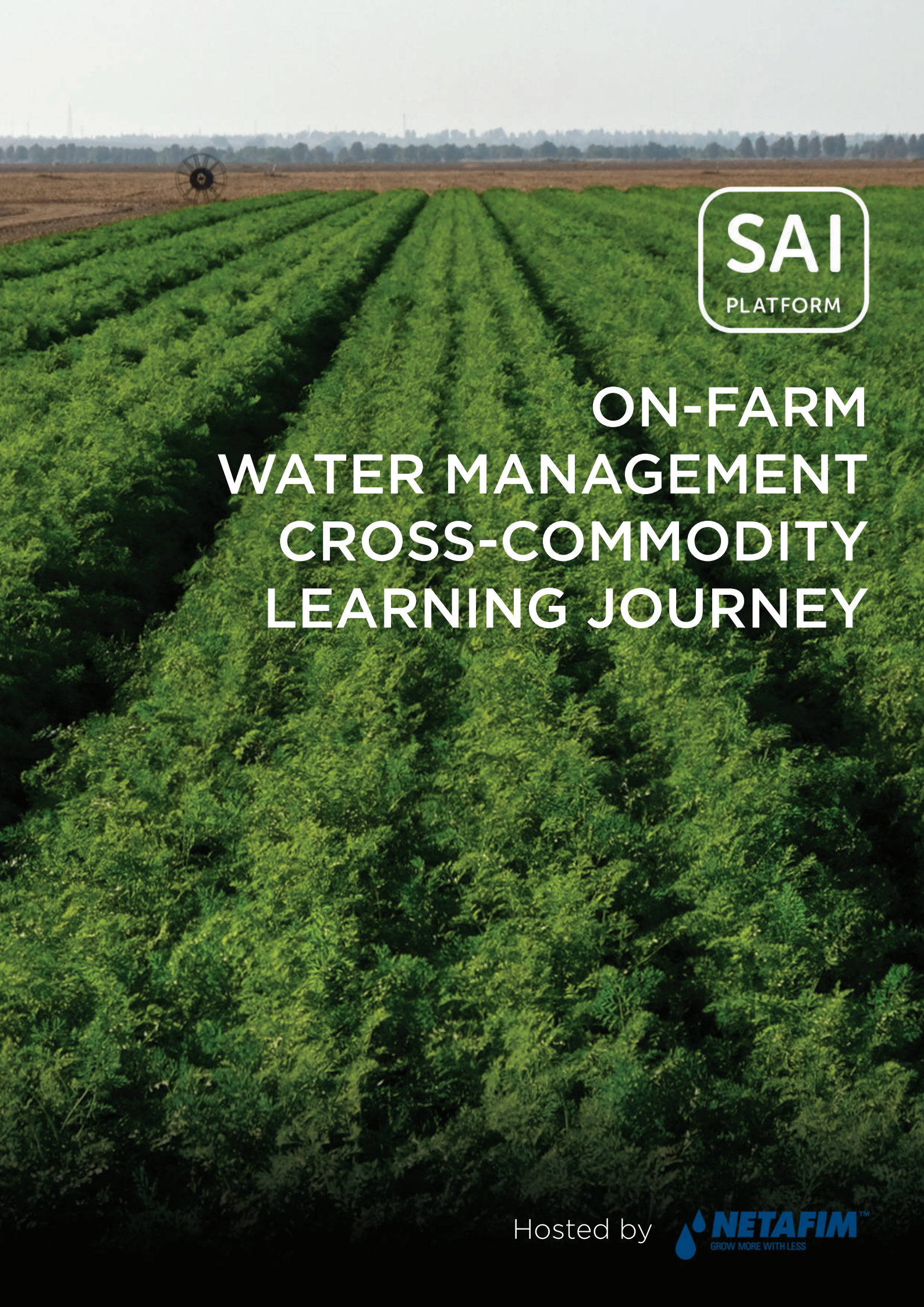

SAI PLATFORM

ON-FARM WATER MANAGEMENT CROSS-COMMODITY LEARNING JOURNEY

Hosted by NETAFIM™ GROW MORE WITH LESS

Source: Peter Easton

SAI PLATFORM

THE UN SUSTAINABLE DEVELOPMENT GOALS (SDGs) CALL FOR COLLABORATIVE ACTION TO IMPROVE WATER-USE EFFICIENCY

Farming communities and the whole food industry are together facing great challenges to sustain their activity in a context where water is becoming an increasingly rare and precious resource.

Pre-competitive collaboration is key to support, accelerate and disseminate water management innovations.

Mankind will need to utilise all of its creativity and technological innovation to bring real solutions to these rising needs, to help the sound management of water within environmental sustainability and economic prosperity.

Water Scarcity and Future Challenges for Food Production

This report has been prepared by the Sustainable Agriculture Initiative Platform and its members following the water management visit to Israel, and summarises the key challenges and lessons from the event. Israel provides an exemplary case of how, in a water scarce region, the availability of water for human use and agriculture can be significantly improved through a combination of technology, an integrated approach, strong governance and individual responsibility. It is apparent however, that Israel's innovations in water management are derived from a necessity for survival and economic sustainability rather than a desire for environmental sustainability.

Given that only 4% of irrigated agriculture globally uses drip technology, and typically without use of recycled waste water, this learning journey provided a good example of new ways of operating that may be transferrable to other regions around the world.

Source: Peter Easton

UN SUSTAINABLE DEVELOPMENT GOAL #6

Ensure access to water and sanitation for all

Water is a critical issue: today we face a tremendous water challenge in many parts of the world. The rising world population, global warming and the decrease in the supply of drinking water have combined to create massive water shortages, impacting health, agriculture, the economy and international relations on a global scale.

Water scarcity directly impacts production costs, the viability of farms, and feed availability. Water stress is also one of the most critical aspects of sustainable agriculture, both for the industry itself, and its impact on the natural environment and the necessity for a more sustainable approach to water resource management.

Agriculture is accountable for 70% of the world's freshwater withdrawals, and up to 90% in some developing countries. The agricultural sector, therefore, provides a vital opportunity to improve global water stewardship over the coming decades of increasing population and water demand. On the other hand, farmers operating in highly intensive areas such as Northern Europe are facing stricter regulations regarding water pollution and manure management for instance, with impact in some cases on their ability to develop their business for the future.

The Industry therefore, needs to support farmers in attaining knowledge and access to new technologies and practices to adapt their production system, increase their resilience and ensure the continuity of their businesses for the future.

Setting the Scene – Water Availability in Israel

Israel faces enormous challenges with its water supply. Already a huge gap exists between demand and supply and this gap will continue to grow in the future to come. This is also due to environmental and climatological changes as well as demographic expansion.

KEY FIGURES

• Israel has **per capita water availability** of **less than 200 m3 per year**. This is well below the U.N. definition of water poverty, which is anything below 1,000 m3 per person per year.

• **Natural supply provides 1.1 billion m3 in an average year**, including rain water capture. Meanwhile, consumption has reached 2 billion m3 a year, representing a deficit of 1 billion m3.

• Almost **62% of the irrigation water** used in Israel comes **from urban and industrial wastewater**, of which 85% is collected and recycled.

• In 2013, of the total water available in Israel **almost 16% came from desalinating sea-water** and another 22% came from recycling wastewater.

Source: Peter Easton

1,016 million m3 of water is used for agriculture (53.2%)

• Currently, the reservoirs in Israel are at a record low and the vital winter rains are becoming increasingly sporadic. As a result, Israel's main Aquifer reservoir has increasingly less water available.

• Precipitation usually only occurs during the winter (December-February) and largely in the northern part of the country. As a result, irrigation, water engineering and new technologies and innovation are considered key to the country's economic survival.

• Israel is an extremely water-scarce region. Yet, as a country it exports high-value agricultural outputs to Europe and many other parts of the world.

• Most domestic water supply is created through desalinisation plants.

• State ownership and control of water resources and wastewater is critical to its success. As a result, most water users see water availability as a privilege to respect and pay for, rather than a right to use at their will.

• Israeli agriculture's association with moral, ideological and social ideas obstructs meaningful reduction in the allocation of water to agriculture.

• Legally, the main water resource in the country can be characterised as common property resource.

Tackling Water Scarcity in Israel

Overcoming the challenges of an arid climate and scarce natural water reserves have always been a vital necessity for the survival of Israel's population and economy. This has led to continuous improvements in Israel's water sector, through innovations in technology, practices and long-term plans. Thanks to technological innovation Israel has today become a global leader in the water arena.

Source: Peter Easton

Israel has developed several systems to save water:

Drip irrigation system, as it has become known world-wide, is responsible for 90% of agricultural irrigation. With only 4% of irrigated agriculture using drip, the potential for expansion is significant. Israel demonstrates this potential with 75% using drip irrigation. Netafim remains the global leader of this technology.

Water conservation education means that children are educated from a very early age to use water in an economical way.

Rain water is collected in winter and used in the summer for irrigation.

Recycling waste water: today, 80% of Israel waste water is treated and reused for agricultural irrigation. The goal is to reach 90% in five years, representing 400 million m3 a year from waste water alone.

Desalination plants supply more than 500 million m3 of water per year, supplying 35% of the country's fresh water needs.

Solutions in irrigation is the result of a **close cooperation between farmers and researchers**, who share a constant flow of information and development.

This model has led to significant developments, including:

- Drip irrigation (see above).
- Subsurface drip Irrigation and fertigation resulting in lowered water use by growing plants.
- Individual spray irrigation allowing for precise irrigation of trees.
- Advanced computerisation of Irrigation Systems allowing for real-time operation, monitoring, and pre-programming of irrigation intervals.
- Buried moisture sensors providing information on moisture levels of the soil.

SAI Platform On-Farm Water Management Learning Journey

hosted by NETAFIM™ GROW MORE WITH LESS

SAI Platform organised a learning journey on water management at farm level for all its members. 14 member individuals and partners joined together to learn best sustainable practices, practical solutions on the ground as well as challenges and opportunities that can be translated to different sourcing regions.

The scope of most participants was to learn more about technology and farming practices allowing high water efficiency and resilience to water shortage and thus help to support farmers to overcome water-related risks and constraints.

Our local host and member was Netafim, a global authority on the technology of drip irrigation. Netafim received the Stockholm Water Award in 2013 for its contributions to farming success across the world.

Source: Peter Easton

The following member companies & partners benefited from this learning journey

AGRANA · BOORTMALT · Coca-Cola · DANONE · FARM FRITES · innocent · PEPSICO · WWF

Highlights from the Field Journey

Netafim Manufacturing Plant in Kibbutz Hatzerim

The day started with an explanation of the discovery and history of the drip irrigation along with the value of new techniques. The visit included a view of drip-irrigated jojoba plantations thriving in the desert.

We learnt that there are ongoing challenges for growers to adopt drip irrigation. Often the business case is easy to demonstrate, but changing habits and traditional use is difficult.

Furthermore, drip irrigation can achieve 90% or more efficiency in water use. That is 90% of the water delivered is used by the target crop. In comparison, overhead irrigation (spray, pivot) achieves 50 to 70%, and flood irrigation <50%.

In addition to water savings, drip irrigation can provide other benefits for instance: controlled and cost-effective use of fertilisers through ‘fertigation’; reduced disease risk due to less wetting of the main plant (canopy); fewer soil damage or salination; less energy ‘wasted’ by plant to grow deep roots and for use of water pumping.

Sorek Desalination Facility

Located about 15km south of Tel Aviv, this facility became operational in October 2013 with a sea-water treatment capacity of 624,000m3/day, which makes it the world's biggest seawater desalination plant.

The desalination facility uses Sea-Water Reverse Osmosis (SWRO) process providing water to Israel's national water carrier system. Construction of the desalination plant began in January 2011 and was completed with a total investment of about $400m.

There is pre-treatment and post-treatment at the plant. Post-treatment involves re-mineralisation of the desalinated water followed by final disinfection.

As a result more water will be saved by reducing pumping from the aquifers and the Sea of Galilee.

Various Farm Field Visits

Visits to an assortment of farm fields demonstrated a range of drip irrigation options across various crops, such as fields of carrots, celery, jojoba, peppers, and date plantations throughout central and southern Israel.

Farmers and plantation managers shared their thoughts and practices on water saving and management. They also highlighted many of their challenges and the steps they, and the government, are taking to overcome them.

Key Sustainability Learning

Drip irrigation can offer innovative solutions to production challenges more than just water – better fertilizer application, reduction in pest pressures, increase usability of waste water.

Water resource management is **more than just how it is applied** (i.e. drip vs flood etc.,); factors also include the water source, other industries requiring the same water, the level to which the water needs to be treated, plant variety requirements, and quality requirements.

Water management needs to ensure that **quality remains high**. Too much water can decrease overall quality of produce e.g. wine grapes, or too much fertigation may reduce the "power" of the super foods.

There are increasing challenges of sourcing from water stressed regions, however, all regions face challenges and the concern should be how well those **challenges are being managed**.

Many of the innovative technologies are cost prohibitive, e.g. drones for monitoring water stress in the fields.

Farmers are focussed on cost management and **quick and flexible adaptation to market demand.**

Pressure stems from consumers to provide organic produce, even when it is not the most efficient production method. Related factors include:
- Organic certification in the EU not allowing the use of recycled water due to nutrient source.
- The same pressure from consumers for a specific variety, may not be the best suited to the region.

Legislation in place such as water quotas for farmers, pricing scheme, regulations and permits on the use of fresh water from the network, underground pounds, saline and/or retreated sewage water is also a life-guarding system to prevent and manage fairly water stress and water shortage at water basin and national level.

The **adaptation** of a large rate **of innovative agronomic practices** to adapt to the local context of very harsh water scarcity were also eye openers. A key component which explains this is due to the support of local agriculture R&D stations cooperating with the community of farmers.

Expected negative outcomes and challenges have often not been realised, for example it was assumed that trees would suffer in the wind due to a shallow root zone, however, to date there have been no such issues.

There are knock-on effects for almost all sustainability initiatives:

• Desalination comes with a large energy footprint.
• Waste water requires long pipelines, it is not always suitable for fresh produce, or may require additional treatment.
• Allowing the soil to fallow means less pesticide required, but also decreases the production of the land.

Stakeholder's governance and organisation is key to building efficient water management systems.

In that sense, the Israeli example is a good model that provides and manages the equipment system (desalination water forecasting and distribution, irrigation water system and pressure management on the whole irrigation network, waste water treatment and distribution of retreated urban waste water to farmers), in partnerships with farming organisations, investors and engineering companies, industry, start-ups, agriculture research stations and users representatives (from urban and rural areas).

Being innovative may involve putting human DNA into plants!

This was part of a lecture we attended with Prof. Oded Shoseyov who researches plant molecular biology protein engineering and nanobiotechnology.

Practical Lessons Learnt

Installation of drip irrigation is almost always possible:

• For field crops, it is likely to require annual removal and installation, with impact on labour resources.
• Some crops can have long-term pipes subsurface, and harvesting machinery can accommodate.

Often plants can handle higher salinity (in water and soil) than expected.

When water is supplied continuously (at low amounts).

Small margin for error with drip irrigation.

Because plants are so dependent on the water source and are not over supplied.

Using recycled/waste water may mean that a fertilizer is not required.

Due to soil salinity, often additional water is required to wash the soil.

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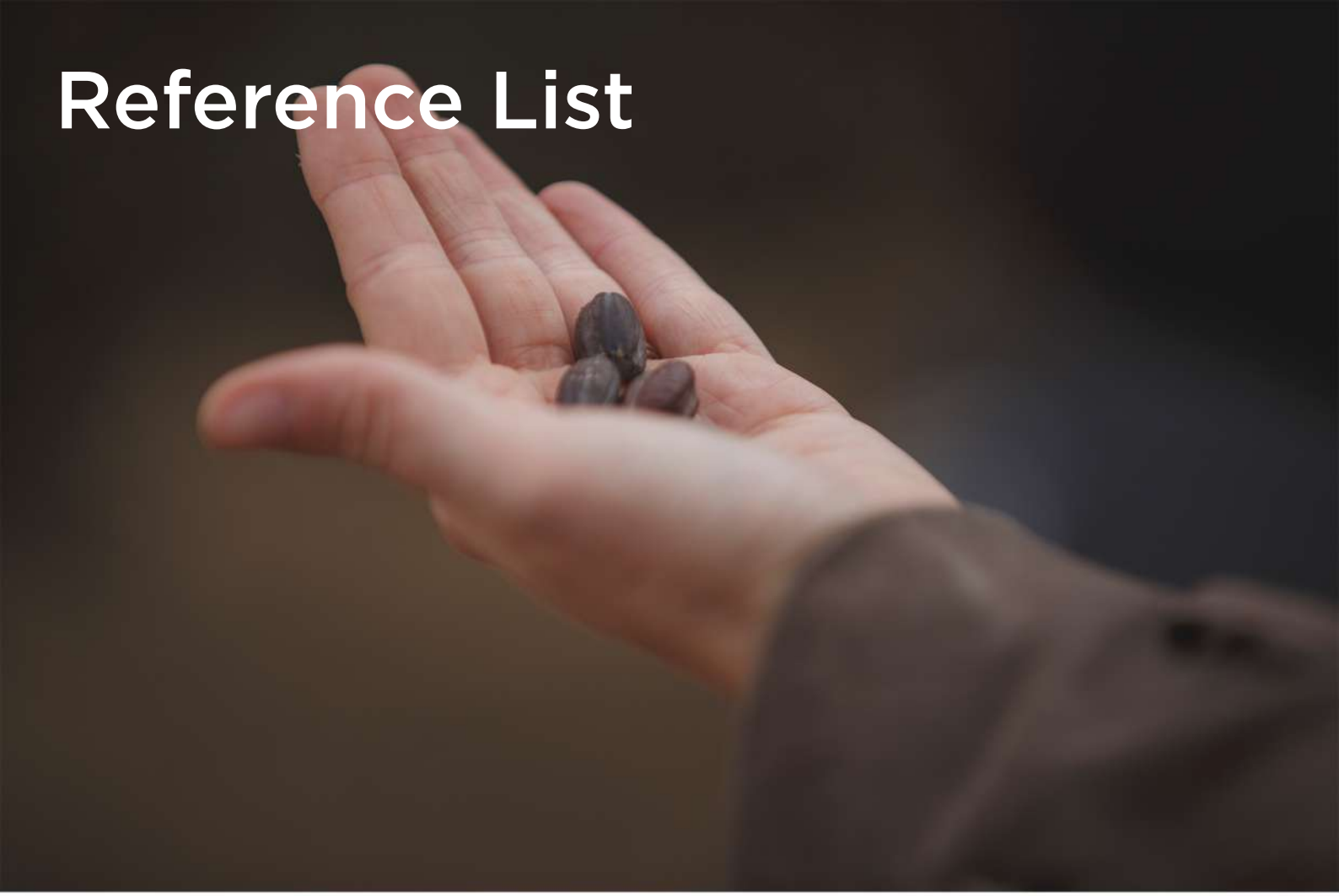

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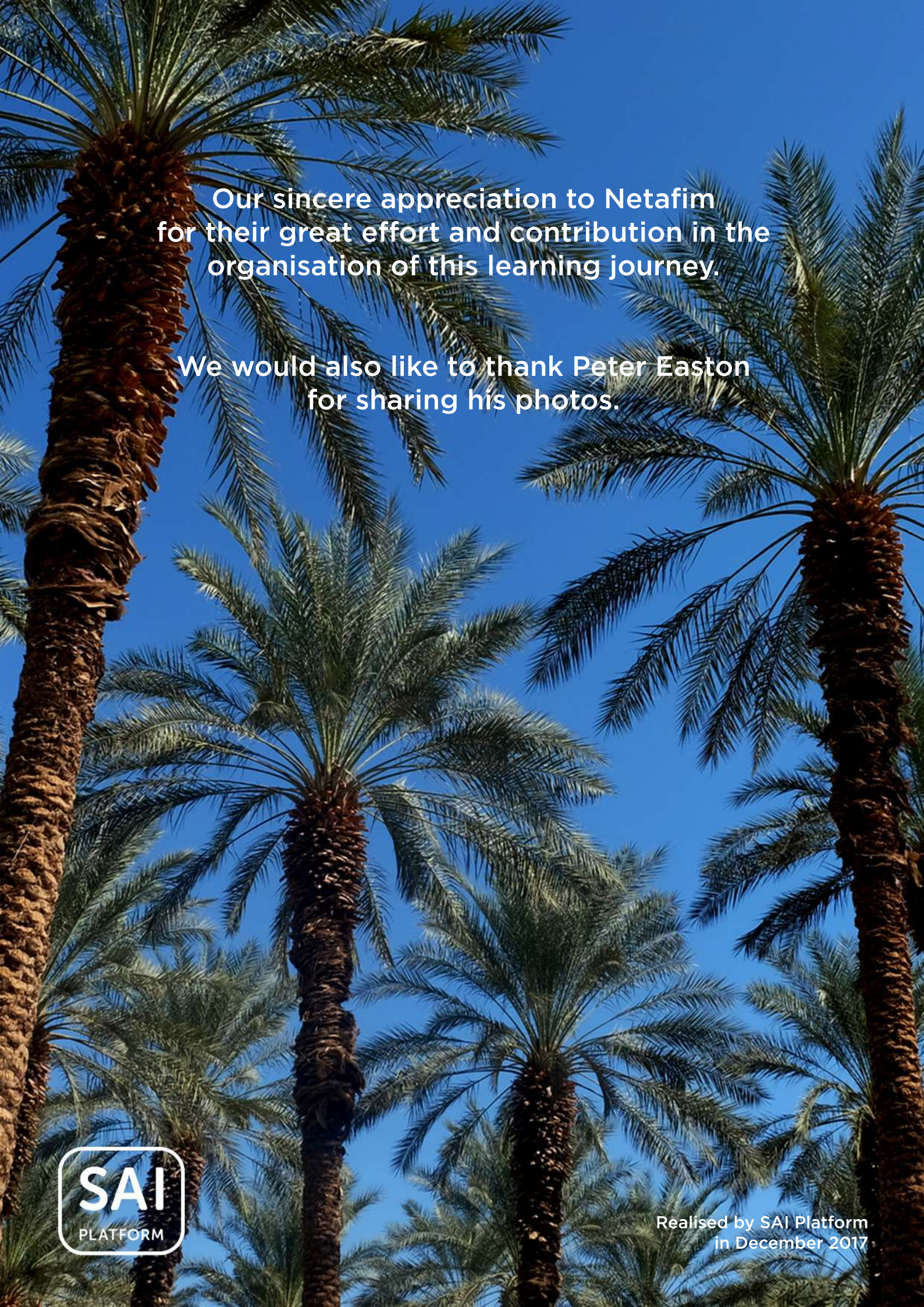

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