

Review of the Technical and Vocational Education and Training (TVET) Curricula in the Jordan Valley Area

- Assessment of Gaps in Green and Sustainable Skills -

Submitted To:



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Abbreviations and Acronyms

ATVET	Agricultural Technical and Vocational Education and Training
CEDEFOP	European Center for the Development of Vocational Training
CCIA	Chambers of Commerce, Agriculture, and Industry
CMV	Climate Most Vulnerable Regions
CVM	Climate Most Vulnerable Region
DCA	Danish Church Aid
EJ	East Jerusalem
EU	European Union
GDP	Gross Domestic Product
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Development Agency)
ISCED	International Standard Classification of Education
JEDCO	Jerusalem Electricity Distribution Company
JV	Jordan Valley
MOE	Ministry of Education
MOHE	Ministry of Higher Education
MoL	Ministry of Labor
NCA	Norwegian Church Aid
NTC	National TVET Commission
PAFU	Palestinian Farmers Union
PCBS	Palestinian Central Bureau of Statistics
PFCCIA	Palestinian Federation of Chambers of Commerce, Industry and Agriculture
TCs	Technical Colleges

TVET	Technical and Vocational Education and Training
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNRWA	The United Nations Relief and Works Agency for Palestine Refugees in the Near East
VSSs	Vocational Secondary Schools
VTCs	Vocational Training Centers
YMCA	The East Jerusalem Young Men's Christian Association

Executive Summary

Overview and Study Context

The Palestinian Jordan Valley, a vital agricultural heartland constituting over 20% of the West Bank, is steeped in potential for growth in sectors critical to the Palestinian economy. Yet, geopolitical constraints severely restrict Palestinian access to resources and development opportunities, with nearly 95% of the land off-limits due to Israeli control. These restrictions, coupled with a significant decline in the local population due to these restrictions coupled with challenges posed by climate change, such as increased temperatures and water scarcity, exacerbate the Valley's vulnerability.

Against this backdrop, the resilient private sector continues to champion agriculture as an economic and cultural mainstay, despite labor shortages and environmental stresses. This resilience underscores the urgency for TVET programs to evolve, integrating green and sustainable skills to empower the local workforce to meet the changing demands of the Jordan Valley's unique environmental and economic landscape.

Scope and Objectives

This study meticulously examines ATVET curricula in the Palestinian Jordan Valley, emphasizing sectors like agriculture, agro-industry, and agro-tourism, to identify gaps in green and sustainable skills. It seeks to align educational content with the capacity-needs of the private sector. Through an in-depth analysis of local market requirements, the research aims to uncover discrepancies between the current educational offerings and industry needs, providing actionable recommendations to enhance workforce preparation in response to specific regional environmental and economic challenges. These findings are geared toward informing policy decisions, guiding educational frameworks, and fostering industry-academia partnerships to ensure market-relevant, sustainability-focused education.

Study Methodology

The study's methodology combined desk research with stakeholder engagement and international benchmarking to assess ATVET curricula in the Jordan Valley. Desk review laid the groundwork, analyzing existing ATVET research and curricula. In-depth qualitative data was then gathered via site visits, interviews, and stakeholder consultations to capture the current state of ATVET and the needs of the region's economic sectors. A comparative analysis with international curricula identified best practices in environmental and sustainability education. The process culminated in a gap analysis that informed strategic recommendations, honed by stakeholder feedback to ensure relevance to the Jordan Valley's unique context. This was completed by the development of a suggested curricula to guide the formation of a unified ATVET curricula that accounts for green and sustainable skills in the region.

Key Findings

In the current ATVET curricula, significant gaps were identified in the incorporation of sustainable and green skills. The private sector's vision for expansion underlines the necessity for optimization of production processes, introduction of new crop varieties, food production and processing, storage and logistics, smart pest management, equipment maintenance, composting, and enhancement of resource efficiency among many others identified in this study. However, there is a lack of clarity on whether current ATVET programs are equipping students for these emerging industry trends. Where till now, there has been no national plan for agricultural TVET (ATVET).

Agro-tourism, a burgeoning opportunity for economic development, lacks emphasis within existing ATVET programs, representing a critical gap. Furthermore, the absence of standardized curricula and the disjointed nature of skill offerings in vital areas like quality control, food processing, and smart agriculture technology present significant challenges. These deficiencies are compounded by the lack of integration of modern, green, and sustainable skills in the curricula, which are crucial for economic resilience and climate change adaptation.

The ATVET programs appear to be out of sync with private sector requirements for specialized skills in areas like renewable energy, recycling, composting, and integrated pest management among many others, which are skills essential for a resilient economy capable of withstanding climate-related shocks. This gap between the skills provided by ATVET programs in the region and the needs of the private sector may result in a workforce that is ill-prepared for the demands of the region's economy, with far-reaching implications for the sustainable development of the Jordan Valley

Gap Analysis

The study revealed significant disparities between the existing ATVET offerings in the region and the evolving demands of the industry for green skills and sustainable practices. Key findings from the gap analysis indicated that while ATVET institutions provide a foundation in traditional agricultural methods, they fall short in equipping students with modern, sustainable techniques that are becoming increasingly essential in light of environmental challenges and market trends. This is with the exception of one institution in the Southern Jordan Valley region that provides a curriculum on sustainable agriculture and home gardening that is based on permaculture, yet needs further development to meet the needs of the dynamic private sector.

There is a clear need for ATVET programs to integrate a stronger focus on topics such as sustainable energy technologies, environmental management and conservation, water resource management, green building and construction practices, and circular economy concepts. Industry feedback and market analysis further reinforced this, highlighting a workforce skills mismatch, with employers seeking candidates possessing practical knowledge in these areas. The current curricula do not adequately address these needs, nor do they prepare students for the technological

advancements shaping the agricultural sector, such as smart and sustainable pest control, agro-tourism, and renewable energy.

Moreover, the private sector emphasized the need for ATVET curricula to be responsive to future plans and market trends, ensuring that capacity building develops skills that align with the direction the market is moving towards. This includes the expansion into sustainable food processing and supply chain management, which are not currently reflected in the available ATVET programs.

The gap analysis underscored the urgent need for curricular reforms to address these gaps, calling for a collaborative effort among educational institutions, industry stakeholders, and policymakers to develop an ATVET framework that is forward-looking, adaptable, and grounded in principles of sustainability and environmental stewardship.

Furthermore, in the course of stakeholder consultations and site assessments, it was observed that the primary entities offering ATVET programs in the region are not only limited but also previously identified. However, emerging organizations and groups are incorporating the development and integration of ATVET programs into their strategic plans or visions. Yet, the concern remains that these efforts are individual and unorganized, which could lead to duplication of efforts and lack of coordination under a unified umbrella.

International Best Practice and Experience Capture

The examination of international best practices in sustainable TVET curriculum development provided a wealth of insights applicable to the Jordan Valley context. The study investigated several models from countries with advanced TVET systems and assessed their applicability to the local context of the Palestinian Jordan Valley.

German TVET programs, recognized for their dual system of education combining classroom instruction and on-the-job training, highlighted the value of practical experience in developing green skills. The European Centre for the Development of Vocational Training (Cedefop) approach emphasized the importance of lifelong learning and adaptability to technological advancements, underscoring the need for ongoing skill development in response to the dynamic nature of the green economy.

Additionally, approaches from the African continent revealed how ATVET programs can be tailored to address specific regional environmental challenges, suggesting a template for curriculum design that integrates local environmental and socio-economic conditions. For example, programs that focused on water conservation, renewable energy, and sustainable agriculture practices demonstrated a significant impact on community resilience and development.

Lessons learned from these international practices underscored the importance of aligning curriculum development with industry needs and ensuring that training programs are both responsive to environmental challenges and focused on sustainability. These insights underpin the recommendation to revise ATVET curricula in the Jordan Valley, advocating for the incorporation of green skills, modern

technologies, and practices that foster sustainable development and enhance economic growth within the region.

Drawing on these models, the study proposes a framework for the Jordan Valley that involves multi-stakeholder collaboration, a focus on hands-on training, and an emphasis on skills that promote environmental stewardship and meet the specific needs of the local market. The international examples provide a roadmap for enhancing the existing ATVET offerings, ensuring they are attuned to global standards of sustainability and preparedness for the green jobs of the future.

Stakeholder Engagements

The consultation meetings took different forms; either through site-visits, bi-lateral meetings, email exchanges, surveys, phone calls, and a final stakeholder workshop which provided valuable affirmation for the necessity of updating ATVET curricula. Stakeholders, including representatives from the private sector, educational bodies, and government, unanimously agreed on the critical need for integrating sustainable and green practices into current programs. There was a shared understanding that these enhancements are essential for meeting the industry's evolving demands and for fostering a workforce capable of contributing to a sustainable economy. These insights from the meetings strongly support the study's findings and the proposed strategic direction for curriculum development in the Jordan Valley.

Strategic Recommendations

ATVET is vital in the agricultural value chain, providing essential knowledge and competencies to tackle diverse farming challenges. By instilling skills in sustainable practices and marketing, ATVET can reduce costs, prevent crop and production losses, and empower farmers to thrive in today's market as well as meeting the private sector's evolving demands.

To enhance the resilience of the region and spur investments and ATVET enrollment rates, the integration of green and sustainable skills into ATVET is paramount. Such integration is also key in developing support services currently absent in agricultural communities, such as auto-mechanics, composting, and waste recycling. This approach is inclusive, supporting women and marginalized groups by fostering gender sensitivity and integrating essential skills such as marketing and cost analysis.

To maximize the impact of ATVET, the study emphasizes the need for strong connections with Work-Based Learning (WBL) and job-matching services, linking training to employment opportunities. Furthermore, it suggests that ATVET should facilitate access to incubation programs and financing schemes.

Recommendations include:

- **National Policies and Strategic Planning:** Develop a unified national vision for TVET and ATVET that aligns with market demands, employment needs, and climate change mitigation. Regular industry engagement is essential to ensure curricula meet market needs, equipping trainees with in-demand skills.

- Training of Trainers (TOT): Invest in the qualifications of trainers to guarantee the delivery of sustainable and green practices in ATVET programs. This investment is critical for the long-term success and adaptation of such practices.
- Agricultural and Environmental Incubation and Entrepreneurship Programs: Establish green business incubators for mentoring and technical support in sustainable ventures. Integrate practical green projects into curricula to prepare trainees for real-life challenges, and support research in green technologies.
- Stakeholder Engagement and Coordination: Foster collaboration across government, private sector, educational institutions, and communities. Engage stakeholders in curriculum design and training modules to ensure relevancy and practicality, and promote a shared commitment towards sustainability.

Furthermore, chapter 11 of the study presents 12 topics of critical importance to be addressed and added to the existing ATVET curricula, these include topics such as sustainable food processing and supply chain, smart and environmentally sustainable pest control, green agricultural machinery, Green-tech and innovation, agro-tourism, and circular economy among others.

Guidelines and Template for Sustainable and Green ATVET Curriculum

Chapter 12 of the study serves as a foundational piece for the future of ATVET curriculum development, laying out comprehensive guidelines and a robust template for the integration of sustainable and green practices. This chapter puts forward a structured approach to curriculum design that prioritizes environmental sustainability and equips students with the practical skills needed for the green economy.

The proposed curriculum framework incorporates essential sustainability topics such as renewable energy, waste management, sustainable agriculture, and water conservation. These subjects are structured into practical modules that provide hands-on learning experiences and reflect the real-world applications of green technologies.

Key integration strategies emphasize the need for curricula to be dynamic and responsive to technological advancements and market changes. This includes recommendations for embedding sustainability into all aspects of ATVET programs, from initial design to delivery, assessment, and continuous improvement.

The guidelines also suggest methods for collaborating with industry experts to ensure that training is aligned with the latest sustainability practices and employment opportunities. By following the blueprint provided in Chapter 12, ATVET institutions can create curricula that not only respond to current environmental challenges but also anticipate future developments in green technologies and practices.

1. Introduction

The Palestinian Jordan Valley constitutes more than 20% of the West Bank's land and holds significant land reserves crucial for the organic growth of Palestinian urban areas. Despite the Palestinian residents of the Jordan Valley region facing water scarcity, the region in actuality boasts about one-third of the West Bank's underground water reserves, to which the Palestinians' access is restricted. Moreover, it possesses immense possibilities for agricultural, industrial, and tourism sectors. The economic advancement of the Jordan Valley is of paramount importance for the growth and revival of the Palestinian community, making it a vital component in ensuring the sustainability and viability of an independent Palestinian State (Al Haq, 2018).

At the heart of fostering skilled human resources to support these sectors lies the importance of Technical and Vocational Education and Training (TVET). TVET programs play a vital role in equipping individuals with relevant skills and competencies, bridging the gap between education and the evolving needs of the private sector.

In recent years, the region has witnessed rapid developments and transformations in the agriculture and related sectors, demanding a workforce equipped with specialized knowledge and practical skills. However, it is crucial to ensure that the education and training provided through TVET programs meet the actual needs of the private sector. As such, this study endeavors to investigate the current state of TVET curricula in terms of green and sustainable skills and to discern the skill requirements of the private sector in the agricultural, agro-industrial, and agro-tourism sectors.

The main objective of this study is to examine the existing TVET curricula related to agriculture, agro-industry, and agro-tourism in the Palestinian Jordan Valley area. The study aims to identify any deficiencies in the incorporation of green and sustainable skills by assessing how well these curricula align with the capacity-building requirements expressed by the private sector. Additionally, the research aims to recognize and address any gaps in the local market context. Throughout the study, stakeholders involved in Agricultural TVET (ATVET) in the region have been identified, and their curricula and interventions have been thoroughly reviewed. This evaluation is in conjunction with engaging with the private sector through surveys and consultations to understand and assess their specific needs. The ultimate goal is to provide concrete and actionable recommendations on how to include green and sustainable skills to meet the evolving demands of the market. Such alignment is not only vital for addressing the workforce's skills mismatch but also for nurturing a skilled workforce that contributes effectively to the economic growth and competitiveness of the Palestinian Jordan Valley area.

The significance of this study extends beyond the mere analysis of TVET curricula; it carries the potential to inform policymakers, TVET institutions, and private sector stakeholders, fostering stronger collaboration between academia and industry (PAFU, 2023).

2. The Study Area: The Palestinian Jordan Valley

The Jordan Valley extends almost 1,200 square kilometers along the west bank of the Jordan River, from the 1949 Armistice Line (Green Line) in the north, to the Dead Sea in the south, stretching along the entire border between the West Bank and Jordan. The Jordan Valley region in Palestine holds immense potential for economic growth and development, owing to its strategic geographical location, fertile lands, and natural resources. These attributes position the area as a significant nexus for agricultural production, agrotourism, agro-industrial and industrial growth alike, with lucrative investment prospects. Nevertheless, the various factors exacerbated by the political situation and the Israeli-Palestinian power dynamic, Palestinians' ability to build in the Jordan Valley, as well as their access to water, land, resources, and movement rights make the development potential of the region a daunting challenge. This has resulted in a stifling of the Palestinian economy and an extremely high poverty rate for Palestinians in the Jordan Valley. Where Settlers directly control 50% of the land and the Israeli military controls another 45%, rendering a whopping 95% of the Jordan Valley totally closed off to Palestinian development (Maan Development Center, 2015). And while they represent 85% of the population in the region, Palestinians are only able to develop 5% of the Jordan Valley due to Area C restrictions.

There has been a drastic decline in the local population rates in the Jordan Valley area, leading to challenges facing the private sector in terms of finding skilled and even unskilled labor at demand season, particularly due to the skill drain where workers leave to work at nearby settlements or behind the green line, as well as skill immigration to other cities in the West Bank. Although the population levels in the past are unclear due to restricted access to official historical records, the Palestinian population of the Jordan Valley prior to the Israeli occupation in 1967 was estimated at 250,000 people. Today, Palestinian population in the region are estimated by PCBS in 2016 to be approximately 53,562 (Al Haq, 2018).

Adding to the prevailing circumstances and challenges facing the region, Climate change has further compounded these obstacles as it has emerged as a critical global challenge, with far-reaching consequences for ecosystems, economies, and human well-being. In the Middle East, including the Jordan Valley area, the impacts of climate change are pronounced due to its unique geographic and climatic characteristics. These impacts manifest through rising temperatures, water scarcity, and changing rainfall patterns, exacerbating existing vulnerabilities and posing significant challenges

to agricultural systems, natural resources, and socio-economic stability. Through the WFP climate vulnerability mapping conducted with GIS modelling and key expert consultation approaches, the Jordan Valley has been identified as a Climate Most Vulnerable (CMV) region with up to 21 localities listed by stakeholders as highly vulnerable. These localities are highly vulnerable to increase in temperatures especially in summer times, low precipitation, less rainy days, and extreme drought. The area is highly affected from Weather instability with short intense rainfall causing flash floods, frost, and high-speed winds in winter times all together (PAFU, 2023).

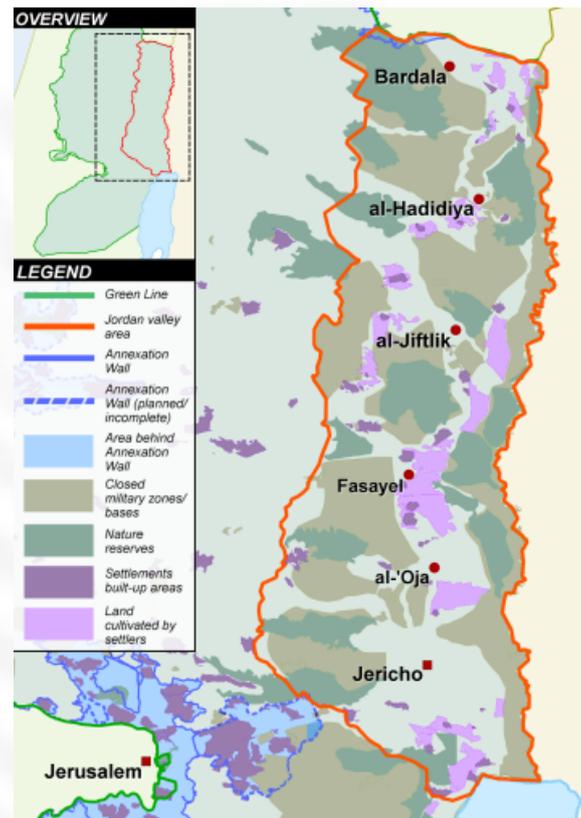


Figure 1: Map of the Jordan Valley Area (Al Haq, 2018)

Notwithstanding the prevailing challenges and status quo, the Palestinian private sector, specifically through the agricultural and agro-industrial sectors, has exhibited tenacity and steadfastness within the region. Through a multitude of projects and establishments, this sector has made substantial contributions to the nation's gross domestic product (GDP), generated employment prospects, and bolstered the resilience of the local population inhabiting the area. Historically, agriculture holds significant cultural and societal importance within the region, serving as an integral component of the region's identity and empowering its inhabitants' resilience and contributing to the local socio-economy.

3. Technical and Vocational Education and Training in Palestine

3.1. Overview

The significance of human resources development systems in fostering the healthy socio-economic growth of societies cannot be underestimated. Particularly, as economies transition towards knowledge-based societies, the crucial role of these systems in meeting employment and labor market demands becomes even more evident. In Palestine, Technical and Vocational Education and Training (TVET) assumes a pivotal role in this regard, primarily offered through training centers, vocational schools, and community colleges. TVET plays a vital role in preparing workers at various occupational levels, ranging from basic to intermediate, including skilled workers, craftsmen, and technicians. (MOHE & MoL, 2010).

As Palestinian unemployment rates are high, especially among youth and university graduates, and poverty is hitting large segments of society, many – including government and policy makers – are turning their attention to the TVET system, hoping that it could provide solutions (Hashweh, 2022). Nevertheless, TVET has been fragmented and delivered by different providers at various qualification levels. The fragmentation has arisen from the uncoordinated actions of multiple government and non-government actors.

In 2010, the National TVET Strategy was developed by Palestinian TVET specialists. It reflects an important paradigm shift of recent years which places quality and relevance of TVET as its priority. The new structure follows the inner logic of a consistent and feasible TVET system. It integrates the labor market in all parts of the TVET system. The overall objective of the National TVET Strategy is to create a knowledgeable, competent, motivated, entrepreneurial, adaptable, creative, and innovative workforce in Palestine. In 2021, the National TVET Commission (NTC) was established and equipped as an overarching governmental institution, tasked with tackling this complex endeavor and aims to unify the TVET sector in Palestine once and for all. The establishment and setup of the NTC is based on the lessons learned from previous governmental attempts to harmonize TVET in Palestine, Based on Law No. 4, the NTC's mandate is characterized by the following: As the national body responsible for policymaking and development in the TVET sector, the NTC is responsible for organizing, supervising, following up, guiding, and controlling all institutions that work in the TVET sector. It also manages the unified funding and coordinates and harmonizes donor activity in the sector. (Jweiles, 2022)

Nevertheless, the relevancy and effectiveness of the Palestinian TVET system has been questioned in terms of its compatibility with labor market needs and requirements (Romahi, 2010). The TVET system in Palestine is quite small and, unfortunately, still fragmented. In the year 2018/2019, there existed around 300 TVET institutions: 243 vocational training centers (VTCs); 39 vocational secondary schools (VSSs), including vocational units in academic schools; and 30 technical colleges (TCs). 71,000 students and trainees were enrolled in these TVET institutions, 21% in VTCs, 7% in VSSs, and 72% in TCs. Females made up about one-third (33 %) of the total number of students (42% in VTCs, 20% in VSSs, and 32% in TCs). (European Training Foundation, 2020). Thus, in 2018, vocational education students reached only 2.3% (MOE, 2019) where the overwhelming majority (97.7%) choose the academic track . Hence TVET enrollment of the total secondary school students, is very low, compared to 30 – 50% in many developed countries.

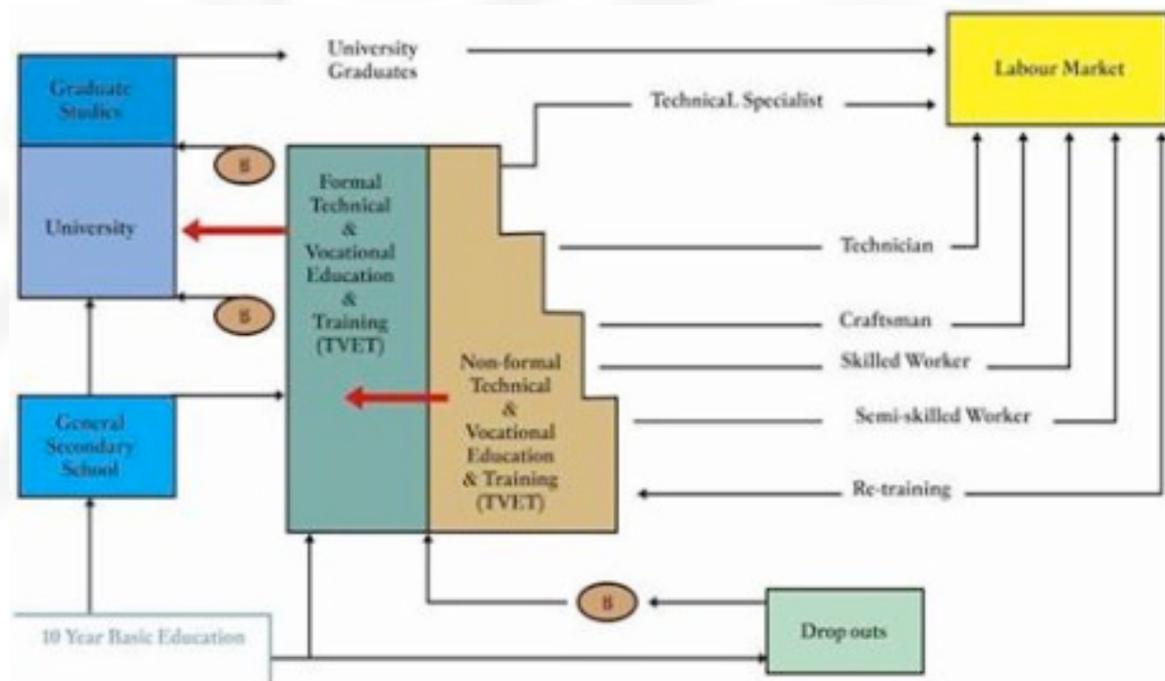


Figure 2: Palestinian TVET Structure per the Revised TVET Strategy (MOHE & MoL, 2010)

Within the field of TVET and Agricultural TVET (ATVET) many authors and policy documents distinguish “Formal”, “Non-Formal” and “Informal” TVET:

- “Formal” TVET refers to education and training programs which are part of the formal education system, guided by a curriculum, and recognized with a certification by the country’s education authority. This is the type of activity which takes place at secondary technical schools, TVET centers, colleges and polytechnics, often resulting in qualifications referred to as “certificates”, “diplomas” or increasingly as education at “levels” 1-4.

- “Informal” TVET refers to a class or course, guided by a curriculum, but not part of the formal education system and not recognized by the education authority. In this report, non-formal TVET is taken to include short training courses, “practical training farms”, “farmer field schools” etc., typically organized or delivered by value chain development projects, training providers, companies but also TVET organizations.

Moreover, there is a diversity of providers for vocational and technical education and training services in Palestine, offering various types and systems of vocational and technical education, allowing for flexibility and versatility. These institutions include:

- I. Industrial and vocational secondary schools under the Ministry of Education.
- II. Technical colleges and community colleges.
- III. Vocational training centers in all provinces, affiliated with the Ministry of Labor.
- IV. Cultural centers and approximately 25 community colleges offering different educational programs for high school graduates.

These institutions are overseen by the public, private, and civil sectors, including the Ministry of Education and Higher Education, Ministry of Labor, Ministry of Social Affairs, UNRWA, charitable and religious associations, as well as local and international non-governmental organizations and private sector entities. These schools and colleges provide technical education and training and are under the supervision of the Ministry of Education and Higher Education¹.

In 2019, the Ministry of Labor (MoL) launched their unified and accredited TVET curricula which included 17 subject matters, which are aimed to be increased to 24². Nevertheless, these curricula till the moment and as consulted with MoL through the preparation of this study do not include curricula on agriculture, and while they are planned to be included in the near future, a study conducted for the Palestinian Federation of Chambers of Commerce, Industry and Agriculture (PFCCIA 2018) identified weak offer for agriculture in TVET although agriculture sector is high on the national agenda.

3.2. TVET in The Jordan Valley Area

There are particularly higher numbers of people with no education, primary education, and preparatory education in area C including the Jordan Valley, and a smaller number of residents with university degrees and technical and vocational degrees. There is a higher concentration of lower educational levels in Area C, especially in the in the

¹ Technical & Vocational Education & Training – Palestine: <https://www.tvet-pal.pna.ps/structure>

² Ministry of Labor: <https://www.mol.pna.ps/news/119>

Jordan Valley. Area C's workers are more likely to be agricultural workers; 39% of all jobs in area C are in agriculture compared to 12% in areas A&B (PARC, 2019).

The majority of area C residents possess practical, yet sub-professional, skills in domains such as construction, agriculture, irrigation, and tending livestock. Thus, facilities that require little previous formal education and focus on such skills with practical applications could prove particularly useful. However this step require reduced costs of attendance and travel for area C residents, most of whom are relatively poor, and live in fragmented and distant localities due to the geopolitical situation of the area.

In response to the need for a unified effort among Nongovernmental vocational and educational training organizations in Palestine, the Vocational Educational Training League was established in 2003. By 2008, the TVET League was officially registered as a legal entity, comprising 16 institutions. However, in the Jordan Valley communities, specifically the Northern JV encompassing Tubas Governorate and the Southern JV encompassing Jericho Governorate, formal and informal TVET centers are relatively scarce, primarily concentrated in Jericho and Tubas cities.

- I. In the Northern JV;
 - i. the Tubas Chamber of Commerce;
 - ii. and the Tubas Charity Association,

Those, along with several private centers, offer trainings in diverse skills such as languages, computer literacy, household economics, IT, finance, and other areas.

- II. In the Southern JV;

TVET centers are more organized and developed, particularly due to the growing industrial pattern in Jericho Governorate and its relatively larger population. Prominent centers in Jericho Governorate include;

- i. the East Jerusalem Young Men's Christian Association (YMCA),
- ii. Al-Birr B'abna' Al Shohada' (Al-Birr) Foundation,
- iii. Jerusalem Electricity Distribution Company's Training Center (JEDCO),
- iv. Jericho's Chamber of Industry, Agriculture, and Commerce, and
- v. Jerusalem Open University TVET Center.

Outside the Jordan Valley region, but with significant relevance, the Hisham Hijjawi College of Technology established the "Al Najah Agricultural Training and Research Center" in Al-Nassariyeh, part of the Northern Jordan Valley area in Nablus governorate. Additionally, the Palestinian Agricultural Relieve Committee (PARC) is preparing for an agricultural training center in Al-Zababdeh in Jenin. Though outside

the geographic boundaries of the Jordan Valley, PARC has actively contributed to TVET and capacity building initiatives in the area.

3.3. Technical and Vocational Education and Training in Agriculture (ATVET)

Agricultural Technical Vocational Education and Training (ATVET) can be defined as the educational process involving the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding, and knowledge relating to occupations in agriculture, in addition to general education (Jones, 2013).

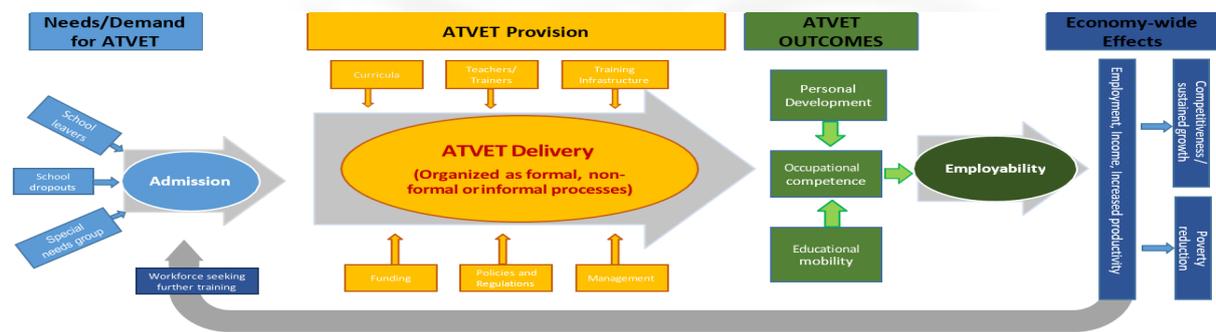


Figure 3: Impacts of ATVET on an individual, agri-food sector and the whole economy (Kehl, 2013)

Locally, Palestine is one of the least Arab countries in terms of the number of agricultural schools (PARC, 2019). In Jordan, for example, there are 21 schools offering agricultural education services. Prior to the academic year 2018/2019, the opportunities for agricultural technical education were available only in two schools: Al- Arroub Agriculture School in Hebron and Beit Hanoun Agriculture School in Gaza. Fortunately, at the beginning of the 2018/2019 school year, three schools were added; Arrabeh / Jenin governorate, Safa / Ramallah governorate and Burin / Nablus governorate. Those agricultural schools offer specializations in general agricultural production, general animal production and food processing.

The first scientific conference on agricultural education and vocational training was inaugurated under the auspices of the Ministry of Education and Higher Education in Palestine on: 28/7/2009 in Hebron Governorate under the title 'Agricultural Education and Training: Reality and Challenges' at Al-Aroub Mixed Agricultural Secondary School in Hebron³.

Unfortunately, until now, there has been no national plan for agricultural vocational education and training, and there is no effective training in the optimal way. In the West

³ Wafa (Palestine News & Info Agency 2009: Opening of the first conference for agricultural vocational education and training in Palestine

Bank, for the educational opportunities after school, mainly through ATVET, the following institutes offer relevant programs;

- **Hisham Hijjawi College, Nablus;** The center was established in 2014 following an in-depth market needs analysis conducted by the Local Employment Center in Nablus Governorate. The college successfully secured the establishment of a specialized agricultural center with full support from the European Union and under the supervision of the German cooperation organization GIZ. The center is located on a private land owned by An-Najah National University, covering an area of 72 dunams, situated in the Jordan Valley region of Nablus - Nasariya. Out of this area, 11 dunams are utilized by An-Najah Community College, housing plastic greenhouses, a fishpond, and open-field agriculture, making it the first of its kind in the governorate. The main objective of this center is to train individuals interested in enhancing their skills in modern agriculture. The training program spans an entire agricultural season, during which participants are closely monitored through different training stages, including crop development and relevant pest control measures. Students acquire essential agricultural principles necessary for implementing integrated pest management in their fields and are trained to use modern technologies, gaining greater control over local field conditions.
- **Palestine Technical University in Al-Aroub and Tulkarem (Khodouri);** Palestine Technical university provides its Diploma TVET programs in both Hebron and Tulkarem. The available programs are food production and protected agriculture. The Protected Agriculture Technologies Program is designed to address current agricultural issues at both local and global levels, utilizing scientific knowledge to enhance production and protect the environment. This program offers practical knowledge and modern techniques in plant production and plant health management or plant care. The program aims to provide educational skills in the fields of crop cultivation, medicinal and aromatic plants, agricultural mechanization, cut flowers, irrigation systems, plant diseases, pests, and pesticides, as well as plant health management under greenhouse conditions.
- **Hebron University;** started a diploma program in agriculture with specializations in plant production and animal production. However, the agricultural faculty of Hebron university was established in 1987 and was the first college to issue agricultural bachelor's degrees in Palestine. In terms of Bachelor's degree, the faculty for currently provides plant production, animal production, nutrition and food processing, agro-economics, and livestock management.

- **As for Al-Quds Open University**, it has completed preparations for a similar program at the beginning of the second semester 2019 which included training in protected agriculture, maintenance of irrigation networks and agricultural machinery. Al Quds university since then has expanded their works particularly in their continuing education center in Jericho to have agricultural research and TVET programs in smart agriculture, irrigation systems, animal production, and apiology. The university has established two mobile training centers to target marginalized and vulnerable groups who have issues of access and transportation, one in Tubas governorate, and one in Hebron governorate.
- **Nablus TVET university**; The Palestinian Government established Nablus TVET university in 2020 which operates under the umbrella of the Ministry of Higher Education (MoHE). The university provides three levels of TVET education, including ATVET; (i) professional certificates which range between 1 week – 14 months, (ii) Diploma degree / technicians which range between 2 – 3 years, and (iii) bachelor's degree / specialists which ranges between 4 – 5 years. The university is intended to provide agricultural engineering and sustainable resources courses and diplomas.
- **YMCA Jericho**: A non-profit community-based center, The EJ-YMCA Vocational Training Centre (VTC) was established in 1948 at Aqbat-Jaber Refugee Camp, in Jericho, after the Nakba where the Palestinian people were displaced from their lands. It started with relief activities and academic education for the refugee children in the camp which was sheltering more than 75,000 refugees. The YMCA has a main curriculum accredited by the Ministry of Labor on sustainable Agriculture and Home gardening. The curriculum is based on permaculture and provides a scientific overview of these principles. The provided program is a short course rather than a diploma.
- **PARC**: Agricultural Relief offers a training program for new graduates that began more than 25 years ago. The duration of the program is eight months. Practical work in the field constitutes 60% of the time, while the training inside the hall is 40%. The training of the hall is also focused on skills, especially technical life skills. The program covers 25-30% of the number of applicants to benefit from training opportunities in the West Bank and Gaza. The training program began in 1992 and continues to this day, with 51 batches graduating, including 1200 agricultural engineers of both sexes and in different specializations. This program is perhaps the largest and most sustainable. Currently, and at the time of inception of this report, PARC is developing their existing training center in Al-Zabadeh, Jenin Governorate to be transformed from being an accelerator and incubator for agricultural start-ups and initiatives

to become a complete training and entrepreneurship center providing ATVET trainings.

- **Chambers of Commerce, Agriculture, and Industry (CCIAs);** Not all chambers of Palestine are accredited to provide formal TVET programs. Most notably to worth is Tubas Chamber of commerce that provides short courses every now and then on agricultural topics, most notably their course on the maintenance of agricultural machinery.

4. Scope and Objective of the Study

The study undertaken encompassed a thorough review of the available TVET curricula in the Jordan Valley region, relevant to the highlighted industries (i.e., agriculture, agro-industry, and agro-tourism), namely ATVET, with a distinctive emphasis on appraising deficiencies in environmental, green, climate resilient, and sustainable competencies. The approach to the study involved detailed analysis of the current curricula, highlighting skill deficits in key areas such as circular economy, renewable energy, resource efficiency, sustainable tourism, and other green and sustainable practices that are proposed to be included based on the outcome of this report to ensure that the ATVET programs adequately address climate change mitigation and adaptation needs specific to the region.

In a bid to understand the multifaceted nature of the problem, stakeholder engagement was conducted through surveys and questionnaires with various entities including government bodies, educational institutions, and industry representatives. Additionally, site visits took place to the private sector institutions in the region to obtain an understanding of their needs, identified gaps, and prospective projects. These dialogues allowed valuable insights to be obtained into their perceptions, experiences, needs, gaps, and expectations, which formed a crucial part of the analysis. Additionally, these engagements allowed to form an understanding not only of the current situation and status quo for both the TVET education system and curricula, but also of prospective and future plans both from a strategic point by the government and its relevant ministries, TVET service providers, and the direction the private sector is considering through their pipeline projects to ensure that any recommendations devised meet not only the current needs but also guarantee that capacity building develops skills that align with the direction the market is moving in.

In addressing the needs of the private sector, gaps were not only identified but also recommendations were devised that aim to bridge the identified gaps. As a part of this study, a comparative review of international best practices was captured. The aim was to adapt and customize relevant methodologies and approaches, and overview recent

developments in ATVET, tailoring them to meet the unique needs and conditions of the Jordan Valley region. Hence, the study has led to the development of practical recommendations, based on these findings, to enhance the ATVET curricula. These enhancements involve the integration of environmental best practices, principles of sustainable development, climate change mitigation and adaptation, and industry-specific skills.

5. Methodology

The methodology employed in this study was meticulously designed to reflect the scope and objectives outlined in the previous section. The process began with a kickoff meeting with Palvision on June 20th, 2023 to obtain an outline of the task and a complete understanding of their program and the goal of the required study. Following, an exhaustive desk review was conducted which involved careful examination of pertinent documents, program materials, and existing reports. This step was crucial in obtaining a comprehensive understanding of the project context, stakeholders, and available data at both national and district levels. The review included a deep dive into related research studies, best practices, and established frameworks that effectively integrate environmental, green, and sustainable practices and skills into ATVET curricula, as well as ATVET research on a national and international level.

Upon completion of the desk review, data collection was the next step undertaken. This entailed a robust qualitative data collection process via site visits, surveys, interviews, and stakeholder consultations. The consultations were undertaken with both the identified private sector establishments, as well as TVET centers and service providers in the region. The rich data gathered offered invaluable insights into the current economic sectors, challenges, and opportunities for the adoption of circular economy, green initiatives, and the enhancement of agro-industries via TVET capacity building in the Jordan Valley area. As well as reviewing existing curricula carefully to understand the current ATVET situation and the content and topics delivered to students.

To identify insights and best practices, we conducted a comparative analysis of successful international TVET curricula that effectively incorporate environmental, green, and sustainable skills. This exercise enabled us to pinpoint exemplary projects and initiatives from diverse countries, thereby allowing the study to draw insights and learn from their methodologies, curriculum structures, and outcomes.

Following, a comprehensive needs assessment and gap analysis was undertaken based on the gathered information. These critical steps helped to identify existing gaps and areas ripe for improvement within the existing ATVET curriculum. Data collected

through surveys, interviews, and industry consultations provided valuable insights into current industry demands, emerging trends, and skill requirements.

A draft of the study was developed based on all the highlighted steps, which was reviewed by Palvision and consulted on with stakeholders identified in the study either in the public sector, private sector, and TVET service providers. Taking into account the feedback received from stakeholders, the findings were reviewed to produce the final report. This report integrated the feedback and comments received, ensuring a comprehensive and well-rounded assessment of the ATVET curricula in the Jordan Valley area. The ultimate goal was to provide Palvision with actionable recommendations that can enhance the TVET programs, align them with industry needs, and promote sustainable development practices.

6. The Private Sector: Employment and Capacity Baseline

It is of paramount importance to develop a comprehensive understanding of the needs of key economic sectors in the region. This understanding is vital for devising prompt and methodical interventions aimed at mitigating and adapting to the impacts of climate change. Among the various interventions seeking to address climate change, there is a pressing need to focus on employment opportunities, capacity building, and skill development. These factors play a crucial role in equipping companies and businesses with the necessary knowledge and competencies to establish resilient enterprises. Furthermore, they contribute to the facilitation of sustainable development in the region, enabling effective adaptation to economic shocks and challenges arising as a result of climate change.

Notwithstanding the prevailing challenges and status quo identified in the second section of this report, the Palestinian private sector, specifically through the agricultural and agro-industrial sectors, has exhibited tenacity and steadfastness within the region. Through a multitude of projects and establishments, this sector has made substantial contributions to the nation's gross domestic product (GDP), generated employment prospects, and bolstered the resilience of the local population inhabiting the area. Historically, agriculture holds significant cultural and societal importance within the region, serving as an integral component of the region's identity and empowering its inhabitants' resilience and contributing to the local socio-economy.

Within the Jordan Valley region, the primary employment sectors comprise Israeli settlements, agriculture and agro-industries, the public sector, remedial labor within Israel (within its proper 1967 borders), and services. A comprehensive investigation conducted by Ma'an Development Center in 2013 revealed an astonishing finding that approximately 60% of Palestinians in the Jordan Valley are employed in Israeli

settlements (Maan Development Center, 2013). This substantial proportion of the workforce being absorbed by settlements has been corroborated in the current study through consultations, surveys, and engagements with the private sector. These interactions have illuminated a prominent challenge faced by employers, namely, labor drain. This phenomenon manifests either during peak seasons in the agricultural and agro-industrial sectors or as a consequence of workers leaving for employment opportunities in settlements, leaving companies understaffed as no local workforce is available. Another challenge is the departure of trained workers to settlements following receiving trainings and capacity building by their Palestinian employers, doubling the cost by employing and training new workers. The impact of this issue was particularly evident during the COVID-19 pandemic, when certain companies reported that they paid full salaries to retain their employees and prevent their migration to Israeli settlements, despite temporary business closures at the time.

The primary objective of this section is to set the basis for the ATVET curricula review through firstly conducting a comprehensive analysis of the existing situation of private sector employment within the Jordan Valley area, while simultaneously shedding light on the predominant challenges that impede its growth and long-term viability. Through an examination of these obstacles, coupled with a subsequent evaluation of technical and ATVET programs and curricula in the region, it becomes possible to identify and understand any disparities that may exist between the requirements of the private sector, the demands of climate change adaptation and mitigation, sustainable development prerequisites, and the ongoing efforts to cultivate human capacity through TVET initiatives. Nevertheless, it is evident through engagement with the relevant stakeholders from the public sector, private sector, and training centers that there are still far too few training opportunities for young people. And often, the available training does not match the needs of the private sector.

6.1. The Northern Jordan Valley: Tubas Governorate

The Tubas Governorate is a largely rural region in the northeast of the West Bank in Palestine, it is located within the Northern JV. Most of this agricultural governorate lies within the Jordan Valley and falls within Area C, which means much of the land is not available for Palestinian use. On the lands they can access, Palestinian farmers grow a range of crops, particularly vegetables like tomatoes, cucumbers, bell peppers, and eggplants, as well as fruits like watermelon, citrus, dates and avocados. Water is scarce and farmers must often purchase it for irrigation. The western corner, including the ancient (Maan Development Center, 2013) city of Tubas and many of the larger towns, are geographically elevated, high above the valley. The main economic activities in Tubas governorate are agriculture, followed by services, commerce, and construction. With some localities relying with percentages higher than 90% of the

population completely on agriculture such as the case is in Salhab, Kishda, and Bardala for instance (Maan Development Center, 2013).

6.1.1. Employment Needs Highlighted by Tubas' Private Sector

Tubas' agricultural private sector relies extensively on seasonal workers, who as per the questionnaires conducted, form the majority of the workforce in the area, these mainly constitute Bedouin and local village families working during the different agricultural seasons as opposed to individual labor, where entire families join the workforce at Tubas' farms.

Depending on the scope of activities, private sector enterprises farm and harvest a collective of either owned or rented farms ranging from a few hundred to donums to a few hundred hectares. And while their fulltime and administrative staffing are relatively small ranging between a few administrative employees, agricultural engineers, and financial cadre, to up to 50 employees including drivers, full time farmers, and salespersons, their seasonal labor needs are a few hundred farmers per season.

As many of the governorate's agricultural enterprises have recently penetrated regional and global markets, new skills have become a necessity which were not previously available in the local labor market, this includes;

- Agricultural marketing
- Agricultural sales
- Supply chain and logistics
- Food Production Engineers
- Specialized agricultural engineers (e.g., herbs)
- Cold Storage and warehouse managers
- Quality engineers
- Smart Pest Control Specialists

Where the following depicts the most prominent employment needs highlighted by Tubas' private sector;



Figure 4: Tubas Private Sector Employment Needs

6.1.2. Capacity Building Needs Highlighted by Tubas' Private Sector

The capacity building and training requirements in Tubas are intricately linked to the region's employment needs. This connection stems from the notable disparity in the socio-economic conditions between Tubas and other areas, such as Jericho and the broader West Bank. Tubas comprises a collection of scattered small communities and localities, many of which are inhabited by marginalized populations facing limited access to education, services, training opportunities, and capacity building initiatives. The geographical expanse of the region, coupled with considerable distances between these dispersed communities, further exacerbates the challenge, and makes it difficult for the private sector to find employees and workers with high-level trainings or specialized capacities. Consequently, individuals, especially the youth residing in these areas, encounter significant obstacles in attending trainings as it involves considerable financial burdens in terms of transportation and disruptions to their livelihoods. The limited outreach and engagement with these marginalized communities further compound the issue, impeding their awareness of available training programs, including technical and vocational education and training (TVET) initiatives.

It is worth noting that Jerusalem Open University has implemented a commendable initiative known as the "Mobile Training and Education Program." Through this program, they have procured and equipped vehicles to serve as mobile training centers, offering diverse curricula, including agricultural training. Trainers visit the localities directly, providing on-site capacity building sessions. The program has been active in Tubas and Hebron governorates, and its implementation will be further examined as part of this assignment.

Through consultation with Tubas' private sector, the following constitute the most appealing and required training and capacity development topics needed in the region;

- Agricultural equipment maintenance
- Process Optimization and Quality Assurance
- Smart and computerized irrigation
- Fertilizers and pesticides applications
- Food production
- Food security and food safety
- Export standards (e.g., ISO and FSCCC) including international markets' requirements
- Agricultural marketing
- Cold storage and logistics
- Water efficiency

- Energy efficiency
- Renewable energy
- Recycling and sorting
- Composting
- Fumigation



Figure 5: Most prominent Capacity Building Needs Highlighted By Tubas' Private Sector

6.2. Tubas' Private Sector Expansion and Pipeline Projects

Most of Tubas' private sector expansion vision as highlighted through site visits and engagement with firms' management revolve around the optimization of production processes, introduction of new varieties and lines, and most importantly increasing the product value through the supply chain by adopting transformative processes such as food processing, i.e., increasing the produce's value by creating various products, such as tomato paste from regular tomato produce. Additionally, it has been witnessed that three of the major firms in the area have adopted renewable energy installations by creating a joint solar energy farm with a combined capacity of 9.5 MWp, and where smaller installations are being adopted by relatively smaller enterprises.

Furthermore, several enterprises have initiated efforts to expand their market reach by venturing into regional and international markets. However, at present, their export activities are limited, partly due to their relative novelty in the field and limited experience. Additionally, complying with export standards and requirements poses a challenge, necessitating the companies to adapt and enhance their capacity in logistics, cold storage, and supply chain management. Where firms are struggling to find specialized and trained employees to assist them. To overcome these limitations,

capacity building and staffing initiatives are crucial to ensure their ability to export a wider array of products successfully.

6.3. The Southern Jordan Valley

The main governorate that is situated within the southern JV is Jericho, Jericho governorate has established itself as an oasis of palm trees and has been known since ancient times as the City of Palms. Where according to PCBS's agricultural survey of 2021, Jericho and the Jordan Valley area were planted with over 270,000 palm trees, constituting a pillar of the agricultural, and private sector as a whole in the region⁴.

As such, 11 key agricultural and agro-industrial private sector enterprises have been identified in Jericho governorate with operations mainly in the date palm tree farming, packaging, and export, particularly Medjool dates. In addition to some firms having operations related to livestock and dairy production.

6.3.1. Employment Needs Highlighted By Jericho's Private Sector

Through meetings, surveys, engagements, and site visits to Jericho's private sector enterprises, a series of questions and assessment has been conducted to obtain an understanding of the sector's needs in terms of employment. As Jericho's Medjool dates farming has expanded, and international support for Palestinian produce as well as appetite for it has increased, the quality of sorting and packaging dates appropriate and appealing for export has also increased. This is shown by the private sector's increasing interest in enhancing their production quality, as seen by the demand for experienced quality engineers, as well as specialized agricultural engineers in palm trees and their pest and diseases, in addition to food processing, marketing, and technicians.

An important issue noted was the labor deficit in Jericho's market especially at high season, whereas highlighted for example by Nakheel Palestine company is that they need 300 harvesting workers on average but receive 230, as well as 170 workers (mainly women) in the sorting and packaging facilities but only receive 120.

⁴ PCBS Agricultural Survey Report 2021: <https://www.pcbs.gov.ps/postar.aspx?lang=ar&ItemID=4258>



Figure 6: Most Frequent Employment Needs Highlighted by Jericho's Agricultural and Agro-industrial Sectors

6.3.2. Capacity Building Needs Highlighted By Jericho's Private Sector

In terms of capacity building, the companies showed significant willingness to the modernization of operations as the export to international markets is significantly increasing. Companies have highlighted capacity gaps that require specialized expertise such as the palm trees agricultural practices and management of palm trees' pests and diseases particularly *Rhynchophorus ferrugineus*, in addition to specialized trainings on pesticides and fertilizers management, after harvest care of crops, irrigation systems and smart irrigation, agricultural equipment maintenance, and food processing related to dates. It is noteworthy to highlight the significant adaptation by some enterprises and the willingness of integration of renewable energy systems, particularly solar PV units, where Jericho due to its sunny climate that receives over 300 sunny days per year is ideal for such installations, where companies face water scarcity issues related to the relatively large amount of water needs for cleaning and are looking for water efficiency measures especially due to the saline nature of water in the area that is considered damaging to the panels.



Figure 7: Capacity Building and Skills Needs Highlighted by Jericho's Private Sector

6.3.3. Jericho's Private Sector Expansion and Pipeline Projects

The potential for expansion within Jericho's private sector primarily revolves around increasing production capacity, introducing new production lines, and cultivating new varieties of crops, such as seedless grapes. Furthermore, certain enterprises are actively exploring opportunities to diversify their operations by venturing into food processing, such as the production of date paste. Notably, it has been observed that several firms are either engaged in or contemplating various initiatives to enhance their operational efficiency from both economic and environmental perspectives. These initiatives as stated by the firms through questionnaires include:

- enhancing production lines and capacity through better quality monitoring
- the introduction of recycling and circular economy practices
- adopting new PV solar energy or expanding on the existing installations
- Integrating smart and computerized irrigation systems

7. Agricultural Technical and Vocational Education and Training Curricula – Jordan Valley

In order to understand the magnitude of existing interventions in terms of TVET in the Jordan Valley as well as the available training curricula, relevant stakeholders have been firstly consulted with. Consultations undertaken included personal visits and meetings with public, private, and non-governmental institutions offering capacity-building programs and training within the region, with a particular focus on institutions providing ATVET programs. The objective of these consultations is twofold: (i) to ascertain the presence of TVET offerings, both formal and non-formal, within these institutions, and, (ii) to identify which TVET providers are accredited by the Ministry of Labor (MoL).

According to MoL⁵, in the Northern JV, there are 3 accredited TVET service providers;

1. Tubas CCIA's TVET Center
2. Continuous Learning Center Jerusalem Open University
3. Techno media Center

In the Southern JV;

1. Al Birr Center
2. The EJ-YMCA
3. JDECO TVET Academy

⁵ <https://www.mol.pna.ps/page/79>

4. Continuous Learning Center Jerusalem Open University
5. Lilita Vocational Cneter

Reviewing these center's training topics, and through either visits or phone calls, it was evident that there is a lack of centers accredited by MoL that provide relevant TVET trainings, in the scope of agriculture, agro-industry, or agro-tourism. In addition to trainings which could benefit from sustainable skills, green and smart practices particularly relevant to climate change adaptation and mitigation. Therefore, following this review, it was evident that the following centers and their training programs are most relevant to the purposes of this study;

1. Tubas CCIA's TVET Center
2. Continuous Learning Center Jerusalem Open University
3. The EJ-YMCA
4. JDECO TVET Academy

Two additional centers will also be discussed briefly which provide ATVET trainings but are not within the JV region. These centers have contributions that are indirectly beneficial to the region and its inhabitants and a review of their activities will be provided, namely;

- I. Hisham Hijawi College of Technology's "Al Najah Agricultural Training and Research Center"
- II. Palestinian Agricultural Relieve Committee (PARC)

7.1. Ministry of Labor TVET Curricula

7.1.1. Overview

In September 2019, the Ministry of Labor, in a collaborative effort with the private sector and the GIZ, introduced new, standardized curricula for its vocational training centers. This marked a significant shift in the approach to Technical and Vocational Education and Training (TVET) in Palestine. Since the inception of TVET in the 1960s, there had been no official printed curricula, with vocational and technical education largely reliant on the individual skills and teaching styles of trainers.

During the launch, the Minister of Labor highlighted that the newly introduced curricula, totaling 17⁶, were specifically designed for government vocational training centers. He further noted that efforts were underway to develop official curricula for private vocational training centers. Each of these curricula is accompanied by comprehensive explanatory materials, and it is anticipated that the number of these curricula will soon

⁶ The current number according to recent interview with MoL is 19

expand to 23. This initiative represents a significant stride towards standardizing and enhancing the quality of vocational and technical education in Palestine.

During consultation with MoL, both in Jericho and in their Headquarters in Ramallah additional information was captured and the direction through which the ministry is heading in terms of TVET was further understood. In meeting at the MoL office in Jericho on June 21st 2023, the dynamics through which the MoL accredits centers was discussed, where it is not necessary to accredit curricula to be approved by MoL, and they sometimes only accredit the Training Plan. In terms of ATVET, the MoL office in Jericho stated that only two centers provide such trainings; (i) EJ-YMCA, and (ii) Open Jerusalem University. They further stated that the CCIA of Jericho provides at instances ATVET trainings but those are non-formal trainings. On the 12th of July, a visit was arranged to the TVET General Directorate at the headquarters of the Ministry of Labor in Ramallah. Mr. Mostafa Sarasra stated during the meeting that currently the MoL does not provide ATVET and it is not included within the 19 current curricula (there have been 2 new curricula issued since the launch in 2019), but is anticipated to be included in the future publications. He further stated that MoL is planning to conduct ATVET trainings in Hebron in the future, but no plans at the moment for the JV region.

MoL expects that new curricula issued relevant to ATVET will include home gardening and marketing of agricultural products. Additionally, relevant curricula to the scope of this study were “Electrical Works and Solar Energy”. Moreover, discussing current curricula in ATVET, MoL stated that the most stringent one that focuses on sustainable agriculture is the one provided at the YMCA, while the curricula itself is not accredited, their training plan is.

7.1.2. Electrical Works and Solar Energy TVET Curriculum

This is the only curriculum offered by the Ministry of Labor (MoL) from the suite of accredited curricula that aligns with the objectives of this study. The new curriculum is currently in its "testing publication" stage and has undergone review. Despite the absence of MoL training centers in Jericho or Tubas (Jordan Valley governorates), the curriculum could be expected to be taught at private centers such as Al-Birr in Jericho as they have an electrical curriculum through which they provide solar energy systems installation TVET. Moreover, analyzing this curriculum remains significant for the study as it provides insights into the recently issued curricula by MoL, their organizational structure, relevant subjects, and overall design. Understanding these aspects is crucial for envisioning potential future curricula in the area of Advanced Technical and Vocational Education and Training (ATVET) and the implementation of instructional methods.

The curriculum, along with other offerings by MoL, demonstrates a well-organized structure that prioritizes practical application over theoretical knowledge. The solar energy and electrical works curriculum comprise nine main modules, the initial seven of which pertain to electrical installations in civil works. However, as this study focuses on green, sustainable, and smart skills, the discussion will concentrate on the last two modules: Module 8, which centers on comprehending the requirements for installing solar energy systems, and Module 9, which covers the practical implementation of solar energy systems installation.

Notably, the curriculum incorporates practical scenarios aligned with each module. Trainees are exposed to 2-5 hands-on practical experiences within each module to enhance their understanding. Specifically, Module 8 and Module 9 include 2 and 3 practical cases, respectively, providing valuable experiential learning opportunities. Additionally, Module 4 features a relevant case (Case No. 4) concerning electrical panels and solar energy systems installations. These practical elements contribute to a comprehensive and skill-focused learning experience for the trainees.

The curriculum is for 1 year and is for skilled workers to enable them to work independently or under a supervisor, providing them with skills to read and interpret plans, electrical diagrams and electricity panels configurations. The curriculum aims to provide trainees with various skills such as lighting fixtures installations, plugs, installation of alarms, and door bells, CCTVs, and anti-theft systems. Among its goals is to provide trainees with skills to install solar energy systems, through firstly planning, implementation of occupational health and safety procedures, and measurements.

Module 8 – “Studying the requirements of solar energy systems installation”; comprises of 20 hours aiming to;

- trainees can plan for solar energy systems installations
- Understand and study the material and equipment needed
- Technical specifications required for the installation
- Monitoring of systems’ efficiency and conduct maintenance
- Maintenance of cables and equipment
- Use of testing equipment and maintenance of electrical panels

For this, the suggested content for the training include;

- Understanding the supervision engineer’s instructions
- Planning for the works
- Renewable energy sources
- Climate and environmental factors affecting solar energy systems’ efficiency according to geographic locations

- References on the web relating to climate and geographic factors
- Cables and fuses used in solar energy systems' installations
- Connecting solar energy systems with the grid
- Solar energy installations plans
- Technical specifications for existing alternatives to solar energy systems
- Bills of Quantities for solar energy systems
- Occupational Health and Safety
- Technical terminology in English

Secondly, module 9 – “Implementation of Solar Energy Systems Installation” is delivered over 20 hours, aiming to;

- Understand and plan for the needed equipment by the client
- Conduct a preliminary site visit to understand its characteristics and environmental factors
- Obtain an understanding of initial quantities needed and their cost
- Analyze solar energy systems electrical plans

Suggested content for the training module;

- Understanding costumers' needs and cost estimation
- Cable and equipment types
- Reading and drawing electrical diagrams
- Occupational Health and Safety requirements

****The other content stated are relevant to the previous module related to anti-theft and alarm systems, and hence have not been included.*

Nevertheless, in terms of practical scenarios and cases lessons, the structure provides the students with hands-on experience in approaching the modules. It provides trainers with the required tasks that the students are required to achieve, most of which are independent and students have to go on field-visits to conducts. The cases start with surveys and information collection by surveying the market and are provided with an arranged visit to a client to practice. Students are then provided with relevant technical information by their trainer, and in groups are required to develop work plans and the resources needed to achieve the task. The students are then tasked with practically implementing the task and to raise points and remarks on their work. Trainers during implementation control the works by validating their installations, and ensuring their commitment to the provided plans and technical standards, they are then tasked with testing and completing their work within the required timeframe.

Throughout the process, students are provided with references and educational material relevant for each step.

7.2. Continuing Learning Center Jerusalem Open University – Northern and Southern JV

7.2.1. Overview

Established in 1991, Jerusalem Open University's Continuing Learning Center has been dedicated to serving the Palestinian community by providing continuing education and lifelong learning opportunities for all segments of society. The center plays a vital role in enhancing individual and institutional capabilities through vocational and technical training services that adhere to both local and international quality standards. Additionally, the center offers administrative and technical consulting services and actively undertakes community and development projects.

Operating in both the Northern Jordan Valley (Tubas) and Southern Jordan Valley (Jericho), Jerusalem Open University's Continuing Learning Center has a rich history of TVET training in diverse sectors, including IT, marketing, computer skills, linguistics, and more. However, recent developments have seen a decline in their involvement in Advanced Technical and Vocational Education and Training (ATVET).

On the 25th of June, 2023, a virtual meeting was held with the center's representation by Dr. Aziz Barghouthi and Dr. Mahmoud Hawamdeh, alongside the Dean of the Faculty of Agriculture, Dr. Khaled Hardan. During the meeting, it was highlighted that the center currently offers a range of technical and vocational training programs as mentioned earlier. Furthermore, the center has been actively engaged in TVET projects related to green skills, resilience and employment, and smart agriculture and irrigation. Plans are underway to develop dedicated curricula for these subjects, though they are not currently available.

The center's training programs presently follow an informal approach, drawing content from existing bachelor and higher studies' curricula, with specific chapters adapted to suit the TVET context. It is noteworthy that Jerusalem Open University's Continuous Learning Center holds licenses from both the Ministry of Labor (MoL) and the Ministry of Education (MoE). Where previous specializations included Animal and Plant production as well as food processing diplomas, however they faced a decline in attendance and enrollment and these programs have been currently discontinued. These programs are accredited by MoL and MoE as diploma programs and are in line with the university's Bachelor programs in the same fields.

In line with its dedication to education, the center is currently implementing a mobile education and training center funded by the United Nations Development Programme

(UNDP), catering to the educational needs of communities in Hebron governorate as well as the Northern Jordan Valley (Tubas).

Moreover, reviewing the current TVET agenda offered by the university, it can be noted that ATVET as well as sustainable, green, or environmental skills development are not present⁷. Where current offered courses are mostly short (20-40 hours) and in different skills such as IT, linguistics, and marketing.

7.2.2. Mobile Education Center project to improve the quality of education in marginalized areas in Tubas and the northern Jordan Valley

Following the success of the mobile education center project in Hebron governorate, a similar project was implemented in Tubas and the northern Jordan Valley through Community Resilience and Development Program (CRDP), which aimed to improve the quality of education in the (C) marginalized areas of the northern Jordan Valley region, through the provision of an equipped education center with a computer lab and a library on a truck that travels in the marginalized areas, to be used by the students and the community in cooperation with the villages' councils, the local government and Tubas Directorate.

7.3. Tubas Chamber of Commerce, Industry, and Agriculture (CCIA)'s TVET Unit – Northern Jordan Valley

7.3.1. Overview

Tubas' CCIA TVET unit was established in 2016 in a joint supported project by Koln's Chamber of commerce in cooperation with the GIZ, and the German Federal Ministry of Economic Cooperation and Development. Their training programs target the members of the CCIA, youth both males and females, and women in marginalized and vulnerable areas. Most notably, the CCIA is implementing the joint vocational training program for the CCIA's members as well as short-TVET programs supported by the GIZ particularly for unemployed youth in vulnerable and marginalized areas in Area C and Refugee Camps.

The CCIA arranges for their programs through consultation with the private sector to understand the needs of the market regularly. Currently, the CCIA's TVET unit implements the following trainings;

- Maintenance of Agricultural Machinery
- Smithing
- CNC and Carpentry
- Mobile Devices Maintenance

⁷ <https://cec.qou.edu/resources/agenda/>

- Makeup and Skin Care
- Tiling
- Photography
- Maintenance of Modern Vehicles

Therefore, and relevant to this scope of the study is the “Maintenance of Agricultural Machinery” program.

7.3.2. Maintenance of Agricultural Machinery – Modules

Similar to the curricula developed and delivered by MoL, Tubas’ CCIA’s Maintenance and Agricultural machinery TVET program follows the module system along with practical cases for students to obtain practical experiences. The program aims to equip students with skills to smith and bend plates and profiles for agricultural machinery, and to be able to recognize the types of such plates as well as their uses. The modules help students to become experienced in measurements and understanding required maintenance works needed.

The TVET program contains the following modules;

- Smithing and metal working
- Agricultural Tractors maintenance
- Plows maintenance
- Fertilizing Machinery maintenance
- Agricultural Choppers Maintenance
- Planting equipment and machinery maintenance
- Agricultural Drills maintenance
- Plastic laying equipment maintenance
- Sprayers maintenance
- Harvesters’ maintenance

Throughout the meeting with the CCIA, it was noted that the curriculum is licensed by MoL, while other curricula are provided by trainers themselves, and others are prepared in cooperation with the GIZ. The CCIA does not currently provide any green or sustainable skills trainings, and those are not currently included in the existing curricula. Previously, the CCIA has conducted plastic and greenhouses installation, dairy production, and solar energy trainings. Moreover, there is a vision for developing additional ATVET curricula in the future. Nevertheless, one of the stated issues was the lack of attendance to these trainings, where it was noted by Tubas’ CCIA that women at this region tend to attend more often than their male counterparts.

7.4. EJ-YMCA: Sustainable Agriculture and Home Gardening – Southern JV

7.4.1. EJ-YMCA's Permaculture Program Overview

Funded by the Danish Church Aid (DCA)/ Norwegian Church Aid (NCA), this project is a continuation of the previously supported project of Permaculture in EJ-YMCA VTC implemented since 2017, it targets women, youth and children in the fields of permaculture

Targeting paths to sustainable food production and the utilization of natural resources for youth to generate income and food security, this curriculum was prepared for the sustainable agriculture and home gardens in the YMCA VTC – Jericho. The YMCA's permaculture farm was established in 2018 as an educational site for the YMCA under the Permaculture program that was developed as the first sustainable agriculture training program in Palestine. The program aims to equip youth, males and females, with sustainable agriculture skills that aim to protect the environment and provides auto sufficiency in terms of home products that are organic and chemical free, while also providing them with skills to establish successful businesses.

In the past 5 years, and according to the EJ-YMCA, Key results under this program include⁸;

- Over 200 graduates of sustainable agriculture, Permaculture Design Certificate "PDC", and soap production courses with enhanced employability as trainers, business owners or employees.
- Environmental awareness in schools and the community through the ongoing outreach activities.

7.4.2. EJ-YMCA's Sustainable Agriculture and Home Gardening Curriculum Review

The "Sustainable Agriculture and Home Gardening" curriculum, developed by the YMCA Vocational Training Center in Jericho, is a comprehensive guide that aims to educate students on the principles of permaculture and sustainable agriculture. However, upon careful review, it appears that the curriculum, while rooted in the foundational principles of permaculture as outlined by Bill Mollison in the late 1970s, could benefit from several enhancements to better address the pressing issues of climate change resilience, sustainable practices, and practical applications. The curriculum seems to be entirely based upon Bill Mollison's "Permaculture: A Designer's Manual" (Mollison, 1979), and while the book is considered the bible of Permaculture, it has been written in the 1979, and as it is around 25 years old, new

⁸ EJ-YMCA VTC: <https://ej-ymca.org/en/programs/vocational-training-center?view=article&id=18:sustainable-agriculture-and-home-gardening&catid=20>

terminologies and treatment of modern topics such as the pressing climate change should be included. Additionally, while the book can be considered a comprehensive practical guideline towards sustainable agriculture basics and general permaculture, the YMCA curriculum have seemed to taken a more generic approach to an overall overview without many of the technicalities established in the original book.

The curriculum is segregated into 15 distinct chapters, each dealing with a different topic, the following review will highlight main aspects and issues for each chapter relevant to the scope of this report.

7.4.2.1. Chapter One: Permaculture

The curriculum commendably explains the principles and development of permaculture, emphasizing the importance of social issues and their integration into sustainable agriculture through mimicking natural interactions and finding environmental solutions through replicating natural dynamics. However, it falls short in providing a robust introduction to key agricultural, environmental, and climate terminology. A more comprehensive introduction would equip students with the necessary vocabulary to fully understand and engage with the material, particularly those with limited background knowledge in these areas. Additionally, Bill Mollison's *Permaculture: Designer's Manual* states that;

“ The world can no longer sustain the damage done by modern agriculture, monoculture forestry, and thoughtless settlement design, and in the near future we will see the end of wasted energy, or the end of civilization as we know it, due to human-caused pollution and climate changes.” (Mollison, 1979).

7.4.2.2. Chapter Two: Environmental Awareness and Energy Cycles

The curriculum discusses the impacts of human activity and modern technology on the environment, offering a philosophical perspective on the environment and its components. However, it does not adequately address the pressing issue of climate change and its effects on environmental patterns, water, and other parameters. Additionally, some of the resources and statistics used seem outdated, which could potentially mislead students. Where for example, there are no references supporting quantitative information classified as facts. Where for example the curriculum states that forests constitute 28% of continental areas, however according to FAO in 2020, the number is 31%.

The curriculum indulges in the impacts of human activity and modern technology on environment, mentioning negative impacts such as gaseous and fumes emissions and the impact on air quality through emitting different compounds, but does not even in short mention climate change, changes of environmental patterns, water, and other parameters despite Bill Mollison's Book having an entire chapter (Chapter 5)

discussing environmental and climatic parameters influence on permaculture and sustainable agricultural practices.

Additionally, while the chapter explains oxygen and nitrogen cycles, it provides general scientific descriptions rather than technical aspects that could provide a general understanding relevant to build knowledge for agricultural practices, and while it still provides a generic description, it indulges in utilizing chemical compounds and chemical processes without clear background for the student on what they are, how they are created, and their significance to agricultural practices or the environment. The curriculum mentions a water budget briefly, which is an important science and a backbone to understand the role of water cycle through inputs and outputs, and builds towards understanding environmental parameters including climate change.

The chapter introduces water harvesting; however, it does not provide background or scientific description on water harvesting, and mentions it briefly with only 4 types and with no clear resources as water harvesting methods contain more methods that could be better relevant for the area and the local agricultural practices. No details on where it can be used, conditions allowing water harvesting and other important information.

7.4.2.3. Chapter Three: Soil and Organic Fertilizers (Compost)

The curriculum provides an overview of soil types and introduces the concept of composting. However, the information presented is too generic and lacks practical background, which could limit the students' understanding of the significance of different soil types and composting techniques to agricultural practices.

Nevertheless, it seems from consulting with the YMCA and the structure of the chapter that while the scientific and literature information is generic, the curriculum depends on practical implementation which takes place in the YMCA's experimental fields.

It is however noteworthy that the chapter does not portray a coherent structure, where for instance it jumps back to awareness and sustainable culture topics as soon as discussing composting, which was already covered in previous chapters. In terms of design strategies, the curriculum again talks about the philosophy, culture, and principles of sustainable culture in terms of composting while technical and vocational training curriculum should help students strategically design composting processes and systems (e.g., preparation of raw materials, environmental factors, (the do's and don'ts). While discussing benefits, it discusses them based on composting methods (e.g., thermal composting) which was not discussed before nor clarified. This has been noticed to repeat under different topics and subjects, creating confusion and lack of focus as there is no specific direction on the topic.

Composting and climate change impacts is briefly mentioned as benefits. The text is generic and could have been enhanced by firstly creating awareness on important

terminology and benefits of composting such as carbon sequestration, waste reduction, soil health and carbon storage. In addition to ensuring that trainees understand the physical process of composting and its limitations.

Practical uses of composting in the local environment and agricultural practices is key but is not mentioned. Solid examples from local experiences, local projects, limitations, challenges, and key considerations are missing.

The chapter only talks about aerobic composting, anaerobic digestion, and vermicomposting. It does not mention other methods of composting such as on-site, aerated static pile, in-vessel, windrow and others.

7.4.2.4. Chapter Four: Trees and Dry Land Management Strategies:

The curriculum discusses various types of forests and forest-AeroSystems. However, many of these are not relevant to the specific geographical context of the Jordan Valley and Palestine in general. This lack of contextual relevance could limit the students' ability to apply the knowledge gained in their local environment.

The curriculum discusses various types of forests and forest-agrosystems such as agroforestry, forest farming, river farming, wind breaks and others. There is no clear reference on this classification or why only these types are presented. While they are good to know about, tangeable types of forest agriculture are not mentioned which could be useful for Palestine and provide experience in the role of trees and forests in combatting climate change.

Efforts are suggested to include types of forestry practices that combat climate change, smart forestry, symbiosis between productive and natural systems in forests. Practical examples and project ideas to develop them in Palestine. This section could have included agro-tourism and provided information on the integration of forestry into such projects.

While the chapter discusses the importance of trees in combatting climate change, it briefly mentions it as a generic topic, not directly related to the local climate or the area. with no tangible practices or examples.

7.4.2.5. Chapter Five: Sustainable Agriculture and its Practices

The curriculum provides a generic introduction and discusses traditional methods. However, it lacks information on modern sustainable practices such as direct seeding, seed bombs, mulching, and others. The inclusion of these practices would provide students with a more comprehensive understanding of current sustainable agriculture practices. While the chapter provides a generic introduction, it does not seem relevant to the title or training methods as it discusses generic information. It could have been more relevant talking about sustainable practices importance, and introducing

scientific and modern terminologies such as economic decoupling and introducing initiatives being done such as with the European Union (EU)'s directives.

The chapter provides interesting and useful techniques on planting, through different methods such as from seeds or saplings. However, the sustainability part is missing as it discusses traditional methods. Methods such as direct seeding rather than starting in pots, seed bombs, mulching, the relation of permaculture to planting as the book is based on permaculture, hydroponics, organic and regenerative farming and community seed banks are not mentioned.

The chapter provides valuable information about the protection of local crop varieties and its relation to sustainable agriculture. It provides a background to the importance of these crops in the local culture and how to maintain this practice. However, and while the chapter discusses biological control, local crops . it does not get into the methodologies or practicalities such as other types of sustainable pest control (e.g., IPM, crop rotation, resistant crops, habitat manipulation and other methods). Just like the above, fumigation methods are briefly mentioned as generic definitions and only two methods are mentioned; 1. Solar sterilization 2. Thermal sterilization.

7.4.2.6. Chapter Six: Hydroponics and Aquaponics

This chapter is one of the best organized and provides a comprehensive understanding of hydro-aqua-and aeroponics. However, it fails to explain the types of crops ideally suitable for such practices, which could limit the students' ability to apply these techniques effectively.

While these practices already offer several sustainable practices, it would have been beneficial to introduce students to other methods to increase their sustainability and to help them think out of the box such as integration of renewable energy measures, water conservation practices, sustainable packaging of products, and carbon footprint assessment tools

There are various ways for aquaponics and hydroponics. Especially for aquaponics the curriculum only briefly mentions two types. (Media based aquaponics and pipe aquaponics).

7.4.2.7. Chapter Seven: Designing a Food Garden (Environmental Design Project)

This chapter is a practical implementation guideline and helps students rely on experience in establishing their own projects. Smart agriculture and sustainable practices could be further enhanced here through the integration of smart agriculture, IPM and eco-friendly pest control methods. These introductions would have been valuable prior to initiating a practical project.

7.4.2.8. Chapter Eight: Clean Energy and Recycling

This chapter could have been beneficial to be mentioned earlier on, to provide students with the vision on the integration of clean energy and recycling practices into their projects. The chapter starts off by providing a a brief and insufficient description of Kyoto protocol only, which was adopted in 1997. It does not mention Paris agreement, the Agenda 21, the SDGs, climate change contributions, national adoption plans or any of the important aspects of climate change.

It would be beneficial to include more information on the mechanisms of the renewable systems and how they function, technologies and other methods. An additional comment noticed throughout the curriculum is that there is a bit of branching, where for instance in this chapter, composting has been mentioned earlier and recycling is mentioned in this chapter.

Recycling is mentioned simply and generally, it does not provide different methods such as for plastics, household waste, paper, and other methods. It provides generic information on reduction and most of it is not relevant to the local context and the existing systems in Palestine (e..g, requesting unwanted post not to be delivered).

Furthermore, for biogas the chapter does not get into the methods of producing it, such as digestors, CHPs, and others

an additional point that would have beneficial is introducing electric vehicles (EVs), their use in agriculture, their maintenance. While this could be a whole separate curriculum, it would be beneficial to introduce students to the technological developments and integration of such equipment and machinery in sustainable agriculture.

7.4.2.9. Chapter Nine: Sustainable Buildings

The curriculum presents outdated methods such as mud blocks and mixing mud with straws, which which are methods used in central Asian villages and may have been used in Palestine or MENA region historically but are outdated and non-existent currently. These methods are not fitting for the local context and are not used. And some other methods which have historically been not relevant to the area, and particularly to the JV region. A more relevant discussion on sustainable building practices in the local context would be beneficial. It could have mentioned them in soil contouring or sustainable agricultural practices

7.4.2.10. Chapter Ten: Mushroom Agriculture

This chapter is very valuable as it provides technical information and useful ones on planting mushrooms which are one of the most sustainable and environmentally friendly crops. It provides general description of limitations in Arab countries and

obstacles facing this industry. It would have been more valuable to mention this from a local context.

The chapter then gets into general information on its benefits without technical use from local perspective. Sustainable and efficient measures could be mentioned in this practice. Where for instance integrated pest management and sustainable pesticide use for mushroom projects, environmental factors control, energy efficiency as mushroom industry often requires HVAC systems, sustainable substrate sourcing, and waste management and recycling.

7.4.2.11. Chapter Eleven: Beekeeping and Apiculture

The curriculum provides a structured view of the process of beekeeping and apiculture, along with relevant examples from the local context. However, it could benefit from a more detailed discussion on sustainable and environment-friendly methods of beekeeping such as Integrated Pest Management (IPM) and biological control methods. As well as types of cultures and bees, types of products from local context, and other relevant and practical examples. The chapter overall provides a very well structured delivery method.

7.4.2.12. Chapter Twelve: Sustainable Agriculture in Cities

The curriculum provides an introduction to sustainable agriculture in cities around the world, but it does not delve into the type of agriculture in Palestine. A more localized discussion would be beneficial for students. The chapter provides valuable input and shows the importance of sustainable agriculture through mainly the planting on rooftop model. It would have been valuable to mention further examples from Gaza or West Bank rather than shortly mentioning Gaza.

It would be helpful to mention the reason for this under the climate change umbrella and how climate change impacts our agricultural practices and why this is needed. The chapter discusses only rooftop agriculture but it could also include other examples and methods (e.g., vertical farming, rainwater harvesting, grey water recycling, local food distribution, renewable energy, carbon farming).

7.4.2.13. Chapter Thirteen: Healthy Nutrition

The curriculum could have presented practical examples on sustainable food choices, lifestyle assessment of products, reduction of food waste, and sustainable sourcing and production. The inclusion of these topics would provide students with a more comprehensive understanding of the relationship between nutrition and sustainability. It mentions the impacts of canned, jarred, and bottled food on the environment, a good topic would have been sustainable packaging

7.4.2.14. Chapter Fourteen: Therapeutic Gardening

While irrelevant to the study, the curriculum could have included ecotourism in this chapter, which would provide students with a broader understanding of the potential benefits and applications of therapeutic gardening.

7.4.2.15. Agricultural Project

This chapter provides students with technical experience on developing their own projects. Guidance could be provided here to integrate the principles of smart agriculture, renewable energy, energy efficiency, 3 Rs principles, and other aspects.

7.5. Jerusalem Electricity Distribution Company TVET Academy – Southern Jordan Valley

The Jerusalem Electricity Distribution Company (JEDCO) Academic Training Center in Jericho Governorate embodies the administration's interest in keeping abreast of the latest technologies in the field of exploiting renewable energy sources, especially solar energy, based on its strategy to focus the system of "storage surplus production of solar and renewable energy" at the national level, which it has begun to implement in the last years.

The training center, which is the first of its kind in Palestine, undertakes the tasks of qualifying and training university students and workers in the technical and administrative sectors from inside and outside the company to use solar energy systems and connect renewable energy generation systems to the electrical grid. It also aims to develop the skills of its employees, in addition to electricians from outside the company inside and outside its concession areas.

Given that the company has made great strides in installing solar cell systems by carrying out installation work on the roofs of public institutions and homes through licensed contractors, it has a highly qualified and experienced staff, authorized to organize training meetings in this field, "referring to what the company has done from the installation of solar energy panels in 14 fields distributed over a number of Palestinian cities and villages, including the Al-Masyoun area in Ramallah, the Jericho region, the Jordan Valley, and the Dead Sea, in addition to a number of villages such as Sinjil, Turmus Aya, Beit Jala, Beit Fajjar, Beit Sahour, Al-Obeidiya, and Al-Doha.

The issue of renewable energy is the main topic for the management of the training center. Since 2012, the center has organized sixteen training courses in the field of solar energy investment for electrical engineers. Fifty-three awareness lectures were given to students in schools in cooperation with the Ministry of Education. The center also received a number of delegations from universities, schools, and various

organizations in order to introduce them to the requirements of the new systems and the skills required in the labor market, and to get acquainted with the reality of solar energy, in addition to organizing visits to the Dead Sea station and the Agro-industrial park in Jericho.

The technical and academic training center, which was established in 2006, is located on a total area of 3,300 square meters, in the Arab construction project “Al-Mashro’ Al Insha’i” in the city of Jericho, with an estimated capacity of 500 trainees annually. The center also includes six technical laboratories for computer, electronics and smart grid, in addition to laboratories for solar energy and high pressure. optical fibers and training grounds.

In consultation meeting that took place with the center on the 21st June 2023, the center stated that they provide Occupational Health and Safety as well as solar energy trainings among other Fiber, IT, electrical, and vocational trainings. They stated that some of their programs, but not all, are accredited by MoL. They additionally offer some energy efficiency and audit programs but those are not complete and are short durations mostly provided in the form of workshops. The center stated that the curricula and trainings they provide are their own but they did not provide any references for the purpose of review for this study.

7.6. Other TVET Service Providers Outside the JV Region

In the Jordan Valley region, certain institutions and organizations currently do not provide ATVET programs or include crucial fields such as agriculture, circular economy, agro-industries, or agro-tourism in their existing TVET programs. Conversely, there are entities outside the Jordan Valley that offer ATVET curricula or relevant TVET programs that may have a direct or indirect impact on the Jordan Valley and its residents.

Despite these differences, including them in this report is vital due to several reasons. Firstly, some organizations within the Jordan Valley are planning to initiate ATVET programs in the near future, while others from outside the region are considering interventions in the Jordan Valley area. Consequently, mapping these institutions becomes crucial for understanding the landscape of TVET and ATVET impacting the Jordan Valley area, either directly or indirectly, currently or in the future.

Furthermore, this study and mapping exercise can serve as an effective means of encouraging institutes and organizations to integrate sustainable practices, smart agriculture, climate change adaptation and mitigation, sustainable agriculture, agro-industry, agro-tourism, and other pertinent topics into their existing programs or develop new ones. The evident market demand and the necessity for such

interventions to build a resilient economy against climate change impacts underscore the importance of this endeavor.

7.6.1. Hisham Hijjawi College of Technology's Al Najah Agricultural Training and Research Center – Nablus Governorate

An-Najah Centre for Training and Agricultural Research was established in 2014 with funding from the European Union and under the supervision of GIZ. The center, located in An-Nassariya, Nablus, spans an area of 72 acres, including 11 acres of arable land from An-Najah National Community College. An-Nassariya is a neighboring area that shares ties with the Jordan Valley region, despite being predominantly within Nablus Governorate's boundaries, significant part of its land lies within the Jordan Valley.

Equipped with an advanced weather station, the center offers students practical training programs throughout a growing season. These programs aim to accelerate crop growth, teach integrated pest management controls, and develop expertise in managing environmental conditions in the field.

One of the center's key objectives is to produce skilled agricultural technicians who can contribute to the Palestinian labor market. Graduates receive certificates accredited by the Palestinian Ministry of Labor.

During a virtual engagement meeting with the center's administration, represented by General Manager Mr. Ala' Darweish, the current TVET programs were discussed. Mr. Ala' mentioned a previous one-year ATVET program in Gardening, which faced challenges with attendance and enrollment. These issues were attributed to the center's location on the outskirts of the Jordan Valley towards Nablus Governorate, the dispersed nature of localities in the region, and transportation difficulties. Despite offering transport options connecting to city centers like Nablus, many trainees found it difficult to attend due to their existing job commitments.

As a result, the center now focuses on shorter, non-accredited programs, such as Hydroponics and Aquaponics, Composting, Crops and Planting, and Capacity Building for farmers. Mr. Ala' emphasized the success of these shorter courses, with the center currently running ten programs, each spanning around 35 hours.

7.6.2. Palestine Agricultural Relief Committees - PARC HUB- Jenin Governorate

PARC has an established program that has been running for more than 25 years targeting fresh graduates of agricultural engineering / sciences. The duration of the program is eight months. Practical work in the field constitutes 60% of the time, while the training inside the hall is 40%. The training of the hall is also focused on skills, especially technical life skills. The program covers 25-30% of the number of applicants

to benefit from training opportunities in the West Bank and Gaza. The training program began in 1992 and continues to this day, with 51 batches graduating, including 1200 agricultural engineers of both sexes and in different specializations. This program is perhaps the largest and most sustainable.

Furthermore, and under the name of Naim Khader Center (PARC HUB), PARC established the center located at 10 dunums of land of Al Zababdeh village nearly one kilometer away on the western road towards the village of Meselieh, and it is away nearly 13 Km from Jenin city. The center was established in 1997 as a community and capacity development center, where later on Agricultural Masters programs were delivered in the center in cooperation with Jerusalem (Abu Dees) University, following it was established as an agricultural innovation and incubation hub.

This institute has been established through Oxfam, Belgium initiative, and funded by EU, after a project application by Naem Khader friendship association. The hub is a training center equipped and qualified to implement various training activities (practical and theoretical), as it includes:

1. Four lecture halls with a capacity of (900) people, equipped with various means of presentation and various educational aids.
2. A computer lab in which (8) devices and a central printer are available.
3. Internet.
4. The center also contains a public library with more than 500 books.
5. A book, a periodical, a scientific journal, and a set of scientific references
6. Studies, scientific research and applied projects that were completed by agricultural engineers during the training process.
7. The center has a comprehensive training unit
8. A shed for raising poultry, and a shed for raising sheep, with an area of 200 square meters each.
9. A plastic house for protected crops with an area of 500 square meters.
10. A farm for breeding bees
11. A water purification plant for agricultural use
12. A water well to meet the water needs of the center
13. A farm with an area of 9 dunums, of which 2 dunums are greenhouses.

A virtual meeting was arranged with Eng. Ismael Suboh, director of the hub on the 13th of July, 2023. Eng. Ismael explained the development of the Hub and the future pipeline activities planned. Where currently the Hub acts as an incubator and accelerator for agricultural businesses. Additionally, he stated that they are working on developing ATVET curricula through PARC where previous trainings depended on curricula and programs provided by external trainers and consultants. The PARC Hub will develop ATVET curricula which will be accredited by MoL, as well as licensing the Hub itself from MoL to become the first ATVET Specialized center in Palestine. The

Hub's team will be trained by MoL to be certified to deliver TVET programs (ATVET specifically). The Hub aims to deliver their first programs in ATVET in protected agriculture, irrigation systems, apiculture and bee keeping, as well as landscaping, and food processing. Eng. Ismael stated that while the Hub is technically beyond the physical boundaries of the Jordan Valley, nevertheless their activities will also target in its first stage Tubas area (Northern JV). The Hub expects to have their programs operational and running within a year's duration.

7.6.3. Tubas Charitable Society – Northern Jordan Valley

A non-profit community-based organization established in Tubas City in 1966 by a collective of entrepreneurial and pioneering women activists in the area, being one of the first organizations in the area to meet the needs of women and children in social, economic, cultural, educational, and capacity building domains.

The organization currently provides trainings and TVET programs that vary annually depending on demand and available financing, where the center provides trainings in cooking and pastry, soft skills, sewing, handcrafts, cosmetics, computer skills and others. The organization stated that they do not provide ATVET programs but have shown willingness to adopt such programs if the need in the market is proven and support is provided to deliver such trainings particularly to women in the Northern JV region.

7.6.4. Al Birr B'abna' Al Shohada (Al Birr) Vocational Training Center – Southern Jordan Valley

The Community-based Non-profit organization was founded in 1952 and holds accreditation from the Ministry of Labor (MoL) as a TVET center, ensuring that the certificates they issue are MoL accredited. The center operates through five main divisions:

- I. Industrial vocational trainings,
- II. Internal extracurricular division,
- III. Kindergarten,
- IV. Guidance and supervision, and
- V. Computer lab.

During the visit conducted on the 21st of June 2023 for the purposes of this study, it was revealed that the center does not currently offer any ATVET programs. Consequently, the focus lies solely on their industrial division, which provides training in various trades, including carpentry, metalworking, aluminum works, mechanics, electrical works (including solar energy), and tailoring to which sustainable and green skills and topics could be introduced.

Mr. Mostafa Abdelrahman, the head of TVET at the center, mentioned that they are exploring new fields of TVET training based on market demand, which might include ATVET programs and sustainable/green skills. He further shared their vision to establish a 2-year diploma program, accredited by the Ministry of Education (MoE), to be offered after high school. Currently, their diploma program holds accreditation only from MoL. Additionally, their electrical works program incorporates a module on solar energy, similar to the one implemented by the MoL's curriculum.

7.6.5. Jericho Chamber of Commerce, Industry, and Agriculture – Southern Jordan Valley

Jericho's CCIA presently does not offer TVET trainings in the technical sense; however, they do conduct short courses and capacity building initiatives through their recently established training and capacity building unit. A visit to the center on the 21st of June 2023 provided an opportunity to meet with Mr. Sabri De'ik, the head of Jericho's CCIA, who outlined their current vision centered around capacity building. Their objective is to incorporate TVET trainings within the CCIA and attain accreditation from the Ministry of Labor (MoL). To this end, they are in the process of relocating their offices to a new building, with the current facility set to undergo renovation and transformation into a dedicated TVET and capacity building center.

Over the past few years, Jericho's CCIA has offered short courses covering various subjects, such as computer skills, CV preparation, marketing, social media, and previous training on solar energy systems, yogurt, and dairy manufacturing. In the agricultural domain, the center has organized trainings on sorting and packaging, agricultural insurances, agricultural machinery maintenance, palm diseases (red palm weevil), handcrafts, and language skills. However, these courses lack standardized curricula as the program, curriculum, and delivery depend on the contracted trainers.

Looking ahead, Mr. De'ik emphasized their ongoing projects, including obtaining licensing from MoL and establishing a women's business forum for the Southern Jordan Valley. Their approach involves incentivizing women to set up businesses while providing assistance in local and international representation.

8. Gap Analysis: Private Sector Needs and Existing ATVET in the Jordan Valley

8.1. Overview of Status Quo

The private sector in the Jordan Valley region faces specific needs that the current TVET programs do not adequately address. Despite continuous efforts to align technical and vocational learning with market demand, the existing TVET service providers in the region have for long struggled with scattered and uncoordinated

efforts, and a lack of administrative guidance and strategic coordinated planning. As a result, the private sector has emphasized particular capacity and employment needs, including but not limited to qualified agricultural engineers, food processing experts, experts in smart pest control, smart irrigation, recycling, renewable energy, and competent cold storage and logistics experts among others. However, these specialized areas are lacking in the current TVET programs.

Moreover, there is a noticeable absence of agricultural and agro-industrial programs in the region. While some short courses are available, only one official program, accredited by MoL that is offered by the YMCA is dedicated to ATVET with a focus on sustainable agriculture and home gardening, which while tackles important topics, is still in need of further development to address the current pressing issues in capacity needs the region is lacking. Additionally, it was evident that there is a complete absence of agro-tourism skills development opportunities in the current programs as well as in future development plans either in the private sector or TVET society.

To effectively address the existing gaps in the TVET landscape, it is crucial to develop comprehensive ATVET programs tailored to the specific needs of the private sector in the Jordan Valley. By bridging this gap between TVET offerings and private sector requirements, the region can nurture a skilled workforce that not only meets the demands of its industries but also contributes to sustainable economic growth.

In addition to the TVET program challenges, the region also faces evident impacts of climate change, which are interconnected with the development plans of the private sector and where its impacts are becoming more evident by time. As such, sustainable development and building climate change resilient economies cannot be neglected. However, current efforts to combat these effects have been disjointed and ad-hoc, lacking systematic and strategic planning. Although some short courses address skills that could contribute to climate change adaptation or mitigation, these initiatives are primarily driven by momentary market demand, lacking long-term planning considerations, and are basic with no emphasis on the actual issues faced, being either water scarcity, desertification, seasonal variations, and temperature increase, all of which are either directly or indirectly related to climate change as evident by data and recent research discussed in section 2.

Furthermore, the skills offered in both the YMCA's ATVET program and other short courses by various organizations are fundamental and insufficient to address the pressing needs of the region in confronting current and impending climate change impacts. Recent studies and data clearly highlight the urgency of enhancing the workforce's skills to effectively tackle the evolving environmental factors affecting the region.

Given these challenges, it is essential for the region to adopt a more coordinated and strategic approach to skill development in ATVET and other relevant programs. Aligning these efforts with the region's specific climate change vulnerabilities and requirements can foster a more resilient and adaptable workforce. This approach will empower the private sector to proactively confront ongoing and future climate change impacts, ensuring sustainable economic development amidst changing environmental circumstances.

The following highlight the main observations that are evident based on review of both aspects of the study, being the private sector's situation in terms of skills and employment, and the current and pipeline efforts of TVET stakeholders, both in terms of ATVET, sustainable, and green skills.

8.2. Mismatch between Private Sector Needs and Existing ATVET Programs

The mismatch between the private sector needs and the existing ATVET programs in the Jordan Valley region is a significant issue that needs to be addressed. The private sector has specific employment needs that are not currently met by the existing programs partly due to their lack, and secondly due to the relatively basic or short nature of the existing programs which do not meet the increasing and developing demands of the private sectors for advanced and specific skills such as palm tree diseases, smart irrigation, sustainable pest management, and supply chain and logistics.

The private sector in the Jordan Valley region is primarily focused on agriculture and agro-industries. The sector has identified a need for specialized and trained employees in areas such as quality monitoring, recycling and circular economy practices, solar energy installations, and smart irrigation systems. However, the existing ATVET programs do not seem to offer specialized training in these areas.

Additionally, other areas such as quality control, food processing, composting, irrigation systems, agricultural marketing, and machinery maintenance for instance are provided in an uncoordinated manner, but in the form of short-courses and in an unspecialized manner. Therefore, the gap between skills requirements of the private sector and the available skills is still existent and is not filled in an effective manner.

Furthermore, the private sector has future plans that involve the optimization of production processes, introduction of new varieties and lines, integration of smart agriculture, smart irrigation, energy efficiency, renewable energy, new crops that require specialized agricultural technicians, and increasing the product value through the supply chain by adopting transformative processes such as food processing.

However, it is unclear whether the existing ATVET programs are preparing trainees for these future trends. Where the existing programs depend on external trainers without appropriate guidance or predetermined topics for delivery that guarantee matching the required skills needed for the future development of the private sector.

In light of these findings, it is clear that there is a significant mismatch between the needs of the private sector and the offerings of the existing ATVET programs. This mismatch is likely to result in a workforce that is not adequately prepared for the demands of the private sector, which could have serious implications for the economic development and sustainability of the Jordan Valley region.

8.3. ATVET Gaps Meeting Future Plans and Market Trends

The future plans and market trends in the Jordan Valley region, particularly in the private sector, are crucial factors to consider when analyzing the gap between these plans and the existing ATVET programs. The private sector in the region has a vision for expansion that revolves around the optimization of production processes, introduction of new varieties and lines, resource efficiency, integration of automated processes, and most importantly, increasing the product value through the supply chain by adopting transformative processes such as food processing.

However, it is unclear whether the existing ATVET programs are preparing learners for these future trends. Moreover, the private sector has identified a need for support in developing agro-tourism, a viable business that is currently neglected by the ATVET service providers. Agro-tourism represents a significant opportunity for economic growth and development in the region, and the lack of support in this area represents a significant gap in the ATVET programs. In light of these findings, strategic guidance is needed to ensure that the ATVET programs align with the future plans and market trends in the region. This could involve the introduction of new courses or modules that address the identified needs, as well as the enhancement of existing courses to ensure they are up-to-date and relevant to the current climate and agricultural landscape.

Furthermore, it is crucial that the ATVET programs are flexible and adaptable, so they can evolve in response to changing market trends and the future plans of the private sector. This includes the development of programs that support the growth of agro-tourism in the region, the development of the agricultural and agro-industrial sectors, and the introduction of modern green and sustainable skills, which are key areas of potential growth and resilience to face the impacts of climate change.

8.4. Lack of Certain Topics in the Available Curricula and Programs

The lack of ATVET programs in certain fields is a significant issue in the Jordan Valley region. The private sector has identified several areas where there is a need for specialized training and skills development, but these are not currently addressed by the existing ATVET programs. Through this research, it became evident that there are key areas where there is a lack of ATVET programs in particularly relevant to sustainable and green skills in the agricultural and agro-industrial sectors, in addition to the previously highlighted absence of agro-tourism skill development. These key areas include skills relevant to these fields and their direct relation to climate change, such as circular economy, skills relevant to sustainability practices, and general green skills that aim to assist the private sector in building a resilient economy against probable shocks as a direct or indirect result of climate change. Such skills include areas such as renewable energy, recycling and sorting, composting, and integrated pest control practices and fumigation. However, the existing ATVET programs do not appear to cover all these areas.

In the field of agriculture, there is a need for ATVET programs that focus on smart and modern agricultural skills. The private sector in the Jordan Valley region is primarily focused on agriculture and agro-industries, and there is a need for skills such as smart pest control, quality monitoring, and smart irrigation systems. The field of agro-industry is another area where there is a lack of ATVET programs. However, it is unclear whether the existing ATVET programs are preparing learners for these future trends.

Lastly, there is a complete absence of ATVET programs that focus on agro-tourism. Agro-tourism represents a significant opportunity for economic growth and development in the region, and the lack of support in this area represents a significant gap in the ATVET programs.

8.5. Lack of Standardized Curricula

The lack of standardized curricula in the ATVET programs is a significant issue that needs to be addressed in order to ensure the quality and consistency of the education and training provided. While the Palestinian Authority has established the NTC, it is still assuming its duties and is still developing its foundations, strategies, and research in order to effectively regulate the TVET sector, including ATVET. Additionally, and while MoL has standardized 19 curricula, ATVET was not included, and other existing curricula do not seem to tackle the pressing issues of climate change and the skill development needed.

In the Jordan Valley region, some institutions, such as the Jericho Chamber of Commerce, Industry, and Agriculture, offer short courses and capacity building

initiatives but lack standardized curricula. The program, curriculum, and delivery depend on the contracted trainers. This lack of standardization can lead to inconsistencies in the quality of education and training provided, and may result in learners not acquiring the necessary skills and knowledge required by the private sector.

Furthermore, with the NTC still developing its capacity, there is no strategic or visionary guidance for the TVET sector, particularly the ATVET. The Jordan Valley area has typically suffered from marginalization due to its sensitive geopolitical situation and the scattered form of its localities, making interventions critical yet difficult in the region. Guiding the ATVET programs in the region with strategic planning that is found on research, data, and market assessment is critical to match the wide gaps between the market and capacity building efforts.

8.6. New Programs Development and Coordination

In the course of stakeholder consultations and site assessments, it was observed that the primary entities offering ATVET programs in the region are not only limited but also previously identified. However, emerging organizations and groups are incorporating the development and integration of ATVET programs into their strategic plans or visions. These most notably include Jericho's CCIA which is in the process of developing an accredited TVET center, Al Birr Organization, and the Continuing learning center of Jerusalem Open University that is implementing a mobile TVET center program.

While these organizations are well-established with past or ongoing ATVET interventions, others have expressed interest in integrating ATVET curricula into their training programs. However, these efforts appear to be individualistic and uncoordinated, with each entity operating independently, lacking a strategic vision for future needs or topics that should be incorporated into such curricula.

This lack of coordination was further highlighted during consultations with PARC, which is developing its own curriculum for delivery at their PARC Hub ATVET center. Although this center is not located within the JV region, it offers insights into the individual efforts organizations are making to address urgent market needs, the Palestinian environment, the agricultural and agro-industrial sectors, and the impacts of climate change.

A similar situation is observed with the YMCA, which currently offers the only ATVET specialized program in sustainable farming and home gardening, teaching the principles of permaculture. In collaboration with the Lutheran World Foundation, the YMCA is also revising its curriculum. A virtual consultation with the Lutheran World Foundation on July 12, 2023, revealed that they have initiated a curriculum review

program and are developing new, revised curricula on a variety of topics. The most relevant for this study include: (i) Sustainable Agriculture – 1 year, (ii) Professional Agricultural Diploma in Plant Production – 1 year, and (iii) Design and Building of Modern Farming Systems – Short Course. The development of these curricula is projected to take approximately one year from the inception of this report.

Therefore, it is crucial for the NTC to facilitate coordination among ATVET service providers and stakeholders to unify topics and capacity-building efforts. These efforts should be based on an accurate assessment of market needs, adequate forecasting of development requirements, the impacts of climate change, and the dynamic nature of the market. This will enhance service delivery and capacity building, ensuring efforts are not duplicated and resources are not scattered.

9. International Best Practices and Lessons

Greening TVET is a novel socio-economic concept and strategic paradigm embraced by many countries, particularly in Asia and the Pacific. The objective is to achieve economic growth while simultaneously safeguarding the environment and realizing sustainable economic and social development.

At the heart of sustainable development is the need to balance economic growth, social progress, and environmental protection. This requires a shift towards a green economy, which is not only low-carbon but also resource-efficient and socially inclusive. To achieve this, it is necessary to incorporate sustainability into all aspects of education, including technical and vocational education and training (TVET).

Numerous international examples have demonstrated remarkable success in incorporating green and sustainable skills into ATVET programs. These initiatives are designed to empower individuals with the necessary expertise to align with the private sector's demands, fostering resilient economies amid the challenges posed by climate change. While the approaches vary across countries, this chapter highlights the most pertinent and practical examples that hold relevance for the Jordan Valley region. Drawing inspiration from countries with comparable contexts or markets with similar needs.

9.1. Germany's Green Skills in Vocational Education and Training

Germany's commitment to integrating green skills into TVET programs exemplifies its leadership in addressing climate change and promoting sustainability. The Federal Institute for Vocational Education and Training (BIBB)⁹ has played a pivotal role in

⁹ <https://www.bibb.de/en/168224.php>

spearheading these efforts by developing a range of initiatives to embed sustainability principles in vocational training curricula. The "Green Skills" project, under the EU's Green Skills Agenda is one such exemplary initiative that aims to identify and incorporate the competencies required for a sustainable economy into VET programs. Through the German example, it was evident that vocational education and training (VET) for new green occupations plays a minor role compared to 'greening' TVET for established occupations and that continuing vocational education and training (CVET) offerings are manifold, but participation in such programs is low because of weak incentives and low transparency. Programs to promote skills for green jobs, including efforts within the framework of the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Action Program, are described. It is noted that many previous programs did not have a persistent impact. With few exceptions, skills for green jobs are not a focus of Active labor market policies (CEDEFOP, 2018).

Nevertheless, capturing the German example, significant topics and curricula developed under the Green Skills program include;

- **Renewable Energy Technologies:** The TVET curricula encompass modules on renewable energy sources, such as solar, wind, and biomass. Students learn about the installation, maintenance, and operation of renewable energy systems, contributing to the country's clean energy transition.
- **Energy Efficiency and Conservation:** Practical training is provided in energy-efficient building techniques, sustainable heating and cooling systems, and energy-saving practices. TVET students gain expertise in implementing sustainable energy solutions to reduce carbon footprints.
- **Sustainable Agriculture and Horticulture:** The TVET programs emphasize eco-friendly farming techniques, agroecology, and organic farming practices. Topics like precision agriculture, water management, and soil conservation techniques are integrated into the curricula to promote sustainable agriculture.
- **Green Building and Construction:** TVET courses cover sustainable construction materials, eco-friendly building design, and green building certifications. Students learn to construct energy-efficient and environmentally friendly structures.
- **Waste Management and Recycling:** The TVET curricula include training on waste separation, recycling processes, and waste-to-energy technologies. Students are equipped to contribute to efficient waste management systems.
- **Green Business and Entrepreneurship:** TVET programs incorporate modules on sustainable business practices, circular economy concepts, and green

entrepreneurship. This empowers students to create and manage environmentally conscious enterprises.

The delivery methods of these curricula emphasize practical hands-on training, site visits, and real-world projects to ensure students gain valuable experience and skills. Apprenticeships and on-the-job training are integral components of TVET programs, allowing learners to apply their knowledge in real work settings. Additionally, the integration of modern technology and e-learning tools enhances the accessibility and effectiveness of these training initiatives.

Furthermore, the "Green Skills" project engages relevant stakeholders, including employers, industry representatives, and sustainability experts, to ensure that the TVET programs align with the current and future needs of the job market. This collaborative approach helps bridge the gap between industry demands and the skills of the workforce, ensuring a seamless transition towards a sustainable and green economy. Surveys are conducted for both employees and employers to continuously assess the market demand and needs.

9.2. The European Centre for the Development of Vocational Training (Cedefop):

CEDEFOP has been working on the "Green Skills" agenda, which aims to ensure that TVET programs across Europe are equipped to provide the skills needed for a green economy. They have developed a range of resources and tools to support this, including a "Green Skills" toolkit for TVET providers (CEDEFOP, 2015). The agenda has resulted in programs that have integrated the following aspects into TVET within the EU¹⁰:

- **Energy Efficiency and Renewable Energy:** CEDEFOP's programs include training on energy-efficient technologies, renewable energy sources, and sustainable energy management. This training equips individuals with the skills to design, install, and maintain energy-efficient systems and renewable energy solutions.
- **Circular Economy:** CEDEFOP emphasizes the principles of the circular economy, which aim to minimize waste and maximize resource use. Vocational training in this area covers topics like waste management, recycling processes, and remanufacturing, enabling participants to support sustainable production and consumption practices.

¹⁰ Examples Austria: <https://www.cedefop.europa.eu/en/data-insights/skills-anticipation-austria>

- Sustainable Construction and Building Design: CEDEFOP's curricula address sustainable construction techniques, eco-friendly building materials, and green building certifications. Participants learn how to design and construct energy-efficient and environmentally responsible buildings.
- Green Transport and Mobility: CEDEFOP's training programs focus on sustainable transport solutions, including electric vehicles, public transportation systems, and efficient logistics management. Participants acquire the skills needed to contribute to greener mobility options and reduce transportation-related emissions.
- Environmental Conservation and Biodiversity: CEDEFOP integrates topics related to environmental conservation, biodiversity protection, and ecosystem management. Participants learn about sustainable land use, wildlife preservation, and conservation strategies.
- Sustainable Agriculture and Agribusiness: CEDEFOP's programs cover sustainable farming practices, agroecology, and organic agriculture. Training includes topics such as precision agriculture, sustainable irrigation, and eco-friendly pest management.
- Green Entrepreneurship and Innovation: CEDEFOP emphasizes the development of green entrepreneurship skills, fostering innovation in sustainable business practices. Participants learn to identify green business opportunities and create environmentally friendly products and services.

9.3. The African Continent's Methodology in ATVET and Green Skills

The African approach presents an alternative perspective while pursuing similar objectives to the previous example. However, it is essential to recognize the distinct local context of underdeveloped countries studied here, which share more similarities with the Jordan Valley region than the previously discussed ones. Notably, the African continent, through the African League for Agriculture and Rural Development, has identified priority areas, with ATVET (Agricultural Technical and Vocational Education and Training) playing a crucial role in socio-economic development. Consequently, the league has recommended member countries to formulate and implement policies that ensure at least 50% of the African workforce can access new or improved skills.

Vocational education and training in agriculture are increasingly supported through vocational colleges, university certificate programs, private sector institutions, and work-based training programs. Under the leadership of the German Federal Ministry

for Economic Cooperation and Development (BMZ), the German government has identified vocational training as one of the educational objectives that promotes the concept of "lifelong learning" and supports partner countries in implementing this concept.

As a result, BMZ, in collaboration with African and national institutions, supports the enhancement of technical and vocational education and training in the agricultural sector in Africa. This program has been integrated into the framework of the New Partnership for Africa's Development (NEPAD), and some elements of lifelong learning are being implemented in pilot countries across Africa, including Kenya, Ghana, and Benin.

South Africa:

Taking the South African Experience for instance, 7 major findings were hypothesized that are required to ensure a just transition to sustainable economies (GIZ, 2023), these include;

- I. A successful Just Transition requires a coherent alignment of green agendas and skills development policies
- II. The private sector needs incentives, sanctions and support to develop a demand for Green Skills
- III. A Just Transition cannot be successful without the integration of the informal economy in green, economic and TVET policies
- IV. TVET is crucial to prepare the labor force for a Just Transition, but TVET systems need to be strengthened and aligned with comprehensive social protection measures
- V. Transition requires holistic TVET reforms, in line with Education for Sustainable Development, to ensure relevance, attractiveness and inclusivity.
- VI. Just Transition increases the need for labor market forecasting to match emerging skill demands
- VII. The emerging skill demand in a green economy will require TVET to rapidly adapt existing occupational profiles and develop new ones

These 7 theses bear striking resemblances to the highlighted challenges, current situation, and gaps observed in the Jordan Valley region. Learning from this experience is immensely valuable, given that it mirrors significant issues faced in the JV. Therefore, it is imperative to engage in policy development, strategic planning, demand forecasting, and aligning TVET programs with the actual needs of the private sector. Additionally, studying emerging skills and establishing a dynamic and adaptive green skills program for TVET is of utmost importance for the region's progress.

Ethiopia:

Agricultural education and training in Ethiopia are considered among the best practices in Africa. Led by the Ministry of Agriculture and Rural Development, Ethiopia has invested significant resources in building its agricultural education and training system through the Agricultural Sector Policy and Investment Framework 2010-2020. Before the introduction of the agricultural education and training system, universities were the only institutions offering agricultural training. However, by the year 2000, the Ministry of Agriculture introduced the educational program for agricultural vocational training in 27 colleges. Five federal colleges and 20 regional colleges offer a three-year training program for development agents. The program accepts students who have completed their general education (up to grade ten) in the national system for two years in school and one year in industrial apprenticeship.

Description of Curriculum and Educational Process:

The curriculum is composed of 30% theory and 70% practical training. Regional agricultural vocational colleges are responsible for designing their own programs based on training needs and the job market. Graduates of the agricultural education and training program must undergo competency assessments. The Ministry of Education is responsible for designing professional standards and qualifications.

Examples of Success:

One example of success in Ethiopia is Alage Agricultural Technical Vocational Education and Training (TVET) College, established in 2002 to enhance the National Technical and Vocational Education and Training program. Alage TVET College is situated on a 4,200-hectare land area with the necessary infrastructure and facilities for practical agricultural training. The college comprises four departments: Plant Science, Animal Science, Natural Resources, and Animal Health.

Togo:

The agricultural vocational education and training project in Togo began in May 2014. Based on value chain analysis, it was found that the rice and aquaculture value chains have the greatest potential for youth employment in Togo. Consequently, the following actions were taken:

- I. Development of a training plan that meets the requirements of the job market and the establishment of specific curricula based on competency in the rice and aquaculture value chains.

- II. Planning for the training of trainers to enable them to master the new courses and train others.
- III. Preparation of a list of official and non-formal training centers, with two leading centers designated for testing the new curriculum.
- IV. Formulation of a national strategy for vocational and technical training with the participation of stakeholders.

Based on these interventions, the following results were achieved:

- 13 jobs were created along the rice value chain, and 10 jobs were created in the aquaculture value chain.
- 150 students were trained in entrepreneurship courses following the "Efficiency-driven Economies through Enterprise Creation" approach.
- 206 rice producers were trained in business management at the Farmers' Business School.
- 30 women were trained on rice parboiling technology.

9.4. Sri Lanka's Greening of TVET Curricula

In Sri Lanka, the TVET system has undergone significant changes in recent years to incorporate sustainability. The government has introduced a new national policy on TVET that places a strong emphasis on sustainable development. This policy recognizes the need for TVET to contribute to economic development, social equity, and environmental sustainability.

To achieve this, the policy recommends the integration of sustainable development concepts into the TVET curriculum, the development of sustainable infrastructure and technology, and the promotion of green skills among TVET students. The government has also established a national council for technical and vocational education and training (NCTVET) to oversee the implementation of this policy.

Both Sri Lanka and Germany have made significant efforts to green their TVET curricula for sustainable development. However, there are some differences in the approaches adopted; In Sri Lanka, the focus is on the integration of sustainable development concepts into the TVET curriculum, while in Germany, the focus is on the greening of the entire VET system. Sri Lanka's approach is more focused on content, while Germany's approach is more holistic.

Another difference is the emphasis on green skills. While both countries recognize the importance of green skills for sustainable development, Sri Lanka places a stronger emphasis on promoting green skills among TVET students, while Germany places a stronger emphasis on the use of green technologies and sustainable production methods in the workplace (S.T Seelan, 2023).

In Sri Lanka, there have been efforts to green the TVET curricula in recent years. According to the National Vocational Qualification (NVQ) Framework, which is the national standard for TVET qualifications in Sri Lanka, sustainability is a cross-cutting theme that runs through all levels of qualifications. This means that sustainability principles and practices are integrated into the TVET curricula at all levels, from Level 1 to Level 7.

The Ministry of Skills Development, Employment, and Labor Relations in Sri Lanka has also taken steps to promote sustainable TVET. In 2018, the Ministry launched the "Green Skills Development Program" to promote the development of green skills in the TVET sector. The program aims to provide training in green skills and promote the adoption of green practices in the TVET sector.

Several institutions in Sri Lanka have taken steps to green their TVET curricula. The Institute of Technology University of Moratuwa, for example, has introduced a new degree program in Environmental Engineering, which aims to produce graduates with the knowledge and skills needed to address environmental challenges in Sri Lanka.

The Colombo Plan Staff College for Technician Education (CPSC) has also taken steps to promote sustainable TVET in the Asia-Pacific region. The CPSC has developed a guidebook on "Greening TVET Institutions¹¹" that provides guidance on how TVET institutions can integrate sustainability principles and practices into their operations (Lamichhane, 2023).

9.5. UNESCO-UNEVOC's Greening TVET

UNESCO-UNEVOC has developed a range of resources to support the integration of green skills into TVET programs. This includes a "Greening TVET" guide¹², which provides practical advice on how to integrate green skills into TVET curricula. aimed at integrating sustainable and environmentally friendly practices into TVET programs worldwide, this initiative recognizes the importance of equipping learners with the skills and knowledge necessary to address pressing environmental challenges and transition to a more sustainable future. Greening TVET focuses on incorporating green skills, green technologies, and sustainable practices into the curricula and training provided by TVET institutions (UNESCO-UNEVOC, 2017).

The guide provides considerations for integration on a variety of sectors such as energy, iron and steel, manufacturing, construction, agriculture, and food. In agriculture for instance, it provides guidance in integration of sustainable and green

¹¹ <https://pub.cpsctech.org/tm-greening-tvet/>

¹² <https://unevoc.unesco.org/up/gtg.pdf>

skills for Inefficient energy consumption; Land use change and expansion of agricultural frontiers; Lack of technical and political instruments so that emission reductions targets are reached; Inefficient water use through irrigation; and the Pollution of the environment through the use of fertilizers and pesticides.

Main curricula and topics included cover various areas, most notably;

- I. Sustainable Energy Technologies
- II. Environmental Management and Conservation
- III. Green Building and Construction
- IV. Waste Management and Recycling
- V. Sustainable Agriculture and Agribusiness
- VI. Climate Change Adaptation and Mitigation
- VII. Environmental Legislation and Policy
- VIII. Green Technology and Innovation
- IX. Sustainable Business Practices

10. Consultation Meeting

On November 22, despite challenging circumstances that took place in Palestine over the course of Q4 2023, a key session was held in the Jericho governorate. This session saw the participation of service providers, public and private sector institutes, that included MoE, MoL, PARC, Al Quds Open University, YMCA, Palvision, Jericho Governor, and the Jericho Governorate team, the Jericho Chamber of Commerce, Industry, and Agriculture, as well as the Farmers representatives. Where the developed recommendations were presented and discussed. Several recommendations were received that were integrated into the conclusions and recommendations of this report, mainly focusing on family-owned farms and the farmers besides the private sector, providing the attendees with the report once finalized, and ensuring continuous engagement between all parties following the completion of the report.



Figure 8: Photos of the Consultation Session held on the 22nd of November 2023

11. Conclusions and Recommendations

The integration of green skills and sustainable practices into Agriculture Technical and Vocational Education and Training (ATVET) in formal curricula is a novel and essential socio-economic concept that holds great promise for the Jordan Valley area. ATVET plays a crucial role in the agriculture value chain by providing indispensable know-how and competencies to address various challenges faced by farmers.

By equipping individuals with the needed skills, ATVET bridges critical gaps in the agriculture sector, ensuring the supply of skilled workers and imparting knowledge to prevent losses in crops, production, and herds. Moreover, it empowers farmers with

sustainable practices that reduce costs, such as cultivating animal feed from remaining cultivation, and offers vital marketing, export, and e-marketing expertise.

Recognizing the significance of resilience in Area C, such integration of these green and sustainable skills particularly in the existing ATVET programs enhances investment prospects and youth activism. Furthermore, these practices contribute to the creation of support services that are currently lacking in agriculture communities, including auto-mechanics, carpentry, and recycling and reuse of waste. It becomes a cornerstone in empowering women and marginalized groups, fostering gender sensitivity, and integrating marketing and costing into their skillsets.

In order to maximize A-TVET's impact, it is vital to establish strong linkages with Work-Based Learning (WBL) and provide job-matching services for employment opportunities. Additionally, ATVET should be seamlessly connected to incubation and access to finance, supporting self-employment ventures and unemployed university graduates.

The subsequent sections present a series of recommendations. With recommendations pertaining as well to the existing official ATVET program, administered by the YMCA. Additionally, the document offers guidance on how to incorporate sustainable and green practices into various institutions. Furthermore, it provides insights for future ATVET development, emphasizing the inclusion of sustainable and green skills in policy and strategic planning processes.

11.1. Strategic Recommendations for the Greening of TVET Programs in the Jordan Valley Area

11.1.1. National Policies and Strategic Planning

The establishment of the National TVET Commission (NTC) has provided a platform for coordinating efforts across various TVET and ATVET providers. However, to maximize the impact of these efforts, it is crucial to align them under a unified national vision. This vision should be comprehensive, taking into account market demand, employment needs, development objectives, and climate change mitigation requirements.

- **Market Demand:** The TVET and ATVET curricula should be designed to meet the current and future demands of the market. This requires regular engagement with industry representatives to understand the evolving needs of the market, as well as ongoing research and analysis of market trends. The curricula should be flexible and adaptable, allowing for updates and modifications as market demands change.

- **Employment Needs:** The curricula should aim to equip trainees with the skills and knowledge they need to secure employment in their chosen fields. This requires a deep understanding of the skills and qualifications that employers are looking for, as well as the ability to deliver training that effectively develops these skills. The NTC should work closely with employers to ensure that the training provided is relevant and valuable.
- **Development Objectives:** The curricula should align with national development objectives, contributing to the broader goals of economic growth, social development, and environmental sustainability. This requires the integration of sustainable and green skills into the curricula, as well as a focus on sectors that are key to national development.
- **Climate Change Mitigation:** The curricula should also contribute to national and global efforts to mitigate climate change. This could involve the inclusion of topics such as renewable energy, energy efficiency, sustainable agriculture, and waste management. Trainees should be equipped with the knowledge and skills they need to contribute to a low-carbon economy.

11.1.2. Training of Trainers (TOT): Developing Skills of Service Providers

Efforts to integrate sustainable skills and green practices in TVET programs are starting to gain momentum, exemplified by the YMCA's establishment of the first sustainable agriculture TVET program in Palestine. Other organizations have also taken strides towards planning for the integration of such practices in their programs and strategic plans. While creating relevant curricula represents an important initial step and an accessible aspect of implementing this agenda, the crucial factor for ensuring the success and continuity of sustainability integration lies in the presence of qualified trainers. Equipping trainers with the necessary expertise and knowledge through Training of Trainers (TOT) initiatives becomes imperative for the seamless delivery of sustainable programs in the long run, thereby facilitating the overall greening of TVET and ATVET programs. This investment in the skills of service providers guarantees a more sustainable and effective approach to fostering environmentally conscious practices in the TVET sector.

11.1.3. Agricultural and Environmental Incubation and Entrepreneurship Programs

In the Jordan Valley, Agricultural and Environmental Incubation and Entrepreneurship Programs hold the potential to enhance green skills development and sustainable practices in TVET significantly. To achieve this, specialized green business incubators should be established, providing mentorship and technical support for aspiring entrepreneurs and TVET graduates seeking to initiate environmentally friendly ventures such as organic farming, eco-tourism, and renewable energy projects. Collaborating with existing local enterprises committed to sustainability can create mentoring opportunities and stimulate market demand for green skills. Setting up

innovation labs within TVET institutions will encourage students to develop sustainable technologies for water conservation, waste management, and climate change adaptation. Access to green certification programs and seed funding for green startups will boost the competitiveness of TVET graduates in the growing green market. Integrating practical green projects into the curricula allows trainees to apply their skills to address real-life sustainability challenges specific to the Jordan Valley. Additionally, supporting research and development in green technologies relevant to the agricultural and environmental sectors will foster innovation and more effective sustainable practices. By promoting awareness through workshops, seminars, and outreach campaigns, these programs will instill a broader understanding of sustainability's importance among local communities, farmers, and businesses.

11.1.4. Stakeholder Engagement and Coordination

Stakeholder engagement and coordination play a pivotal role in developing green skills in TVET programs within the context of the Jordan Valley. By involving relevant stakeholders, including government agencies, educational institutions, private sector companies, civil society organizations, and local communities, a collaborative approach can be fostered. Such engagement ensures that the design and implementation of green skills development initiatives align with the region's specific needs and challenges related to agriculture and the environment. Through active participation and consultation, stakeholders contribute their expertise and insights, which lead to more relevant and practical curricula and training modules. Moreover, stakeholder engagement promotes ownership and buy-in, fostering a sense of shared responsibility and commitment towards building a sustainable workforce. The strategic benefits of stakeholder engagement include improved resource allocation, reduced duplication of efforts, and optimized utilization of existing infrastructure and facilities. Furthermore, coordination among stakeholders facilitates knowledge-sharing, best practices dissemination, and the creation of a supportive ecosystem for green skills development.

11.2. Green Skills and Sustainable Practices Topics to Include in Existing and Planned ATVET Programs

Based on the comprehensive analysis presented in the preceding chapters, which encompassed market dynamics, demand, employment, capacity requirements, and a thorough mapping of existing ATVET programs and curricula, a robust gap analysis has been conducted. Additionally, international experiences and successful examples of TVET greening initiatives were reviewed, while carefully considering the Jordan Valley region's sensitive and unique environment, encompassing its geopolitical status quo, environmental characteristics, and socioeconomic dynamics.

In light of this comprehensive examination, the following topics have been meticulously selected to serve as prime recommendations for the development of green and sustainable skills. These recommendations embody three key criteria: tangibility and practicality, alignment with market demand to ensure relevance, and a dedicated focus on addressing the impacts of climate change, necessitating adaptation and mitigation efforts. Furthermore, given the emerging nature of these interventions and the evolving platform and infrastructure supporting them, these recommendations prioritize direct and uncomplicated approaches. This emphasis ensures that local capacity can effectively deliver and sustain these skills over time, thereby safeguarding programs from potential risks posed by a lack of qualifications among trainers and other highlighted factors.

These handpicked topics, derived from a thorough analysis of the Jordan Valley's unique context and the prevailing global trends, offer a powerful framework for fostering a skilled workforce adept in green and sustainable practices. By embracing these recommendations, the Jordan Valley region can confidently advance towards a more environmentally conscious and resilient future while simultaneously catering to the demands of a rapidly evolving job market.

11.2.1. Sustainable Energy Technologies

The incorporation of Sustainable Energy Technologies into TVET programs in the Jordan Valley holds immense potential for advancing the region's transition towards a greener and more sustainable energy landscape. This comprehensive topic encompasses a diverse range of renewable energy sources, but mainly solar and bioenergy. By offering specialized training on these renewable energy technologies, TVET programs can equip trainees with the expertise needed to harness the abundant natural resources of the Jordan Valley efficiently and sustainably.

The curriculum under this topic would encompass theoretical knowledge about the principles and functioning of each renewable energy source, addressing the unique characteristics and applicability of solar photovoltaic (PV) systems, and biomass conversion processes. Waste to Energy practices are highly important due to the waste issue in the region and the dark fact that many agricultural projects revert to burning waste due to the lack of waste collection infrastructure, and the administrative issues faced to build structures to collect waste or transport it due to Israeli restrictions. Practical skills training would be a significant component, focusing on hands-on experience in the installation, operation, and maintenance of renewable energy systems.

Moreover, the topic extends its scope beyond energy generation by exploring the integration of smart and computerized irrigation systems. Smart irrigation techniques, enabled by the Internet of Things (IoT) and sensor technology, facilitate precise and

water-efficient irrigation practices, optimizing water use in agriculture. Trainees will receive specialized training in the design, installation, and management of smart irrigation systems, aligning with the Jordan Valley's need to enhance water conservation and address water scarcity challenges.

By providing a comprehensive understanding of renewable energy sources and sustainable irrigation practices, this topic enables TVET graduates to become trailblazers in the sustainable energy sector and agricultural industry. The acquired expertise will empower them to contribute to the deployment and maintenance of renewable energy systems across the Jordan Valley, supporting the region's transition towards a low-carbon future. Additionally, the integration of smart irrigation practices will enhance agricultural productivity while reducing water consumption, promoting sustainable farming and resource management.

11.2.2. Environmental Management and Conservation

The Environmental Management and Conservation topic is a crucial component of TVET programs in the Jordan Valley, aiming to instill a profound understanding of the principles and practices necessary for safeguarding the region's unique natural resources and ecosystem. This comprehensive topic delves into the intricacies of environmental management, equipping trainees with the knowledge and skills needed to address environmental challenges and contribute to conservation efforts.

The curriculum would encompass the fundamental principles of environmental management, covering topics such as ecological balance, biodiversity conservation, and sustainable resource utilization. Trainees would gain insights into the importance of protecting delicate ecosystems in the Jordan Valley, including the sensitive flora and fauna that rely on its natural habitats.

A key focus within this topic would be strategies for mitigating and adapting to the impacts of climate change. Trainees would be exposed to the latest scientific research on climate change and its implications for the region. They would explore innovative adaptation measures, such as climate-resilient agricultural practices and sustainable water management techniques to cope with changing climatic conditions and minimize risks to agriculture and the environment.

Additionally, the topic would delve into environmental conservation initiatives, emphasizing the significance of promoting eco-friendly practices and raising awareness about the importance of environmental protection among local communities and businesses. Trainees would learn about sustainable waste management, recycling practices, and ways to minimize pollution, enabling them to actively contribute to reducing the ecological footprint in the Jordan Valley.

11.2.3. Water Resource Management

The Water Resource Management topic is of paramount importance in TVET programs for the Jordan Valley, given the region's persistent water scarcity challenges. This comprehensive topic is designed to equip trainees with essential knowledge and practical skills to tackle water-related issues effectively and sustainably.

The curriculum would center around water conservation strategies, emphasizing the urgent need to preserve this precious and finite resource. Trainees would explore various conservation techniques, including water-efficient irrigation practices, drought-resistant crops, and optimized water use in agriculture and other industries. They would be exposed to cutting-edge technologies and innovative approaches to minimize water wastage and maximize its utilization, fostering a culture of responsible water management among future professionals.

A significant aspect of this topic would be water harvesting techniques, addressing the need to capture and store rainwater to augment water supplies. Trainees would learn about different methods of rainwater harvesting, such as rooftop collection systems, ponds, and underground storage tanks. Understanding these practices will enable them to implement practical solutions to augment water availability, especially during dry periods, contributing to greater agricultural productivity and overall resilience in the Jordan Valley.

Efficient water use in agriculture would be a focal point of this topic, acknowledging the vital role agriculture plays in the region's economy. Trainees would gain insights into precision irrigation methods, such as drip and sprinkler systems, that ensure targeted and efficient water delivery to crops, minimizing wastage and optimizing crop yields. By integrating such practices, TVET graduates can support local farmers in adopting sustainable water management techniques, contributing to increased food security and agricultural sustainability.

Moreover, the curriculum would explore the broader context of water resource management, encompassing both surface and groundwater sources. Trainees would be educated on the importance of preserving water quality, preventing pollution, and addressing water-related challenges specific to the Jordan Valley's unique environment.

11.2.4. Green Building and Construction

The Green Building and Construction topic holds immense significance in TVET programs for the Jordan Valley, especially with the building restrictions, difficulties to source and transport material, and the hardship in construction works given the fragmentation and local environment, such program is important as it addresses the

urgent need to embrace eco-friendly and sustainable practices in the built environment. This comprehensive topic is designed to equip trainees with cutting-edge knowledge and practical skills necessary to transform the construction sector towards a greener and more sustainable future.

At the heart of this topic lies energy-efficient building design, where trainees would be introduced to innovative architectural concepts and construction techniques that prioritize energy conservation and reduce environmental impact. They would learn about passive design strategies, such as optimizing building orientation, using natural ventilation, and maximizing daylight, to minimize the need for artificial heating, cooling, and lighting. Emphasizing energy-efficient design will help future professionals play a pivotal role in reducing carbon emissions and mitigating the environmental footprint of buildings in the Jordan Valley.

The curriculum would also delve into the use of sustainable building materials, introducing trainees to environmentally friendly alternatives that promote resource efficiency and reduce waste. From recycled and reclaimed materials to low-emission adhesives and finishes, trainees would be familiarized with a wide range of sustainable options that align with the region's commitment to sustainability. Understanding the environmental impact of different materials will enable TVET graduates to make informed decisions in their future construction projects, fostering a culture of responsible material selection.

Green landscaping would complement this topic, emphasizing the importance of integrating nature into the built environment. Trainees would explore landscape design principles that promote biodiversity, reduce water consumption, and create resilient and aesthetically pleasing outdoor spaces. Understanding the significance of green spaces in mitigating heat island effects and enhancing overall well-being will empower graduates to advocate for green initiatives in future construction projects, contributing to a more sustainable and livable urban environment.

Moreover, the curriculum would introduce trainees to sustainable construction certifications and rating systems, such as LEED (Leadership in Energy and Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method), providing a framework for assessing and improving the environmental performance of buildings. Familiarity with these standards will enable TVET graduates to work towards achieving green certifications for their projects, demonstrating a commitment to sustainability and attracting environmentally conscious clients.

11.2.5. Circular Economy and Waste Management

The Waste Management and Recycling topic plays a pivotal role in TVET programs for the Jordan Valley, as it addresses the pressing need to adopt sustainable waste

practices and transition towards a circular economy. This comprehensive topic empowers trainees with the knowledge and skills necessary to tackle the growing challenges of waste generation and promote responsible waste management practices.

Recycling and circular economy practices form the foundation of this topic, where trainees would be introduced to the principles of resource recovery and reuse. They will explore innovative recycling technologies and techniques that enable the transformation of waste materials into valuable resources, reducing the strain on natural resources and minimizing environmental impact. Understanding the significance of a circular economy approach will empower graduates to advocate for closed-loop systems and sustainable consumption patterns that support the region's long-term sustainability goals.

A key focus within this topic is waste reduction, addressing the need to minimize waste generation at its source. Trainees would be educated on waste prevention strategies, such as promoting the use of reusable and eco-friendly products, implementing source separation of waste, and adopting sustainable packaging practices. By understanding waste reduction measures, TVET graduates can contribute to reducing the volume of waste sent to landfills, leading to more efficient resource management and reduced environmental pollution.

The curriculum would also encompass waste management strategies, covering the planning, collection, transportation, and disposal of waste materials. Trainees will gain insights into the importance of integrated waste management systems that prioritize recycling, composting, and energy recovery over traditional landfilling. Understanding waste management best practices will enable graduates to design and implement effective waste management plans that cater to the specific needs and challenges of the Jordan Valley.

Moreover, the topic would explore innovative waste-to-energy technologies, such as anaerobic digestion and waste incineration, as viable solutions for converting organic waste into renewable energy sources. Trainees would be familiarized with the environmental and economic benefits of these technologies, helping them promote sustainable waste-to-energy initiatives in the region.

11.2.6. Agro-tourism

While completely absent from the scene in the Jordan Valley, developing skills and creating expertise in this field could unlock a new neglected sector that would result in an increased economic value, employment opportunities, and developing economic activities that inherently address the efforts of mitigating climate change impacts.

Agro-tourism is a significant area that combines agricultural and tourism activities, providing visitors with unique, educational, and enjoyable experiences. The curriculum should cover the principles and practices of agro-tourism, including the basics of agro-tourism, its benefits for local communities, and its role in promoting sustainable development. It should also delve into the planning and management of agro-tourism activities, encompassing visitor management, risk management, and the development of agro-tourism products and services. Marketing and promotion strategies for agro-tourism, including the use of social media, online marketing, and community engagement, should be taught. Sustainable practices in agro-tourism, such as the use of renewable energy, waste management, and the promotion of local and organic produce, are essential. The curriculum should also cover the cultural and heritage aspects of agro-tourism, including the promotion of local traditions, crafts, and culinary practices. Finally, the legal and ethical aspects of agro-tourism, including land use regulations, safety regulations, and ethical considerations in working with local communities, should be included.

11.2.7. Green Technology and Innovation

The Green Technology and Innovation topic explores the transformative power of eco-friendly technologies and fosters a culture of innovation in sustainable practices. This comprehensive topic aims to equip trainees with the knowledge and skills necessary to harness green technologies and drive forward-thinking solutions for a more sustainable future.

Encompassing various sectors, this topic will delve into the use of green technologies in agriculture, energy, water management, waste treatment, and other industries. Trainees will explore state-of-the-art technologies and practices that promote resource efficiency, reduce greenhouse gas emissions, and minimize environmental impact. Understanding the practical applications of green technologies will empower graduates to play active roles in implementing these solutions across different sectors in the Jordan Valley.

A key aspect of this topic is the principles of innovation in the development and application of green technologies. Trainees will be encouraged to think creatively and critically, identifying opportunities for improving existing technologies and developing novel solutions to address pressing environmental challenges. By fostering a culture of innovation, TVET programs can produce forward-looking professionals who actively contribute to the region's sustainable development agenda.

The curriculum would also highlight the role of research and development in driving green technology advancements. Trainees will be exposed to the latest research findings and technological trends, encouraging them to engage in continuous learning and stay abreast of cutting-edge developments in the field. Understanding the

importance of research-driven innovation will enable graduates to remain at the forefront of sustainable practices and drive progress in the Jordan Valley's green technology landscape.

Moreover, the topic would explore successful case studies and real-world examples of green technology implementation, showcasing best practices and inspiring trainees to replicate successful models in their future endeavors. By studying such examples, TVET graduates will be equipped with practical insights and the confidence to initiate similar projects, further accelerating the adoption of green technologies in the region.

11.2.8. Sustainable Business Practices

This topic is important for employees and trainees working or looking for work in administrative and management fields. It instills in trainees the principles of sustainability and responsible business conduct. This comprehensive topic aims to equip future professionals with the knowledge and skills necessary to drive positive change, ensuring that businesses in the region prioritize environmental stewardship, social responsibility, and economic sustainability.

At its core, this topic will cover the principles of sustainable business, where trainees will be introduced to the concept of the triple bottom line – people, planet, and profit. They will explore strategies for integrating environmental, social, and economic considerations into business operations, highlighting the importance of balancing financial success with positive societal and environmental outcomes.

A key focus within this topic is on reducing environmental impact. Trainees will learn about resource-efficient practices, energy conservation, waste reduction, and eco-friendly product development. Understanding the significance of sustainable supply chain management and environmentally conscious decision-making will enable graduates to advocate for green practices within business settings, driving the adoption of eco-friendly alternatives.

The curriculum will also emphasize improving social responsibility, guiding trainees to consider the welfare of employees, customers, and communities. Trainees will explore principles of ethical business conduct, fair labor practices, and community engagement, fostering a sense of corporate social responsibility among future professionals. By instilling these values, TVET graduates can become advocates for positive social impact, contributing to inclusive growth and community development in the Jordan Valley.

Moreover, the topic would explore ways to enhance economic performance while maintaining sustainability objectives. Trainees will learn about innovative business

models, such as circular economy practices and social entrepreneurship, which promote profitability while advancing environmental and social goals. Understanding the interplay between economic success and sustainability will enable graduates to make informed and responsible business decisions that benefit both the bottom line and the well-being of society and the environment.

11.2.9. Electric Vehicles (EV) Technology

The Electric Vehicles (EV) Technology topic represents a significant step towards sustainable transportation in TVET programs for the Jordan Valley. This forward-looking curriculum is designed to equip trainees with the knowledge and skills necessary to contribute to the transition from conventional to electric vehicles, driving cleaner and greener mobility solutions in the region.

At its core, this topic will introduce trainees to the design, maintenance, and repair of electric vehicles, providing a comprehensive understanding of the technology behind EVs. Trainees will explore the unique components and systems of electric vehicles, including batteries, electric motors, and power electronics. Understanding the intricacies of EV technology will empower graduates to play essential roles in the assembly, servicing, and maintenance of electric vehicles, fostering a skilled workforce that supports the growing demand for cleaner transportation options in the Jordan Valley.

A key focus within this topic is on the development of charging infrastructure. Trainees will learn about the design, installation, and operation of charging stations for electric vehicles, addressing the need for a robust charging network to support the widespread adoption of EVs. By understanding charging infrastructure requirements, TVET graduates can actively contribute to building a comprehensive and accessible charging network in the region, essential for promoting the adoption of electric vehicles and facilitating sustainable mobility.

Moreover, this topic aligns with the region's commitment to reducing greenhouse gas emissions and mitigating the environmental impact of transportation. By promoting electric vehicles as a cleaner and more sustainable alternative to conventional vehicles, the Jordan Valley can take significant strides towards achieving its climate goals. Graduates of the EV Technology program will become advocates for sustainable mobility solutions, encouraging the adoption of electric vehicles and driving positive environmental change.

11.2.10. Green Agricultural Machinery

The Green Agricultural Machinery topic represents a transformative element in TVET programs for the Jordan Valley, as it empowers trainees with the expertise to operate and maintain eco-friendly agricultural machinery. This forward-looking curriculum is

designed to embrace sustainable technologies in the agricultural sector, contributing to lower carbon footprints and enhanced efficiency in farming practices.

At its core, this topic will provide comprehensive training on the operation, maintenance, and optimization of eco-friendly agricultural machinery. Trainees will gain insights into the latest advancements in sustainable agricultural equipment, including electric or solar-powered tractors and machinery with reduced emissions. Understanding the functionalities of green agricultural machinery will enable graduates to promote their adoption among local farmers, driving the transition towards cleaner and more sustainable farming practices in the Jordan Valley.

A key focus within this topic is on sustainable technologies that contribute to lowering carbon emissions. Trainees will explore the benefits of electric or solar-powered agricultural machinery, which significantly reduce greenhouse gas emissions compared to traditional diesel-powered equipment. By embracing green agricultural machinery, TVET graduates can actively contribute to mitigating the environmental impact of farming activities and promoting sustainable agriculture in the region.

11.2.11. Smart and Environmental Sustainable Pest Control

The topic equips trainees with expertise in integrated pest management (IPM) techniques. This forward-looking curriculum focuses on minimizing the use of chemical pesticides and promoting environmentally friendly approaches to pest control, ensuring ecological balance and reducing environmental impacts.

At its core, this topic will provide in-depth knowledge and skills in integrated pest management techniques. Trainees will learn how to identify pests and assess their impact on crops while understanding the principles of ecosystem dynamics. By emphasizing natural methods and biological controls, graduates will be equipped to develop sustainable pest control strategies that protect crops while minimizing adverse effects on the environment and human health.

A key focus within this topic is on innovative technologies that support smart and sustainable pest control. Trainees will explore cutting-edge approaches, such as precision agriculture and remote sensing, to monitor pest populations and implement targeted interventions. Understanding the application of smart technologies will enable TVET graduates to contribute to precision pest control, optimizing resource use and reducing the ecological footprint of pest management practices.

11.2.12. Sustainable Food Processing and Supply Chain

This topic focuses on environmentally friendly and energy-efficient food processing techniques. This comprehensive curriculum encompasses post-harvest handling,

preservation, and packaging, aiming to create a more sustainable and resilient food system in the region.

At its core, this topic will provide extensive training on environmentally friendly food processing techniques. Trainees will learn about energy-efficient methods and technologies that reduce the environmental impact of food processing while ensuring food safety and quality. By embracing sustainable practices in food processing, graduates will be equipped to drive positive change in the food industry, contributing to a more sustainable and responsible approach to food production.

A key focus within this topic is on post-harvest handling and preservation techniques. Trainees will gain insights into methods for reducing food waste, enhancing food shelf life, and preserving nutritional value. Understanding the importance of efficient post-harvest practices will enable TVET graduates to promote sustainable food processing methods that contribute to a more efficient and resource-conscious food supply chain.

Moreover, this topic encompasses sustainable supply chain management practices. Trainees will explore strategies for efficient transportation, sustainable sourcing, and reduced food waste throughout the supply chain. By optimizing supply chain operations, graduates can play a vital role in building a more resilient and environmentally conscious food system in the Jordan Valley.

11.3. Recommendations for YMCA Curriculum Enhancement

Currently, and through the Lutheran World Foundation, several curricula are being reviewed and new ones are being developed. From the review of the existing “Sustainable Agriculture and Home Gardening” curriculum that is based on the principles of permaculture; the following are recommendations that are noteworthy of consideration when reviewing and updating the curricula to ensure that the curriculum is up-to-date and relevant to the current climate and agricultural landscape, several enhancements are recommended:

- **Segregate Topics:** The current curriculum combines a plethora of topics under one program. It would be beneficial to have dedicated programs for apiculture, aquaponics, composting, renewable energy, sustainable agriculture, and so on.
- **Update Terminology:** Include a comprehensive glossary of key agricultural, environmental, and climate terminology. This will equip students with the necessary vocabulary to fully understand and engage with the material.
- **Incorporate Climate Change:** Integrate climate change resilience into each chapter, discussing its effects on each topic and how these challenges can be

mitigated. This will provide students with a more comprehensive understanding of the pressing issue of climate change and its impact on agriculture.

- **Local Relevance:** Ensure all topics are relevant to the local context. This could involve discussing the specific challenges and opportunities related to sustainable agriculture in the Jordan Valley and Palestine in general, and tailoring the content to address these specifics.
- **Modern Practices:** Update the curriculum with modern sustainable practices such as direct seeding, seed bombs, mulching, and hydroponics. This will ensure that students are up-to-date with the latest techniques and practices in the field of sustainable agriculture.
- **Climate Change Frameworks:** Include a comprehensive overview of important climate change agreements and initiatives, such as the Paris Agreement, the Agenda 21, the SDGs, and national adoption plans. This will provide students with a better understanding of the global efforts to combat climate change and the role of sustainable agriculture in these efforts.
- **Sustainable Packaging and Waste Management:** Discuss the importance of sustainable packaging and waste management in the chapters on Clean Energy and Recycling and Healthy Nutrition. This will provide students with a more comprehensive understanding of the lifecycle of agricultural products and the importance of sustainability at every stage.
- **Update Building Practices:** Replace the outdated building methods currently discussed in the curriculum with more relevant and up-to-date sustainable building practices used in the local context.
- **Localize Urban Agriculture:** Discuss the specific challenges and opportunities related to sustainable agriculture in Palestinian cities, and provide examples of successful urban agriculture initiatives in the local context.
- **Include Ecotourism:** Discuss the potential benefits and applications of therapeutic gardening in the context of ecotourism, providing students with a broader understanding of the field.

12. Sustainable and Green ATVET Curriculum Preparation Guideline and Suggested Template

12.1. Overview

As presented in this study, there is a systematic lack of ATVET curricula in the Jordan Valley region, despite the region making up over 20% of the West Bank area and where over 30% of its lands being agricultural cultivated¹³. Additionally, it was highlighted that efforts aiming to address TVET in general and ATVET in particular are fragmented and uncoordinated, where the relevant TVET institutions partaking in ATVET have been identified and their current and prospective interventions have been highlighted.

As such, and based on the previous conclusions and recommendations section, it was evident that there is a need to develop ATVET curricula that focus on sustainable and green practices, given that there is only one ATVET curriculum provided by the YMCA that deals with Sustainable Practices in Agriculture. Hence, and having identified the gaps in the existing curricula, as well as devising recommendations for the integration of green and sustainable skills into ATVET curricula, it was clear that there is a need to develop a systematic and comprehensive curriculum that integrates and includes the recommendations and findings of this study, which will serve as a basis for further development of subsequent and topic-specific Sustainable and Green ATVET curricula.

This section serves as a guideline for the development of a comprehensive ATVET curriculum that merges the recommendations of this study, the identified needed topics, and addresses the gaps highlighted in TVET and ATVET in the region. The topics included herein have been carefully selected based on the gap assessment between skill and capacity building being currently provided, the labor and skill needs of the private sector that have been identified over the various engagement activities, and the science and data regarding the impacts of climate change and the skills needed to mitigate its impacts and build towards an adaptive and resilient economy in the Jordan Valley region.

12.2. Structure

While formulating this guideline, the pivotal role of the ninth chapter within this study involving international best practices and lessons has been paramount. Despite the

¹³ The potential for agriculture is much higher, but due to Israeli restrictions on land use and the various geopolitical factors governing the region, the number is estimated to be significantly higher as most of the Jordan Valley land is arable.

unique environmental and socio-economic characteristics of the Jordan Valley region, the inclusion of successful models from other countries has served as a valuable platform for learning. These models contribute insights into the integration of highly effective practices, ATVET (Agricultural Technical and Vocational Education and Training) topics, and delivery methods. This integration aims to ensure a seamless and efficacious assimilation of green and sustainable practices into the educational process.

Particular emphasis has been placed on adopting the German and Austrian DualVET methodology. This choice is substantiated by its comprehensive approach, encompassing both classroom-based learning methodologies and practical hands-on experience. Notably, this approach extends beyond the confines of academic settings to real-world environments, with direct implementation in private sector institutions. By doing so, it reinforces the potential for training programs to end up in employment opportunities.

Furthermore, considering that Palvision presently undertakes cost-sharing employment initiatives within the agricultural sector, the project possesses the capacity to endorse partial employment for trainees. This encourages private sector involvement in their training and underscores the commitment to cost-sharing in their employment until the successful culmination of the program and ATVET training course.

12.3. Proposed Topics and Curriculum

12.3.1. INTRODUCTION TO SUSTAINABILITY

12.3.1.1. *Theoretical Modules*

I. Importance of Sustainability:

- Definition of sustainability and its significance in various contexts, including agriculture.
- Explanation of how sustainable practices can address environmental, social, and economic challenges.

II. Green Skills and Their Relevance:

- Definition of green skills and their growing importance in today's workforce.
- Explanation of how green skills contribute to sustainable practices in agriculture.

III. Circular Economy and Its Principles:

- Definition of circular economy and its application in agriculture.

- Explanation of how circular economy principles promote resource efficiency and reduced waste as well as its economic potential and monetization values.
- IV. Climate Change Overview:
- Definition of climate change and its causes, including human activities and natural factors.
 - Exploration of the link between climate change and the agriculture sector.
- V. Impacts of Climate Change:
- Discussion of current and projected impacts of climate change on agriculture, including shifts in weather patterns, water availability, and crop productivity.
- VI. Local Impact on the Jordan Valley:
- Examination of how climate change and sustainability issues specifically affect the Jordan Valley region.
 - Identification of vulnerabilities, such as water scarcity, temperature changes, and soil degradation.
- VII. Adaptation and Mitigation Strategies:
- Introduction to adaptation strategies for minimizing the impacts of climate change on agriculture.
 - Exploration of mitigation strategies to reduce greenhouse gas emissions and promote sustainability.
- VIII. International Efforts; Paris Agreement, Sustainable Development Goals (SDGs), Sindai Framework and others:
- Overview of the United Nations' Sustainable Development Goals and their relevance to agriculture and the environment.
 - Overview of international Agreements, conventions, and projects that aim to combat climate change and their relevance to the region.
- IX. Food and Resource Security
- Overview of the Food-Energy-Water Nexus
 - Overview of Food Security situation in Palestine and examples from countries that successfully managed efforts towards achieving their food-water-energy security.
- X. Case Studies and Success Stories:
- Examination of real-world case studies highlighting successful sustainability initiatives in agriculture from around the world.

- Analysis of the lessons learned and potential applications in the Jordan Valley context.

12.3.1.2. *Practical Modules*

I. Practical Module 1: Sustainability Assessment

- **Objective:** Students assess the sustainability practices of a local agricultural operation.
- **Activities:** Students visit a local farm or agricultural site to evaluate its practices against sustainability criteria. They analyze factors like water usage, waste management, energy efficiency, and use of renewable resources.
- **Outcomes:** Students learn to evaluate real-world scenarios using sustainability principles and identify areas for improvement.

II. Practical Module 2: Climate Change Impact Assessment

- **Objective:** Students assess the local impact of climate change on agriculture.
- **Activities:** Students collect data on temperature, precipitation, and other relevant factors over a period of time. They analyze the data to understand trends and potential implications for local crops and ecosystems.
- **Outcomes:** Students gain practical skills in data collection, analysis, and interpretation related to climate change's impact on agriculture.

12.3.2. Circular Economy

12.3.2.1. *Theoretical Modules*

I. Understanding Circular Economy Principles

- Introduction to the concept of circular economy and its application in various industries, including agriculture.
- Explanation of the principles of circularity: reduce, reuse, recycle, and regenerate.
- Case studies illustrating successful circular economy initiatives in agriculture.

II. Circular Economy Strategies in Farming

- Exploration of circular economy strategies applicable to different aspects of farming, such as inputs, outputs, and waste management.
- Discussion of approaches like closed-loop systems, resource optimization, and product life extension.
- Examples of circular economy practices in crop cultivation, animal husbandry, and agribusiness.

III. Waste Minimization and Resource Efficiency

- Examination of techniques for reducing waste and optimizing resource utilization in agriculture.
- Implementation of strategies to minimize packaging waste, repurpose byproducts, and reduce excess inputs.

IV. Circular Economy and Agricultural Value Chains

- Understanding circular economy implications across the entire agricultural value chain, from production to consumption.
- Analysis of how circular practices influence supply chain management, distribution, and consumer behavior.
- Exploration of partnerships and collaborations that promote circularity within the industry. Reflection of potentials on local markets and the region's agricultural supply chain.

V. Sustainable Packaging and Processing

- Focus on sustainable packaging solutions that align with circular economy principles.
- Evaluation of packaging materials, design, and end-of-life options.
- Discussion of circular approaches to food processing and the reduction of food loss.

VI. Reuse and Recycling in Agriculture

- Exploration of options for reusing materials and recycling agricultural byproducts.
- Case studies highlighting innovative recycling practices, such as converting waste into bioenergy or compost.
- Review of local context in the Jordan Valley, obstacles that face solid waste management and the application of reuse and recycling. Review of options to integrate circular economy given the local context.

VII. Circular Economy and Market Opportunities

- Introduction to the economic benefits of circular economy practices for farmers, businesses, and consumers.
- Discussion of market demand for sustainably produced agricultural products.
- Analysis of business models that align with circular economy principles.

VIII. Composting¹⁴

- Understanding the fundamentals of composting as a natural decomposition process. Exploring the components of successful composting: organic matter, moisture, aeration, and microorganisms. Learning the aerobic composting process: waste breakdown, temperature management, and nutrient-rich humus formation. Discussing the importance of proper C:N (Carbon to Nitrogen) ratio and its impact on the composting process.
- Exploring composting techniques suitable for different scales: home, community, and industrial operations.
- Understanding home composting methods like bin composting, vermiculture (worm composting), and trench composting.
- Analyzing industrial composting processes such as windrow, static pile, and in-vessel systems for larger organic waste management.
- Identifying key factors that impact composting success in the region.
- Understanding local climate conditions and how they affect moisture retention and microbial activity.
- Analyzing the types of organic waste materials available locally and their suitability for composting.
- Discussing the importance of proper site selection, aeration, and turning frequency for efficient composting.
- Addressing challenges like odors, pests, and disease management in composting operations.

12.3.2.2. *Practical Modules*

I. Practical Module 1: Waste Audit and Reduction Plan

- **Objective:** Students conduct a waste audit to identify sources of waste in a local agricultural setting.

¹⁴ It is advised to harmonize this module with the YMCA's composting chapter. The YMCA have conducted successful trainings and their experience would be beneficial in devising an effective training chapter.

- **Activities:** Students collect data on waste generation, categorize waste types, and analyze trends. They develop a waste reduction plan that incorporates circular economy principles, such as reusing and recycling.
- **Outcomes:** Students learn practical skills in data collection, analysis, and waste reduction planning. They gain an understanding of how circular economy principles can be applied to minimize waste in agriculture.

II. Practical Module 2: Agribusiness Waste-to-Value Project

- **Objective:** Students develop a waste-to-value project that transforms agricultural waste into profitable products.
- **Activities:** Students identify a local waste stream (e.g., fruit peels) and create a small-scale enterprise producing value-added products like biochar, or natural dyes.
- **Outcomes:** Students witness how circular practices can generate income by converting waste into marketable goods, fostering entrepreneurship in a marginalized region.

III. Practical Module 3: Community Space Composting

- **Objective:** Gain hands-on experience in composting techniques suitable for home and community-level applications.
- **Activities:** Students collaboratively plan a composting project for a community space. They select a suitable composting method based on available resources and space (e.g., bin, vermiculture, trench). They divide tasks among students: setup, maintenance, turning, monitoring, troubleshooting. Each student group is responsible for a specific phase of the composting process. Monitor the compost piles collectively and address any challenges that arise. Assess compost maturity and quality, and discuss the potential use of finished compost.
- **Outcomes:** By participating in the community composting initiative, students will acquire practical skills in planning, implementing, and managing composting projects at the home and community scale. They will gain hands-on experience in various composting techniques, teamwork, problem-solving, and the importance of sustainable waste management practices within their local community.

12.3.3. Resource Efficiency: Water and Electricity

12.3.3.1. Theoretical Modules

I. Water Efficiency Principles

- Understanding the significance of water conservation in agriculture and daily life.
- Exploring water efficiency techniques: drip irrigation, rainwater harvesting, and soil moisture management among others.
- Analyzing case studies of successful water-efficient practices in agricultural contexts.

II. Smart Irrigation and Precision Water Management

- Introduction to smart irrigation systems and precision water management.
- Exploring technologies like soil moisture sensors, weather data integration, and automated irrigation control.
- Understanding how smart irrigation optimizes water usage and minimizes waste.

III. Sensors and Optimization in Agriculture

- Exploring the role of sensors in resource-efficient agriculture.
- Understanding sensor applications for monitoring soil moisture, temperature, humidity, and plant health.
- Analyzing how sensor data can inform decision-making and optimize resource usage.
- Examples of sensors, types, data reading exercise, and the indicators.

IV. Energy Audits in Agriculture

- Introduction to energy audits and their importance in assessing resource usage.
- Exploring the steps involved in conducting an energy audit.
- Understanding how energy audits help identify areas for energy-saving improvements.
- Exploring certificates, and further career development opportunities in energy auditing such as LEED certificates.

V. Energy Efficiency Methods and Possibilities

- Overview of energy-efficient practices in agriculture.
- Exploring methods to reduce energy consumption, such as optimizing equipment usage, adopting energy-efficient technologies, and implementing renewable energy solutions.
- Analyzing the economic and environmental benefits of energy efficiency.

12.3.3.2. Practical Modules

I. Practical Module 1: Designing Water-Efficient Irrigation Systems

- **Objective:** Students design and set up a water-efficient irrigation system.
- **Activities:** Students plan and install a drip irrigation system or rainwater harvesting system for a small plot. They calculate water flow rates, layout design, and water distribution.
- **Outcomes:** Students gain practical skills in designing and implementing water-efficient irrigation methods.

II. Practical Module 2: Smart Irrigation and Sensor Installation

- **Objective:** Students experience smart irrigation technologies and sensor-based water management.
- **Activities:** Students set up soil moisture sensors, weather stations, or automated irrigation controllers. They configure sensors, collect data, and adjust irrigation schedules based on real-time data.
- **Outcomes:** Students learn how to integrate technology to optimize water use in agriculture.

III. Practical Module 3: Energy Auditing in Agricultural Settings

- **Objective:** Students conduct energy audits on agricultural facilities to identify energy-saving opportunities.
- **Activities:** Students perform on-site energy audits, collecting data on equipment, lighting, and energy usage patterns. They analyze the data and propose energy-saving solutions.
- **Outcomes:** Students gain skills in energy auditing and understand how to identify and prioritize energy efficiency improvements.

IV. Practical Module 4: Energy-Efficient Equipment Implementation

- **Objective:** Students learn to optimize equipment usage for energy efficiency.

- **Activities:** Students assess different agricultural machinery and equipment to identify energy-efficient models. They operate and maintain equipment following energy-efficient practices.
- **Outcomes:** Students understand how selecting and using energy-efficient equipment can contribute to reduced energy consumption.

12.3.4. Renewable Energy¹⁵

12.3.4.1. Theoretical Modules

I. Introduction to Renewable Energy

- Understanding the importance of renewable energy sources for sustainability.
- Exploring various types of renewable energy: solar, wind, hydro, geothermal, and biomass.
- Analyzing the feasibility and applicability of different renewable energy sources in the Jordan Valley region.

II. Solar Energy Fundamentals

- Introduction to solar energy as a clean and abundant renewable resource.
- Understanding the solar energy conversion process through photovoltaic cells and solar thermal systems.
- Analyzing the advantages and limitations of solar energy technologies in the context of the Jordan Valley area.

III. Solar Energy Site Assessment

- Exploring the key factors for assessing the suitability of a site for solar energy projects.
- Understanding how geographic conditions, solar irradiance, shading, and orientation impact energy production.
- Analyzing the steps involved in conducting a solar energy site assessment.

IV. Solar Energy System Design and Installation

- Exploring the components and configurations of solar energy systems.
- Understanding system sizing, layout design, and energy production estimation.

¹⁵ This module is advised to be aligned with MoL Modules on Renewable (solar) energy

- Analyzing the steps for proper installation of solar energy systems, including electrical connections and mounting structures.

V. Solar Energy System Operation and Maintenance

- Understanding the operation and maintenance requirements of solar energy systems.
- Exploring best practices for system monitoring, performance evaluation, and troubleshooting.
- Analyzing the economic benefits of regular maintenance and efficient system operation.

VI. Integrating Solar Energy in Agriculture

- Exploring innovative applications of solar energy in agricultural practices.
- Understanding solar-powered irrigation systems, agrovoltaics (combining solar panels with farming), and solar-powered livestock management.
- Analyzing the potential of solar energy to enhance agricultural productivity and sustainability.
- Integration of water supply, irrigation systems, pumps and other farm components with solar energy technologies.

VII. Solar Energy Project Economics

- Understanding financing options for solar energy projects.
- Exploring investment models, return on investment, feasibility of solar installations and other financial indicators.
- Analyzing financial considerations when planning and implementing solar energy projects.

12.3.4.2. *Practical Modules*

I. Practical Module 1: Solar Site Assessment and Mapping

- **Objective:** Students assess a site for its solar energy potential and map solar irradiance.
- **Activities:** Students use solar measurement tools to collect data on solar irradiance at different locations. They create solar maps indicating areas with optimal sun exposure.
- **Outcomes:** Students gain skills in site assessment and understand how to identify the best locations for solar installations.

II. Practical Module 2: Designing and Building a Solar Photovoltaic System

- **Objective:** Students design and construct a small-scale solar photovoltaic system.
- **Activities:** Students select components (solar panels, inverters, wiring), design the layout, and install the system on a test setup. They connect the system to power small appliances.
- **Outcomes:** Students acquire practical knowledge of solar system design, installation, and wiring.

III. Practical Module 3: Solar-Powered Irrigation System Setup

- **Objective:** Students design and install a solar-powered irrigation system for a small garden or water pump.
- **Activities:** Students select appropriate components (solar panels, pumps, drip lines), design the system layout, and install the irrigation setup. They observe the system in operation.
- **Outcomes:** Students understand how solar energy can be used to power agricultural practices.

IV. Practical Module 4: Solar Energy System Maintenance Workshop

- **Objective:** Students learn hands-on maintenance skills for solar energy systems.
- **Activities:** Students perform basic maintenance tasks, such as cleaning solar panels, checking connections, and troubleshooting common issues. They practice safety protocols.
- **Outcomes:** Students gain practical skills to ensure the proper functioning of solar energy installations.

12.3.5. Smart and Sustainable Agriculture

12.3.5.1. *Theoretical Modules*

I. Introduction to Smart and Sustainable Agriculture

- Understanding the significance of adopting smart and sustainable practices in agriculture.
- Exploring the principles of resource efficiency, precision agriculture, and integrated pest management.
- Analyzing the benefits of smart and sustainable agriculture for marginalized communities.

II. Precision Agriculture Techniques

- Exploring precision agriculture technologies for optimized resource usage.
- Understanding global positioning systems (GPS), remote sensing, and Geographic Information Systems (GIS) in agriculture.
- Analyzing how precision agriculture enhances yield, reduces input wastage, and improves resource allocation.

III. Sustainable Soil Management

- Exploring soil conservation and management techniques.
- Understanding soil erosion prevention, cover cropping, organic matter enrichment, and soil fertility maintenance.
- Analyzing the importance of soil health for sustainable crop production.

IV. Water-Efficient Crop Cultivation

- Introduction to water-efficient crop cultivation practices.
- Exploring techniques such as mulching, crop rotation, and rain-fed farming to conserve water.
- Analyzing how water-efficient methods contribute to agricultural sustainability in water-scarce regions.

V. Agroecology and Biodiversity Enhancement

- Understanding the principles of agroecology and biodiversity conservation in agriculture.
- Exploring practices like agroforestry, polyculture, and habitat creation to promote biodiversity.
- Analyzing the role of agroecological approaches in enhancing ecosystem resilience and sustainability.

VI. Digital Agriculture and Farm Management

- Introduction to digital tools for farm management and decision-making.
- Understanding farm management software, data analytics, and relevant devices.
- Analyzing how digital agriculture enhances efficiency, reduces risks, and improves yield prediction.

VII. Climate-Resilient Farming Practices

- Exploring farming practices that enhance resilience to climate change impacts.
- Understanding techniques like crop diversification, soil moisture management, and drought-tolerant crop varieties.
- Analyzing how climate-resilient practices mitigate risks and ensure agricultural sustainability.

12.3.5.2. *Practical Modules*

I. Practical Module 1: Precision Agriculture Field Demonstration

- **Objective:** Students experience precision agriculture techniques in action.
- **Activities:** Students use GPS and mapping tools to delineate planting zones. They collect soil samples and analyze data to make informed decisions about planting density and nutrient application.
- **Outcomes:** Students gain practical skills in precision agriculture and understand its benefits.

II. Practical Module 2: Sustainable Soil Management Techniques

- **Objective:** Students practice sustainable soil management techniques.
- **Activities:** Students set up cover cropping plots, create compost, and assess soil health using simple tests. They learn about erosion prevention methods and practice applying mulch.
- **Outcomes:** Students gain practical experience in maintaining healthy soils and conserving soil resources.

III. Practical Module 3: Water-Efficient Irrigation Setup

- **Objective:** Students design and set up a water-efficient irrigation system.
- **Activities:** Students implement techniques like drip irrigation and use rainwater harvesting systems. They calculate water requirements and establish efficient watering schedules.
- **Outcomes:** Students learn to optimize water usage for crop production.

IV. Practical Module 4: Digital Farm Management Simulation

- **Objective:** Students simulate farm management using digital tools.

- **Activities:** Students use farm management software to plan crop rotations, schedule irrigation, and monitor yields. They analyze data to make informed decisions.
- **Outcomes:** Students gain experience in using digital tools for efficient farm management

V. Practical Module 5: Climate-Resilient Farming Experimentation

- **Objective:** Students experiment with climate-resilient farming techniques.
- **Activities:** Students grow different crop varieties with varying levels of drought resistance. They assess how these crops perform under different water availability scenarios.
- **Outcomes:** Students learn to adapt farming practices to changing climate conditions.

12.3.6. Smart and Sustainable Pest Management

12.3.6.1. Theoretical Modules

I. Introduction to Smart and Sustainable Pest Management

- Understanding the importance of pest management in sustainable agriculture.
- Exploring the negative impacts of chemical pesticides on the environment and human health.
- Introducing the concept of integrated pest management (IPM) as an alternative approach.
- Highlighting the economic benefits of smart and sustainable pest management practices.
- Highlighting most common pest problems in the region particularly for date palms.

II. Principles of Integrated Pest Management (IPM)

- Exploring the core principles of IPM: prevention, monitoring, suppression, and intervention.
- Understanding the ecological approach to pest management, considering pest life cycles and natural enemies.
- Analyzing the role of cultural practices, crop rotation, and resistant crop varieties in pest control.
- Discussing the importance of threshold levels in determining when intervention is necessary.
- Exploring the application of IPM in the region and for common pest problems.

III. Biological Pest Control Methods

- Introduction to biological control as a key component of smart pest management.
- Exploring methods such as releasing beneficial insects, using predators and parasitoids, and introducing pathogens.
- Understanding the advantages of biological control in reducing pest populations sustainably.
- Analyzing case studies of successful biological pest control implementation in various crops.

IV. Cultural and Mechanical Pest Management Techniques

- Exploring cultural practices that reduce pest infestations, such as crop spacing and intercropping.
- Understanding mechanical methods like traps, barriers, and physical removal of pests.
- Analyzing how cultural and mechanical techniques contribute to minimizing pest damage.

V. Natural Pesticides and Biopesticides

- Understanding the concept of natural pesticides derived from plant extracts, minerals, or other natural sources.
- Exploring the benefits and limitations of using biopesticides to manage pests effectively.
- Analyzing the role of biopesticides in reducing environmental pollution and promoting safe pest control.

VI. Monitoring and Decision-Making in Pest Management

- Introducing techniques for pest monitoring and identification.
- Understanding the importance of accurate pest population assessment and data collection.
- Exploring decision-making processes based on pest thresholds and economic considerations.
- Analyzing the use of technology, such as pheromone traps and remote sensing, in pest monitoring.

VII. Economic and Environmental Benefits of Smart Pest Management

- Analyzing the economic advantages of adopting smart and sustainable pest management practices.
- Understanding how reduced chemical pesticide use leads to cost savings and increased profitability.
- Exploring the environmental benefits, including reduced pesticide runoff, soil and water contamination, and non-target species impact.

12.3.6.2. *Practical Modules*

I. Practical Module 1: Beneficial Insect Release and Monitoring

- **Objective:** Gain practical skills in deploying beneficial insects for pest control and monitoring their impact.
- **Activities:** Students will release beneficial insects in designated areas and observe their behavior. They will monitor pest populations, beneficial insect presence, and plant health over time. Students will analyze collected data to assess the effectiveness of beneficial insects in reducing pests.
- **Outcomes:** Students will acquire hands-on experience in deploying and monitoring biological control agents. They will be able to assess the ecological dynamics of pest-natural enemy interactions and recognize the value of beneficial insects in integrated pest management.

II. Practical Module 2: Cultivation of Trap Crops for Pest Management

- **Objective:** Learn to grow trap crops that attract pests away from main crops for enhanced pest control.
- **Activities:** Students will select suitable trap crops and cultivate them alongside target crops. They will monitor pest activity on trap crops and assess the effectiveness of diverting pests away from main crops. Students will record observations and evaluate the potential of trap cropping in pest management.
- **Outcomes:** Students will acquire practical skills in implementing trap cropping strategies. They will understand how trap crops can contribute to reducing pest impact on main crops and explore options for sustainable pest management.

III. Practical Module 3: Application of Biopesticides in the Field

- **Objective:** Apply biopesticides as an alternative to chemical pesticides for pest management.
- **Activities:** Students will prepare and apply biopesticides on infested plants in the field. They will monitor the treated plants and assess the impact on pest

populations. Students will analyze data to determine the effectiveness of biopesticides in pest suppression and compare results to untreated control plants.

- **Outcomes:** Students will develop practical proficiency in preparing and applying biopesticides. They will gain insight into the potential of biopesticides as an eco-friendly alternative to chemical pesticides in sustainable pest control.

12.3.7. Modern Agricultural Technologies

12.3.7.1. Theoretical Modules

I. Introduction to Smart and Modern Agricultural Technologies

- Agricultural technology evolution and its impact on sustainable farming practices.
- Role of smart technologies in enhancing efficiency, productivity, and resource management.
- Overview of modern agricultural equipment, machinery, and their benefits.
- Introduction to electric vehicles, solar-powered equipment, and their relevance in agriculture.

II. Solar-Powered Agricultural Equipment

- Understanding the concept of solar-powered equipment in agriculture.
- Exploring solar water pumps, solar-powered irrigation systems, and their advantages.
- Analysis of cost savings, energy efficiency, and environmental benefits.
- Case studies of successful implementation of solar-powered equipment in agriculture.

III. Electric Vehicles and Machinery in Agriculture

- Introduction to electric vehicles and machinery for sustainable farming.
- Advantages of electric vehicles over traditional fuel-powered counterparts.
- Discussion on electric tractors, vehicles, and their contribution to emission reduction.
- Exploring challenges and opportunities in adopting electric vehicles in agriculture.

IV. Precision Agriculture and IoT

- Understanding precision agriculture as a technology-driven approach to farming.
- Role of IoT (Internet of Things) in collecting real-time data for informed decision-making.
- Applications of precision agriculture in variable-rate fertilization, irrigation, and pest management.
- Benefits of reducing input wastage and optimizing resource utilization.

V. Drones and Remote Sensing

- Exploring the use of drones and remote sensing in agriculture.
- Applications in crop monitoring, disease detection, and yield estimation.
- Understanding aerial imagery, multispectral data, and their interpretation.
- Discussing the potential of drones in reducing labor and improving data accuracy.

VI. Vertical Farming and Hydroponics

- Introduction to vertical farming and hydroponics as innovative growing methods.
- Exploring controlled environment agriculture and its advantages.
- Understanding vertical stacking, LED lighting, and nutrient solutions in vertical farming.
- Analyzing how vertical farming addresses space limitations and water conservation.

VII. Robotics and Automation in Agriculture

- Role of robotics and automation in labor-intensive tasks in agriculture.
- Applications in planting, harvesting, weeding, and sorting.
- Understanding the potential for reducing labor dependency and increasing efficiency.

12.3.8. Eco and Agro Tourism

12.3.8.1. *Theoretical Modules*

I. Introduction to Eco and Agro Tourism

- Understanding the concept and importance of eco and agro tourism.
- Exploring the potential economic, environmental, and social benefits.
- Discussion on how agro tourism contribute to sustainable development.

- Introduction to the principles of responsible and ethical tourism practices.

II. Benefits of Agro-Tourism

- Analyzing the economic advantages and financial returns of agro tourism projects.
- Understanding the role of tourism in diversifying the local economy and creating employment.
- Exploring how agro tourism can promote cultural preservation and community engagement.
- Case studies showcasing successful agro tourism initiatives and their impacts.

III. Developing Agro-Tourism Projects

- Step-by-step guide to conceptualizing and planning an agro-tourism project.
- Identifying potential attractions, accommodations, and facilities for visitors.
- Understanding the importance of site selection, accessibility, and infrastructure development.
- Understanding the components of agro-tourism projects such as fruit trees, lodgings, parks, and attractions.
- Understanding and identifying sources of revenue in agro-tourism projects.

IV. Sustainable Management and Operations

- Exploring sustainable practices in managing and operating agro-tourism projects.
- Understanding waste management, water conservation, and energy efficiency.
- Discussing visitor management strategies to minimize environmental impact.
- Integrating local communities and cultural heritage in project operations.

V. Marketing and Promotion of Eco and Agro Tourism

- Strategies for effectively marketing and promoting agro-tourism projects.
- Utilizing digital platforms, social media, and partnerships for visibility.
- Understanding the importance of storytelling and showcasing authentic experiences.
- Analyzing market segmentation and targeting to attract diverse visitor profiles.

VI. Community Engagement and Socio-Cultural Aspects

- Highlighting the role of local communities in agro- tourism projects.

- Understanding community engagement, empowerment, and equitable benefits.
- Discussing the importance of preserving cultural heritage and traditions.
- Exploring potential challenges and conflicts in managing community interactions.

VII. Best Practices and Lessons Learned

- Learning from successful eco and agro tourism case studies around the world.
- Identifying best practices in project development, management, and sustainability.
- Analyzing lessons learned from challenges faced and their resolutions.
- Discussing the potential for replicating successful models in the Jordan Valley region.

12.3.8.2. *Practical Modules*

I. Practical Module: Designing Agro-Tourism Project Components

- **Objective:** Develop the components of an agro-tourism project based on identified attractions.
- **Activities:** Students will work in groups to design project components, including accommodation, guided tours, workshops, and interactive experiences. They will outline schedules, visitor interactions, and engagement strategies. Each group will present their project components and receive feedback.
- **Outcomes:** Students will acquire hands-on experience in designing comprehensive agro-tourism projects. They will understand how to structure diverse activities and offerings to engage visitors effectively.

12.3.9. Sustainable Food Processing, Agro-Manufacturing, and Quality Assurance

12.3.9.1. *Theoretical Modules*

I. Introduction to Food Processing and Agro-Manufacturing

- Understanding the significance of food processing in agricultural value chains.
- Exploring the role of agro-manufacturing in adding value to local products.
- Discussion on the importance of sustainable practices in food processing.
- Introduction to quality assurance and its impact on product safety and consumer satisfaction.

II. Sustainable Practices in Food Processing

- Analyzing sustainable techniques in food processing, including energy-efficient methods.
- Exploring minimally processed and value-added products for local markets.
- Discussion on waste reduction, by-product utilization, and eco-friendly packaging.
- Case studies highlighting successful implementation of sustainable food processing practices.

III. Quality Assurance and Food Safety Management

- Understanding the principles of quality assurance in food processing.
- Exploring the importance of traceability, hygiene, and compliance with standards.
- Discussion on HACCP (Hazard Analysis and Critical Control Points) and its application.
- Introduction to food safety regulations and their implications for agro-manufacturing.

IV. Post-Harvest Handling and Preservation Techniques

- Exploring post-harvest handling practices that enhance product quality and shelf life.
- Understanding different preservation methods, such as drying, canning, and freezing.
- Discussion on maintaining nutritional value during preservation.
- Analyzing the economic benefits of proper post-harvest handling and preservation.

V. Processing Local Agricultural Products

- Investigating the processing of specific local products like dates, herbs, and Palestinian varieties.
- Understanding the unique challenges and opportunities in processing these products.
- Exploring traditional processing techniques and their modern adaptations.
- Analyzing market trends and consumer preferences for locally processed goods.

VI. Market Access and Distribution Strategies

- Analyzing market entry strategies for locally processed agro-products.

- Understanding distribution channels, retail partnerships, and online platforms.
- Discussion on building consumer trust and loyalty through transparent practices.
- Exploring opportunities for export and tapping into niche markets.

12.3.9.2. *Practical Modules*

I. Practical Module 1: Developing a Value-Added Product

- **Objective:** Gain hands-on experience in creating a value-added agro-product.
- **Activities:** Students will choose a local agricultural product (e.g., herbs, dates) and design a value-added product. They will develop a processing plan, considering sustainable practices and quality assurance. Students will prepare a prototype of their product and present it to the class, discussing processing methods, ingredients, and packaging.
- **Outcomes:** Students will learn how to transform raw agricultural products into value-added goods. They will understand the importance of product innovation, quality, and market readiness.

II. Practical Module 2: Scaling Up Production

- **Objective:** Experience the challenges and considerations of scaling up food processing operations.
- **Activities:** Students will assess value-added product for scalability. They will identify potential bottlenecks, process modifications, and equipment needs for larger-scale production. Students will discuss strategies for maintaining product consistency and quality during scaling up.
- **Outcomes:** Students will understand the complexities of transitioning from small-scale to commercial production in the agro-manufacturing sector.

12.3.10. Sustainable Structures and Building Material – Agricultural Uses

12.3.10.1. *Theoretical Modules*

I. Introduction to Sustainable Building Practices

- Understanding the significance of sustainable building practices in the agricultural sector.
- Exploring the challenges and opportunities of building within restrictions.
- Discussion on resource-efficient construction methods and their benefits.
- Introduction to green building certifications and their relevance.

II. Building Materials for Agricultural Structures

- Analyzing suitable building materials for agricultural structures in the Jordan Valley.
- Exploring locally available materials that align with building restrictions.
- Discussion on the properties of materials like adobe, compressed earth blocks, and recycled materials.
- Understanding how material selection influences structural integrity and energy efficiency.

III. Design Considerations for Agricultural Structures

- Exploring design principles for agricultural structures in constrained environments.
- Understanding load-bearing capacities, wind resistance, and thermal insulation.
- Discussion on optimizing layout, orientation, and natural ventilation.
- Analyzing case studies of innovative agricultural structure designs.

IV. Greenhouse Construction and Technology

- Understanding greenhouse construction techniques suitable for the region.
- Exploring materials for greenhouse frames, covering, and shading.
- Discussion on climate control systems, irrigation integration, and automation.
- Analyzing the potential of controlled environment agriculture in arid regions.

V. Storage Solutions and Water Harvesting Structures

- Investigating sustainable storage solutions for agricultural produce and equipment.
- Understanding materials and design principles for storage buildings.
- Discussion on rainwater harvesting systems and their integration.
- Exploring water storage structures to address water scarcity challenges.

VI. Energy-Efficient Structures and Solar Applications

- Exploring energy-efficient design strategies for agricultural buildings.
- Understanding passive solar design, insulation, and natural lighting.
- Discussion on the integration of solar panels and renewable energy systems.

- Analyzing the benefits of energy-efficient structures in resource-constrained regions.

VII. Case Studies and Best Practices

- Learning from case studies of sustainable agricultural structures around the world.
- Analyzing best practices in design, material selection, and construction techniques.
- Understanding the potential of adaptive reuse and repurposing of existing structures.
- Discussing lessons learned from overcoming challenges in building within restrictions.

12.3.10.2. *Practical Modules*

I. Practical Module 1: Designing a Greenhouse for Arid Climates

- **Objective:** Gain practical experience in designing a greenhouse suitable for arid climates.
- **Activities:** Students will work in teams to design a greenhouse that considers factors like orientation, ventilation, shading, and water management. They will use sustainable building materials and incorporate passive climate control strategies. Each team will present their greenhouse designs, explaining their material choices and design rationale.
- **Outcomes:** Students will learn how to apply sustainable design principles to greenhouse construction, addressing the unique challenges of arid climates.

II. Practical Module 2: Rainwater Harvesting System Design

- **Objective:** Develop skills in designing rainwater harvesting systems for agricultural buildings.
- **Activities:** Students will design rainwater harvesting systems that collect and store rainwater for agricultural use. They will consider building rooftops, gutters, storage tanks, and distribution systems. Students will present their rainwater harvesting designs, discussing water management strategies.
- **Outcomes:** Students will learn how to implement sustainable water management practices in agricultural structures through rainwater harvesting.

12.3.11. Final Project

The final project is an opportunity for students to apply the knowledge and skills gained throughout the "ATVET in Green and Sustainable Practices" curriculum to a real-world agricultural sustainability project. This project aims to foster practical experience, critical thinking, and innovative problem-solving in the context of sustainable agriculture, agro-tourism, and agro-manufacturing.

- **Project Description:**

For the final project, students are required to conceptualize, plan, and present an agricultural sustainability project that addresses a specific challenge or opportunity within the Jordan Valley region's agricultural sector. The project should reflect the principles and concepts covered in the curriculum, demonstrating the student's ability to integrate sustainable practices into agricultural activities.

- **Guidelines:**

- **Project Selection:** Students can choose a project related to any aspect covered in the curriculum, such as sustainable crop cultivation, agro-manufacturing, eco-tourism, or building structures. The project should address a real need or opportunity within the region's agricultural context.
- **Project Proposal:** Students will start by developing a detailed project proposal. This should include a clear project objective, scope, methodology, anticipated outcomes, and a timeline for project execution.
- **Implementation:** Once the project proposal is approved, students will implement their projects following the proposed methodology. This may involve practical fieldwork, research, experimentation, or demonstration of sustainable practices.
- **Documentation:** Throughout the project, students should document their progress, challenges faced, and lessons learned. Visual aids like photos, videos, and data collection are encouraged.
- **Final Presentation:** At the end of the project, students will present their findings, results, and insights in a formal presentation. This can include a slideshow, videos, and any physical products or prototypes created.
- **Evaluation:** Projects will be evaluated based on their alignment with sustainable practices, innovation, practical applicability, documentation quality, and the effectiveness of the final presentation.
- **Collaboration:** While students are encouraged to work independently, they can collaborate with peers, instructors, and experts to gather insights and feedback.

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Annex I: Northern Jordan Valley Private Sector Employment and Capacity Building Mapping

Private Sector/ Tubas								
#	Company Name	Location	Industry	Focal Point	Phone No.	Capacity and Skills Development Needs	Employment Needs	Pipeline Expansion / Development Plan (Remarks)
1	Zadona Agri-Industrial Co.	Tubas/ Al-Fara'a	Pickles Factory	Hamdalla Abu Hashem	569671409	Machinery Maintenance Skills	Machinery Maintenance Technician	NA

2	Al- Forat Agricultural Co.	Tubas	Vegetable Farms	Mohammad Daraghmeh	569899969	<ol style="list-style-type: none"> 1. Smart Irrigation 2. trainings on pesticides and fertilizers management 3. trainings on growing herbs 4. After Harvest Skills 5. Cold Storage and Quality Mngement 	<ol style="list-style-type: none"> 1. Machinery Maintenance Technician 2. Irrigation Systems Technician 3. Agricultural Engineer 4. Food Processing Engineer or Technician 5. Smart and computerized irrigation specialist 	<ol style="list-style-type: none"> 1. Expanding produce varieties 2. Inclusion to medical herbs farming 3. Agro-industries (Fresh freeze potatoes / frozen vegetables / etc.)
3	Al Kafir Ideal for Irrigated Agriculture Co.	Tubas	Vegetable Farms	Kayed Daraghmeh	594261262	<ol style="list-style-type: none"> 1. Training on Vegetable agricultural practices (pesticides and fertilizers management, after harvest care of crops, and smart irrigation...etc.) 	<ol style="list-style-type: none"> 1. Agricultural Engineer 2. Expert technician in herbal cultivation 	<p>The company is downsizing since the COVID-19 Pandemic, where they used to have herbs farming business that was halted as the produce was for export</p>

						2.trainings on growing herbs 3.Marketing Skills		
4	Jannat Aden Company	Tubas/ Tayasir	Herbs Farms	Mosa Daraghmeh	599119354	1. life and business skills 2. trainings on growing herbs 3. trainings on Organic Farming 4. Fumigation 5. International Export Standards and Quality Management (e.g., ISO, FSCC, etc.) 6. Recycling and Sorting 7. Renewable Energy 8. Resource	1. Agricultural Engineer 2. Expert technician in herbal cultivation 3. Supply chain and quality engineers	Increasing and expanding the export business and adoption of organic farming for international markets

						Efficiency (water / Electricity)		
5	Al Hanaa Co for the Trade of Pickles & Foodstuffs	Tubas/ Tammun	Factory for Pickles & Cheese	Raed Bani Audi	599798510	1. Training on Product Quality 2. Marketing Skills	Production Quality technician	Inclusion of a cheese production production line (Workshop), purchase of raw milk from farms and production of yogurt varities

6	Haifa Co for Agricultural Marketing	Tubas/ Akkaba	Food Factory (Date, Olive oil, Thymes,..)	Sulaiman Mohammad	598575763	<ol style="list-style-type: none"> 1. Food Processing Skills for dates 2. Sorting & Packaging Skills 3. life and business skills 4. Pest control and safe pesticides use 	<ol style="list-style-type: none"> 1. Food Processing Engineer 2. Sorting & Packaging technician 	inclusion of food processing operations rather than packaging only
7	Al Dahlia Company	Ein Al-Beida/ Bardalah	Grape Farms	Eng. Mohammad Sawafta	599359102	<ol style="list-style-type: none"> 1. life and business skills 2. Computer Skills 3. Training on Smart Irrigation 	Agricultural Engineer	sorting and packaging facility

8	Top Field / Al Bqe'ia Al Haditha / Wadi Al Thora / Hi Tec Plantations (Agricultural Companies Owned by Abu Khizaran Family)	Tubas, Tammun, Kfeir and different areas in Northern Jor. Valley	Vegetables, corn, herbs, decoration plants	Ahmad Abu Khizaran	598575763	<ol style="list-style-type: none"> 1. Smart and computerized irrigation 2. Food security and safety including standards and export requirements 4. organic farming 5. cold storage and logistics 	<ol style="list-style-type: none"> 1. Cold storage and HVAC technicians 2. Solar energy technicians 3. Irrigation systems engineer / technician 4. Logistics specialist 5. Quality Engineer 	Expanding cold storage facilities and export produce varieties
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Annex II: Southern Jordan Valley Private Sector Employment and Capacity Building Mapping

Private Sector/ Jericho

#	Company Name	Location	Industry	Focal Point	Phone No.	Capacity and Skills Development Needs	Employment Needs	Pipeline Expansion / Development Plan (Remarks)
1	Al Zara'on Al Arab Group Co.	Jericho/ Deir Hajla	Palm farms	Qasem Abu Fara	592055504	1. Soft Skills 2. Smart Irrigation 3. Palm trees Diseases particularly Rhynchophorus 4. Best practices	1. Palm Trees Agricultural Engineer or Technician 2. Quality Engineer 3. OHS Officer 3. Environment friendly Fumugation and sterilization 4. Process engineer	expanding production lines

2	Alwadi Farm Company for Agricultural Investment	Jericho	Palm farms & factory for date	D. Ismail Ediq	568828257	<ol style="list-style-type: none"> 1. Soft Skills 2. palm trees agricultural practices (pesticides and fertilizers management, after harvest care of crops, and smart irrigation...etc.) 	Palm Trees Agricultural Engineer & Technician	Developing a dates sorting and packaging factory, utilization of modern technology for pest control, and introduction of smart irrigation systems
3	Q Fine Food Company for Food Industry	Jericho	factory for date	Ibrahim Qawasmi	592550805	<ol style="list-style-type: none"> 1. Soft & business Skills 2. Maintenance of Industrial Equipment 3. Sorting & Packaging Skills 4. Sale & Marketing Skills 	<ol style="list-style-type: none"> 1. Maintenance Equipment Technician 2. Sorting & Packaging Technician 3. Marketing Employer 	Introduction of new date varieties production lines and vertical expansion by increasing current production capacity

4	Palm Farmers Association Cooperative	Jericho/ Deir Hajla	Palm farms	Mohamma Qawasmi	595220011	<ol style="list-style-type: none"> 1. palm trees agricultural practices (Best practices) 2. After Harvest Skills 3. Marketing Skills 4. Date products quality assurance 5. smart irrigation 	<ol style="list-style-type: none"> 1. Palm Trees Agricultural Engineer or Technician 2. Food Processing engineer or Technician 3. Marketing Employer 4. Irrigation systems engineer 5. agricultural machinery maintenance technician 	<p>Introduciton of dates production lines and marketing its different varieties, in addition to adopting solar energy</p>
5	Al- Awael Co. for Investment Agriculture	Jericho	Palm farms	Ibrahim Ediq	568828256	<ol style="list-style-type: none"> 1. Smart Irrigation 2. palm trees agricultural practices 3. Palm trees Diseases particularly Rhynchophorus 	<p>Palm Trees Agricultural Engineer</p>	<p>Adoption of smart irrigation systems in all company farms</p>

6	Nakheel Palestine Company	Jericho	Palm farms & factory for date	Eng. Mohammad Sawafta	599359102	<ol style="list-style-type: none"> 1. Smart Irrigation 2. Solar Energy Systems 3 Maintenance of Agricultural Equipment 	<ol style="list-style-type: none"> 1. Irrigation System Technician 2. Electrician Engineer 	NA
7	Pal Gardens Agricultural Company	Jericho/ Al Awjeh	Palm farms & factory for date	Moamen Sinokrot	599671436	<ol style="list-style-type: none"> 1. life and business skills 2. palm trees agricultural practices (Best practices) 3. Product microbiological testing 	<ol style="list-style-type: none"> 1. Palm Trees Agricultural Engineer & Technician 2. Quality Engineer 3. Production engineer 4. Logistis 	Introducing new packaging varieties and adding new production lines for different packaging sizes
8	Rift Valley Agricultural Co.	Jericho/ Al Awjeh	Palm and vegetable farms	Ahmad Zedan	593999717	<ol style="list-style-type: none"> 1. Dates producing skills. 2. After Harvest Skills 	Food Processing Engineer or Technician	Developing the factory and increasing production capacity
9	Palestine Dates Company	Jericho	Palm farms & factory for date	Eng. Jamal Abu Jarrar	0595262404 0598401000	<ol style="list-style-type: none"> 1. palm trees agricultural practices 2. Dates producing skills. 3. After Harvest Skills 	Food Processing Engineer or Technician	

10	Oja Orchards for Agriculture Investment Co.	Jericho/ Al Awjeh	1. Palm and vegetable farms 2. Water distribution to farmers	Eng. Ibrahim Qtishat	594205678	1. Computer Skills 2. Smart Irrigation 3. Modern vegetables' agricultural skills	Agricultural Engineer & Technician	Transforming company wells into solar energy systems and expanding date farms and including seedless grapes into company operations
11	AL Junaidy Farm Animal & Agricultural Production Co.	Jericho	Cow farms	Wahed Shatat	599346021	1. Milking technologies 2. Cattle & Livestock Breeding	Cattle & Livestock Breeding Technician	



Annex III: Survey Forms

Company form/operating enterprise				
Capacity determination form				
General information				
Company name:				
Address:				
Name of Focal Point				
Phone number:				
E-mail:				
Existing Facilities				
Area of the facility				
Location				
Possession type (owned/rented)				
Number of working employees	Men		Women	
Percentage of working youth in the company (18-29)				
How many job vacancies per year (TOTAL)				
Staff structure				
#	Type of the job	Specialization	Number	
1				
2				
3				
4				
5				
6				
7				
8				
9				
Does the company have interest in training its employees in the following				
1. Administration and finance				
2. Marketing and attainment				
3. Technical and vocational				
What are the important training needs for the jobs you want to attract				
1				
2				
3				
4				
5				
6				
Number of company projects since inception				
#	Project name	Project activities	In Process / Discontinued	If not/why
1				
2				
3				
4				
5				
6				
Does the company keep tracking with developments in the technical and vocational field?				
Is there an evaluation review of the company (annual/semi-annual) to determine the needs of the market?				
Does the company believe that institutions and training centers including TVET provide trainings and capacity building that results in a workforce matching the company's needs, particularly for the company's scope of work, and in general for the labor market				
Mention the most important 5 needs in the technical and vocational field of the company				
1				
2				
3				
4				
5				
6				
What are the company's future development plans(within 3 years)?				

Annex IV: Site Visit Attendance Sheet



Jobs and Green TVET for young people in the Occupied Palestinian Territory (OPT)

نموذج حضور ورشة عمل

البلدة او المدينة: طوباس / بردلا	مكان انعقاد الورشة: المصفاة نسج / دائرة التجارة
اليوم: الاحد	تاريخ انعقاد الجلسة: 2023/6/25
عدد الحضور: 7..... اثنا (1) تكور (6)	موعد الجلسة: من 6:00... الى 3:30

الرقم	الاسم	الجوال	الايمل	المنصب/ المؤسسة	التوقيع
1	محمد سينا	0569892969	Alfaraf@gmail.com	صبر ادرا	[Signature]
2	سحر داني	059938553	Sura.d89@gmail.com	TVET Coordinator Tabachawba	[Signature]
3	أحمد زيان أحمد بنيران	0569455556	topfield.farming@hotmail.com		[Signature]
4					[Signature]
5	أسيد احمد زيان بنيران	0562455556	Osaid-sos@hotmail.com		[Signature]
6	محمد سحر داني	0562455556	Fannet.adan@gmail.com	عبد الله	[Signature]
7	سحر داني	0598316838			[Signature]
8	سحر داني	0598575768	ahmed-sel-saliman@gmail.com	نائب المدير	[Signature]
9					
10					

لغزات
غرفة تربية
أحمد بنيران
القبة
دي الزين
سحر داني