0,00	<b>0,31</b>	<b>0,39</b>
	14	1,00	1,00		
	15	0,43	1,00		
	16	-0,50	-0,50		
	17	1,00	1,00		
	18	0,00	0,00		
	19	0,25	0,25		
	20	0,83	1,00		
<b>Governance</b>	21	0,88	1,00	<b>0,76</b>	<b>0,92</b>
	22	0,33	0,67		
	23	1,00	1,00		
	24	1,64	2,00		
<b>Other</b>	25	1,67	1,67	<b>1,28</b>	<b>1,37</b>
	26	1,00	1,00		
	27	0,80	0,80		

Table 55. Average SA Index per Impact Category for various weighting scenarios.

Scenarios	Community Infrastructure	Health and Safety	Human Rights	Labor Rights	Governance	Other	Average Score (all)	Average Score (strict)
<b>Scenario 1</b>	14,29%	17,86%	14,29%	25,00%	14,29%	14,29%	0,52	0,58
<b>Scenario 2</b>	15,00%	15,00%	15,00%	25,00%	15,00%	15,00%	0,53	0,59

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<b>Scenario 3</b>	5,00%	30,00%	25,00%	30,00%	5,00%	5,00%	0,48	0,52
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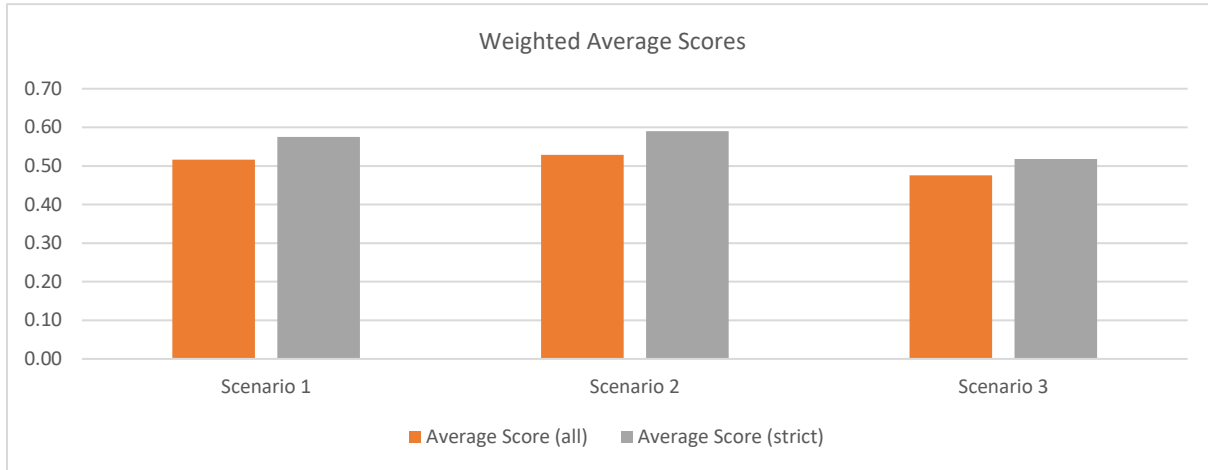


Figure 61. Average SA Index per Impact Category for various weighting scenarios for impact categories.

As presented in Figure 61, the total SA Index remains positive for all scenarios and analyses. In the Strict approach, it is around 0,55, while in the All-answers approach, it is visibly lower. This shows that participants (in general) who answered questions outside their targeted questions have a slightly more negative perception of those aspects than those in the intended group.

### 3.5.4 Statistical analysis

#### 3.5.4.1 Correlation

After the above analysis, a correlation analysis is conducted, based on the methodology presented in Section 2.4.

Table 56. Correlation analysis between stakeholder groups (All answers).

Correlation	Worker	Farm Management	Regulators	Local Community
Worker		39%	51%	65%
Farm Management			76%	97%
Regulators				73%
Local Community				

Table 57. Correlation analysis between stakeholder groups (Strict).

Correlation	Worker	Farm Management	Regulators	Local Community
Worker		N/A	N/A	54%
Farm Management			N/A	100%
Regulators				N/A
Local Community				

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In the Strict approach, the correlation where applicable, is not 100%, due to the fact that some participants had been assigned to more than one stakeholder group, which in general is acceptable. Nevertheless, it is clear that in the Strict approach, the social impact perception of Workers seems to have a weak correlation with the Local Community, while in the case of the All-answers approach, the perception of Workers versus the ones of Farm Management seems to be the weaker.

### 3.5.4.2 Chi-Square Test

After the correlation analysis, the chi-square test is conducted.

Table 58. Chi-Square Test | Observed Data (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	13	9	2	<b>24</b>
<b>Farm Management</b>	9	1	0	<b>10</b>
<b>Regulators</b>	9	0	0	<b>9</b>
<b>Local Community</b>	11	10	3	<b>24</b>
<b>Total</b>	<b>42</b>	<b>20</b>	<b>5</b>	<b>67</b>

Table 59. Chi-Square Test | Expected Values (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	15,04	7,16	1,79	<b>24</b>
<b>Farm Management</b>	6,27	2,99	0,75	<b>10</b>
<b>Regulators</b>	5,64	2,69	0,67	<b>9</b>
<b>Local Community</b>	15,04	7,16	1,79	<b>24</b>
<b>Total</b>	<b>42</b>	<b>20</b>	<b>5</b>	<b>67</b>

Table 60. Chi-Square Test | Contribution to the chi-square statistic (All answers).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	0,28	0,47	0,02	<b>0,77</b>
<b>Farm Management</b>	1,19	1,32	0,75	<b>3,26</b>
<b>Regulators</b>	2,00	2,69	0,67	<b>5,36</b>
<b>Local Community</b>	1,09	1,12	0,82	<b>3,03</b>
<b>Total</b>	<b>4,55</b>	<b>5,60</b>	<b>2,26</b>	<b>12,41</b>


The Sum of the Chi-Square Contributions is 12,41, the degrees of freedom (df) is 6,00, and finally the (p-value is calculated to be 0,05.

Table 61. Chi-Square Test | Observed Data (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	9	4	2	<b>15</b>
<b>Farm Management</b>	8	1	0	<b>9</b>
<b>Regulators</b>	2	0	0	<b>2</b>
<b>Local Community</b>	7	9	3	<b>19</b>
<b>Total</b>	<b>26</b>	<b>14</b>	<b>5</b>	<b>45</b>

Table 62. Chi-Square Test | Expected Values (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	8,67	4,67	1,67	<b>15</b>
<b>Farm Management</b>	5,20	2,80	1,00	<b>9</b>

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<b>Regulators</b>	1,16	0,62	0,22	<b>2</b>
<b>Local Community</b>	10,98	5,91	2,11	<b>19</b>
<b>Total</b>	<b>26</b>	<b>14</b>	<b>5</b>	<b>45</b>

Table 63. Chi-Square Test | Contribution to the chi-square statistic (Strict).

Stakeholder Type	Better (Q1=1)	Neutral (Q1=0)	Worse (Q1=-1)	Total
<b>Worker</b>	0,01	0,10	0,07	<b>0,17</b>
<b>Farm Management</b>	1,51	1,16	1,00	<b>3,66</b>
<b>Regulators</b>	0,62	0,62	0,22	<b>1,46</b>
<b>Local Community</b>	1,44	1,61	0,37	<b>3,43</b>
<b>Total</b>	<b>3,58</b>	<b>3,49</b>	<b>1,66</b>	<b>8,73</b>

The Sum of the Chi-Square Contributions is 8,73, the degrees of freedom (df) are 6,00, and finally the (p-value is calculated to be 0,19.

In the All-answers approach, since the p-value is less than 0,05, this means the results are statistically significant, and we can conclude that there is an association between the variables, i.e. stakeholder groups are significantly associated with the perception of social impact. This, on the other hand, does not apply to the Strict approach where the p-value is 0,19 and thus, there is no association between the variables.

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## 4 CONCLUSIONS

In general, apart from the case of the pilot case in Germany, the total SA Index remains positive for all scenarios and analyses.


Analysing the results per country in Greece, Labor Rights, particularly wage and compensation improvements, were perceived negatively as most workers did not experience enhancements in their wages and compensation due to the project. Additionally, training programs for energy efficiency and safety were deemed insufficient, with the majority of workers reporting inadequate training related to these areas. This negative perception can be attributed to the fact that the questionnaires were provided and completed by the stakeholder groups before the training session, which occurred after the fine-tuning of the heat pump system.

In Italy, Community Infrastructure faced negative perceptions, especially regarding the impact on local infrastructure, as most workers did not observe any changes in roads or other local infrastructure following the project's implementation. Furthermore, within Labor Rights, the project led to an increased workload for workers, with many noting a rise in working hours as a direct consequence of the RES initiatives.

Belgium experienced similar challenges in the Labor Rights category, particularly concerning worker living conditions. Most workers reported no improvements in their housing conditions, and there were negative changes in the availability and quality of worker housing units within the community. This lack of improvement in living conditions contributed to overall dissatisfaction among the workforces. Germany presented a more nuanced picture, where the All-answers approach indicated that while perceptions were generally positive, some participants still held slightly negative views. In particular, there were reports of incidents related to energy efficiency and thermal comfort, a lack of comprehensive training programs, and ongoing health and safety issues. Those answers are attributed mainly to the training of a limited part of the farm's personnel which in turn, creates the opinion that the installed technologies may cause problems in various aspects.

Overall, the main negative impacts observed from the RES implementation include:

- No Wage and Compensation Improvements:** Workers across Greece reported no significant enhancements in their wages and compensation, leading to dissatisfaction and a sense of unmet expectations.
- Insufficient Training Programs that might lead to Health and Safety Issues:** A lack of comprehensive training in energy efficiency and safety was a common concern, particularly in Greece and Germany, where workers felt unprepared to handle the new technologies and protocols introduced by the project and additionally, they fear that particular technologies may cause serious health and safety incidents.
- General Health and Safety Concerns:** Ongoing health and safety issues were reported, mainly in Germany, particularly due to the installation of the biogas station, for which there is the perception from the untrained personnel that might cause serious incidents.
- No Improvements in Local Infrastructure:** In Italy, the absence of observable changes in local infrastructure projects resulted in neutral or negative perceptions among workers regarding the community's development.
- Increased Workload:** The implementation of RES technologies in Italy led to an increase in working hours, contributing to higher workloads and potential burnout among workers. This however might be due to the pilot character of the project and should be further assessed in the future.
- No Worker Housing Conditions Improvements:** In Belgium, the project did not lead to improvements in worker housing availability and quality, causing negative perceptions and impacting worker well-being.

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These negative impacts underscore the importance of RES4LIVE's social impact and - most importantly - by tackling the negative areas, future implementations of RES technologies can better align with stakeholder expectations and foster more positive social outcomes.



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## 5 ANNEX - QUESTIONNAIRE DATA FROM PILOT CASES

Table 64. Questionnaire Data from AUA pilot farm.

Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22	
Community Infrastructure	Impact on local infrastructure	1. Have you observed any changes on road or other local infrastructure in the area recently? (Improved/Deteriorated/No Change)																							
		Improved										X	X		X		X					X			
		Deteriorated																			X				
		No Change	X	X	X	X	X	X	X	X	X			X		X				X				X	X
	Effect on worker housing availability and quality	2. Have there been any changes in the availability or quality of worker housing units in the area? (Improved/Deteriorated/No Change)																							
		Improved																						X	
		Deteriorated													X		X				X				
		No Change								X	X	X	X			X		X		X		X		X	X





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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22
	Changes in access to utilities (e.g., energy, water)	3. Have there been changes in access to utilities like energy and water in the community? (Improved/Deteriorated/No Change)																						
		Improved												X								X		
		Deteriorated																						
		No Change							X	X	X	X	X		X	X	X	X	X	X	X		X	X
	Availability of community services (e.g., healthcare, education)	4. How has the project affected your access to essential services like healthcare and education? (Improved/Deteriorated/No Change)																						
		Improved									X			X							X	X		
		Deteriorated														X								
		No Change							X	X		X	X		X		X	X	X	X			X	X
<b>Health and Safety</b>	Workplace safety measures and	5. Have there been any changes in workplace safety measures as a result of the project?																						



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	improvements	(Improved/Deteriorated/No Change)																						
		Improved																						
		Deteriorated																						
		No Change	X	X	X	X	X	X		X	X		X											
	Incidents related to energy efficiency and thermal comfort	6. Have there been any incidents related to the project? (Yes/No/I do not know)																						
		Yes																						
		No	X	X	X	X	X	X		X	X									X				
		I do not know														X								X
	Training programs for energy efficiency and safety	7. Have you received sufficient training related to energy efficiency and safety? (Yes/No)																						
		Yes				X	X	X		X	X													
		No	X	X	X																			



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22
	Health and safety of workers and community	8. How safe do you feel regarding energy efficiency and thermal comfort related to the farm's operations? (Very Safe/Somewhat Safe/Not Safe)																						
		Very Safe		X	X	X				X	X													
		Somewhat Safe	X																					
		Not Safe																						
	Working conditions	9. Have the working conditions, including air quality, levels of illumination (lighting), levels of noise, and comfort level on the farm got better after the implementation of the project? (Yes/Probably yes/Probably no/No)																						
		Yes	X	X	X			X		X	X													
		Probably yes				X	X																	



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22
		Probably no																						
		No																						
Human Rights	Prevention of discrimination and harassment	10. Have you experienced any form of discrimination or harassment on the farm after the project implementation? (Yes/No)																						
		Yes																						
		No	X	X	X	X	X	X		X	X													
	Protection of workers' human rights	11. Do you feel that your human rights are adequately protected while working on the farm after the project implementation? (Yes/No)																						
		Yes	X	X	X	X	X	X		X	X													
		No																						



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Pillar	Theme	Question	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU
			A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	A 10	A 11	A 12	A 13	A 14	A 15	A 16	A 17	A 18	A 19	A 20	A 21	A 22
	Fair and ethical treatment of stakeholders	12a. How would you rate the farm's practices in treating all stakeholders fairly and ethically? (Highly Ethical/Somewhat Ethical/Not Ethical).																						
		Highly Ethical	X	X	X	X	X	X		X														
		Somewhat Ethical									X													
		Not Ethical																						
		12b. Does the project implementation changed this? (Yes for the better / No / Yes for the worst)																						
		Yes for the better					X	X																
		No	X	X	X	X					X													
		Yes for the worst																						
<b>Labor Rights</b>	Wage and compensation improvements	13. Have you experienced improvements in wages and compensation as a																						



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22
		result of the project? (Yes/No)																						
		Yes																						
		No	X	X	X	X				X	X													
	Compliance with working hour regulations	14. Are the working hours on the farm in compliance with regulations? (Compliant/Non-compliant)																						
		Compliant	X	X	X	X				X	X													
		Non-compliant																						
	Impact on employment	15. Was there a change in workforce due to the implementation of the project (Increase, Decrease, No)																						
		Increase																						
		Decrease																						
		No	X	X	X	X				X	X													



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22
	Improved worker living conditions (if applicable)	16. Have there been changes in worker living conditions? (Improved/Deteriorated/No Change)																						
		Improved		X	X					X														
		Deteriorated																						
		No Change	X			X					X													
	Prevention of child labor	17. Have you observed any incidents of child labor on the farm? (Yes/No)																						
		Yes																						
		No	X	X	X	X				X	X													
	Impact on workload	18. Have your working hours changed due to the project? (Increase, Decrease, No)																						
		Increase																						



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		Decrease									X													
		No	X	X	X	X				X														
	Gender equality	19. Could the workforce gender balance change after the implementation of the project, and how? (Yes, more male workers could be employed / Yes, more female workers could be employed / No, it is unlikely to affect the gender balance)																						
		Yes, more male workers could be employed																						
		Yes, more female workers could be employed								X	X													
		No, it is unlikely to affect the gender balance	X	X	X	X																		





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<b>Governance</b>	Compliance with energy efficiency and emissions regulations	20. Is the farm complying with energy efficiency and emissions regulations? (Compliant/Non-compliant/Partial Compliance/I do not know)																							
		Compliant				X	X	X			X														
		Non-compliant																							
		Partial Compliance																							
		I do not know									X														
	Transparency in energy efficiency and emissions reporting	21. How transparent are the farm's operations and reporting related to energy efficiency and emissions reduction? (Very Transparent/Somewhat Transparent/Not Transparent/I do not know)																							
		Very Transparent					X	X		X															



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22
		Somewhat Transparent																						
		Not Transparent																						
		I do not know				X																		
	Engagement with local authorities for energy efficiency	22. Have there been any collaborations or interactions between the farm and local authorities regarding energy efficiency efforts? (Frequent/Limited/None)																						
		Frequent								X														
		Limited					X	X																
		None				X																		
	Internal policies and practices for energy efficiency	23. Does the farm have internal policies and practices in place to further improve energy efficiency? (Yes/Partially/No)																						
		Yes				X	X			X														



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22	
		Partially						X																	
		No																							
Other	Environmental Aspects	24. If you support RES as a means of mitigating fossil fuel use in the livestock sector, please indicate your level of agreement with this statement (Strongly Agree/ Agree/ Neutral/ Disagree/ Strongly Disagree). If you do not support RES for this purpose, please briefly explain why.																							
		Strongly Agree		X	X	X				X	X	X									X			X	
		Agree	X				X	X					X	X		X		X	X	X			X		X
		Neutral													X		X					X			
		Disagree																							
		Strongly Disagree																							



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22
	Economical Aspects	25. Are you interested in sourcing animal products from environmentally friendly facilities? (Very Interested/ Somewhat Interested/ Neutral/ Not Very Interested/ Not Interested at All)																						
		Very Interested		X	X	X	X	X	X		X		X	X	X		X	X	X	X		X	X	
		Somewhat Interested								X		X												X
		Neutral	X																					
		Not Very Interested																			X			
		Not Interested at All														X								
	Economical Aspects	26. Would you still be interested in obtaining animal products from environmentally friendly facilities if they were priced higher than conventional																						



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22
		options? (Yes/ No/ Not Sure)																						
		Yes		X	X	X	X	X				X	X	X	X	X		X	X		X	X		
		No	X						X								X			X				
		Not Sure								X	X												X	X
	Ethical Aspects	27. If you do not consume animal products, do you believe that RES applications on farms are more environmentally friendly and/or could enhance animal welfare conditions? (Yes, more environmentally friendly/ Yes, could improve animal welfare conditions/ No, neither/ Not Sure)																						
		Yes, more environmentally friendly							X	X	X		X	X	X	X				X	X	X		



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Pillar	Theme	Question	AU A 1	AU A 2	AU A 3	AU A 4	AU A 5	AU A 6	AU A 7	AU A 8	AU A 9	AU A 10	AU A 11	AU A 12	AU A 13	AU A 14	AU A 15	AU A 16	AU A 17	AU A 18	AU A 19	AU A 20	AU A 21	AU A 22	
		Yes, could improve animal welfare conditions								X	X	X							X	X				X	
		No, neither																							
		Not Sure																X							

Table 65. Questionnaire Data from GOLINELLI pilot farm.

Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11	
Community Infrastructure	Impact on local infrastructure	1. Have you observed any changes on road or other local infrastructure in the area recently? (Improved/Deteriorated/No Change)																											
		Improved																											



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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11	
		Deteriorated																X					X	X			X	X	
		No Change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X				X	X		
	Effect on worker housing availability and quality	2. Have there been any changes in the availability or quality of worker housing units in the area? (Improved/Deteriorated/No Change)																											
		Improved																											
		Deteriorated																											
		No Change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Changes in access to	3. Have there been changes in access to																											



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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11		
	utilities (e.g., energy, water)	utilities like energy and water in the community? (Improved/Deteriorated/No Change)																												
		Improved	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X													
		Deteriorated																												
		No Change																X	X	X	X	X	X	X	X	X	X	X	X	
	Availability of community services (e.g., healthcare, education)	4. How has the project affected your access to essential services like healthcare and education? (Improved/Deteriorated)																												





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	education)	d/No Change)																												
		Improved																												
		Deteriorated																												
		No Change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Health and Safety</b>	Work place safety measures and improvements	5. Have there been any changes in workplace safety measures as a result of the project? (Improved/Deteriorated/No Change)																												
		Improved																	X	X		X								X
		Deteriorated																												



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		No Change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X		X	X						
	Incidents related to energy efficiency and thermal comfort	6. Have there been any incidents related to the project? (Yes/No/I do not know)																											
		Yes																											
		No	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						X
		I do not know																											
	Training programs for energy efficiency	7. Have you received sufficient training related to energy efficiency																											



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	and safety	and safety? (Yes/No)																												
		Yes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
		No																												
	Health and safety of workers and community	8. How safe do you feel regarding energy efficiency and thermal comfort related to the farm's operations? (Very Safe/Some what Safe/Not Safe)																												
		Very Safe	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X						
		Somewhat Safe											X								X									
		Not Safe																												



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	Working conditions	9. Have the working conditions, including air quality, levels of illumination (lighting), levels of noise, and comfort level on the farm got better after the implementation of the project? (Yes/Probably yes/Probably no/No)																												
		Yes														X	X	X		X	X	X								
		Probably yes	X	X		X	X		X	X	X	X	X	X	X				X											
		Probably no			X			X																						



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		No																												
Human Rights	Prevention of discrimination and harassment	10. Have you experienced any form of discrimination or harassment on the farm after the project implementation? (Yes/No)																												
		Yes																												
		No	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Protection of workers' human rights	11. Do you feel that your human rights are adequately protected while working on the farm																												



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		after the project implementation? (Yes/No)																												
		Yes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		No																												
	Fair and ethical treatment of stakeholders	12a. How would you rate the farm's practices in treating all stakeholders fairly and ethically? (Highly Ethical/Somewhat Ethical/Not Ethical).																												
		Highly Ethical	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
		Somewhat Ethical																												



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		Not Ethical																												
		12b. Does the project implementation changed this? (Yes for the better / No / Yes for the worst)																												
		Yes for the better				X									X	X	X	X		X	X	X								
		No	X	X	X		X	X	X	X	X	X	X	X						X										
		Yes for the worst																												
<b>Labor Rights</b>	Wage and compensation improvements	13. Have you experienced improvements in wages and compensation as a result of the																												



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		project? (Yes/No)																												
		Yes																												
		No	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Compliance with working hour regulations	14. Are the working hours on the farm in compliance with regulations? (Compliant/Non-compliant)																												
		Compliant	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
		Non-compliant																												
	Impact on employment	15. Was there a change in workforce due to the implementation																												





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		of the project (Increase, Decrease, No)																												
		Increase						X	X																					
		Decrease																												
		No	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X									
	Impro ved work er living condi tions (if applic able)	16. Have there been changes in worker living conditions? (Improved/Deteriorated/No Change)																												
		Improved					X									X	X					X	X							
		Deteriorate d																												
		No Change	X	X	X	X		X	X	X	X	X	X	X	X				X	X	X									



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	Prevention of child labor	17. Have you observed any incidents of child labor on the farm? (Yes/No)																												
		Yes																												
		No	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Impact on workload	18. Have your working hours changed due to the project? (Increase, Decrease, No)																												
		Increase				X			X																					
		Decrease																												
		No	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X								



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	Gender equality	19. Could the workforce gender balance change after the implementation of the project, and how? (Yes, more male workers could be employed / Yes, more female workers could be employed / No, it is unlikely to affect the gender balance)																											
		Yes, more male workers																											



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		could be employed																												
		Yes, more female workers could be employed																												
		No, it is unlikely to affect the gender balance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Governance</b>	Compliance with energy efficiency and emissions regulations	20. Is the farm complying with energy efficiency and emissions regulations? (Compliant/Non-compliant/Partial Compliant)																												



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		e/I do not know)																												
		Compliant	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Non-compliant																												
		Partial Compliance																												
		I do not know																												
	Transparency in energy efficiency and emissions reporting	21. How transparent are the farm's operations and reporting related to energy efficiency and emissions reduction? (Very Transparent/Somewha																												



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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11	
		t Transparent/Not Transparent/I do not know)																											
		Very Transparent	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
		Somewhat Transparent																					x						
		Not Transparent																											
		I do not know																											
	Engag emen t with local autho rities for energ y	22. Have there been any collaborati ons or interactio ns between the farm and local authorities regarding																											



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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11		
	efficiency	energy efficiency efforts? (Frequent/Limited/None)																												
		Frequent	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Limited																										x		
		None																												
	Internal policies and practices for energy efficiency	23. Does the farm have internal policies and practices in place to further improve energy efficiency? (Yes/Partially/No)																												
		Yes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Partially																												



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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11		
		No																												
Other	Environmental Aspects	24. If you support RES as a means of mitigating fossil fuel use in the livestock sector, please indicate your level of agreement with this statement (Strongly Agree/ Agree/ Neutral/ Disagree/ Strongly Disagree). If you do not support RES for this purpose, please																												





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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11	
		briefly explain why.																											
		Strongly Agree	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Agree																											
		Neutral																											
		Disagree																											
		Strongly Disagree																											
	Economic Aspects	25. Are you interested in sourcing animal products from environmentally friendly facilities? (Very Interested/ Somewhat Interested/ Neutral/ Not Very																											



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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11		
		Interested/ Not Interested at All)																												
		Very Interested	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Somewhat Interested																												
		Neutral																												
		Not Very Interested																												
		Not Interested at All																												
	Econ omica l Aspec ts	26. Would you still be interested in obtaining animal products from environme ntally friendly facilities if they were																												



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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11		
		priced higher than conventional options? (Yes/ No/ Not Sure)																												
		Yes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		No																												
		Not Sure																												
	Ethical Aspects	27. If you do not consume animal products, do you believe that RES applications on farms are more environmentally friendly and/or could enhance animal welfare																												



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Pillar	Theme	Question	GOL INE LLI 1	GOL INE LLI 2	GOL INE LLI 3	GOL INE LLI 4	GOL INE LLI 5	GOL INE LLI 6	GOL INE LLI 7	GOL INE LLI 8	GOL INE LLI 9	GOL INE LLI 10	GOL INE LLI 11	GOL INE LLI 12	GOL INE LLI 13	GOL INE LLI 14	GOL INE LLI 15	U n i 1	U n i 2	U n i 3	U n i 4	U n i 5	U n i 6	U n i 7	U n i 8	U n i 9	U n i 10	U n i 11	
		conditions? (Yes, more environmentally friendly/ Yes, could improve animal welfare conditions/ No, neither/ Not Sure)																											
		Yes, more environmentally friendly			x										x	x	x	x	x	x	x	x	x	x		x	x	x	x
		Yes, could improve animal welfare conditions																											
		No, neither																											
		Not Sure	x	x		x	x	x	x	x	x	x	x	x											x				


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Table 66. Questionnaire Data from LVAT pilot farm.

Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
<b>Community Infrastructure</b>	Impact on local infrastructure	1. Have you observed any changes on road or other local infrastructure in the area recently? (Improved/Deteriorated/No Change)												
		Improved												
		Deteriorated									X		X	X
		No Change	X		X	X				X				
	Effect on worker housing availability and quality	2. Have there been any changes in the availability or quality of worker housing units in the area? (Improved/Deteriorated/No Change)												
		Improved												
		Deteriorated	X			X							X	X
		No Change			X				X					
	Changes in access to utilities (e.g., energy, water)	3. Have there been changes in access to utilities like energy and water in the community? (Improved/Deteriorated/No Change)												
		Improved							X			X		
		Deteriorated											X	X
		No Change	X		X	X				X	X			



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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
	Availability of community services (e.g., healthcare, education)	4. How has the project affected your access to essential services like healthcare and education? (Improved/Deteriorated/No Change)												
		Improved		X										
		Deteriorated							X					
		No Change	X		X	X				X	X		X	
<b>Health and Safety</b>	Workplace safety measures and improvements	5. Have there been any changes in workplace safety measures as a result of the project? (Improved/Deteriorated/No Change)												
		Improved		X										
		Deteriorated												
		No Change	X		X	X	X	X	X		X		X	X
	Incidents related to energy efficiency and thermal comfort	6. Have there been any incidents related to the project? (Yes/No/I do not know)												
		Yes		X			X	X		X	X			
		No	X		X	X							X	
		I do not know												
	Training programs for energy efficiency and safety	7. Have you received sufficient training related to energy efficiency and safety? (Yes/No)												



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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
		Yes		X		X								
		No			X		X	X	X	X		X	X	X
	Health and safety of workers and community	8. How safe do you feel regarding energy efficiency and thermal comfort related to the farm's operations? (Very Safe/Somewhat Safe/Not Safe)												
		Very Safe	X											
		Somewhat Safe				X					X		X	X
		Not Safe		X	X				X	X				
	Working conditions	9. Have the working conditions, including air quality, levels of illumination (lighting), levels of noise, and comfort level on the farm got better after the implementation of the project? (Yes/Probably yes/Probably no/No)												
		Yes												
		Probably yes		X		X				X				
		Probably no					X	X						
		No			X				X		X			X
<b>Human Rights</b>	Prevention of discrimination and harassment	10. Have you experienced any form of discrimination or harassment on the farm after the project implementation? (Yes/No)												



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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
		Yes											X	
		No	X	X	X	X	X	X	X	X	X	X		X
	Protection of workers' human rights	11. Do you feel that your human rights are adequately protected while working on the farm after the project implementation? (Yes/No)												
		Yes		X			X	X				X		X
		No				X			X					
	Fair and ethical treatment of stakeholders	12a. How would you rate the farm's practices in treating all stakeholders fairly and ethically? (Highly Ethical/Somewhat Ethical/Not Ethical).												
		Highly Ethical		X		X								
		Somewhat Ethical			X		X	X			X		X	X
		Not Ethical												
		12b. Does the project implementation changed this? (Yes for the better / No / Yes for the worst)												





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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
		Yes for the better												
		No			X	X	X	X					X	X
		Yes for the worst												
<b>Labor Rights</b>	Wage and compensation improvements	13. Have you experienced improvements in wages and compensation as a result of the project? (Yes/No)												
		Yes												
		No		X	X	X	X	X	X	X	X		X	X
	Compliance with working hour regulations	14. Are the working hours on the farm in compliance with regulations? (Compliant/Non-compliant)												
		Compliant		X	X	X	X	X						
		Non-compliant							X	X	X		X	X
	Impact on employment	15. Was there a change in workforce due to the implementation of the project (Increase, Decrease, No)												
		Increase												



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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
		Decrease							X	X		X	X	X
		<i>No</i>		X	X	X	X	X			X			
	Improved worker living conditions (if applicable)	16. Have there been changes in worker living conditions? (Improved/Deteriorated/No Change)												
		Improved												
		Deteriorated											X	
		No Change			X	X	X	X	X	X				X
	Prevention of child labor	17. Have you observed any incidents of child labor on the farm? (Yes/No)												
		Yes												
		No		X	X	X	X	X	X	X	X	X	X	X
	Impact on workload	18. Have your working hours changed due to the project? (Increase, Decrease, No)												
		Increase												
		Decrease												
		No		X	X	X	X	X	X	X	X		X	X



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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
	Gender equality	19. Could the workforce gender balance change after the implementation of the project, and how? (Yes, more male workers could be employed / Yes, more female workers could be employed / No, it is unlikely to affect the gender balance)												
		Yes, more male workers could be employed												
		Yes, more female workers could be employed									X		X	X
		No, it is unlikely to affect the gender balance		X	X	X	X	X	X	X				
<b>Governance</b>	Compliance with energy efficiency and emissions regulations	20. Is the farm complying with energy efficiency and emissions regulations? (Compliant/Non-compliant/Partial Compliance/I do not know)												
		Compliant				X								
		Non-compliant												
		Partial Compliance									X		X	X
		I do not know												
	Transparency in energy efficiency and emissions reporting	21. How transparent are the farm's operations and reporting related to energy efficiency and emissions reduction? (Very Transparent/Somewhat Transparent/Not Transparent/I do not know)												
		Very Transparent				X								



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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
		Somewhat Transparent		X							X		X	
		Not Transparent							X	X				X
		I do not know												
	Engagement with local authorities for energy efficiency	22. Have there been any collaborations or interactions between the farm and local authorities regarding energy efficiency efforts? (Frequent/Limited/None)												
		Frequent				X					X			X
		Limited	X										X	
		None												
	Internal policies and practices for energy efficiency	23. Does the farm have internal policies and practices in place to further improve energy efficiency? (Yes/Partially/No)												
		Yes		X		X	X	X			X			X
		Partially											X	
		No												
<b>Other</b>	Environmental Aspects	24. If you support RES as a means of mitigating fossil fuel use in the livestock sector, please indicate your level of agreement with this statement (Strongly Agree/ Agree/ Neutral/ Disagree/ Strongly Disagree). If you do not												



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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
		support RES for this purpose, please briefly explain why.												
		Strongly Agree		X		X								
		Agree									X		X	X
		Neutral					X	X						
		Disagree												
		Strongly Disagree												
	Economical Aspects	25. Are you interested in sourcing animal products from environmentally friendly facilities? (Very Interested/ Somewhat Interested/ Neutral/ Not Very Interested/ Not Interested at All)												
		Very Interested		X		X	X	X			X	X		X
		Somewhat Interested	X											
		Neutral			X				X	X			X	
		Not Very Interested												
		Not Interested at All												
	Economical Aspects	26. Would you still be interested in obtaining animal products from environmentally friendly												



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Pillar	Theme	Question	1	2	3	4	5	6	7	8	9	10	11	12
		facilities if they were priced higher than conventional options? (Yes/ No/ Not Sure)												
		Yes	X	X					X		X	X		
		No												X
		Not Sure			X	X	X	X		X			X	
	Ethical Aspects	27. If you do not consume animal products, do you believe that RES applications on farms are more environmentally friendly and/or could enhance animal welfare conditions? (Yes, more environmentally friendly/ Yes, could improve animal welfare conditions/ No, neither/ Not Sure)												
		Yes, more environmentally friendly	X						X			X		
		Yes, could improve animal welfare conditions	X										X	
		No, neither												
		Not Sure					X	X						



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Table 67. Questionnaire Data from ILVO pilot farm.

Pillar	Theme	Question	ILVO 1	ILVO 2	ILVO 3	ILVO 4	ILVO 5	ILVO 6	ILVO 7	ILVO 8	ILVO 9	ILVO 10	ILVO 11	ILVO 12	ILVO 13	ILVO 14	ILVO 15	ILVO 16	
<b>Community Infrastructure</b>	Impact on local infrastructure	1. Have you observed any changes on road or other local infrastructure in the area recently? (Improved/Deteriorated/No Change)																	
		Improved																	
		Deteriorated																	
		No Change	X								X	X	X						
	Effect on worker housing availability and quality	2. Have there been any changes in the availability or quality of worker housing units in the area? (Improved/Deteriorated/No Change)																	
		Improved																	
		Deteriorated	X			X			X										
		No Change		X	X					X									
	Changes in access to utilities (e.g., energy, water)	3. Have there been changes in access to utilities like energy and water in the community?																	



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Pillar	Theme	Question	ILVO 1	ILVO 2	ILVO 3	ILVO 4	ILVO 5	ILVO 6	ILVO 7	ILVO 8	ILVO 9	ILVO 10	ILVO 11	ILVO 12	ILVO 13	ILVO 14	ILVO 15	ILVO 16
		(Improved/Deteriorated/No Change)																
		Improved																
		Deteriorated																
		No Change		X	X					X	X	X						
	Availability of community services (e.g., healthcare, education)	4. How has the project affected your access to essential services like healthcare and education? (Improved/Deteriorated/No Change)																
		Improved																
		Deteriorated																
		No Change		X	X					X	X	X						
<b>Health and Safety</b>	Workplace safety measures and improvements	5. Have there been any changes in workplace safety measures as a result of the project? (Improved/Deteriorated/No Change)																
		Improved																
		Deteriorated																





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Pillar	Theme	Question	ILVO 1	ILVO 2	ILVO 3	ILVO 4	ILVO 5	ILVO 6	ILVO 7	ILVO 8	ILVO 9	ILVO 10	ILVO 11	ILVO 12	ILVO 13	ILVO 14	ILVO 15	ILVO 16
		No Change		X	X													
	Incidents related to energy efficiency and thermal comfort	6. Have there been any incidents related to the project? (Yes/No/I do not know)																
		Yes								X				X				
		No		X	X	X	X								X		X	
		I do not know																
	Training programs for energy efficiency and safety	7. Have you received sufficient training related to energy efficiency and safety? (Yes/No)																
		Yes	X		X	X												
		No		X				X										
	Health and safety of workers and community	8. How safe do you feel regarding energy efficiency and thermal comfort related to the farm's operations? (Very Safe/Somewhat Safe/Not Safe)																



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Pillar	Theme	Question	ILVO 1	ILVO 2	ILVO 3	ILVO 4	ILVO 5	ILVO 6	ILVO 7	ILVO 8	ILVO 9	ILVO 10	ILVO 11	ILVO 12	ILVO 13	ILVO 14	ILVO 15	ILVO 16
		Very Safe	X	X	X													
		Somewhat Safe						X	X									
		Not Safe																
	Working conditions	9. Have the working conditions, including air quality, levels of illumination (lighting), levels of noise, and comfort level on the farm got better after the implementation of the project? (Yes/Probably yes/Probably no/No)																
		Yes																
		Probably yes			X	X	X	X										
		Probably no	X						X									
		No		X														
Human Rights	Prevention of discrimination and harassment	10. Have you experienced any form of discrimination or harassment on the farm after the project implementation? (Yes/No)																
		Yes																
		No	X	X	X				X									



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Pillar	Theme	Question	ILVO 1	ILVO 2	ILVO 3	ILVO 4	ILVO 5	ILVO 6	ILVO 7	ILVO 8	ILVO 9	ILVO 10	ILVO 11	ILVO 12	ILVO 13	ILVO 14	ILVO 15	ILVO 16
	Protection of workers' human rights	11. Do you feel that your human rights are adequately protected while working on the farm after the project implementation? (Yes/No)																
		Yes	X	X				X	X									
		No																
	Fair and ethical treatment of stakeholders	12a. How would you rate the farm's practices in treating all stakeholders fairly and ethically? (Highly Ethical/Somewhat Ethical/Not Ethical).																
		Highly Ethical	X	X	X								X	X	X		X	X
		Somewhat Ethical																
		Not Ethical																
		12b. Does the project implementation changed this? (Yes for the better / No / Yes for the worst)																
		Yes for the better												X			X	



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Pillar	Theme	Question	ILVO 1	ILVO 2	ILVO 3	ILVO 4	ILVO 5	ILVO 6	ILVO 7	ILVO 8	ILVO 9	ILVO 10	ILVO 11	ILVO 12	ILVO 13	ILVO 14	ILVO 15	ILVO 16
		No		X	X	X									X			
		Yes for the worst																
<b>Labor Rights</b>	Wage and compensation improvements	13. Have you experienced improvements in wages and compensation as a result of the project? (Yes/No)																
		Yes																
		No	X	X					X									
	Compliance with working hour regulations	14. Are the working hours on the farm in compliance with regulations? (Compliant/Non-compliant)																
		Compliant	X	X	X				X									
		Non-compliant																
	Impact on employment	15. Was there a change in workforce due to the implementation of the project (Increase, Decrease, No)																
		Increase												X	X		X	
		Decrease																
		No	X	X	X	X												



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	Improved worker living conditions (if applicable)	16. Have there been changes in worker living conditions? (Improved/Deteriorated/No Change)																
		Improved																
		Deteriorated	X		X													
		No Change		X					X									
	Prevention of child labor	17. Have you observed any incidents of child labor on the farm? (Yes/No)																
		Yes																
		No	X	X					X									
	Impact on workload	18. Have your working hours changed due to the project? (Increase, Decrease, No)																
		Increase																
		Decrease																
		No	X	X	X				X									



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	Gender equality	19. Could the workforce gender balance change after the implementation of the project, and how? (Yes, more male workers could be employed / Yes, more female workers could be employed / No, it is unlikely to affect the gender balance)																
		Yes, more male workers could be employed																
		Yes, more female workers could be employed	X															
		No, it is unlikely to affect the gender balance	X	X	X				X									
<b>Governance</b>	Compliance with energy efficiency and emissions regulations	20. Is the farm complying with energy efficiency and emissions regulations? (Compliant/Non-compliant/Partial Compliance/I do not know)																
		Compliant	x	X	X	X		X	X			X		X	X		X	
		Non-compliant																
		Partial Compliance																
		I do not know								X	X							



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	Transparency in energy efficiency and emissions reporting	21. How transparent are the farm's operations and reporting related to energy efficiency and emissions reduction? (Very Transparent/Somewhat Transparent/Not Transparent/I do not know)																
		Very Transparent		X	X	X								X	X		X	
		Somewhat Transparent								X	X							
		Not Transparent																
		I do not know																
	Engagement with local authorities for energy efficiency	22. Have there been any collaborations or interactions between the farm and local authorities regarding energy efficiency efforts? (Frequent/Limited/None)																
		Frequent												X			X	
		Limited								x	X	X			X			
		None																



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	Internal policies and practices for energy efficiency	23. Does the farm have internal policies and practices in place to further improve energy efficiency? (Yes/Partially/No)																
		Yes										X	X	X	X		X	
		Partially																
		No																
<b>Other</b>	Environmental Aspects	24. If you support RES as a means of mitigating fossil fuel use in the livestock sector, please indicate your level of agreement with this statement (Strongly Agree/ Agree/ Neutral/ Disagree/ Strongly Disagree). If you do not support RES for this purpose, please briefly explain why.																
		Strongly Agree				X	X					X	X	X	X		X	
		Agree	X	X	X													X
		Neutral																
		Disagree																
		Strongly Disagree																





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	Economical Aspects	25. Are you interested in sourcing animal products from environmentally friendly facilities? (Very Interested/ Somewhat Interested/ Neutral/ Not Very Interested/ Not Interested at All)																
		Very Interested								X	X							
		Somewhat Interested										X						
		Neutral																
		Not Very Interested																
		Not Interested at All																
	Economical Aspects	26. Would you still be interested in obtaining animal products from environmentally friendly facilities if they were priced higher than conventional options? (Yes/ No/ Not Sure)																
		Yes								X	X	X	X					
		No																
		Not Sure																



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	Ethical Aspects	27. If you do not consume animal products, do you believe that RES applications on farms are more environmentally friendly and/or could enhance animal welfare conditions? (Yes, more environmentally friendly/ Yes, could improve animal welfare conditions/ No, neither/ Not Sure)																
		Yes, more environmentally friendly						x	X	X	X							
		Yes, could improve animal welfare conditions																
		No, neither																
		Not Sure										X						