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Smart Agritourism Route Design for Rural Destinations: Application to Píllaro Canton

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Abstract: The article analyzes the design of two proposed agritourism routes for Píllaro—Chacra Viva Píllaro and Raíces de Píllaro—and outlines their evolution toward smart routes supported by low-cost digital tools. It integrates itineraries, maps, costs, productive resources, and demand preferences with an architecture that incorporates geolocation, QR codes, booking systems, capacity control, and route analytics. The proposal preserves the territorial and cultural structure of the original routes while adding a technological layer designed to improve orientation, interpretation, and management. It argues that digitalization should enhance the rural experience and stakeholder coordination without turning the product into a purely virtual experience.

Keywords: Agritourism routes; smart tourism; geolocation; QR codes; tourism product; Píllaro

Introduction

Tourist routes allow dispersed resources to be organized into a understandable and marketable experience. In the rural context, this function is particularly relevant because farms, workshops, cultural attractions, and landscapes often operate in isolation. The thesis by [1] addresses this problem through two routes structured with schedules, stops, costs, and maps: Chacra Viva Píllaro and Raíces de Píllaro. The objective of this article is to examine these routes as territorial products and incorporate a technological layer that allows them to be transformed into smart routes Figure 1. The term "smart" is used here in an operational sense: updated information, navigation, digital interpretation, bookings, measurement, and capacity coordination. It does not imply replacing the guide or fully automating the experience Figure 2.

Map of the Living Chacra Píllaro Route

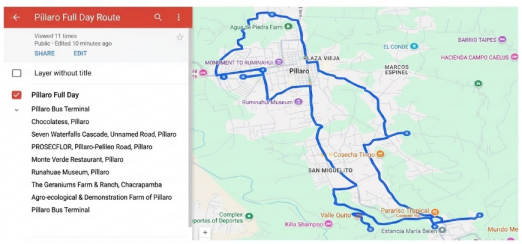

Figure 1. Map of the Living Chacra Píllaro Route. Source: Villavicencio Carrillo (2026).

Costs of the Living Chacra Píllaro Route

Living Chacra Píllaro Route				
Fixed Costs				
Item	**Unit Value**	**Number of Days**	**Unit Cost Unitario**	**Cost (15 pax)**
Transportation	10	1	10	150
Guiding Services	3	1	3	45
Total, FC			**13**	**195**
Variable Costs				
Meals / Food	6	1	6	90
Dried Flower Workshop	5	1	5	75
Entrance fee to Rumiñahui Museum	2	1	2	30
Entrance fee to G. Geranios	2	1	2	30
Total, VC			**15**	**225**
Total Costs			**28**	**420**
Contingencies 12%			3.36	50.4

Figure 2. Cost structure of the Living Chacra Píllaro Route. Source: Villavicencio Carrillo (2026).

Tourism Product Design The methodology of [4] used in the thesis starts with the evaluation of tourism potential and advances toward the design and operation of the product. The itinerary must coordinate attractiveness, territoriality, plurality, and implementation. In an agritourism route, these principles translate into selecting stops with genuine productive value, ensuring geographical continuity, combining activities, and verifying that times, access, and services are feasible Table 1 .

Table 1. Design principles and digital support

Criteria	Design Question	Technological Application
Attractiveness	What makes the stop unique?	Multimedia profile and verified reviews
Territoriality	How are the points connected?	Map and GPS navigation
Plurality	Does the route combine nature, culture, and production?	Interest-based filters
Implementation	Is there availability, schedule, and a responsible contact?	Booking and capacity control

Living Chacra Píllaro Route The Living Chacra Píllaro Route integrates cultural, gastronomic, and rural activities into a full-day itinerary. The original itinerary structures gathering, departure, cultural landmark visits, breakfast, flora observation, transfers, farm visits, workshops, and return. This sequence is important because it alternates transit times with active participation, preventing the experience from turning into a series of brief, disconnected visits.

Living Chacra Pillaro Route			
Duration:	**Character:**	**Difficulty:**	**Language:**
1 day	Nature, culture, and history	Medium	Spanish
Centro de operacionalización: Píllaro Canton			
Day 1			
Time	**Activity**	**Time (H)**	**Distancia: (km)**
07:30 – 08:00	Gathering at the Píllaro bus terminal	30 min	
08:00 – 08:05	Departure from terminal to Choco Saladitos restaurant	5 min	4.2 km
08:05 – 09:05	Breakfast at the restaurant.	60 min	
09:05 – 09:25	Transfer to the 7 Chorros Waterfall	20 min	16.7 km
09:25 – 10:55	Descent and recreational swimming at the waterfalls, flora observation, photography.	1 h 30 min	
10:55 – 11:10	Transfer to the Prosecflor Factory	15 min	7.5 km
11:10 – 12:10	Guided tour of the factory and dried flower processing workshop.	60 min	
12:10 – 12:15	Transfer to Monte Verde Restaurant	5 min	4.2 km

Figure 3. Itinerary of the Living Chacra Píllaro Route. Source: Villavicencio Carrillo (2026).

As shown in Figure 3, the original budget identifies fixed and variable costs. For 15 passengers, the reported total cost amounts to USD 420, to which 12% for contingencies is added. This structure provides a foundation for developing a digital costing module that automatically updates the price per person according to the number of passengers, season, and contracted components. Raíces de Píllaro Route The Raíces de Píllaro Route proposes a second itinerary with an emphasis on local identity, production, and farm activities. Its itinerary and costs make it possible to offer a complementary alternative to Chacra Viva, preventing a tourism portfolio reliant on a single product. The coexistence of two routes facilitates market segmentation and the distribution of visitors across different local enterprises.

Ruta Raíces Pillareñas Nature, culture, and history			
Duration:	**Character:**	**Difficulty:**	**Language:**
2 days / 1 night	Nature, culture, and history	Medium	Spanish
Operational core: Píllaro Canton			
Day 1			
Time	**Activity**	**Duration (H)**	**Distance (km)**
07:30 – 08:00	Meeting at the Píllaro terminal	30 min	
08:00 – 08:05	Departure from the terminal to the ChocoSaladitos restaurant	5 min	3.3 km
08:05 – 09:05	Breakfast at the restaurant	60 min	
09:05 – 09:10	Transfer to the Píllaro Agroecological and Demonstrative Farm	5 min	3.3 km
09:10 – 10:10	Sowing and care of medicinal and fruit crops, fruit or vegetable harvest, feeding domestic animals, organic composting workshop, photography, talk by the farm guide.	60 min	

Figure 4. Itinerary of the Raíces de Píllaro Route. Source: Villavicencio Carrillo (2026).

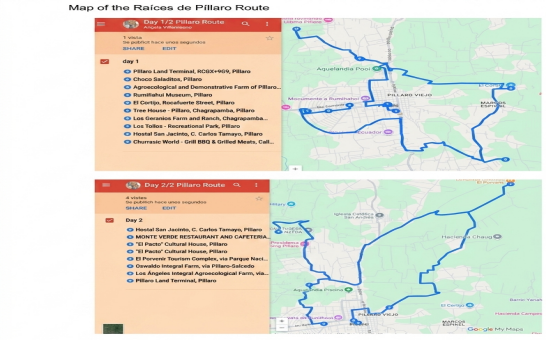

Figure 5. Map of the Raíces de Píllaro Route. Source: Villavicencio Carrillo (2026).

Architecture of a smart route The incorporation of technology should not be understood as a replacement for the rural experience, but rather as a support layer to make it visible, bookable, interpretable, and measurable. In emerging destinations, a digital architecture can connect farm information, maps, schedules, capacity, pricing, audiovisual content, QR codes, and visitor feedback. The smart tourism framework proposed by [13, 14] is applicable at a local scale when low-cost, interoperable solutions focused on specific problems are prioritized. In Píllaro, demand-side evidence justifies this approach: social networks concentrate the highest preference as a medium for discovering agritourism activities, and audiovisual content ranks among the most attractive promotional formats. The proposed architecture is organized into five modules: stop catalog, georeferenced map, booking and capacity management, QR-based interpretation, and operation panel. The visitor accesses the system from a mobile phone without needing to install a native application Table 2; a progressive web application can store basic information, open maps, and display content even with intermittent connectivity.

Table 2. Functional architecture of the smart route.

Module	User	Main Function	Generated Data
Catalog	Visitor	Compare routes and activities	Interests and clicks
Map	Visitor/Guide	Navigation between stops	Route start and end
Bookings	Visitor/Operator	Select date and capacity	Occupancy and demand
QR	Visitor	On-site interpretation	Scans and viewed content
Panel	Farms/GAD	Update offerings and review indicators	Capacity, sales, and satisfaction

Geolocation, security, and connectivity Geolocation should be used as an orientation tool rather than a surveillance mechanism. The system can display the location of each stop, approximate distance, travel time, and operational alerts. The visitor's location data does not need to be stored permanently to fulfill this function. A clear privacy policy and the principle of data minimization are sufficient for an initial implementation. In rural areas, connectivity can be irregular. Therefore, route fact sheets, contact phone numbers, simplified maps, and emergency codes should be temporarily storable on the device. QR codes can function as links to lightweight content, and each farm must maintain physical signage as a backup. Technology complements security management, but it does not replace first-aid protocols, risk assessments, or coordination with authorities Table 3.

Table 3. Hybrid security in rural routes

Operational Risk	On-Site Measure	Digital Support
Loss of orientation	Signage and guide	Downloadable map and GPS point
Weather changes	Suspension protocol	Booking alert and notification
Overcrowding	Access control	Time-slot capacity limits
Medical emergency	First aid kit and local contact	Call button and emergency info sheet

Digital interpretation of the experience Interpretation turns a crop, an animal, or a transformation process into meaningful content. A QR code installed next to a plot can explain the variety, production cycle, gastronomic uses, and sustainable practices. In a dairy workshop, it can show process stages, sanitary measures, and the origin of the milk. At a cultural attraction, it can integrate audio, historical photographs, or local testimonials. The main design rule is that digital content should not distract from interaction with the host. Materials should be brief, optional, and accessible. For educational groups, questions or small challenges can be included; for foreign visitors, bilingual versions; for people with disabilities, audio, appropriate contrast, and transcripts Table 4.

Table 4. Interpretive micro-content per stop

Point Type	QR Content	Recommended Digital Duration
Crop	Fact sheet, season, usage, and sustainable practice	1–2 min
Livestock	Welfare, feeding, and production	1–2 min
Gastronomy	Ingredient origin and local recipe	2–3 min
Heritage	History, photography, and audio	2–4 min

Costs, bookings, and capacity In Figure 6, the costing of rural routes changes according to group size, transportation, food, entry fees, and activities. A digital system can parameterize these components and calculate the price per passenger without manually updating spreadsheets. Likewise, it can block reservations when a farm reaches its agreed-upon capacity, preventing degradation of the visitor experience and pressure on local resources. For small producers, a simple booking model is advisable: date, number of visitors, contact phone number, selected route, and proof of payment. The transition toward online payments can be implemented after validating demand and operational capacity. This incremental approach reduces adoption costs and avoids imposing technology that is more complex than the actual business process.

Costs of the Raíces de Pillaro Route

Raíces Pillareñas Route				
Fixed Costs				
Detail	**Unit Value**	**Number of days**	**Unit Cost**	**Pax 15 Cost**
Transportation	10	2	20	300
Guiding	3	2	6	90
Total, FC			**26**	**390**
Variable Costs				
Meals	9	2	18	270
Entrance to Rumiñahui Museum	2	1	2	30
Entrance to 'El Cortijo' Dairy Factory Factory	5	1	5	75
Entrance to 'G. Geranios'	2	1	2	30
Entrance to Tollos Park	3	1	3	45
Accommodation	15	1	15	225
Entrance to 'El Pacto' Cultural House	2	1	2	30
Entrance to 'El Porvenir' Tourist Complex	1.50	1	1.50	22.50
Total, VC			**48.5**	**727.50**
Total Costs			**74.50**	**1117.50**
Contingencies 12%			8.94	134.10
Breakeven Point			83.44	1251.60
Profit (20%)			16.68	250.32
Total Value			**100.12**	**1501.92**

Figure 6. Costs of the Raíces de Píllaro Route. Source: Villavicencio Carrillo (2026).

Discussion and Governance model Smart routes require shared governance. The Municipal A.D. (GAD) or a coordinating organization can manage standards, branding, and the platform, while each farm updates its own availability and content. Data ownership, cancellation policies, revenue sharing, and quality protocols must be established prior to launch. Without these operational rules, technology risks accelerating conflicts rather than resolving them. The primary advantage of this approach is that it provides clear visibility into each route's performance. Management can observe demand by date, reservation drop-offs, most-frequented stops, visitor satisfaction, and geographic distribution. These metrics enable data-driven decisions to adjust schedules, modify route sequences, and design targeted promotional campaigns based on empirical evidence.

Conclusions

The Chacra Viva Píllaro and Raíces de Píllaro routes constitute a sufficiently detailed baseline to evolve toward smart products. The proposed digitalization integrates a catalog, maps, bookings, QR codes, and analytics without altering the experiential nature of agritourism. The primary value lies in reducing information friction, improving orientation, and coordinating capacity among multiple stakeholders. Implementation should be carried out in phases: first, catalog and maps; second, bookings; and subsequently, QR codes and advanced analytics. Each phase must evaluate ease of use, producer adoption, connectivity, and operational benefits. Technological success should be measured by its contribution to the visitor experience and product sustainability, rather than the volume of incorporated features..

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