22D023

28 March 2022

The Hon Dr Susan Close MP
Deputy Premier
Minister for Industry, Innovation and Science
Per email: ptadelaide@parliament.sa.gov.au

Dear Deputy Premier,

Re: Briefing – SADA – Traceability

Congratulations upon your re-election and your return to the Ministry of South Australia.

This letter is one of two letters. I am writing to you in your capacity as the Minister for Industry Innovation and Science to inform you of the work that is being done by the South Australian Dairyfarmers' Association (SADA) in the development of blockchain related technology for the governance of supply chains in the dairy sector.

A second letter has been addressed to you attending to your role as the Minister for Climate, Environment and Water.

SADA is the representative voice of dairy farmers in South Australia. We have a proud tradition of representing farmers which began in 1936, and we continue to remain focussed on outcomes for dairy farmers today with a clear eye into the future.

While we appreciate that you will be very busy in the near future, we nevertheless would appreciate an opportunity to talk to you about some of the work that we are doing as an organisation to advance the dairy industry in South Australia.

As part of that briefing, we would specifically seek to brief you on elements of the dairy industry that correspond to your portfolio areas, namely:

- The SADA block chain traceability project (covered in this letter) and
- SADA's commitment to net zero emissions by 2030, and
- The water challenges that face the industry in South Australia today and into the future. (to be covered in a subsequent letter).

SADA was pleased to received feedback from your party prior to the election indicating that a Labor Government *will be keen to explore the best ways to support the Traceability project.* The following provides detail regarding our work to date and the underlining technology.

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The SADA Blockchain traceability project

The South Australian dairy industry has developed and adopted the South Australian Dairy Industry Action Plan 2019-2024.

This plan's adoption from participants in the SA Dairy supply chain means that South Australia is uniquely positioned to explore emerging technologies throughout the dairy supply chain. With the change of government after the recent election SADA is enthusiastic to maintain a strong relationship with government moving forward. Public comments by the new Premier give SADA every confidence that there will be no radical shift away from the importance of the primary sector in our state.

SADA has taken the lead in the exploration of block chain and traceability technologies by partnering with Datahash Pty Ltd, a South Australian distributed ledger development company.

This lead has resulted in expenditure by SADA in conducting an Alpha trial of distributed ledger-based technology in South Australia as a proof of concept. The cash commitment to the trial has exceeded $100,000 with further in-kind support from various participants being in the order of at least $50,000.

That trial, which was completed using the Hedera Hashgraph network, has now been successfully completed. It resulted in the technology proving effective operational capability along a section of existing supply chains.

SADA in partnership with Datahash now intends to move to the second stage of the development of the protocols to enable a Beta trial.

The purpose of the Beta trial will be to demonstrate a traceability system which can be applied to all dairy supply chains throughout Australia.

The Distributed Ledger and the Hedera Hashgraph choice

As you are aware, distributed ledger technology is a digital or binary system that records transactions related to assets and goods both tangible and intangible. Transactions on a distributed ledger, as well as other information relating to a transaction, are simultaneously recorded at discrete places on computers that support the distributed ledger as a whole. Information on a database recorded on a distributed ledger does not include an administration system or central data storage. Rather, the database exists among multiple unrelated computers across different geographical locations, which are run by unrelated and importantly, independent, parties.

Distributed ledger technology permits users to record, share and synchronise data and transactions across a distributed network. The network is made up of numerous unrelated participants.

Distributed ledger technology, as well as information stored on the ledger, can be classified as either public or private. The classification depends on the pre-set accessibility protocols of the ledgers by anyone or by their devices. These devices are generally referred to as nodes. These nodes serve the overall ledger. Depending on the system, the ledger can be classified as permissioned or permissionless based on whether participants require permission from a certain entity to enter information onto the ledgers.

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Distributed ledger technology has been identified as being useful for many applications, such as government financial systems, clean energy and manufacturing, and can help to improve existing processes. Distributed ledger technology removes the requirement of a central record keeping system, hence it can increase the speed of transactions. Moreover, it can reduce transaction costs.

Since the records are held at each network node, manipulating or successfully attacking the record is exceedingly difficult and therefore distributed ledger technology is believed to be a more secure way to keep business records. As the information is shared across a network, distributed ledger technology provides a more transparent and secure means of managing records.

Blockchain and distributed ledger technologies are frequently used as synonyms. However, both are different. Blockchain uses many technologies for applications. Distributed ledger technology is one of them. Blockchain is a form of distributed ledger technology that uses cryptography. This makes it effectively impossible to manipulate a record. It is unchangeable and distributed ledgers are used for recording transactions, tracking assets and recording the execution of contracts. Blockchain and similar technologies ensure security, transparency and trust in different types of transactions involving digital assets.

In blockchain technology, as the name suggests, data is organised and stored in packages known as blocks and those blocks are electronically chained together. The blocks in the chain cannot be edited, as blockchain technology allows only the addition of more blocks of data.

Furthermore, blockchains are usually public, implying that transaction histories can be viewed by anyone. In a blockchain, anyone can become a node and participate in the operations. Thus, blockchain is permissionless.

Alternatively, not all distributed ledger technologies necessarily use chains of blocks. Where they do not, they still employ cryptographic validation. Distributed ledger technology creates a ledger in a decentralised way for obtaining consensus from the participants who do not automatically have a trust relationship with each other. Hence, new information is added only when all the participants consent to the action.

Unlike blockchains generally, distributed ledger technology usually imposes restrictions on its access, use and who is permitted to be a node. Nevertheless, as a technology it uses cryptographic signatures to timestamp a new entry automatically.
Distributed ledger technology provides both public and private features. Also, it can be both permissioned and permissionless. Permissioned and permissionless systems are systems which either require authorisation from a governing body to use the system or alternatively a system where anyone can use the system without the permission of a governing body. In more mature distributed ledgers governing bodies are less prevalent.

Why Hedera Hashgraph?
Hedera Hashgraph is a distributed ledger project which currently is still a governed ledger. There are currently 39 businesses and corporations which form the governing council of the project. These businesses include Boeing, IBM, Google, LG, Deutsche Telekom, Standard Bank and Eftpos. These businesses are time limited in their role and participants are drawn from multiple interest groups including information technology companies, academia, supply chain managers, retailers and communications companies.

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The ledger is the brainchild of Dr Leemon Baird who created the system to attend to some of the limitations which blockchains are subject to, particularly scalability.

Any distributed ledger or blockchain is impacted by a 'trilemma'. This trilemma means that a chain is either secure, widely distributed or slow. Blockchains like Bitcoin are extremely secure and are widely distributed with the resulting impact that they are slow, processing about 7 transactions per second. By way of example, Visa executes about 1,600 transactions per second. Similar blockchains like the Ethereum network execute at about 15 transactions per second. This makes the transactions expensive and scalability becomes a problem in these traditional systems.

Hedera Hashgraph has a 10,000 transactions per second capability because of the protocols which have been designed into it, without diminishing its security. The system is designed to also be inexpensive as transactions on the system typically cost one ten thousandth (1/10000) of a US cent to execute. This capacity to sidestep the trilemma is the product of the protocols (non-blockchain but still a distributed ledger) the system uses.

Combined with the calibre of the governing council, and at those speeds and costs, the project and its ledger are difficult to resist for the purposes of the proposed Beta trial.

For more information on Hedera Hashgraph please visit: Hello future | Hedera (www.hedera.com)

Datahash and their role

Datahash is an Australian data company. Over the past two years Datahash has built and immutable Event Ledger (and advanced database) and an application programming interface (API). The Event Ledger records certain agricultural supply chain information, while the API allows this data to be seamlessly exchanged with other users' systems.

Datahash's Event Ledger operates on Hedera, an enterprise grade distributed ledger technology (DLT), and as pointed out above, that is governed by up to 39 of the world's largest companies, academic institutions and non-profits, including Google, IBM, Boeing, LG, Deutsche Telekom, Nomura, Standard Bank, UCL and Eftpos. Datahash is currently one of the only two agricultural companies operating on Hedera. The use of Hedera means Datahash has inherited superior properties of trust, scalability, security, stability and fair ordering. Datahash supports the tokenisation of all supply chain assets such as goods, money and contracts.

Hedera is the third generation of what is commonly called 'blockchain'. Generation one (Bitcoin) and two (Ethereum), are traditional blockchains. Hedera is also a public ledger, but overcomes the challenges of time, cost and energy consumption through its unique application of gossip and virtual voting protocols. Hashgraph is an alternate DLT protocol to blockchains and the only authorised ledger is Hedera Hashgraph. Hedera's native cryptocurrency is HBAR, ($\hbar$).

The Hedera patent of the Hashgraph algorithm prevents forking and therefore protects all HBAR value. (Forking is when competing development teams take open-source code and create their own block chain variants, which duplicates tokens on the network, and potentially undermines all the value stored on the network).

Datahash's API is 'smart' because it allows simultaneous access, validation, and record updating on a network that's spread across multiple entities and locations. This is important as it allows for the

transparent transfer of ownership, transaction recording and asset tracking and in an environment where trust is confirmed via a third party using digital payment methods.

Results of the Alpha trial

The Alpha trial achieved its objective of proving the concept that critical supply chain data could be immutably recorded to a distributed ledger and viewed by a third-party consensus service. It also produced a user interface (UI) that can be used to audit or verify claims of the product.

It was highlighted in this Alpha trial that dairy supply chains are highly complex, for this reason any system that has to track the supply chain must make allowances for this complexity. This means that material movements are not linear, blending and splitting of material is common and there is high variability of recipes and processes. Accordingly, the system must be flexible and should eventually be configurable by the administration users from the dairies. This was one of the main issues that occurred during Alpha testing. For the Alpha trial the configuration of operations and forms was performed by Datahash in conjunction with the trial site businesses.

The Alpha trial did identify a number of challenges, peculiar to the dairy industry and the technology was adjusted to accommodate some of these challenges. The Beta trial will address these issues with updated technology and improved UI systems.

Ultimately, it is the nature of software development to improve the software over multiple iterations. For the Datahash Dairy application, the feedback from both Trial Site Businesses was generally positive. This bodes well for using the application as a regular part of logging the supply chain within the dairy industry.

The Datahash Event Ledger has recorded immutable data, meaning the data are available indefinitely and cannot be tampered with. Data events are encrypted as a message on the Hedera Consensus Service Network (Hedera Hashgraph proofs). These two functions allow us to ensure data provenance so the complete history of a data event could be retrieved (if necessary) with Hedera Hashgraph proofs testifying to that history. The importance of this function is to allow accurate data synchronisation between systems as well as independent verification of events where necessary for compliance-based activities.

The need for partners in the Beta trial

As the Alpha trial is complete SADA has commenced the next step of assembling partners for the Beta trial. Partners in the Beta trial will form a complete supply chain from cow to customer.

A number of partners have already indicated their commitment to the Beta trial.

Thus far SADA has received a commitment to participate from:

- Woolworths Supermarkets
- Bega Cheese Limited
- Fleurieu Milk Company
- Golden North
- ValAi

Furthermore:

- Coles has indicated an interest but has yet to be onboarded
- Lactalis has also indicated interest and the matter is still under consideration by them.

In any instance with the commitments we currently have the Beta Trial is already able to cover the field for its trial purposes. Notably, Woolworths and Bega's presence means that the trial will essentially become Australia's Alpha trial as these are businesses with national reach, and the implications of this are self-evident.

There are currently no complete distributed ledger-based supply chains in Australian dairy.

There are a number of government grants which are, or will become available to assist with the development of this technology. In February the Federal Minister for Agriculture announced further expenditure of $68 million in this area for technology development and co-ordination. This included an unspecified commitment of further grant money. The co-ordination of the expenditure of this money currently rests with GS-1 prior to a national co-ordination body being established. SADA maintains a chair on the GS-1 Traceability committee in the personage of Ashley Pulford.

SADA is also aware that there will soon be money available for rural development grants through the Commonwealth Department of Agriculture, Water and Environment. At an informal level departmental officials have already contacted SADA encouraging it to make applications. Naturally, were a private business to offer investment in the scheme that would also be accepted, subject to arrangements being formalised between all parties. Any intellectual property would remain the property of Datahash. Equally there has been an announcement from the Government in SA that there will also be grant money here for development of agricultural technology which has been specifically earmarked to include traceability projects.

The SADA Alpha trial has received national attention and regular reports have been made to GS1 and other interested parties regarding progress.

Partnering and the SA Government's contribution

SADA has now assembled partners for the establishment of the Beta trial in South Australia, with possibly more to come.

As indicated the trial will need both a supermarket and a processor which have a national footprint. The reason for such a requirement is that the datapoints which are needed to prove up a national model should be demonstrated by organisations which use systems that already operate in the national domain.

What will not be exposed will be intellectual property which resides in the participants and all necessary safeguards will be put in place to protect commercially confidential material. NDAs have been prepared for participants and in some instances already signed.

Smart contracts which may be incorporated into the Beta trial will be constructed in such a fashion to enable material which is sensitive or confidential to remain encrypted on the ledger or, alternatively, not even collected for the purpose of executing the contract.

The proposed model will replicate and expand on the functionality of the Alpha trial. It will reflect the pre-constructed system where information is extracted from systems only to the extent that they are required to inform the inputs to the ledger.

Once the partners in the supply chain have been formed, the supply chain and all its relevant inputs will be mapped as they were in the Alpha trial. The mapping process identifies all the places where

the parts of the supply chain intersect with other parts of the supply chain. The intersection points on the supply chain then form the places where data is entered and/or smart contracts are executed. Many of the points on the existing supply chain are already recorded by way of barcodes tracking material through a chain. Supermarkets already use distribution centres where much of the material is scanned as part of supply chain management. Similarly, processors, transport companies and farmers to varying degrees have points of data entry.

The Alpha trial has already revealed that otherwise non-compatible systems can be interrogated by the interface systems created by Datahash, with that information able to be loaded onto the distributed ledger.

The bulk of the work will happen at this point where Datahash, working with the various businesses in the supply chain, will build the supply chain management system on the Hedera Hashgraph distributed ledger.

This process will also identify points where non-electronic systems exist. The ideal system will be electronic devices which are connected via the internet of things (IoT) and which provide information to the distributed ledger automatically. Such devices input information into the ledger through code referred to as 'oracles'. These oracles will ultimately communicate with technology such as in-vat testing systems which can do all the milk testing currently done by processors.

Under the current system there can be a delay of up to 6 weeks for a farmer to be paid while tests are completed. Tainted milk mixed in a tanker or a processor's vat can lead to substantial losses for processors and farmers. However, in-vat testing using an 'oracle' will not only prevent contamination but also will alert farmers to problems earlier. Moreover, when a tanker picks up from the farm the smart contract can execute immediately meaning the farmer can be paid before the tanker leaves the farm.

The final intended result will be a fully integrated supply chain visible to all.

Costs

A detailed costing to advance this project has not yet been completed. SADA is awaiting full project cost estimate which will influenced by the final project partners. It is expected that Datahash costs will be in the order of about $450,000 for the project. Moreover, a Beta trial will also require full time management by SADA as well as cost impacts from various participants in the project. While it is early days the overall cost of the project is estimated to fall between $950,000 and $1 million to bring the project to completion.

Conclusion

SADA expresses its gratitude to you for your time and attention to these matters in particular. We look forward to discussing the traceability trial and the South Australian Dairy Industry Action Plan 2019-2024. This plan is about ensuring a future for SA dairy by building partnerships for premium outcomes.

Yours sincerely

John Hunt
President

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