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Final report

Residues in Livestock Production – On-Farm Risk Mitigation

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Abstract

The Residues in Livestock Production On-Farm Risk Mitigation project was undertaken to strengthen on-farm risk management around biosecurity and food safety by improving the capture of on-farm recording and declaration of cattle treatments and communication of this down the supply chain.

To achieve this Integrity Systems Company (ISC) partnered with Simon Winter Agriculture Consulting and Digital services company Concentrix Catalyst, to complete an Experience Definition engagement; a user led consulting process used to define the future vision of digital solutions. With only the Discovery phase of the project fulfilled before the contract was terminated, the project team completed numerous stakeholder workshops and research activities to understand the business challenge before progressing into user interviews to understand end users pain points and opportunities to improve the capture of on-farm cattle recording and declaration of treatments in the cattle production process.

Following a proposal for an On-Farm Risk mitigation concept, ISC made the decision to terminate the Statement of Work for V.RDA.2101 Residues in Livestock Production, as the project scope and deliverables were not aligning to the expectations of the broader ISC team. Furthermore, ISC confirmed that they need to conduct further internal work to define the verification/compliance space where residues and contaminants fit in.

Executive Summary

This project report provides a comprehensive summary of the completed Discovery phase for the Residues in Livestock Production-On-Farm Risk Mitigation project. The aim of the project was to take a consultative, user-led approach to strengthen on-farm risk management around biosecurity and food safety by improving the capture of on-farm recording and declaration of cattle treatments in the cattle production process.

Concentrix Catalyst's Experience Definition process is a methodology used to define the future vision for digital solutions. The methodology puts users at the centre of the process to understand how technology can improve a particular challenge or pain point.

The project was proposed to be delivered over a 15-week period and was executed by a multidisciplinary team of designers, technology experts and agriculture consultants. The project comprised three phases (Discovery, Ideate and Define) in order to gain a deep understanding of the business landscape for risk management process around biosecurity and food safety and propose pathways to deliver validated, demonstrated enhancements to the service.

Having completed the Discovery phase of the project, a range of opportunities were identified, and a proposed On-Farm Risk mitigation concept was developed by Simon Winter's team to validate its value to both ISC and end users. Following stakeholder validation, a decision was made by ISC to terminate the Statement of Work for V.RDA.2101 Residues in Livestock Production, as the project's scope and deliverables were not aligning to the expectations of the broader ISC team.

Based upon the results of the research conducted to date, our recommendation would be for ISC to conduct further internal work to define the verification/compliance space where residues and contaminants fits, in order to further explore the opportunities derived from the Discovery phase. By adopting this approach, ISC will be able to ideate on concepts, that can be validated with users to further understand where enhancements can be made, to deliver demonstrated enhancements to the service.

1. Background

Presently, Australia's red meat integrity systems rely on manual on-farm processes to identify animals that have been treated with Hormone Growth Promotant (HGP), veterinary chemical treatments or have been exposed to agricultural chemicals and heavy metals. The producer or person responsible is required to identify treated animals or animals at risk on their Livestock Production Assurance National Vendor Declaration (LPA NVD) when livestock are moved. There are several challenges with this methodology including the lack of real-time risk identification, risk of human error causing incorrect records, the time-consuming process of manual record-keeping, generation of static data which cannot then be linked to, compliance documentation, risk profiles or individual animal data.

Incorrect declaration of information on the LPA NVD can create unnecessary and economically damaging risk to Australia's export markets (exceeding Maximum Residue Levels (MRL) or Export Slaughter Intervals (ESI) as well as reputational risk. For cattle, it is not only important to provide correct and validated answers to the questions on the LPA NVD but also use the data available through the National Livestock Identification System (NLIS) to understand the risk or status of the property. Recently, the focus for cattle has been the detection of heavy metals and chemical residues.

The aim of this project was to strengthen on-farm risk management around biosecurity and food safety. The project explored mechanisms and solutions to enhance data accuracy where potential incidences of contamination or exposure are required to be declared on the LPA NVD or require an NLIS Property Identification Code (PIC) status to be applied. Ideally, the overarching solution will enable automatic verification and notification to users and stakeholders of the traceability/integrity system in order to manage and mitigate the risk of sending livestock to sensitive markets that do not meet the required contamination and/or exposure specifications. This project was initially set as a discovery and define phase in solution development (including prototype testing), to inform a separate phase for a full build and rollout.

2. Objectives

2.1 Residues in Livestock Production Project Objectives

The Residues in Livestock Production - On-Farm Risk Mitigation project had four distinct objectives, that are listed in Table 1 below, along with an explanation as to whether the respective objective was met prior to the termination of the contract.

Table 1: Project Objectives

Objective	Objective met prior to contract termination (Yes/No)
1. Red meat chemical and heavy metal detection/notification system/process completely mapped and interviews with relevant stakeholders undertaken to clearly identify pain points.	Yes - This objective was met prior to the termination of the contract. The current state was completely mapped out with stakeholders and key pain points were identified by conducting user interviews with the supply chain.
2. Straw man developed and proposed for On-farm Risk Mitigation System Concept following review of processes in other industries and synthesis of user and stakeholder feedback.	Yes - This objective was met prior to the termination of the contract. Following the Discovery phase, a Straw man and proposed On-Farm Risk Mitigation System Concept were developed having synthesised user and stakeholder feedback.
3. Straw man tested with relevant stakeholders and refined	No - This objective was not met due to termination of the contract.
4. Commercialisation pathway defined	No - This objective was not met due to termination of the contract.

3. Methodology

3.1 Experience Definition Methodology

Concentrix Catalyst's Experience Definition process is a user led, consulting engagement used to define the future vision for digital solutions. The process includes three dedicated phases of: Discovery, Ideate and Define. The consultant team of designers and technical experts take into account business goals, user needs and the technical landscape to inform decisions about product features, functionality and appropriate technology to deliver the solution. Due to ISC's decision to terminate the Statement of Work for V.RDA.2101 Residues in Livestock Production, only the Discovery phase of the project was completed.

3.1.1 Discovery Phase

The objective of the Discovery Phase was to uncover detail around the project, particularly around areas of risk or uncertainty and achieve strategic alignment between all parties around the product goals, objectives and success factors. This phase was highly collaborative and comprised of a number of workshops and research activities to understand the business challenge the project was setting out to solve. The project then progressed into rounds of user research to understand how cattle production end users manage their part in the process of capturing critical data, as well as extracting members current pain points and their suggested ideas for opportunities to improve the process.

Activity Summary:

Summary of activities completed during the Discovery Phase included:

I. Strategic Alignment Workshop

The consultants and ISC stakeholders completed a series of interactive exercises to align on the problem we were setting out to solve. Insights were used to inform success factors of the project and learning goals for the project's team research activities to conduct during the Discovery Phase.

II. Business & Technical Workshops:

The consultants and ISC stakeholders then completed Business and Technical Workshops. The Business Workshop was held to discuss and document the details of the current end to end Livestock production assurance process to map out the following:

- The existing high-level process, systems, stakeholders, opportunities, and risks
- An optimal, future state process, systems, stakeholders, opportunities, and risks.

The goal of the Technical Workshop was to discuss and document the current process for capturing residues and contaminants data and to assess ISC's IT/technical environment. It's important that we identified any dependencies and influencing factors that will inform a revised experience with regards to capturing residues and contaminant data.

III. Peak Council Meetings & Member Interviews

In order to achieve buy in across the supply chain from the outset of the project, the consultants met with the executives of five Peak Councils to explain the extensive consultation processes in

place for the project, articulate the project's objectives and confirm the engagement processes with their respective members. The Peak Council's that the project team met with were:

- Cattle Council of Australia (CCA)
- Australian Livestock & Property Agents Association (ALPA)
- Australia Meat Industry Council (AMIC)
- Australian Livestock & Rural Transporter Association (ALTRA)
- Australian Lot Feeders Association (ALFA)

Following the Peak Council meetings, the consultants conducted 15 one-on-one interviews with the Peak Council's nominated members to get a deeper understanding of how cattle producers, meat processors, lot feeders, livestock agents and livestock transporters manage their part in the process of capturing critical data. During the interviews the project team also asked members what their current points were, as well as capturing their suggested ideas for opportunities to improve the current process.

IV. Comparative Analysis

The project team completed Comparative Analysis to assess and document best practice features and User experience (UX) principles from existing agriculture applications that should be considered for exploration in the proposed solution.

V. On Farm System Analysis

A comprehensive review of On-farm management software was also conducted by the project team to further document key take-aways for the proposed solution. Synthesis of the one-on-one member interviews from an On Farm system perspective was also conducted to derive technical integration challenges and opportunities to improve the proposed solution.

VI. Research Report

The consolidated findings from the Discovery phase were presented to the ISC stakeholders. The objective of the session was to playback the project team's key findings from the Discovery phase and to highlight and align on key learnings with project stakeholders.

4. Project Outcomes

The main research findings from the activities completed in the Discovery Phase are included in the summarised tables below and can also be found in Appendix 1.

4.1 Peak Council Interview Findings

Having met with executives of five Peak Councils to explain the processes in place for the project and to articulate the project's objectives, the below findings in Table 2 were extracted from the resulting interviews.

Table 2: Key Themes and Findings from Peak Council Interviews

Peak Council Interviews Findings

<ul style="list-style-type: none"> An improved system needs to be designed and based on the considerations of all the users who interact with it throughout the supply chain. For the system to operate well, it needs to address all industry's issues and their shared concerns as well as their individual user needs.
<ul style="list-style-type: none"> All the interviewees have encountered issues with the current systems they have in place: the user friendliness needs to be improved for LPA and eNVD; paper-based system can't be verified; NVD doesn't supply all the critical information users need; LPA audits are random and not risk based.
<ul style="list-style-type: none"> 80% of the interviewees mentioned that multiple platforms used to achieve various purposes is also an issue. They need to interact with several points to retrieve complete information, which is time consuming, and some systems are outdated and don't integrate well.
<ul style="list-style-type: none"> For users down the supply chain, they need to rely on the data entered on-farm. Considering how busy producers are, the system needs to be as simple as possible for ease of data capture, even when they're in offline situations. A good data format is also essential for what's being passed on, that considers critical information needed by users.
<ul style="list-style-type: none"> When thinking about what a better system may look like, we heard suggestions on what can be improved in the current system: eNVD and LPA need to be simplified and practical to ensure the system is easy to use; ensure farmer's knowledge is communicated accurately through the supply chain; background validation would be helpful for the NVD process. In addition, new systems could be developed to facilitate feedback and allow integration with different systems.
<ul style="list-style-type: none"> 80% of the interviewees said there are industry requirements specifically for their sectors that need to be met. These requirements may not be key focus areas in the current system but could be supported by assisting compliance, audits and animal welfare; incorporate critical information required by individual sectors that rely on other parties.
<ul style="list-style-type: none"> Currently, it's difficult for producers to see the big picture, understand why they need to use the system/technology and the potential risks that could impact them and others due to mistakes during their work. Hence, ongoing education is important to help them understand the process and benefits and realise their responsibilities.

4.2 Member Interview Findings

Following the Peak Council meetings, the consultants conducted 15 one-on-one interviews with the Peak Council's nominated members to get a deeper understanding of how cattle producers, meat processors, lot feeders, livestock agents and livestock transporters manage their part in the process of capturing critical data. During the interviews the project team extracted members current pain points, cost of impact and opportunities to improve the process.

4.2.1 Cattle Producers

Table 3: Cattle Producers - Current Pain Points

Key Pain Points	Other Pain Points
<ul style="list-style-type: none"> Complexity of WHP / ESI system Traded cattle may receive multiple treatments 	<ul style="list-style-type: none"> Property to property (P2P) transfers not always completed

<ul style="list-style-type: none"> • Identification is not reliable (lost tags) • Extensive production systems operate on a mob basis for recording treatments - NLIS is too slow operationally • Cull cattle sold to slaughter within withholding periods • Inaccurate information inputted to NVD • Lack of validation of NVD data • Producers' lack of understanding of importance of residue/contaminant information • Fodder being brought onto properties that could be contaminated (community hay runs big issue!) • Loss of knowledge of previous issues - e.g. organochlorines (OC) • Lead contamination from batteries • Inconsistent approaches to managing and enforcing requirements between jurisdictions (states) • Lack of digital literacy across many producers. • Connectivity • The low number of producers that have or access NLIS accounts 	<ul style="list-style-type: none"> • More detailed descriptions for cattle needed on NVD • Risk assessments not detailed enough • Consignee being responsible for transfers on NLIS • Dry cow management after medication • Manual nature of data recording • Many rules and regulations (State, Commonwealth) / MICOR (Importing Country Requirements) / Client requirements • Making sure that dose rates are accurate for each animal • Identification of treated animals • Linking chemical / contaminant history to an animal • Reliance on truck drivers to deliver documents • Warnings in NLIS system not clear for individual animals • Some herbicides and pesticides warnings are not accurate for usage on animals
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Table 4: Cost of impact to Cattle Producers

Cost of impact to Cattle Production
<ul style="list-style-type: none"> • The trace back time for violations of residues is up to 200 days in one state • Property to property transfers are not being done 5% of the time • Multiple treatments impact WHP as it accumulates in the animal • Some chemicals approved years ago and getting up to date technical information is not possible as companies will not spend \$ if already approved • Current NLIS technology limits the speed of operation (extensive operations)

Table 5: Cattle Producers - Opportunities to improve current process

Key Opportunities	Other Opportunities
<ul style="list-style-type: none"> • Automated data capture of chemical inventory, chemical use, contaminant records, individual animal treatments • Digitisation of data flow through supply chain • Develop validation systems for data provided • Common data language relating descriptions for residues and chemicals • Stronger rules and enforcement to deter non-compliance 	<ul style="list-style-type: none"> • Improved identification technology • The system should make the Consignor responsible for transferring records into the NLIS • Increased consistency between jurisdictions • Consistent label information across chemicals with the same active ingredients

<ul style="list-style-type: none"> • Increase producers' understanding of the importance of providing accurate treatment and potential contaminant data and the consequences of not doing so • Whole of life records of chemical use / potential contaminant exposure on an animal and property basis 	
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4.2.2 Livestock Agents

Table 6: Livestock Agents - Current Pain Points

Key Pain Points	Other Pain Points
<ul style="list-style-type: none"> • Incomplete or inaccurate data captured on the NVD • Poor connectivity where data is collected • Poor digital literacy by producers (up to 20% do not have an email address) • The language and technologies used in the systems are complicated to producers - e.g. eNVD, NLIS • Searching PIC Registers can be difficult • Agents provide services to clients regarding collecting NVDs, LPA audits and NLIS transfers (given usernames and passwords, etc) • Producers are concerned about giving data and how it might be used • Resources required to correct data before sales • Lack of clarity about how the systems fit together - LPA, NLIS, NVDs, MyMLA, MyLPA • Absentee owners not understanding the importance of providing accurate data 	<ul style="list-style-type: none"> • Manual data entry required for information sent with livestock • No data standards • Reliance on truck drivers to deliver documents • There's a lack of system support (eNVD, LPA)

Table 7: Cost of impact to Livestock Agents

Cost of impact to Livestock Agents
<ul style="list-style-type: none"> • Agents can waste several hours when searching for producer and property details in LPA • Agents spend on average an hour a day helping clients understand LPA accreditation, correcting vendor declarations • There used to be one assistant for every two agents to assist with NVD follow up, etc. Now it is two assistants for every agent • Agents frequently encounter a lack of connectivity when away from town centres

Table 8: Livestock Agents - Opportunities to improve current process

Key Opportunities	Other Opportunities
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<ul style="list-style-type: none"> • Simplify the systems, recognising the limited capabilities of users • Systems designed with consideration of user needs (e.g. capturing data once, PIC searches) • Targeted programs for small producers, who do not understand risks but pose major threats • Education of all participants of the industry on why we need to record and declare the treatment information • Simplify the systems so clients can do it themselves (eNVD/LPA) • The system should be operable with periodic connectivity • Auto-population of digital forms 	<ul style="list-style-type: none"> • Simplification and automation of data capture • A management tool that captures relevant data to support a range of issues - NVD, LPA, etc. • Systems should guide users when completing forms
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4.2.3 Livestock Transporters

Table 9: Livestock Transporters - Current Pain Points

Key Pain Points	Other Pain Points
<ul style="list-style-type: none"> • Incorrect or incomplete paperwork • Lack of documentation from saleyards requiring drivers to operate illegally in some states • Current system requires the driver to remember to pick up the NVD / paperwork 	<ul style="list-style-type: none"> • A lack of regulatory enforcement of NVD/ paperwork travelling with stock • NVD does not include curfew information • Transporters have to undertake livestock headcount themselves • Caught between competing priorities of maximum hours driving and maximum time animals can stay on the truck

Table 10: Cost of impact to Livestock Transporters

Cost of impact on Livestock Transporters
<ul style="list-style-type: none"> • 20% of the NVDs aren't filled in, 20-25% aren't filled in correctly - addresses & numbers • 30,000 sheep are transported every week, without any paperwork (waybills) from saleyards from South NSW • Any effluent coming out of the trucks during transport can be given a fine \$600 • Environment Protection Authority (EPA) can also fine livestock truck drivers if effluent tank is full - \$10k-\$20k fine • Drivers can't afford holdups, they have to adhere to National Heavy Vehicle laws and animal welfare laws, if drivers overwork, they can be fined up to \$10K and \$20k-\$30K if matter goes to court

Table 11: Livestock Transporters- Opportunities to improve current process

Key Opportunities	Other Opportunities
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<ul style="list-style-type: none"> Saleyards need systems to produce paperwork in real time for truck drivers 	<ul style="list-style-type: none"> Better understanding of National Heavy Vehicle laws to all in the supply chain, especially chain of responsibility issues (mostly producers) Standardise the waybill requirements for NSW and SA Ability to have counters for livestock onto trucks Include the last time of feed & water of livestock in the NVD RFIDs on all animals would make it a lot more traceable for pickup and transportation
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4.2.4 Lot Feeders

Table 12: Lot Feeders - Current Pain Points

Key Pain Points	Other Pain Points
<ul style="list-style-type: none"> A few residue tracebacks per year that can impact the whole supply chain Incorrect or incomplete data on NVDs Lack of understanding by producers about the importance of disclosing all treatments or that NVD is a legal document The manual nature of data capture and transmission Using HGPs and not declaring cattle as being treated with them Unable to capture data from eNVDs digitally or to send data directly to processors Disincentive for producers to report treatments as it could reduce price 	<ul style="list-style-type: none"> Producers using fodder that may be contaminated - incorrect use of commodity NVDs Drought feeding poses additional contamination risks Electronic systems are not user friendly Short fed cattle may be sent to slaughter within WHP/ESI Incorrect history data on whole of life traceability takes days to fix There is no program to merge all the information when buying from different sources using different systems No backups for data records

Table 13: Cost of impact to Lot Feeders

Cost of impact to Lot Feeders
<ul style="list-style-type: none"> It can take up to 2 days to fix the problem with full life traceability of cattle At least 50% of NVDs are handwritten Disincentive for producers to declare treatments as it may decrease price A small percentage of farmers not complying and will not change Cattle incorrectly described as HGP-free must be downgraded to another market or sold

Table 14: Lot Feeders - Opportunities to improve current process

Key Opportunities	Other Opportunities
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<ul style="list-style-type: none"> • Better informed cattle and fodder providers to increase understanding of the consequences of residue issues and ensure residue and contaminant declarations are correct • Develop 'producer champions' to communicate the need to accurately describe treatments and contaminants and the ramifications of not doing so • Standardisation of data through the supply chain to enable systems to talk to each other • Automated data capture systems • Greater access to data on an animal's history (treatments, contaminants, statuses) 	<ul style="list-style-type: none"> • Greater integration of data systems • Improved ease of system use and data capture • Feedlotting process usually long enough to clear WHPs/ ESIs, therefore minimal risk • Linked data to RFID tags
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4.2.5 Red Meat Processors

Table 15: Red Meat Processors – Current Pain Points

Key Pain Points	Other Pain Points
<ul style="list-style-type: none"> • Having to trust all parts of the supply chain prior to them to: <ul style="list-style-type: none"> ○ have accurately recorded treatment/contaminant information ○ have the skills to properly treat cattle ○ properly source inputs using CVDs and maintaining records - purchase, use and treatment • Incorrect or inaccurate data captured on NVD • Any liability created against an animal in terms of treatments or contaminants accrues to the processor • Hobby farmers and peri-urban producers do not know, understand or want to comply • The consignee being responsible for NLIS transfers takes the onus off the consignor to be diligent with the whole consigning process • Whole of life history is not all captured electronically in a single format • NVDs are 'modular' - there is no link between NVDs as animals move through the supply chain • Because NVDs are not linked, there is no cumulative data and historical data is lost 	<ul style="list-style-type: none"> • Cattle presented that are ineligible for slaughter as do not meet market requirements • Treatment and potential contaminant data is captured and stored manually • Lost time and staffing costs in fixing problems • Lack of compatibility of systems through the supply chain • Cattle history data being delivered in different formats (e.g. NVD, post-sale summaries) • Inability to detect parasites in live animals • Cadmium accumulation, from super phosphate usage, can result in liver rejection (and no risk status) • Traceability of animal is big issue - reliant on human input • It is unclear how non-compliant cattle / properties are 'locked out' of the supply chain (greater disincentives) • Processors not communicating enough about the need to accurate data and consequences of failure • Everyone in the supply chain is trying to maximise value, so any downgrading can impact all

(causing double treatments etc.), limiting the ability of cattle suppliers to access whole of life data	<ul style="list-style-type: none"> Inconsistency between jurisdictions, even though 100,000s livestock move between them every year
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Table 16: Cost of impact to Red Meat Processors

Cost of impact on Meat Processors
<ul style="list-style-type: none"> Lack of lifetime traceability can cost over \$1/kg (not EU eligible) A single abattoir spends ½ to 2 FTE fixing NVD errors Cadmium / Heavy Metals residues in animals is costing a processing company \$350K per week (products discarded) Identified residues in cattle can cost up to \$2 per kg + wages + holding costs

Table 17: Red Meat Processors - Opportunities to improve current process

Key Opportunities	Other Opportunities
<ul style="list-style-type: none"> Make the consignor responsible for NLIS transactions Automated data capture particularly for whole of life recording Digitise all data, including NVD, MSA requirements and the contract of sale. Improve communication to producers about the importance of correct NVD completion and the cost of non-compliance Greater accountability on producers for the information they provide, given the massive investment through the supply chain Ensure chemical use information (chemical treatments, batch number product source) flows through from producers to processors - consider QR codes, etc. to assist 	<ul style="list-style-type: none"> Greater integration of data systems Technologies that can detect lead / HGP, etc. in live animals or real time Have standardised data field across systems Consider 'right to farm' / licensing Nationalise livestock and animal welfare regulations

4.2.6 Consolidated key themes and findings from member interviews

Following synthesis of the member interviews, the below consolidated themes listed in Table 18 were captured by the project team:

Table 18: Consolidated key themes and findings from member interviews

Consolidated key themes and findings from member interviews
<ul style="list-style-type: none"> Producers do not understand why compliance is important, resulting in inaccurate or incomplete treatment and contaminant data being entered onto NVDs.

- | |
|--|
| <ul style="list-style-type: none"> Connectivity and digital literacy are major challenges, particularly for producers. Technologies also need to be integrated through the supply chain to provide a whole of life picture. |
| <ul style="list-style-type: none"> Rules and regulation create challenges. Jurisdictions are inconsistent and there is little incentive to comply. Increasing responsibility of the consignor was identified as an option. |
| <ul style="list-style-type: none"> Production inputs (fodder, chemicals) must be managed correctly, using CVDs and maintaining records of chemical purchase and use. |
| <ul style="list-style-type: none"> Hobby farmers, absentee owners and peri-urban producers were flagged as specific risks due to the non-commercial nature of these operations. |
| <ul style="list-style-type: none"> Focus and understanding of required outcomes increased as you move down the supply chain, with processing being the focal point of issues and liability. |

4.3 On Farm System Analysis

A comprehensive review of on-farm management software was also conducted by the project team to further document key take-aways for the proposed solution. Synthesis of the one-on-one member interviews from an On-Farm system perspective was also conducted to derive the below technical integration challenges and opportunities for exploration in the proposed solution.

Challenge and Opportunity #1 - PubCRIS

Challenge	Opportunity
Producers must manually capture Chemical Product Name, Withholding Period and Export Slaughter Intervals on NVDs. This process is prone to mistakes and could lead to invalid data being recorded.	Provide an integration point for the eNVD system (including 3rd party providers) to the Public Chemical Registration Information System (PubCRIS) to allow the most up to date information to populate the animal treatments.

Challenge and Opportunity #2 - Treatment

Challenge	Opportunity
Further to Challenge #1, producers are required to keep records of livestock treatments, property risks assessment and stock feeds, fodder crops, grain, and pasture treatments. The majority of the data required is captured manually on paper-based systems. Currently the LPA Record Keeping Feature only allows for uploading the paper-based forms.	As recognised through all stakeholder interviews to date, the benefits of digitising data capture are well recognised. For example, the data filled in for animal treatment records could be used to pre-fill data in the electronic NVDs and help producers at audit time. The process for recording Animal Treatments could be made easier by including the previously mentioned integration to PubCRIS. The WHP from Paddock Treatments could be used as a guide to identify when Livestock are eligible to move.

Challenge and Opportunity #3 - Standardisation

Challenge	Opportunity
There are inconsistencies between the data that producers are required to record and the data that is recorded by the 3rd Party On-Farm Management systems. For example, the Animal Treatment Data form is currently paper based and there are some systems that record this digitally, there is nothing to ensure that both are capturing all the required data.	<p>Defining requirements and new digital data standards / common language for residues and contaminants is necessary to deliver consistency in data collected and can be used to drive technical integrations through the supply chain, going forward.</p> <p>Many stakeholders identified whole of life traceability, with treatment and contaminant data linked to this, as the goal of a future system. This is unachievable if data collected as an animal moves through the supply chain is not consistent.</p>

Challenge and Opportunity #4 - Auditing

Challenge	Opportunity
Only a subset of producers are audited, which means that the on-farm chemicals and treatments are only captured for a subset of the producers. When the audits are completed, the data captured is not available to be consumed by other systems.	Producers could complete a self-assessment tool that reports, among many things, the chemicals and treatments they have available on their farm (an inventory). This information could be used to integrate suggestions or prompts based on that data into the process of filling out an electronic NVD and Animal Treatment Records online.

Challenge and Opportunity #5 - eNVD

Challenge	Opportunity
There are quite a few systems capable of creating an electronic NVD. Feedback from Producers is that some are difficult to use.	<p>There is an opportunity to use data recorded as a requirement of being an LPA Producer to make a better overall user experience. This could include the following features:</p> <ul style="list-style-type: none"> • Add external system integrations like PubCRIS (previously mentioned). • Allow users to select the livestock attached to their PIC. • Notify users of a potential WHP breach.

Challenge and Opportunity #6 - NRS

Challenge	Opportunity
The National Residue Survey captures vast amounts of data that drives reports on the overall industry but is siloed from the ability for	This data could be used to drive many features and integrations within the existing Integrity systems. The LPA producer auditing process could be informed by the history of a producer

Producers or other interested parties to evaluate the data and learn from it.	and their levels of residues for one. Producers could use their data to improve their on-farm practises and procedures as well.
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4.4 'Strawman' On-Farm Risk Mitigation System Concept

The project team utilised the outcomes of the Discovery Phase and their extensive industry knowledge and experience to produce a draft 'strawman'. This was presented to ISC via video conference on 20th April 2022.

5. Conclusion

The Discovery Phase highlighted cattle treatments and potential contaminants continue to pose significant risks. While many risks are known and well-documented, some less well-known risks were identified through the Discovery phase, such as the cumulative affects of multiple treatments applied to animals that might be inducted onto multiple properties in a short timeframe.

The inter-relatedness of industry programs to address a range of issues through the red meat supply chain also became apparent from this project. While this project had a singular focus on residues and contaminants, other related issues, such as identification and traceability, vendor declarations and on-farm quality assurance programs, all have a role to play in addressing residues and contaminants. The process to deliver systemic improvements to the industry by addressing individual aspects of the system, is an ongoing challenge with no straight forward solution.

5.1 Benefits to the Industry

The red meat industry should continue to strive for improved risk management of chemical residues and potential contaminants. It is essential that Australia's reputation as a supplier of wholesome and healthy red meat is maintained and enhanced over time.

6. Future Research and Recommendations

Future research opportunities will stem from analysis of current research priorities and any associated gaps. Further engagement with stakeholders will also provide support for ISC in determining future research and development priorities.