Landell Mills

ADB

Greater Mekong Subregion Sustainable Agriculture & Food Security Program

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DEMONSTRATION CONCEPT NOTE:

Cross Border Animal Health and Value Chains Improved (Output 2.2)

Livestock Traceability Demonstration 1

TA 9916-REG: Greater Mekong Subregion Sustainable Agriculture and Food Security Program

April 2022

In association with Berkeley Economic Advising and Research

BEAR
BERKELEY ECONOMIC ADVISING AND RESEARCH

Report submitted by:

Landell Mills Ltd in association with Berkeley Economic Advising and Research

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Key Data

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2. Contents

3. Acronyms and Abbreviations

ADB	Asian Development Bank
ASM	Appropriate Scale Mechanizations
AWD	Alternative Wet and Drying
CCWA	Climate Change and Water Adaptation
CSA	Climate Smart Agriculture
DALaM	(Lao PDR) Department of Agricultural Land Management
DS	Demonstration Site
GDA	General Directorate of Agriculture
GMS	Greater Mekong Subregion
MAFF	(Cambodia) Ministry of Agriculture, Forestry and Fisheries
NAFFRI	National Agriculture and Forestry Research Institute
OP	Operational Priority
PDAFF	Provincial Department of Agriculture, Forestry and Fisheries
SA	Sub Activity
SAFSP	Sustainable Agriculture and Food Security Program
SIWRR	Southern Institute of Water Resources Research (Vietnam)
TA	Technical Assistance
WFE	Water-Food-Energy
WGA	Working Group in Agriculture

1. Summary of Demonstration

Title of demonstration	**Livestock Traceability Demonstration 1 - Lao-Yunnan Cattle Trade**
Implementing agency	Ministry of Agriculture and Forestry (MAF), Lao PDR Department of Livestock and Fishery (DLF), MAF, Lao PDR Ministry of Agriculture and Rural Affairs (MARA), PRC Department of Agriculture and Rural Affairs (DARA), Yunnan, PRC.
Location	South-North Corridor linking Xayaburi and Yunnan Provinces.

1. The agrifood industry in the GMS ls underdeveloped and presents significant opportunities for economic growth. GMS member countries have a comparative advantage in high quality natural resources, fertile agro-ecosystems, and rich biodiversity, all of which contribute to their ability to meet the increasing demand for livestock products. ADB and other development partners have supported the growth of the GMS agriculture sector through CASP and its associated initiatives to help implement a modernized trade system in order to supply safe and high value agrifood products.

2. The Livestock Traceability Demonstration (LTD) for TA-9916 supports GMS agrifood modernization by providing a mechanism to improve livestock product quality, safety, and to market access for farmers across the region. The system uses simply, cost-effective technology that can be adapted to the institutional, geographic, and economic landscape livestock flows from remote rural areas to major cities. LTD provides strong incentives for farmers to invest in improved product quality and value, limit disease propagation and food contamination, and adhere to international food safety standards needed for efficient and successful cross-border trade. This demonstration will pilot the technology, training, and record keeping standards to capture LTDs benefits for farmers in the Lao-Yunnan trade corridor and, by extension, across the GMS region.

2. Rationale and Objectives

2.1. Rationale

3. Market access is the primary gateway out of poverty for poor smallholders, the majority of farmers in low- and middle-income Asia. LTD creates incentives for smallholder farmers to make investments to increase the quality of their products and sell them on to urban and cross-border markets at premium prices. By supporting self-directed poverty reduction in this way, LTD contributes to two of ADBs core objectives: regional integration and economic convergence. Additionally, since women across the region generally allocate more labor to livestock keeping than men, LTD affords opportunities for women who may have been denied educational access. By increasing the production and trade of high-quality livestock products and reducing poverty, LTD also helps implement national agricultural development strategies and reflect the national, social, and economic development goals of all GMS member countries.

1.1. Objectives and Expected Results

2.1.1. Objectives

Food Safety

1. Consumers are demonstrating an increasing concern for food safety, which has resulted in an growing demand for agricultural food products grown using more environmentally friendly methods. This creates an incentive for producers to modify or adopt production methods and practices that can enhance product safety and quality. GMS member countries have increased risks related to mycotoxins and bacterial contamination due to the region's year-round high temperatures and humidity. The temperature increases resulting from global warming are expected to increase contamination risks. Thus, methods of limiting disease propagation and food contamination are critical as the GMS member countries expand their agricultural production and grade into the global market.

2. Informal cross-border livestock trade remains significant in the GMS, presenting significant challenges to national disease control policies. Additionally, increased requirements for documentation and reporting to meet international trade standards are challenging for smallholder farmers due to the high cost and complex reporting requirements. LTD offers a way through which smallholder farmers can reduce the cost of documentation while seamlessly meeting international trade reporting standards. Importantly, LTD combines certification, labeling, and traceability procedures that are required in international trade into a single step that complies with regional food safety and regulatory standards.

3. Most importantly, LTD offers an effective surveillance method for supply chains and is able to monitor disease propagation and food contamination. Traceability systems facilitate disease identification and containment in the event of outbreaks, creating an efficient method of monitoring and modifying supply chains as needed. Since end users can trace the animals transit route and original producers, LTD creates strong incentives for producers and middlemen to reduce disease transmission risk and improve the quality of the final product. Careful documentation of commercial animal movements through LTD, especially information regarding movements across national borders and health characteristics of animals, help create and maintain a safe supply chain throughout GMS member countries.

Value creation through increasing product quality

4. The information documented by traceability systems is essential in addressing issues in livestock trade that affect product quality and safety. In traditional smallholder livestock supply chains, animals pass through intermediary markets before reaching the final consumer. This leads to problems of moral hazard and adverse selection, where the inability of individual producers to be matched with animals of higher quality results in underinvestment and lower product value. LTD can increase the value of livestock production by linking animals to smallholder producers and overcoming these information asymmetries. With proper information exchange between producers and consumers, producers have higher incentives to invest in quality improvements and build a positive reputation.

5. A key component of LTD and its contribution to CASP Phase II initiatives is the ability of LTD to incorporate a certification system and visibly display quality related information. In addition to the traceability system, LTD also supports certification systems linked to their record within the database. This enables supply chain participants and end users to know the identity, transit history, and safety of animals, thereby confirming that the participating animals are safe and of high quality. Overall, the certification system allows for producers to be clearly recognized for higher quality products, incentivizing them to invest in increasing product quality and also receive a price premium for higher quality products.

6. In addition to increasing the value of livestock products, LTD contributes to value creation by minimizing the costs associated with system and market participation. LTD is a cost-effective and simple method to share information and was designed to limit transaction costs. Proper certification not only adds a premium on animal products, but it also facilitates their passage through supply chains, ultimately lowering the cost of market access compared to informal transit methods.

Improved market access and poverty reduction

7. Market access is the primary gateway out of poverty for poor smallholder households, the majority of farmers in Asia. LTD creates incentives for smallholder farmers to make investments to increase the quality of their products and sell their products to urban areas and cross-border markets at premium prices. By supporting self-directed poverty reduction in this way, LTD contributes to two of ADBs core objectives: regional integration and economic convergence. Additionally, since women allocate more labor to livestock keeping than men, LTD affords opportunities for women who may have been denied educational access. By increasing the production and trade of high-quality livestock products and reducing poverty, LTD also helps implement national agricultural development strategies and reflect the national, social, and economic development targets of all GMS member countries.

2.1.2. Expected Results

1. The successful implementation of the proposed demonstration should include the following results:

- Improved regional food productivity, food and health security, and poverty reduction.
- Establishment of domestic and bilateral standards for livestock value chain traceability, including diffusion of hard and soft technology, best practices, and information sharing.
- Training of “sentinel” value chain actors who can propagate these skills and practices among their cohorts and emulate them for other agrifood products and supporting activities.
- Training of domestic and border inspectors, including “back office” data managers and public health staff, both for implementation and to raise public sector awareness of the benefits.
- Deployment of a regional livestock product database that supports public and private information sharing on animal health, value, and market activity.
- Promotion of regional policy dialog on harmonized standards for biosecurity.

2.1.3. Contribution to Regional Cooperation and Integration

4. One of the most important strategic advantages for the GMS and its economic development in the food and agriculture sector is the proximity of its member countries. Investments in transport infrastructure facilitate cross-border trade between GMS member countries and have consequently made intraregional agrifood trade one of the fastest growing sectors in the sub-region. Importantly, cross-border agrifood trade is underutilized and has the potential for dramatic growth and geographic expansion,

conferring direct and indirect economic benefits throughout the region. Enhanced regional cooperation is a key factor in increasing the region's competitiveness and agrifood is considered a priority sector in realizing the potential of the region's ambitious transport corridor investments. Ultimately, the information resource of an advanced livestock traceability system can make essential contributions to food safety and livelihoods. The open-source database at the heart of this system is designed with capacity for extensions that include multilingual implementation, differentiated (but interoperable) national implementation options for each GMS government, and extensions to full distributed ledger ("blockchain") accounting for value chain activities.

3. Selection Process

3.1. Selection Categories

Public Sector Counterparts

Ministries of Agriculture, Trade, and Health:
Ministry of Agriculture and Forestry (MAF), Lao PDR
Department of Livestock and Fishery (DLF), MAF, Lao PDR
Ministry of Agriculture and Rural Affairs, PRC
Department of Agriculture and Rural Affairs (DARA), Yunnan, PRC.

5. Ministries will provide overall supervisory activities, including local focal points to facilitate implementation along the corridor.

Traceability Technology Providers

6. Selected technology providers will work with project staff to enroll livestock producers, in an internet-resident database, providing tags, mobile apps, and training to smallholder farmers, downstream intermediaries, processors, vendors, and public inspectors and customs agents. All events recorded during the demonstration will be consolidated on a digital platform with SQL internet databases open to official counterparts from all public sector participants (including ADB). Farmers and other network participants will have selective access to the database, which will otherwise be protected and confidential. All records will be protected by regular backup and remain the shared property of ADB and participating governments.

Supply Chain Contractors, including Input and Service Providers

7. At least **5** (five) supply chain contractors will be enrolled in the demonstration to support smallholders and also facilitate technology adoption. These value chain actors will be offered

financial incentives (amount TBD) to promote their outreach and support, especially for smallholder producers. The detailed selection criteria for contractors shall be presented in the full proposal.

Livestock Vendor/Aggregators

8. To facilitate market engagement, at least **10** (ten) livestock aggregators will be enrolled in the demonstration to buy or convey animals owned by participating farmers. Local livestock vendors will also get (amount TBD) vendor credit to compensate them for traceability technology adoption and participation in the demo. Detailed selection criteria for input service providers shall be presented in full proposal.

Producers

9. At least 100 livestock producers or intermediaries (targeting 50% female and 30% youth participation)[1] holding marketable livestock along the livestock transit corridor between Xayaburi and Luang Namtha provinces will be invited to participate in the traceability system for transit of animals north to the PRC border[2]. Selected farmers will receive free vaccination for their animals, tags, mobile apps[3], and training. Selection Process (this has been moved) will be focused on smallholder (<= 1 acre of land) producers.

Selection of Demonstration Locations and Livestock Species

10. A variety of GMS localities and animal species were objectively evaluated as candidates for two livestock demonstrations. See the annex to this document (Sections A and B) for scoring results.

11. Final selection of each demonstration for all five GMS countries and five marketable livestock species. Both categories were scored for a variety of the same essential attributes meeting project objectives (see Appendix 3 for details), yielding two recommended demonstrations.

[1] Project aims to include at least 50% women as they are heavily engaged small scale livestock farming and facing additional constraints to avail formal financing. Similarly, may youths (age <= 35 years) who used to work in the others sectors have returned to village due to COVID and opting farming. Therefore, project plans to include at least 30% of youth in the pilot.

[2] Input service providers, vendors and smallholder farmer's selection criteria will be prepared in the detailed program design

[333] As part of a baseline reconnaissance, it will be necessary to confirm the density of mobile phone adoption and network support.

4. Technical Description

4.1. Outline of the proposed demonstration

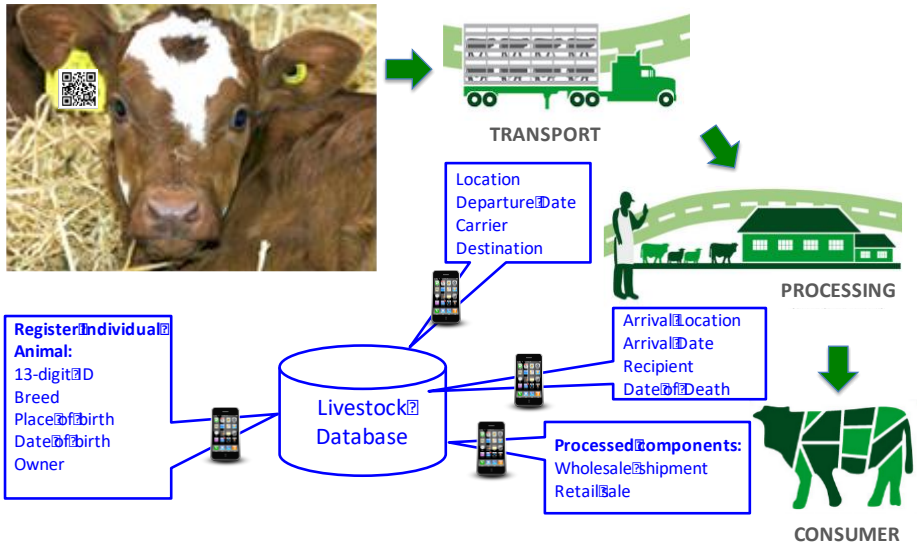
-	Description	Dates
Finalize Pilot Plan	Work with the Department of Livestock and Fisheries, Ministry of Agriculture and Forestry TFPs to finalize pilot plan including site location, implementation staff, and selection of traders and farmers for pilot participation.	2022, Q2
Consultative Meeting with TFPs	This will include a consultative meeting with TFPs, tentatively scheduled to be completed in April, 2022.	2022, Q2
Site Visit Request	Upon finalization of pilot locations, BEAR team will request site visits including TFPs to evaluate current market conditions and identify traders and farmers for pilot participation.	2022, Q2
Site Visit and Baseline Assessment	Baseline corridor assessment, identifying local nodes for engagement, assessing initial conditions and capacity needs for implementation.	2022, Q2
Finalize technology design and training material for LTD Implementation	Develop online database, test scanning technology in pilot setting, and develop Lao language training material, including LTD Training Manual, Online Training Manual, and User-Friendly Traceability Handbook for Farmers	2022, Q2
Central Training followed by subsequent local trainings conducted at respective trainer posts.	Conduct central training in Vientiane Capital on: · LTD implementation (including cattle tagging, scanning, and QR and RFID tag technology) · Online database use and management (accessing, entering and updating cattle information) · Briefing on User-Friendly Traceability Handbook for Farmers and Traders.	2022, Q3

Demonstration 1 implementation	Pilot implementation will begin in Xayaburi Province with cattle tagging and registration, followed by implementation in the designated transit corridor connecting Xayaburi and Luang Namtha Provinces.	2022, Q3-Q4
Demonstration 1 Completion	Upon project completion in all three countries BEAR will produce the following	2023, Q4
	· Policy brief summarizing results	
	· Final Assessment report	
	· Project Completion report	

4.2. Technical features

8. Each livestock traceability demonstration uses **livestock tags** to identify individual animals and track their information, event history, and movement. These livestock tags can be scanned (with password access) to view or enter new information about a particular animal. The system will use two types of **mobile-based scanners** and a web interface to provide straightforward access to the **database** from any location. Cattle are tagged with ear tags that include two types of scanning technologies integrated with an online database. Dual integration of these technologies allows for detailed data to be viewed and updated for individual animals, as well as location traceability to be conducted for groups of animals. The specifications and functionality of the tags, scanning technology, and database are explained in the three following Livestock Traceability Technology segments. Figure 1 illustrates livestock movement from producer to consumer and the corresponding scans conducted and information gathered.

Figure 1: Livestock Traceability Tag and Scan Pathway


TRANSPORT
Location
Departure Date
Carrier
Destination
PROCESSING
Arrival Location
Arrival Date
Recipient
Date of Death
Register Individual Animal:
13-digit ID
Breed
Place of birth
Date of birth
Owner
Livestock Database
Processed Components:
Wholesale shipment
Retail sale
CONSUMER

9. LTD will use a standard 30mm circular yellow tag for all project sites. Each ear tag is custom printed with a globally unique QR individual alphanumeric code, and equipped with an ultra-high frequency (UHF) RFID chip. Veterinary officers will assist producers and traders during Initial Registration and attachment of the tags, which will be described in a local language user manual.

Figure 2: Livestock Ear tag with embedded RFID chip

Source: Datamars (2022)

10. The chosen RFID technology utilizes a passive FDX-B chip. Passive means that the tag does not have an internal battery source continuously powering the tag, but instead relies on energy transferred from the RFID reader to transfer its information. Livestock Traceability RFID system operates in the 860 – 960 MHz frequency range, and complies with the Ultra High Frequency RFID Class 1 Generation 2 (UHF Class 1 Gen 2) protocol. The UHF Class 1 Gen 2 protocol is the global standard for electronic product code identification across sectors, which assists in global coordination of product quality and performance. These chips meet the highest international (ICAR) standards for technology performance for identification and tracing of animals in accordance with ISO 11784 and ISO 11785. The RFID technology facilitates rapid scanning of multiple animals at a safe distance.

4.2.1. Scanning Technology on Tags

11. Hand-held scanners will be used to read the ear tag information for each animal, passing it to a smart phone that will automatically access the animal's unique database record on the internet.. Scanning will occur (1) when the tag is initially registered to the cattle and (2) when a value-chain event occurs. Events will include any relevant production phase data (vaccination, inspections, breeding, etc), veterinary visits, sales, movement, and any other activities deemed relevant by the executing agencies and project enterprise partners. All of the livestock information will be contained in a central project database that is programmed with open-source software and protected by multilayered secure access protocols and full archiving of all record history.

4.2.2. QR Codes

12. We are also considering including QR codes printed on the front of the ear tags. The QR code is a widely established technology commonly used for a variety of applications around

the world. This technology is a 3-dimensional version of the traditional barcode. In both the 2 and 3 dimensional versions, barcodes store information efficiently so that any compatible scanner can read and display the stored information. Any QR scanner can read the code and unpack the link. There are numerous free QR code scanning applications available for mobile smart phones, which can be downloaded in a few minutes.

13. One of the primary benefits of the Livestock Traceability QR codes is that *anyone* who comes across tagged livestock can access the animal's information by scanning the QR code with a mobile smart phone. Figure 3 displays an example Livestock Traceability QR code. To demonstrate the QR technology you can scan the QR code using a smart phone, which will link you to a sample animal's information. It is important to note that although anybody with a smart phone and a tag in front of them can view an animal's information, the ability to edit the animal's information is password protected and restricted to certified personnel.

Figure 3: Example QR Code

4.2.3. QR Code Scanner

14. Any smart phone equipped with a camera and access to the internet can be used as a QR scanner. There are also many popular free apps for enabling QR scanning, but any app that scans QR codes would suffice. The apps read the QR code and allow the user to follow the encoded URL to the database user interface in their phone's browser. Upon providing credentials to this site, the user can view some or all of the data associated with the scanned tag or they may be authorized to log in to enter additional data about the scanned animal. The date, time, and GPS location of all scans of the tag will be automatically recorded, regardless of whether the user enters new data, just views the animal's information, or does not even log in. **In the latter case, a stolen animal's whereabouts can be precisely identified if anyone scans or attempts to photograph the tag.**

4.2.4. RFID Codes

15. In addition to QR codes, the livestock tags are also equipped with RFID chips. For large batches of cattle, or for situations where individual QR codes cannot be conveniently scanned, RFID technology will be used to record the location and time of an event. The RFID chip is built into the tag, and emits a radio signal with associated data that can be read by RFID scanners.

4.2.5. RFID Scanner

16. Select smart phones will be equipped with RFID scanners and provided to relevant authorities (e.g., checkpoint officials). Attaching this external device to the phone turns it into an RFID scanner with the added benefit of an interactive screen connected to the internet.

By enabling RFID scanning, officials can batch scan animals without training a camera on each tag individually. This saves time and is a necessary feature of any system striving for scalability.

17. The device is compatible with a wide range of both Android and iOS mobile phones:

Apple iOS device compatibility

Supported Apple iOS devices have following specifications:

- iOS phones and tablets running 6.0 or higher
- iPhone 4 or higher, iPad 2 or higher

Android device compatibility

Supported Android devices have following specifications:

- Android 3.0 (Honeycomb) or higher
- A standard 3.5 mm audio port that supports both speaker and mic
- Devices without audio enhancement technology such as modified audio sound or microphone modulation Samsung Galaxy Tab 4 or higher- While the Galaxy Tab 4 is supported, you will need to update your Grokker to the latest firmware (v1.9.5 or later) in order to use the Galaxy Tab 4. You must do this with a non-Tab4 device (iOS or Android)

18. The *RFID scanning* device detects the date, time, location, and ID number of all tags within range, then transmits this information to the smart phone which accesses the internet. This process sends the data to the website database, which organizes and stores the new event information for each individual animal identified. A given livestock tag can have an unlimited number of entries from QR code scans and RFID scans.

Figure 4: RFID Scanner Attachment for Smart Phone

Notes: *The U Grok It device connects to a standard smart phone via the audio port. The device comes with an app (U Send It) that facilitates communication with the database.*

4.2.6. Data Management

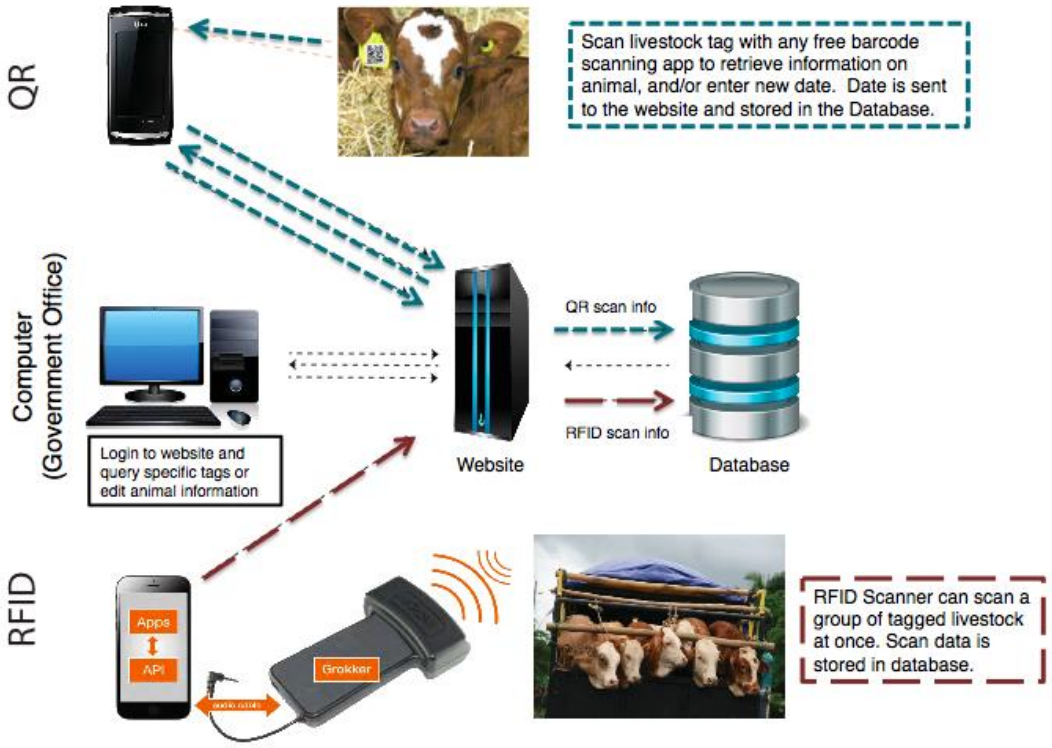
19. A web interface connects the underlying database with users through mobile phones and computers. Figure 5 illustrates the communication channels within the LTD. Mobile phones can access and/or enter information about a particular animal by using either QR or RFIT scanning. The scanners receive the identification number from the livestock tags and the web interface queries the database for the history of the animal(s) with the entered tag information. There are two levels of security in the system. The first level, with no security, allows anybody to view the animal's history by scanning the QR code on the livestock tag. The second level of security, which requires password login, allows data entry into the system. Authorized personnel (customs officials, licensed veterinarians, etc.) will be granted access to the data entry level of the system. Potential buyers, farmers, etc. can view all of the animal's history without editing or adding information.

4.2.7. Central Database

20. The central database hosts the records of all livestock in the LTD system. Each animal has its own record, indexed by country and Animal ID (AID). The information associated with each animal includes registration information and all subsequent scanning events. Every scan of an animal's tag will constitute an event that adds information to the database. However, once registration data is entered, the primary data cannot be amended without password access to the database. The database includes a complete record history, recording any edits or other modifications of existing records.

21. In addition to recording events for scanned livestock, the database will be available to officials in each country so that they can view tagged cattle information, monitor cattle movement, and edit information for individual entries as required. Information associated with a single cow can be looked up by searching the animal's unique Animal ID. Records can be downloaded into an Excel spreadsheet for further analysis. While the demonstration version fo the database will focus on information for registration, transit, and other simple custody events, the ultimate configuration will accommodate more detailed health, nutrition, breeding, transactions, and customs information. Using the ICAR standard data record structure, the database will also be configured to be compatible with more complex downstream product (ISO/GS1 standard) information, extending through animal processing and on to retail livestock products.

Figure 5: Livestock Traceability System Communication Channels



4.3. Animal Identification

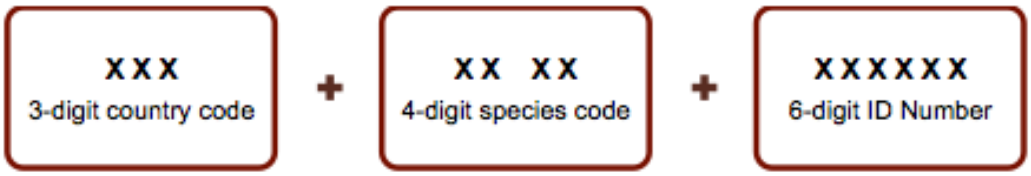
22. All tagged livestock will receive a 13-digit alphanumeric Animal Identification (AID) number. Each AID is individually unique and is encrypted in the animal's respective QR and RFID code. The AID code structure includes three components:

1. A three character (ISO-3166-1-Alpha-3) country of origin code
2. A four digit product code (species in the case of live animals)
3. A six digit animal identification number

AID Examples:

- KHM 0001 0000001 (Cambodia, Live Cattle, No. 000001)
- LAO 0001 0000012 (Lao PDR, Live Buffalo, No. 000012)
- MMR 0001 0000102 (Myanmar, Live Cattle, No. 000102)

Figure 6: Animal Identification (AID) Number Construction



3-Digit Country Code	
Code	*Country*
KHM	Cambodia
LAO	Lao PDR
MMR	Myanmar

4-Digit Species Code			
Code	*Live/Fresh*	*Animals*	
0001	00	01	Cattle
0002	00	02	Buffalo
0003	00	03	Pig
0004	00	04	Chicken

6-Digit ID Number
ID Number
000001
000002
⋮
999999

4.4. Initial Registration

23. Initial Registration will take place at the farm locations where livestock originate. Implementation staff will work with district veterinarian officers to identify and visit farmer locations and register livestock. All farmer/household participating in Livestock Traceability will be assigned an Owner ID for use in animal registration This ID will be part of the tagged animal's information and visible during all future scans. Veterinary Officers will administer the tagging and registration process.

24. During the registration process the QR code will be used to access the database (password protected) registration form, and the following information will be collected and entered:

- ✓ Animal ID
- ✓ Current location (GPS)
- ✓ Current date/time
- ✓ Owner Name
- ✓ Owner Mobile
- ✓ Species
- ✓ Breed
- ✓ Production Category (Meat, Dairy, Egg, Breeding, Traction)
- ✓ Sex
- ✓ Animal date of birth

25. Any device with an internet/network connection, such as a smartphone, tablet, or computer, can be used to enter the registration information. In the event that network access is not available at a given demonstration site, information can be manually recorded and entered as soon as a network connection is available. Initial Registration Forms will be provided at all project sites in case manual entry is needed.

4.5. Livestock Traceability Event Recording

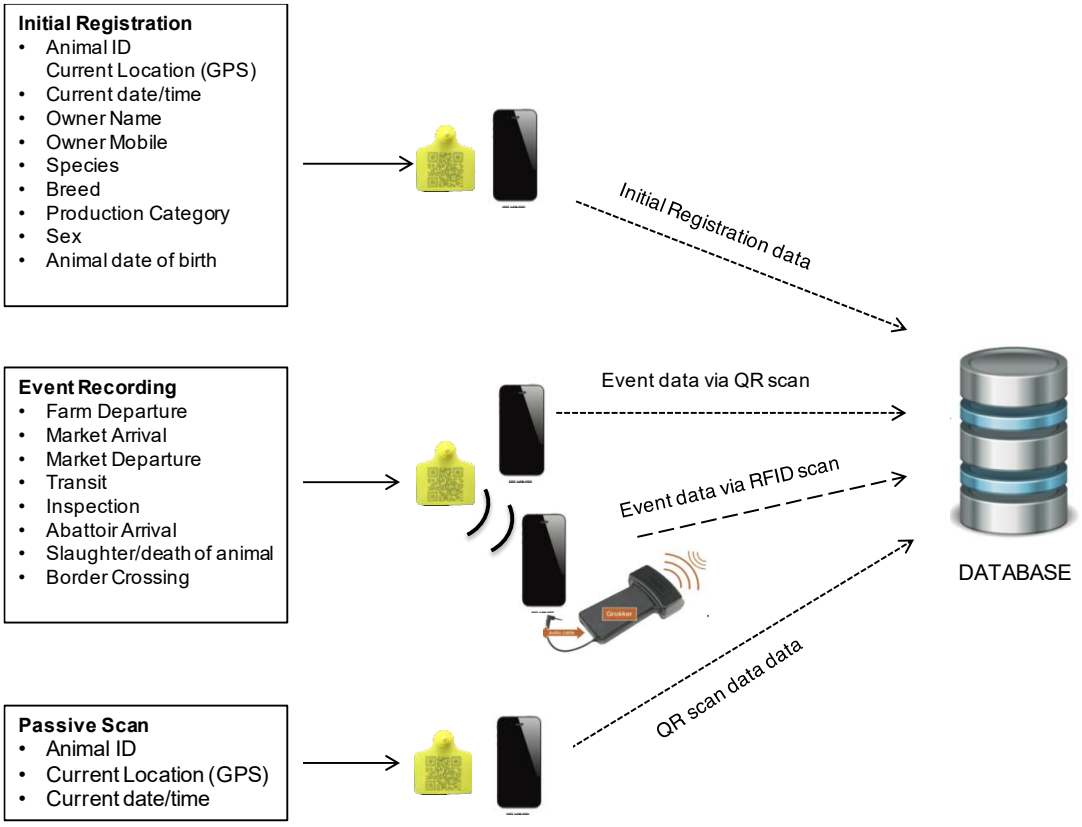
26. Events constitute actions that trigger data entry into the database, such as the movement or inspection of a tagged animal. After an animal has been registered, that animal will be rescanned during an event. An event can include any of the following activities:

- ❖ Farm Departure
- ❖ Market Arrival
- ❖ Market Departure
- ❖ Transit
- ❖ Inspection
- ❖ Border Crossing
- ❖ Abattoir Arrival
- ❖ Slaughter/death of animal

27. To conduct a scan during an event, the scanning agent will follow two steps:

1. Enter event information on the database Event Page for that animal and save
2. Scan the animal's tag to access the database, and record the event as instructed in the User Manual

Figure 7: Schematic of Database Record for Individual Animals



4.6. Initial registration (QR or RFID Code Scan):

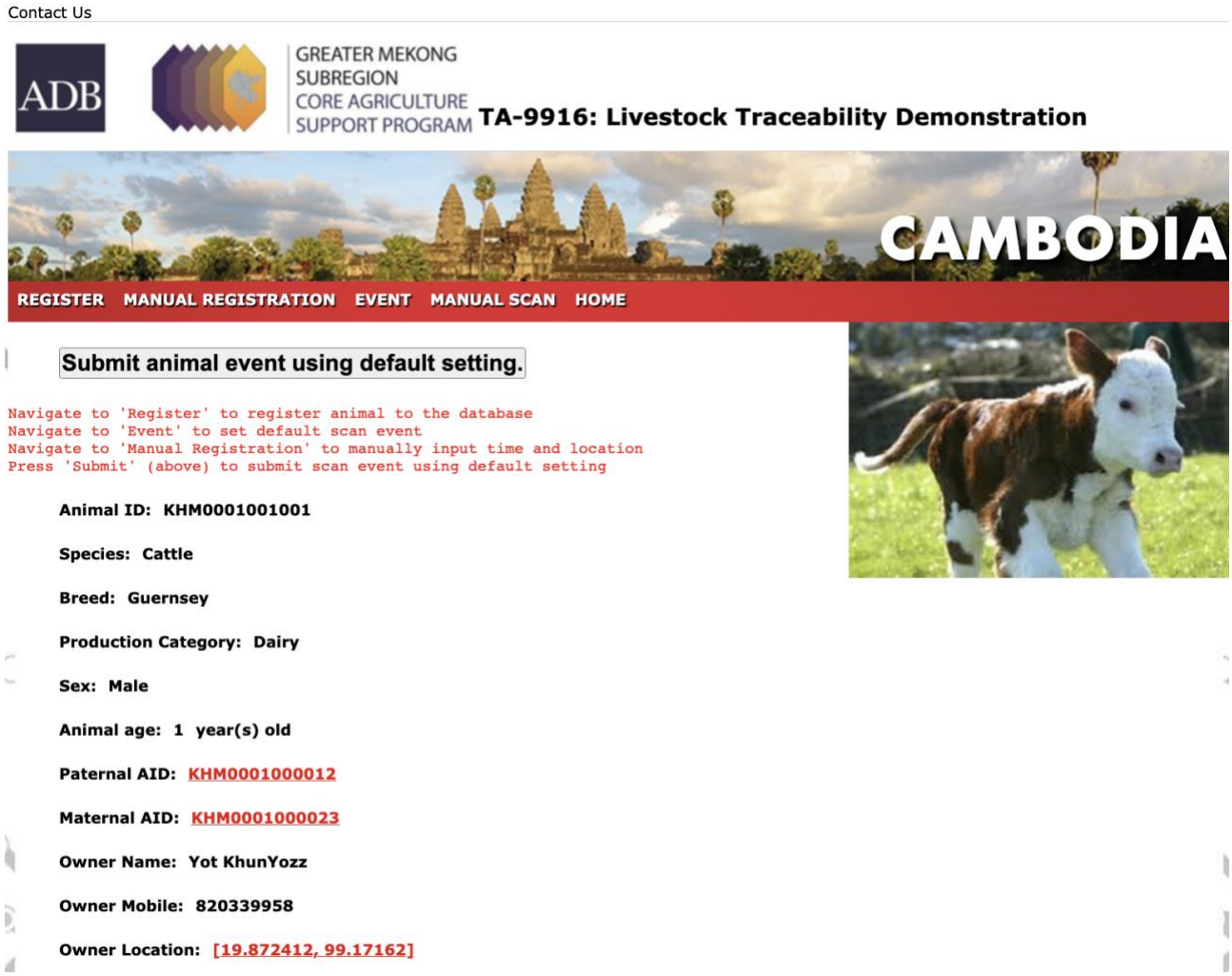
28. When a tag is assigned to an animal for the first time, the QR/RFID code on the tag will be scanned and the relevant registration information can then be entered via an online database registration form viewed on the mobile phone.

4.7. Information Collected during an event:

29. When an animal is being moved or arrives at a checkpoint or other location where they will be tracked, QR or RFID scans can be used to record the current location of the animal as well as additional information including

- ✓ Current Manager
- ✓ Manager Mobile Number
- ✓ Means of Arrival (Walk, Truck, Car, etc)
- ✓ Means of Departure (Walk, Truck, Car, etc)

Figure 8: Sample Animal Record on the Database



4.8. Passive scans viewing animal information

30. When a non-registered individual scans the livestock tag to view the animal's information, the location and time of the scan is automatically recorded even if the user does not manually enter any information. Examples of these types of passive scans include the farmer scanning his own cattle to show his friends, potential buyers scanning the tag to see the animal's history, etc. These scans are more likely to be done using the QR codes since passive users are unlikely to have access to an RFID scanner. The information stored during a passive scan includes the location, date, and time that the scan was conducted. Event data cannot be edited or entered by a non-registered individual.

4.9. Innovation Features

The following properties of LTD are key digital innovations over conventional livestock handling and meet the highest international standards for traceability.

- Individual (uniquely identified) animal identification and tracking (extensible to animal products)

- Detailed animal source registration (digital record of origin, ownership, photo, physical inspection data, etc.)
- Electronic sampling of individual animal ID, date, GPS location, and any supplemental inputs at any stage of transit using an electronic scanner and/or mobile phone
- Detailed transit sampling data (GPS location, date and time) sent to a cumulative individual animal record in a secure internet-resident SQL database.
- Transaction, custody, SPS, health, medication, customs, and other event data can also be added at any time, with all entries (including deleted and revised) archived.
- Complete GPS tracking of animal movements from registration to finishing.
- Additional database (ISO/GS1) record architecture for passing on to downstream livestock products after processing, transit, and sales through agri-food supply chains to final consumers.
- Secure database access can be controlled by institution and by data type. All database access will require identification, but records will be entered automatically whenever scans are taken with an internet connected device. This feature can facilitate location of stolen animals.
- This open-source database is designed with capacity for extension to include multilingual implementation, differentiated (but interoperable) national implementations for each GMS government, and extensions to full distributed ledger (“blockchain”) accounting standards.

4.10. Outputs

31. The main outputs of Livestock Demonstration 1 are set forth in the following table. A second Demonstration will be conducted in the time period indicated and will be the subject of a separate Concept Note.

Table 1: Outputs -Livestock Traceability Demonstration - Lao/PRC Corridor

Outputs	Timing
Baseline assessment of demonstration corridor conditions and capacities	2022 Q2
Work plan and schedule completed with DLF and PRC counterparts	2022 Q2
Establish primary nodes and official representation along the livestock transit corridor	2022 Q2
Recruit private value chain actors	2022 Q3
Deploy traceability technology and training modules	2022 Q3
Begin animal registration, transit monitoring, and program evaluation	2022 Q3
Promote active recruitment of Lao national producers and importers	2022 Q3
Data collection	2022 Q3 - 2023 Q1
Midterm Project Review	2022 Q4
Demonstration 2	2023 Q1 - 2023 Q4
Knowledge product (KP9) on improving livestock value chains with traceability	2023 Q3
Knowledge product (KP11) on anti-microbial resistance	2023 Q3
Data analysis, program evaluation, and reporting	2023 Q3 - 2023 Q3
Evaluation Report	2023 Q4

4.11. Budget

12. The following table summarizes the budget categories for the project. Detailed procurement expenses are set forth in Appendix 2 of this document.

Table 2: Summary Budget Livestock Traceability Demonstration - Lao/PRC Corridor

Item	Cost
Equipment and Material	$ 13,400.00
Technical Services	$ 59,000.00
Implementation Allowances	$40,000
Other	$10,000
Total	$ 122,400.00

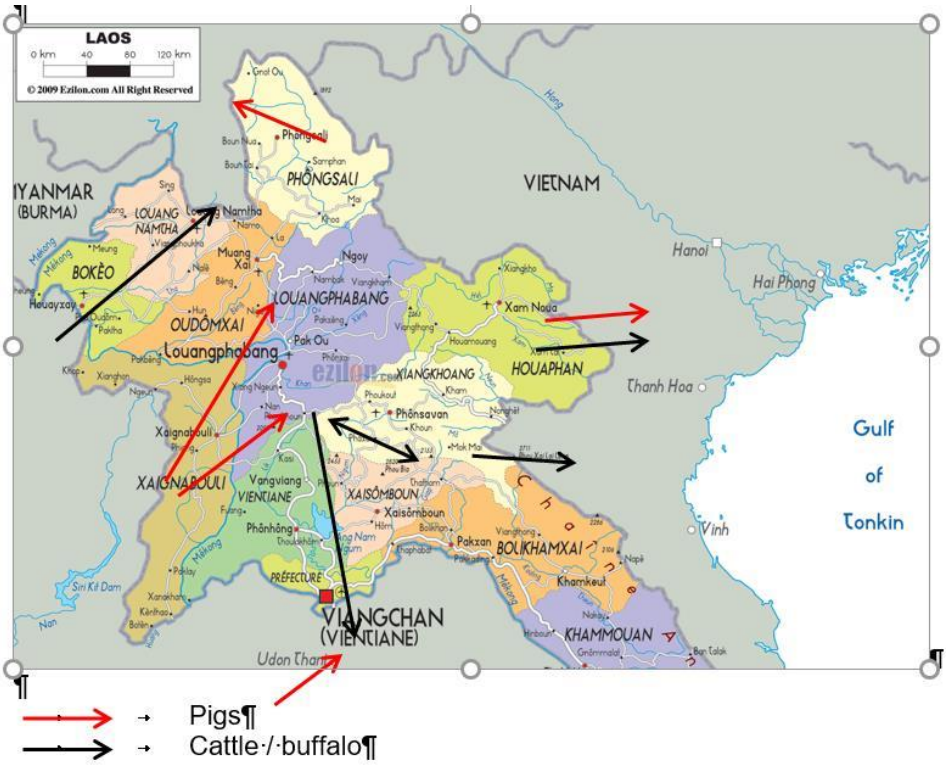
4.12. Other Contributions

13. The TA-9916 team are actively negotiating with WGPS enterprise partners for in-kind contributions and complimentary implementation support.

4.12.1. Demonstration Location

14. The first livestock traceability demonstration will extend across a geographic corridor linking Lao to Northern Thailand and Southern Yunnan/PRC province. This area has special historical, present, and future significance for GMS cattle trade generally and live animal transit from Lao to Yunnan in particular. In the past, large numbers of animals have moved through formal and informal market channels linking Lao to the GMS and even beyond to Southeast and South Asia. Today, such flows persist, but there is also growing trade in the

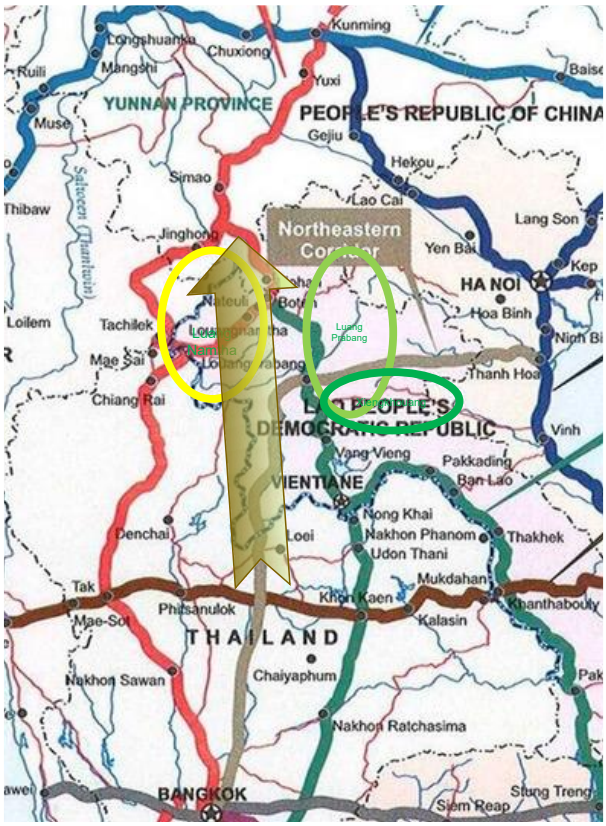
Figure 6: Historical Cattle and Swine Trade Routes in Lao



Source: IFAD: 2016

15. The following figure illustrates two salient influences on Lao's prospects as a regional livestock exporter. The heavy colored lines trace the major highway and rail systems being developed across this part of the GMS, a major infrastructure commitments that will dramatically increase mobility and market access for Lao agrofood products across the GMS region. In proximity to these corridors, IFAD, ADB, and other development partners have been committed for over 5 years to ambitious smallholder livestock development projects in the three regions indicated with ellipses (Luang Namtha, Luang Prabang, and Xiengkhouang). Because of this combination of events, we believe the optimal transit corridor for implementing the cattle traceability demo would extend between these new herd development areas, in parallel to the main North-South transport corridors. The livestock transit corridor (arrow in Figure 2) would begin in the Thai border area in Xayaburi, near Vientiane, where most of today's commercial grade cattle are traded, extending NNW until it reaches the Lao-PRC border shared by Bokeo and Luang Namtha provinces. More detailed nodes and other characteristics of the corridor will be identified during the Baseline Assessment for this demonstration.

Figure 7: Lao-China Rail Corridor and IFAD Livestock Development Projects



Source: IFAD: 2016, World Bank:2016.

4.13. Feasibility Study and Baseline Assessment

16. The initial implementation effort for Sub-output 2.2 will comprise two activities, a Feasibility study for Livestock Traceability Demonstration and an assessment of initial (Baseline) conditions in the chosen project area. Feasibility will be studies by validating the use of traceability tools to improve consumer safety, supply chain efficiency product identification, cross-border verification, and to improve risk management processes in cross-border livestock trade.

17. In parallel, the Baseline Assessment will conduct diligent study of economic, demographic, and agronomic initial conditions along the livestock trade corridor targeted for the demonstration. This will provide important insights about patterns of agrifood production, consumption, employment, and income distribution, revealing the potential for expanded value chain development to stimulate market engagement and livelihood improvements. Beyond economic-demographic indicators, the assessment will analyze current and potential gaps and challenges related to logistics, market access barriers, knowledge and technology gaps, regulatory frameworks, and other barriers to success. Taken together, the Feasibility Study and Baseline Assessment will be used to confirm proof-of-concept and inform the strategy and approach of the upcoming Livestock Traceability Demonstration 1 in Lao/Yunnan PRC.

18. This component of the demonstration will be encapsulated in a report (M5) including details from pilot sites for on various demonstrations on digital technologies for livestock traceability of food (2022 Q2).

4.14. Technical Risks

19. Risks arise mainly from the timely and correct management and implementation of the demonstration site. It is planned to manage this as best as possible by having a well-prepared work plan and schedule, close monitoring and regular meetings. The TA 9916 will provide support to build the local capacity of DLF and DARA in technical areas as needed.

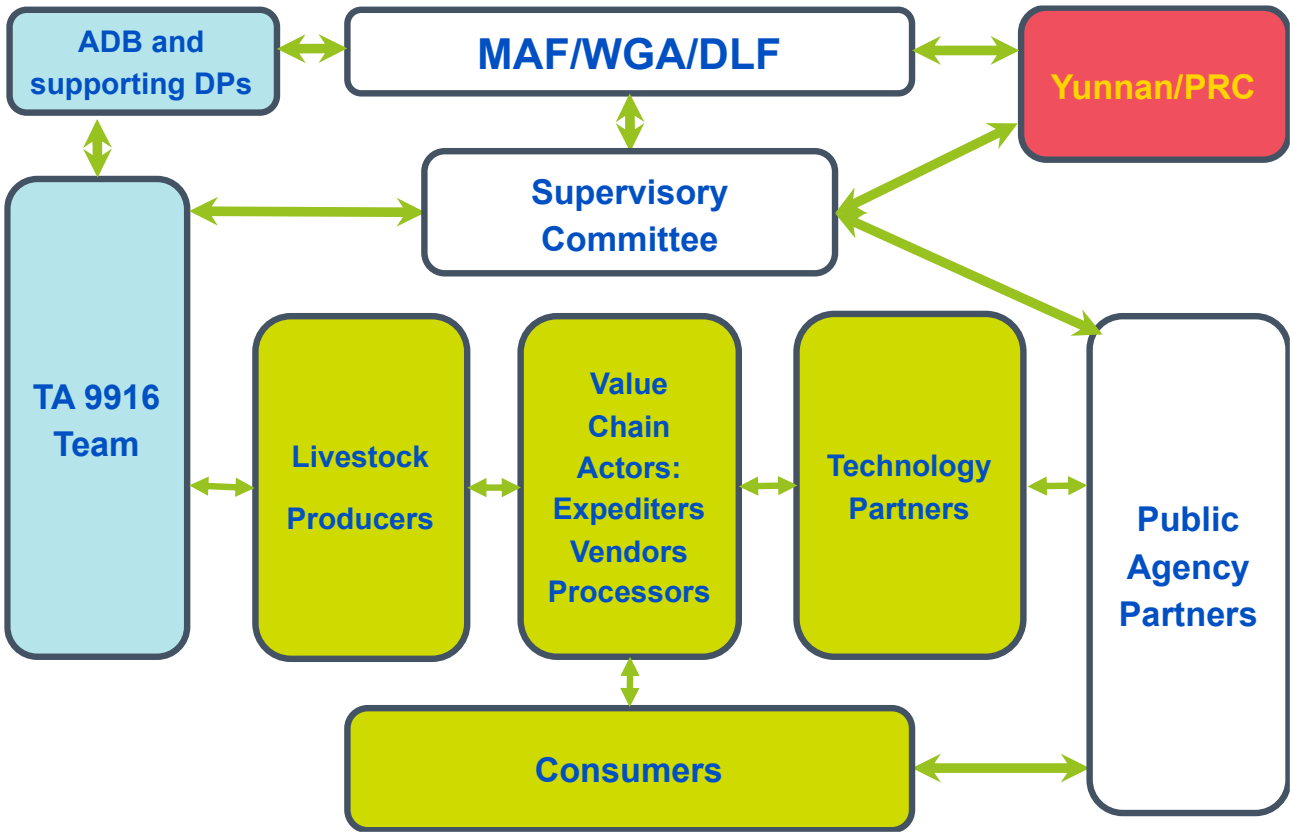
20. Safeguarding issues are discussed in section **Error! Reference source not found.**

5. Implementation Arrangements

5.1. Oversight and Implementing Agencies

21. Oversight arrangements, implementation processes for implementation activities is summarized below. As the schematic hierarchy, suggested, the ultimate authority for the project rests with the Lao MAF/DLF, working collaboratively with DARA in Yunnan/PRC and in concert with the support of ADB and other development partners. Day-to-day implementation will be managed by the TA-9916 team and designated local Public Agency Partners.

Figure 8: Implementation Arrangements



5.2. Management

22. As Figure 8 indicates, WGA and Yunnan/PRC authorities will have primary oversight responsibility for the demonstration, exercised through the mechanism of a Supervisory Committee, empaneled with resource persons invited by MAF in consultation with its DP and PRC counterparts. The TA-9916 team will regularly report implementation progress to this committee with written quarterly progress reports that can be forwarded to higher authorities and shared with Development Partners and designated public/private observers and stakeholders.

5.2.1. TA 9916 – our role and tasks

23. The TA 9916 consultant team will have primary responsibility for coordinating implementation, translating the overall project design into directions for project participants (green boxes above). This engagement will include managing project engagement, training, technology transfer, and ongoing project monitoring.

5.2.2. Public Agency Partners

24. This group will comprise public representatives delegated from Lao and PRC official national, provincial, and local agencies, including but not limited to MAF/DLF and DARA. Their responsibilities will include collaboration with the TA-9916 team and reporting to their higher authorities, but on a day-to-day basis they will facilitate project implementation in the performance of regular duties. The full complement of these participants will be determined as implementation progresses, but the primary categories include the following:

a. Animal health surveillance personnel.
b. Agricultural and livestock officials.
c. Relevant trade officials, including customs and commercial inspectors.

The primary role of these partners will be to ensure compliance of the demonstration with relevant local regulations and to facilitate deployment and implementation of the traceability technologies. Inspectors will also participate directly in monitoring animal transit and be trained in using the technology.

5.2.3. Private Sector Partners

25. The three general types of Private Sector Partner in the demonstration are Livestock Producers, Other Value Chain Actors, and Technology partners. Each of these will be recruited to the demonstration project by the TA-9916, subject to approval by Public Agency Partners and their superiors. Producers and Value Chain Actors who join the demonstration will receive no-cost training in use of the traceability technology and provided with basic learning and implementation materials (see Procurement) at no cost. Modest financial incentives for private partner participation are being considered. Technology Partners are being recruited on a competitive basis, based on their willingness to offer affordable solutions with complementary implementation support and possible in-kind contributions.

5.2.4. Consumers

26. Although Consumers are understood to be primary beneficiaries of a successful traceability system, in terms of food safety, quality, and affordability, they are not directly engaged during project implementation. Because consumer-protective technical standards are integral to agrifood value chains, however, it is understood that some Public Agency Partners associated with the project will attend to this stakeholder group's interests.

5.3. Procurement

27. All procurement for the demonstration will be undertaken by the Landell Mills Ltd TA-9916 procurement consultant. Procurement will be undertaken in accordance with the competitive procurement principles detailed in the ADB Procurement Policy (2017 and as amended from time-to-time), associated Procurement Regulations for ADB Borrowers, and Guidance Notes on Procurement 2017. This section describes general procurement practices for the project. For each livestock demonstration, specific goods and services to be procured are listed in Appendix 2 of this document.

5.3.1. Process

Landell Mills Ltd TA-9916 procurement consultant will, in consultation with the Working Group in Agriculture (WGA) and partner departments and institutes undertake the following actions on behalf of procurement for implementing this demonstration:

1. Prepare the procurement packages for required goods and services and launch procurement;

2. Coordinate with the WGA and project-relevant Departments to evaluate bids and selections of service providers/contractors/suppliers;
3. Landell Mills Ltd will contract the selected providers/contractors/suppliers, arrange their payments, and delivery of services and equipment.

5.3.2. Goods

Off-the-shelf goods or standard specification commodities, including technical equipment and materials for each demonstration, will be procured using the "Shopping" method. This is based upon the Request for Quotations (RFQ) practice, requiring three written quotes from suppliers (in the case of goods) based upon technical specifications. Quotations are then evaluated on a lowest price, technically acceptable principle.

The ADB may waive the three quotation requirement for the purchase of small items – under $10,000. This will be considered on a case-by-case basis.

- Technical specifications for any equipment or services will be pre-defined to ensure that each case meets the quality standards required and quotations are comparable;
- Where goods (equipment) are procured locally, knowledge and experience from partner departments and institutes will be utilized to identify the best available suppliers.

5.3.3. Services

Consulting or non-consulting services may be provided by national technical service providers. Procurement of consulting service providers will be on an Open Competitive Bidding (OCB) basis by default, though Request for Quotations (RFQ) may be used for procuring routine non-consulting services of relatively small value. The selection methods applied with OCB may include any of the following for the proposed technical services:

- Quality- and Cost-Based Selection (QCBS)
- Least-Cost Selection (LCS)
- Quality-Based Selection (QBS)
- Fixed Budget Selection (FBS)
- Consultants' Qualifications Selection (CQS)

Recruitment of individual consultants may be through open or limited competitive bidding (LCB), or, in approved exceptional cases, through Direct Contracting. The successful consultant will be selected based on their qualifications and experience for the assignment, from a pool that have filed an expression of interest (EOI) in response to a request for expressions of interest (including a detailed TOR and criteria to be applied for that selection). Whether issued by advertisement (OCB) or by invitation (Direct Contracting or LCB), this is to be a one-step process.

Single Source Selection (Direct Contracting) for specialized national service providers, including National Technical Institutes, can only be approved by the ADB on a case-by-case basis. Any National institutes must meet the ADB criteria for being financially autonomous (not dependent upon the Government for funding).

5.4. Financial Management

28. The Lao and PRC WGAs want the demonstration project to be implemented under a Letter of Agreement (LoA) between their respective Agriculture Ministries and ADB. MAFF has LoA experience from the Core Agriculture Sector Program II. Both national counterparts have long experience with such arrangements, including accounting sections with capable staff to oversee

the demonstration based upon the conditions of the LoA. Once the LoA is signed, national counterparts will open dedicated bank accounts for the demonstration.

29. There will be an internal financial agreement between the WGAs and their sector departments (DLF and DARA). The former will transfer funds on an output basis to the implementation departments.

5.5. Stakeholder Participation, Roles and Responsibilities

30. The demonstration will involve a wide range of MAFF department technical staff, PDAFF technical staff, women and men farmers, value chain and market system actors, and agribusinesses stakeholders. The main stakeholders are presented in **Table 3**.

Table 3: Stakeholders of prime relevance for the demonstration sites in Lao and Yunnan

Stakeholder Name	Category	Role and Contribution
MAFF/DLF, MARA/DARA	Government	Project implementation and management
WGAs for GMS countries	Government	Observe demo site activities and discuss applications at GMS level
Value chain agribusiness	Private	Supply seed, drip irrigation installation, farm inputs, exposure and engage in new technologies
Agri Equipment Businesses	Private	Supply farm and land management services such as ASMs, exposure and engage in new technologies
Producers and cattle owners (near to site)	Private	Observe demo site activities, participate in training and extension events, exposure to new technologies
Agri Cooperatives	Private	Observe demo site activities, participate in training and extension events, exposure to new technologies
TA 9916 consultants	Donor contractor	Co-implement, support monitoring and reporting of the demo site activities, evaluate results, provide admin oversight

5.5.1. Roles and Responsibilities

31. The demonstration management roles and responsibilities are shown in **Table 4**. There are eight key people involved in the establishment, implementation, monitoring and reporting of the demonstration site activities. These are: MAFF DALRM Director, DAEng Director, two national consultants, and the Output 3.1 TA 9916 Consultants, in addition to two Landell Mills backstopping staff. Labor will be employed for farming activities and will be managed through the DALRM station and paid for by the demonstration budget.

32. MAFF does not have the staff and operational funds to fully support the implementation of the demonstration. Therefore two national technical consultants will be contracted to manage the activities and to direct labor working through, and with, the DALRM station manager. Terms of reference for the national technical consultants are shown in **Appendix 4**. The SAFSP will provide the equipment, materials, labor and technical supervision, to set up, implement, monitor, and report on the demonstration activities. Accordingly, the SAFSP will facilitate these working arrangements with MAFF staff and the two national consultants. The arrangements will be defined in the agreement that will be developed with General Directorate of Agriculture (GDA).

Table 4: Management and Operations Roles and Responsibilities for the Demonstration

Organization	Position	Responsible for	Supporting Roles
DEMONSTRATION MANAGEMENT AND SUPERVISION			
MAFF General Directorate of Agriculture	**Working Group Agriculture Representative**	• Attend meetings, conduct site inspections, manage fund flow, and compliance with ADB requirements	• Review reports as needed
MAFF/MARA	**Director and designated teams**	**Managing TA National Consultants** to perform task as follows: • Develop annual workplans with TA 9916 consultants • Implementation of field activities in line with work plan. • Oversight of work of TA consultants and monitor progress • Monthly progress report and required invoices, receipts, timesheets, and other records as indicated in contract • Data collection schedule • Ensure data and info is secure, backed up • Report and data translation into English as needed	• Reporting and communications external • Support demo design and plan process • Admin functions as indicated in Terms of Reference • Support budget development, find In Kind contributions • Identify local consultants for procurement • Manage inputs of local consultants and suppliers
National technical support Consultants managed by DLF and DARA	As recruited for the project	**Follow work plan as directed by DLF or DARA leaders:** • With MAFF station leader, supervise labor inputs, to achieve work plan activities and tasks • Install equipment as directed by MAFF, MARA, and/or TA 9916 consultants • Collect data and samples according to Monitoring Calendar • Monitoring animals, value chain events, and data related to demonstration activities • Data compilation, storage, back up and reporting	• Reporting and communications external • Support demo design and plan process • Admin functions as indicated in Terms of Reference
TA 9916 consultants	**International Procurement specialist**	• Manage procurement (goods, services, consultants, equipment) • Communications externally and to ADB	• Develop contract • Translation of key docs and forms into Khmer as needed

	TA 9916 consultants (International and National)	• Quarterly Reporting to ADB • Develop demo design and plan • Develop Demo site SOP • Develop Monitoring Calendar • Develop budget and track expenditure • Training needs analysis of Partner Implementing team and identify support plan	• Support demo design and plan implementation • Review and monitor data collection plan • Support data analysis • Check data integrity and security • Communications external and to ADB
	Landell Mills backstopping staff	• Monitoring and progress tracking • Expenditure tracking • Liaison with ADB	• Reporting

5.6. Readiness for Implementation

33. A readiness assessment has been made by the TA 9916 consultants of the MAFF departments that will be involved in managing the demonstration as shown in **Table 5.** The assessment is that DLF and DARA may have limited technical capacities and resources to design and implement the demonstrations, without significant TA assistance and oversight. However, with TA support and guidance, they are well-positioned to implement this demonstration activity. The TA 9916 consultant's support, especially for the introduction, testing, trainingss and evaluation of new technologies and practices, will be essential.

Table 5: Assessment of the Readiness of MAFF Departments for Demonstration Management and Implementation

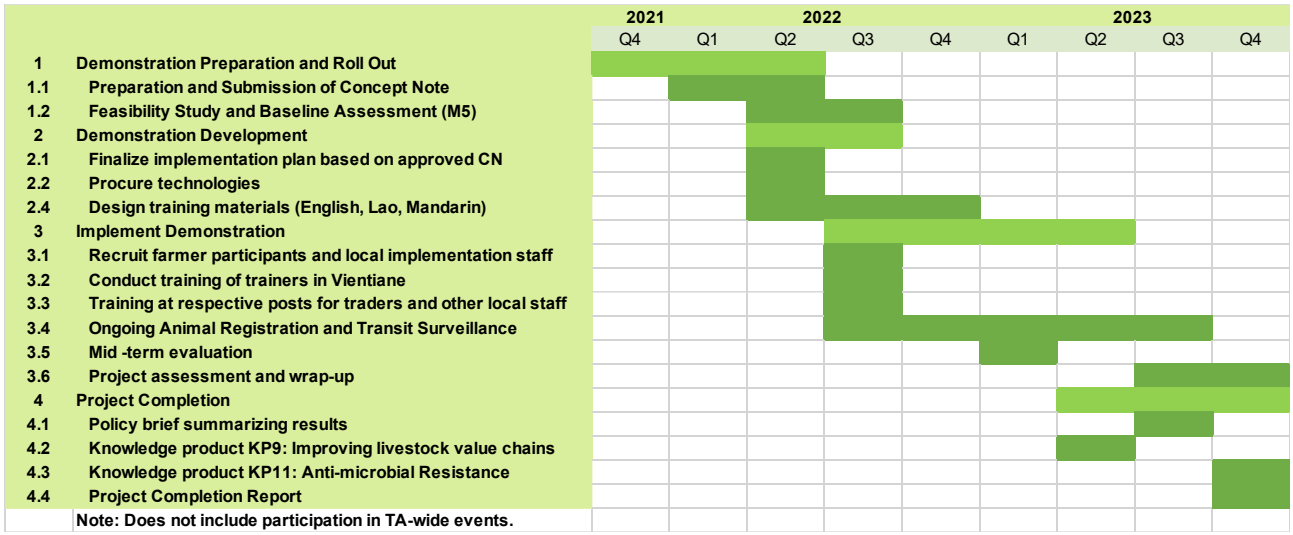
Implementation Partners	Resources for Implementation	Capacity to Implement
Implementation Readiness		
WGAs, MAFF, and MARA	Have substantial accounting and financial management systems	Considerable implementation experience eg CASP II Accounting section has capacity to manage finances Will need some support to comply with ADB requirements
DLF	Have adequate staff resources for implementation	Have adequate experience for implementation oversight
DARA	Have adequate staff resources for implementation	Have adequate experience for implementation oversight
Technical Readiness		

DLF	Limited technical staff to assist with implementation	Variable – some strong technical areas, but technical support and training required for implementation of LTD and database use.
DARA	Some technical staff to assist with implementation	Limited technical capacity in traceability technology implementation.
Livestock Producers	Limited technical staff and experience	Very limited technical capacity in traceability technology implementation.
Agribusiness and Supply Chain Intermediaries	Limited technical staff and experience	Variable technical capacity in traceability technology implementation.

Implementation Schedule

34. The main activities of the demonstration are set forth in the following work plan. More detail will be provided in the final implementation plan (stage 2.1).

Figure 9: Livestock Traceability Demonstration 1 - Lao/PRC Corridor



Monitoring and Reporting

32. In addition to primary reports listed in the Implementation Schedule (Figure) and overall TA workplan, the TA-9916 Team will file quarterly progress reports on the demonstration to the Supervisory Committee for approval and sharing with other public stakeholders. Minutes for any meetings with the Supervisory Committee will also be complied for final project reporting.

33. With respect to the traceability technology implementation itself, all electronic records of animal registration and transit will be monitored by TA-9916 over the term of project

implementation. This centralized record system will support monitoring of system utilization and practices by actors at all stages of the value chain. This monitoring will support more effective management of system continuity and performance, as well as yielding detailed and permanent records for ex post analysis of the system.

2. Sustainability

34. Because of the real time recording of all traceability events on a centralized, stable, and secure internet server, the system can be tuned and adapted to changing circumstances, averting possible disruption, and adapting demonstration management dynamically over time and space. For example, relatively low registration levels in one region can be compensated by moving to other locations or increasing recruitment efforts. Likewise, depressed transit monitoring levels can signal logistical challenges or other supply disruptions.

35. All Public and Private Partners for the project will be fully trained to support outreach, recruitment, and deliver implementation support. The mobile app used for transit and registration will also host messaging capacity to facilitate cross-project support.

36. All technologies and practices will rely on readily available, standardized technologies that can be implemented with only local language adaptation and mobile phone access. Existing learning materials will be provided at no cost and indefinitely on the internet.

37. All technologies and skills acquired in this demo are eligible for application a broad array of other agrifood and rural sector products, including specialty fuits, vegetables, handicrafts, etc.

3. Outreach and Communications

5.6.1. Outreach

35. Extension outreach activities will be targeted at three main stakeholder groups: (i) livestock producers; (ii) DLF and DARA extension staff; and (iii) value chain intermediaries.

36. There will be a regular series of training events at demonstration sites for farmers, extension staff, and value chain intermediaries (see **Table 6** below). These will feature the traceabilitiy technology and presentations on its many contributions to product quality, food safety, and livelihoods.

37. At least one GMS event at the Lao/PRC border is planned. This will align with one of the three following TA 9916 workshop events: (i) M12 Digital technologies for climate smart agriculture; (ii) M14 Water Accounting; and, (ii) M16 Climate smart agri-food systems in the GMS (see also below)

5.6.2. Capacity Building

38. The planned events related to targets and deliverables include:

i. Support: Centralized (VTE) and local training in traceability technology adoption and use
ii. Support or lead workshops demonstrating the benefits of traceability for value chain actors from “farm to fork”
iii. Evaluate innovations for scaling up traceability and linking value chain actors to these, through promotion events
iv. Knowledge product (KP9) on improving livestock value chains with traceability

v. Knowledge product (KP11) on anti-microbial resistance

5.6.3. Communications

39. A communications calendar (**Table 6**) shows the proposed messaging, reporting and data updates.

Table 6: Communication Calendar for Key Events, Reporting and Stakeholder Outreach

Task	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q1 2024
Newsletter contributions to SAFSP	1	1	1	1	1	1	1	1	1
Quarterly progress reports	1	1	1	1	1	1	1	1	
Field days promotion			1	1	1	1	1	1	
Open day Demo Site, farmer seminar			1	1	1	1	1	1	
MAFF/ PDAFF training schedule		1	1	1					
Posts to SAFSP website		1	1	1	1	1	1	1	1
Pre-Success Stories of adoption				1	1	1	1	1	
Posts to SAFSP private Facebook page		1	1	1	1	1	1	1	1
Video of CSA innovations at Demo site		1	1	1	1	1	1	1	
Final Report drafting								1	1

4. Social, Gender and Environmental

5.7. Social and Resettlement

38. Social features – Across the GMS, livestock transit corriders like the candidates being considered for the demonstration pass through montane and border areas with higher concentrations of ethnic minorities. Early phases of implementation will recruit and deliver animals with established trading enterprises, but the smallholder focus envisioned for long term implementation will benefit these groups disproportionately. Because of historical marginalization, their market access has been more limited than ethnic majority populations with more urbanized and motorized populations.

39. Resettlement – land issues- there are no known requirements in this demonstration for reallocation or reassignment of property or property rights, and any personal activities are expected to be in normal course and location of prior activity. Farmers may elect to adapt investment or marketing decisions based on the traceability decision, but these are voluntary and unlikely to significantly impact land entitlement or location decisions.

5.7.1. Gender

40. The proposed livestock demonstrations aim to strengthen market linkages between lower income cattle producers and downstream supply chain actors by reducing market access barriers, information asymmetries, and their attendant costs and risks. As these livestock producers find themselves in a stronger position to identify market conditions, bargain with

service providers, input suppliers, and downstream counterparts, and to be recognized for their investments in product quality, they become more likely to take such risks and enter a virtuous cycle leading to higher incomes and enterprise development. This relatively more stable financial footing makes these producers more resilient to climate strains and 'shocks' to their production (e.g. animal loss from droughts or floods, and disease propagation), as well as improving their economic capacity to invest in resilience and climate-adaptation strategies.

41. For a variety of reasons, female-headed and female-represented farm households (in livestock and other agrifood activities) have disproportionately low access to credit, extension services, and other productive resources as compared to their male counterparts - typically facing even steeper pathways towards improved, more remunerative production. The Lao poultry sector is particularly emblematic of these trends in that, as compared to other livestock sectors, women are more commonly in charge of poultry production and marketing. The interventions we propose can forge stronger links between farmers and downstream vendors, establishing a mutual economic interest in the success of one another's production. Our project Inception Report will set forth a gender action plan to target equitable female participation in all interventions. The market connections our technologies enable will be a source of competitive advantage for our participants, opening doors to better and more affordable inputs, lines of credit, contracting, and other market support. In this way, the pilots will illustrate how gender-neutral technology diffusion can act as a corrective for other structural biases.

5.7.2. Environmental and Climate Change

40. The environmental and climate benefits expected from this demonstration site are considerable and relate to both climate change adaptation, resilience and mitigation, as well as reducing negative environmental impacts. The demonstration site is expected to validate benefits arising from the testing of innovations linked to climate smart soil and water management adaptations and mitigation. These include:

    i. Reduced water usage and increased water productivity for irrigated rice production, associated with reduced greenhouse gas (GHC) emissions from flooded soils;
    i. Reduced water usage and increased water productivity for irrigated vegetable production;
    ii. Increased soil health and soil organic carbon resulting from appropriate scale mechanizations, improved soil structure, cover crops, green manures, integrated nutrient management;
    iii. Increased atmospheric carbon capture through cover crops and green manure incorporation into soils;
    iv. More efficient and effective fertilizer usage and reduced synesthetic fertilizer usage resulting from quick testing methods/ integrated nutrient management, leading to reduced GHG emissions;
    v. Climate data capture and usage for farm management, decision support and early warning systems;
    vi. Digital agriculture ecosystem is explored and evaluated for digital agriculture applications, to support the measurement, monitoring and management of climate change adaptations and mitigations.

41. These benefits and mitigation effects will be established using data collected from soil water sensors, carbon balance models, water accounting, climate data, soil data and soil health assessments.

5.8. Potential for Scaling Up and Replication

42. The demonstration will be a showcase and validation site for innovative livestock management and substainable, climate resilient food production technologies and practices. Proven, beneficial and cost-effective technologies and practices will be promoted to raise awareness, interest and engagement of farmers and other key stakeholders. The next step that follows from this is demand creation for the new technologies and practices, led by the private sector agribusinesse to support the uptake and adoption.

43. The process will begin with SAFSP supporting workshops, field days, training, and other extension activities, targeted to the farmers that are in the vicinity of the demonstration site and also to key MAFF/MARA staff, and the private sector. This will be the platform for sustainable scaling up of the new technologies and practices. Key elements of this sustainability will be to ensure that youth and women are actively supported and their needs met, as discussed in more detail in the Section on Social, Gender and Environmental aspects above.

44. The post demonstration evaluation survey will review outcomes against the baseline data collected before and after the demonstration was implemented. The knowledge products and workshops will take the experience and learning accumulated from the demonstration site, and apply them into content and processes for those capacity building tools. The TA 9916 consultants will work with the partner extension departments and the private sector to ensure relevance and exposure to the new technologies and practices raised for promotion.

45. The TA 9916 consultants will particularly focus on promoting adoption of effective and affordable new technologies and practices, by ensuring that relevant private sector actors are engaged and involved in extension, training, and outreach. It is expected that this will continue beyond the ADB support for the demonstration site and that the MAFF will continue to use it for climate smart agriculture-based work.

Appendix 1: Demonstration Selection

42. The strategy for selecting demonstrations examined the following series of project attributes, scoring in each category across all GMS countries:

- Host country readiness - Each host country would be home to the majority of value chain activities and agents for a given demonstration.
- Value Chain Product - Which among the four major livestock categories (Bovine, Swine, Poultry, Fish) would be most appropriate for demonstrations.
- Technology partners - Most important attributes for partners working on TA and WGA partners on demonstrations.
- Agrifood Enterprises - Most important attributes for food industry partners joining the demonstration.

43. An objective scoring method was applied across all five countries and the above four categories, resulting in the following tabulations.[4]

[4] Detailed narratives of the evaluation interviews were also made but will not be published.

Scoring Sheet for 2.1 Livestock Demonstration 1: Countries, Products, and Partners

		APPLICABILITY OF CRITERIA: Yes= 1, No = 0					
A	**Country Selection Criteria**	**Cambodia**	**Lao PDR**	**Viet Nam**	**Thailand**	**PRC**	**Myanmar**
1	Strong interest expressed by the WGA and Ministry of Agriculture in the demonstration	0	1	1	1	1	0
2	Alignment of demonstration to the TA 9916 outcomes and vision	1	1	1	1	1	1
3	Potential for the demonstration to contribute to enhanced and coordinated GMS agri-food trade-- Demonstrations should contribute to regional cooperation and integration and enhanced regional trade.	1	1	1	1	1	0
4	Potential for knowledge sharing across countries and potential for upscaling and replication	1	1	1	1	1	0
5	Builds on existing experiences and best practices, and not start from scratch, and high potential for transferability of experiences	1	0	1	1	1	0
6	Offers regional investment potentials	1	1	1	1	1	0
7	Availability of service providers/partners with good track record who are willing to cooperate, and and has the capacity to implement local digital technologies	0	0	1	1	1	0
	TOTAL	**5**	**5**	**7**	**7**	**7**	**1**

B.	**Product Selection Criteria**	**Cattle**	**Swine**	**Poultry**	**Fish**
1	High trade potential	6	6	5	4
2	High-value products for export and/or cross border trade	7	4	3	3
3	High consumer preference for food safety and quality standards	5	5	4	4
4	Contract farming potential for cost-effective supply and inspection	4	4	4	3
5	Significant food safety risks, especially for fresh produce and livestock zoonotic diseases	5	4	4	4
6	Value chain actors/stakeholders: government, private sector groups and relevant stakeholders (agribusinesses and digital services providers) available and willing to participate.	6	3	2	2
7	Smallholder producers, represented by both female and male farmers, can be given access to higher value markets.	4	4	3	3
8	Strong participation by local/provincial public and private actors	5	5	5	3
9	Strong linkages with producers (production farms, cooperatives, farmer groups).	5	5	3	3
	TOTAL	**47**	**40**	**33**	**29**

C.	Technology Partner Selection Criteria	OpsSmart Global	Jixun	Jingzhou Syntek	Chainway	Chengdu MIND	Beijing extraRFID	Datamars
1	Has a good track record and willing to cooperate with external partners	4	3	2	4	2	3	5
2	Cross-border/international presence	2	2	2	4	3	3	5
3	Capacity for interoperable systems and standards	2	3	3	3	3	3	5
4	Capacity to implement local digital technologies	4	3	2	3	2	4	4
5	Can provide tech solutions with long-term potential for scaling-up	4	2	2	2	2	4	4
6	Rights of the technology after the project ended—ideally non-proprietary, open-sourced technology that can be scaled up and mainstreamed.	2	3	3	3	3	3	3
7	Able to contribute counterpart funding/support to demo pilot	3	3	3	3	3	3	3
8	Potential to integrate systems and effectively work with government regulatory bodies (SPS, customs, etc.)	3	3	2	3	2	3	4
	TOTAL	**24**	**22**	**19**	**25**	**20**	**26**	**33**

D.	Agribusiness Partner Selection Criteria	NSTDA Thailand	GS1 Thailand	Trace Thai Team	ACFS Thailand			
1	Agribusinesses are transparent, willing to open their systems, and share in costs (could be in kind) if needed (good reputation, strong experience in external collaboration, etc)	1	1	1	1			
2	Trade/ export/import enterprises with strong linkages to producers (production farms – including women owned/led agro- businesses and/or cooperatives, farmer groups).	1	1	1	1			
3	Prior experience and/or capacity for compliance with existing domestic food safety standards.	1	1	1	1			
4	Advantageous, if there is familiarity with any traceability systems (i.e., paper-based, bar/QR-coding, digital software, etc.)	1	1	1	0			
	Producer groups/cooperative with trading partners involved in international trade must have:	1	1	0.5	0			
5	Experience in application of product specific food safety/quality certification standards.	1	1	1	0.5			
6	Adequate number of contract or other supply chain linkes to smallholder producer, aggregators, expeditors.	1	1	0	0			
7	Good management systems and well-defined membership participation rules and responsibilities.	1	0	1	0			
8	At least 50% of the producer group / cooperative members and/or leaders are women, including women-owned/led agrobusinesses / cooperatives.	1						
	TOTAL	**9**	**7**	**6.5**	**3.5**			
	* Only 1 Value Chain will be selected							
	** There can be multiple implementing/technology partners, but one should be designated to coordinate.							
	*** There can be multiple agribusinesses							

Appendix 2: Procurement

44. This Appendix provides detailed lists of goods, listed in **Table X.** Full technical specifications, and terms of reference for services, will be prepared by the TA 9916 consultants.

Table 7: Demonstration Procurement of Goods and Services

Goods	Number	Unit Cost	Estimated Value	Procurement Method
RFID, UHF responsive and QR encoded livestock ear tags.	2000	$ 1.50	$ 3,000	Shopping
UHF scanning devices with mobile phone interfaces.	20	$ 500.00	$ 10,000	Shopping
Ear tag applicators.	20	$ 20.00	$ 400	
Services				
Internet domain hosting the interactive traceability database.	1	$ 500.00	$ 2,000	Shopping
SQL database recording, retaining, and securing all tracing records.	1	$ 10,000.00	$ 15,000	Direct Contracting
Applications support for registration and transit scanning devices.	1	$ 10,000.00	$ 10,000	Direct Contracting
Training modules for public and private sector value chain actors.	10	$ 2,000.00	$ 20,000	TA-9916 team and public sector partners.
Learning materials and manuals for the trainings and implementation activities.	12	$ 1,000.00	$ 12,000	TA-9916 team and Direct Contracting
Total			**$ 72,400**	

Appendix 3: List of Contacts

Partner Agency	Staff	Phone	Email
MAFF WGA	Dr Somany Prum	+855-16 811827	prumsomany35@gmail.com
MAFF	Mr.Chheng Vibolrith	+855 12 465 398	chheng.vibolrith@gmail.com
MAFF DALRM	Dr Seng Vang	+855 12 804 181	sengvangkh@gmail.com
MAFF DAEng	Mr Ngin Kosal	N/A	nginkosal9@gmail.com
TA-9916 Consultant	Nic Richards	+61 433 831 238	nrichards0743@gmail.com
TA-9916 Consultant	Chantha Oeurng	+855 12 895 840	chanthaposat@yahoo.com

Appendix 6: Demonstration Implementation Arrangements

4.1. Purpose

The purpose of this Implementation Arrangements note is to provide the GMS Working Group in Agriculture, and Agriculture Ministry Departments and Institutes with an outline of how the TA-9916 demonstrations will be managed. Final Implementation Arrangements will vary between demonstrations due to the different features of each demonstration.

4.2. Management

It is intended that Agriculture Ministry departments, or in some case institutes, will manage the implementation of the demonstration.

4.3. Department

Each department will manage the implementation of the demonstration as described in the Demonstration Proposal. A Letter of Agreement (LoA) will be prepared with terms of reference to define the implementation management functions and activities. Responsibilities of all parties will be defined in the LoA, that will also include the Demonstration Proposal as an appendix. Each department will appoint a Demonstration Manager. There will also be technical departmental staff assigned to assist with implementation and provide technical inputs.

Main management tasks that the department will be responsible for may include:

- Assist with the establishment of the demonstration
- Provide regular technical support inputs
- Monitoring of implementation progress
- Liaison with demonstration farmers
- Coordinate with the TA 9916 consultants and other service providers
- Gathering of data for results
- Periodic reporting.

Some management support will be provided by the TA 9916 consultants, and there may also be some inputs by specialist technical service providers. These will all be defined in the LoA.

4.4. Learning and Extension

Departments will use the demonstration for farmer extension and capacity development. This will include TA 9916 funded extension and capacity development, as well as any department funded farmer extension and capacity development activities.

4.5. Procurement

Procurement of goods, services and works will be managed by the TA 9916 Procurement Specialist, in coordination with the WGA and Departments, as described in the Procurement Guidance Note.

4.6. Financial

Landell Mills, the TA 9916 consultant, is responsible to the ADB for the management of the demonstration funds. Departmental staff will receive allowances for their field inputs, and some operational expenses may be refunded. It is expected that the following will be funded:

- Field allowances - at an agreed rate

- Travel to the field (fuel costs)
- Consumables – paper, and some materials
- Communications (set amount)

These costs will be included in the demonstration proposal budget and in the LoA. Full financial records will be required for all expenditure.

4.7. Institutes

Eligible institutes may be contracted as a service provider to manage the implementation of the demonstration. In such cases the implementation management responsibilities will be defined in the terms of reference that are part of the LoA.

The institute will be contracted to Landell Mills to manage the demonstration. Technical oversight will be by the TA 9916 consultants, and the WGA.

4.8. TA 9916 Responsibilities

The TA 9916 consultants will provide management oversight, and technical support, for each demonstration.

Management

Key tasks will include:

- Procurement (as noted above)
- Manage baseline survey
- Management support to departments and institutes
- Monitoring and progress reporting
- Payments to departments and service providers
- Final survey.

Technical

Key tasks will include:

- Assist to plan technical activities
- Assist to implement technical activities
- Regular technical monitoring
- Conduct extension and capacity development activities -includes for GMS technical staff
- Technical reporting.

The TA 9916 consultants will use the data gathered from the demonstrations to contribute to the GMS capacity development workshops and knowledge products, as defined in the TA 9916 terms of reference.