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Business Models of Seasonal Logistics Services in The U.S. Agricultural Sector

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Abstract: This article conducts a systematic analysis of business models for seasonal logistics services within the United States' agri-industrial sector. Its relevance is underscored by significant crop losses due to delays in transportation and growing demand for flexible delivery solutions for fresh produce and agricultural inputs. The study's novelty lies in comparing two organizational paradigms: specialized agro-logistics operators versus general carriers that retool their fleets seasonally to handle perishable goods. We describe the scale of seasonal movements, rate dynamics, workforce and equipment constraints, and we analyze inter-state resource migration practices enabled by digital freight platforms. Our objectives include assessing these models' resilience, estimating their financial potential, and offering market participants actionable recommendations. Employing comparative analysis, econometric and statistical modeling, custom-harvester case studies, and content analysis of nine key sources (FAO, USDA, ATS, OTR Solutions, Corrigan Logistics, USCHI, among others), we pay special attention to how government policy affects staffing and storage infrastructure development. Findings confirm the effectiveness of hybrid contracting schemes and demonstrate that digitalization enhances trans-regional fleet mobility, reducing off-season idle time. Optimizing empty-run rates cuts CO_2 emissions and fuel consumption—boosting supply-chain sustainability. Future research should evaluate how climate change will shift harvest calendars and require new routing strategies. We also present an empirical ranking of states by seasonal peak intensity, guiding strategic investments in rolling stock

and warehouse capacity.

Keywords: seasonal logistics; agricultural sector; USA; refrigerated transport; grain harvest; custom harvesters; digital freight platforms; contract carriers; price dynamics; cooperative models.

INTRODUCTION

Logistics in the agri-industrial sector exhibits pronounced seasonality: agricultural production follows natural cycles, causing demand for transport and storage services to surge during planting and harvest campaigns and to fall off in the off-season. In the United States—where the agricultural sector is vast and production and consumption zones are geographically dispersed—the challenge of organizing seasonal logistics is paramount. Harvested crops must be collected within tight windows and moved swiftly, or the risk of spoilage and economic loss skyrockets.

This study's relevance stems from FAO estimates [2] that up to 40 percent of horticultural output in developing countries is lost due to logistical and storage shortcomings. While developed nations fare better, their losses remain substantial. Therefore, timely establishment and operation of seasonal logistics services in agriculture bear not only economic but also food-security importance.

The aim of this research is to analyze existing business models for seasonal logistics services in the U.S. agricultural sector and to evaluate their efficiency and resilience. Our specific tasks are to:

1. Classify the primary types of seasonal logistics services (e.g., grain haul during harvest, peak-season fruit and vegetable transport, mobile custom-harvester deployments, farmer supply of seasonal inputs).

2. Describe typical organizational models within each category (for example, contract carriers vs. cooperatives vs. farmer-owned fleets).

3. Analyze economic performance indicators and the key challenges these businesses face (off-season equipment downtime, recruitment of seasonal labor, peak-period pricing, and competitive dynamics).

4. Discuss future prospects for seasonal logistics services in light of sectoral changes (increasing production concentration, the rise of digital platforms, and so forth).

The investigation draws on data from the past five years, including industry reports from USDA, FAO, and relevant trade associations, as well as academic publications and real-world case studies.

METHODS AND MATERIALS

The Food and Agriculture Organization of the United Nations [1] provided data on global post-harvest losses in fruits and vegetables and overall supply-chain performance metrics. K. Hunter [2] detailed the specific challenges of autumn grain logistics in the U.S. Midwest. L. Williams [3] described the rural driver shortage and Illinois's state-sponsored training programs. K. Pośia [4] analyzed the impact of the produce season on refrigerated-transport market rates. R. V. Steffen, K. V. Fraser, D. G. Watson, and T. V. Harrison [5] mapped regional grain-export routes in southern Illinois. The Custom Harvester Association [6] compiled statistics on custom-harvester operations. The U.S. Department of Agriculture [7] supplied weekly tariffs and grain-transport volume data by mode. A. Walsh [8] characterized waves of freight-demand and capacity. S. L. Nimik [9] outlined regulatory initiatives providing visa support for seasonal workers.

This article employs comparative analysis of empirical data, case-study examination of custom-harvester enterprises, and systematic content analysis of industry publications.

RESULTS

Logistics services supporting U.S. agriculture exhibit pronounced seasonality, which fundamentally shapes their business models (Figure 1).

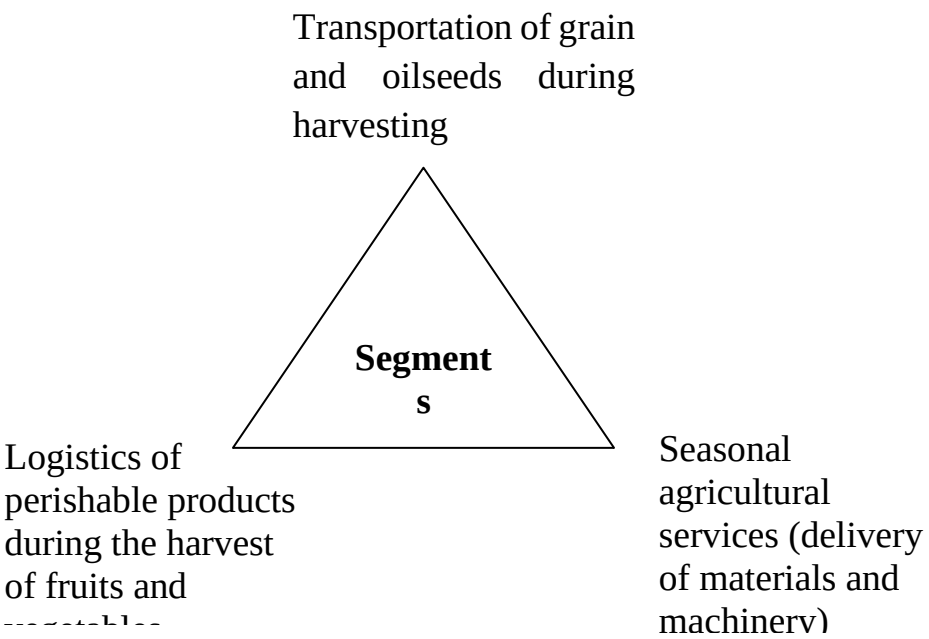

Figure 1 – Key Service Segments in the United States (Compiled by the author based on [1, 3–6, 8, 9])

In most grain-producing regions (the Midwest and Great Plains), the bulk of cereal harvest occurs in autumn (September–November). During this brief window, the volume of grain requiring transport from fields to elevators and processors far exceeds the annual average. For example, in the Midwest, October's peak corn and soybean harvest triggers a sharp surge in trucking demand: many over-the-road drivers temporarily switch to local farm runs, reducing long-haul capacity and driving up freight rates for agricultural loads [1]. Consequently, transport capacity for other industries contracts, while it remains scarce—despite equipment influx—for agro-logistics. This imbalance produces peak-season tariffs on both produce and ancillary freight. In October 2022, spot rates for hauling grain from key farms rose significantly above summer levels [8].

The predominant business model in this segment is seasonal contract carriage: farmers or cooperatives sign agreements with trucking firms for the harvest period, specifying the number of vehicles and the ton-mile rate. Many small farms form cooperatives that jointly own or lease grain trucks or negotiate priority access with local carriers during harvest. This cooperative approach optimizes vehicle utilization across members. However, a substantial portion of haulage is handled by independent operators—small transport firms or owner-operators who spend most of the year on construction or general freight, then switch to grain hauling during harvest to capitalize on elevated seasonal rates. Farmers benefit by flexibly accessing capacity without year-round fleet ownership.

Supply–demand balance in this segment is typically achieved via pricing: when trucks are scarce, rates climb rapidly, attracting carriers even from other regions. For instance, during strong harvest years, fleets from the U.S. South have been known to redeploy to the Midwest to profit from the grain-haul peak. Nevertheless, local shortages still occur. In Illinois and neighboring states, rural areas face a deficit of CDL-licensed drivers—young workers are not always willing to join harvest campaigns on short notice [3]. To address this, the Illinois Farm Bureau [3] launched a targeted driver-training grant in 2022, underscoring the critical role of workforce development in seasonal agricultural logistics.

In the U.S. fruit-and-vegetable sector, seasonal peaks are even more acute—driven by narrow harvesting windows and the perishability of the produce. In California's Central Valley, table grapes and berries come off the vine in late summer through early fall; in Florida, citrus is picked in winter; in Washington State, apples are harvested in the autumn. During these periods, demand for refrigerated trucks ("reefers") surges as growers race to move fresh produce from

farms to distribution centers and ports. This phenomenon ripples through the entire U.S. trucking market: reefers devoted to fruits and vegetables reduce capacity for dry freight, pushing rates upward across the board (see Table 1) [4].

Table 1. Peak Harvest Seasons in Key States (Compiled by the author based on [4])

State	Peak Season	Main Crops
Florida	March–June	Oranges, tomatoes, strawberries
California	April–August	Grapes, almonds, lettuce
Texas	May–July	Watermelons, onions, citrus
Georgia	May–July	Peaches, onions, blueberries
Washington	June–September	Apples, cherries, pears
New York	June–October	Apples, grapes, corn
Illinois	July–September	Corn, soybeans, pumpkins
Michigan	June–October	Apples, cherries, blueberries
Ohio	July–September	Corn, soybeans, tomatoes
Pennsylvania	July–October	Apples, mushrooms, corn
Minnesota	August–October	Corn, soybeans, sugar beets

Because delivery timing hinges on climate, harvest cycles, and regional weather, seasonal-logistics business models fall into two broad categories (see Table 2).

Table 2. Core Business Models for Seasonal Logistics Services (Compiled by the author based on [4])

Model	Resources & Personnel	Contracts & Rates
Specialized Agro-Logistics Companies	Permanent reefer fleet; staffing augmented by temporary crews during peak months	Long-term contracts with growers; fixed seasonal rates

Model	Resources & Personnel	Contracts & Rates
Universal Carriers with Seasonal Switch	Mixed tractor-trailer fleet; a portion of trucks retrofitted for refrigeration; drivers shift between dry and reefer runs	Spot and short-term agreements; rates spike during harvest

In practice, most operators blend contract and spot work: a share of volume moves under pre-negotiated agreements (often via brokers), while the balance is booked on freight exchanges at prevailing spot rates. Smaller farms—lacking in-house logistics—turn to digital platforms where they post harvest-pickup requests and carriers (including owner-operators with one or two reefers) bid in real time, effectively creating an "Uber for farm freight." This on-demand model brings additional capacity into seasonal networks.

Still, finding reefers can be challenging—even at peak rates—especially in remote farming regions. For example, during Maine's July blueberry peak, local reefer capacity has historically fallen short, causing shipment delays. In recent years, carriers have adopted proactive staging: empty reefers are repositioned ahead of harvest (e.g., moving trucks from California to the Northwest early in the summer) based on yield forecasts and historical demand data [4]. This shift—from reactive to data-driven planning—exemplifies the evolving sophistication of seasonal logistics.

Logistics in the agricultural sector encompasses not only the removal of harvested crops but also the timely delivery of essential inputs—seeds, fertilizers, fuel, and machinery—to farms. Two pronounced peaks mark this cycle: the spring planting season and the autumn harvest (plus post-harvest fieldwork). In spring, thousands of farms nationwide simultaneously require seed deliveries, fertilizers, and crop-protection products. For example, the distribution of liquid nitrogen fertilizers (UAN and aqua ammonia) to high-intensity farming regions occurs in March–April; the compressed delivery window drives up tanker-truck rates and can even create local shortages of rail and road tank cars. Firms operating in this space typically adopt a seasonal-distributor model for agricultural inputs, with full logistical infrastructure. Major seed and agrochemical suppliers—such as Cargill and Nutrien—pre-position stockpiles in regional hubs and charter additional transport capacity to fulfill farm-delivery contracts.

Farm machinery itself is another seasonal commodity. Combines, for instance, are often transferred from state to state along the "harvest belt," and their movement on low-boy trailers constitutes a seasonal logistics service. Many equipment dealers and farmer-operators coordinate through industry associations (e.g., U.S. Custom Harvesters, Inc.), orchestrating the relocation of dozens of combine crews from the Texas Gulf Coast to the northern prairies of Montana and Kansas as crops mature [9].

The business model of custom-harvester contractors is straightforward: farmers hire these contractors, who bring their own combines, grain trucks, and labor crews to field sites, handle the harvest, and transport grain to local elevators. Contractors follow the harvest from state to state, operating seasonally. Their logistics repertoire includes highway "road trains" for moving combines, mobile repair workshops, and temporary lodging for crews. In effect, they offer an end-to-end service package—from harvesting to storage delivery. This model dates back to the mid–20th century and remains prevalent; it is estimated that roughly 500–700 operations across the United States specialize in custom combining and grain transport [6, 9]. Farmers benefit by avoiding year-round combine ownership—paying only for harvesting weeks—while contractors achieve full seasonal utilization across multi-state routes, justifying the capital investment. The principal risk to this model is weather variability: if a crop fails or the harvest is delayed in a given region, contractors face downtime "gaps" in their schedule and associated revenue losses. Nevertheless, their flexibility and mobility allow them to partially mitigate these disruptions.

From these examples, key characteristics of seasonal-logistics business models emerge: a focus on flexibility and scalability. Unlike year-round carriers, seasonal

providers must rapidly ramp up capacity at peak and then scale down to minimize off-season costs. To that end, many use temporary labor contracts, short-term equipment leases, and even consignment arrangements—for instance, an elevator may contract a carrier to supply a set number of railcars or trucks during harvest, paying only for actual usage. Pricing is generally dynamic: rates spike during peak weeks, incentivizing additional carriers to enter the market. In some cases, formal surcharges apply—railroads impose higher fees on grain cars during export season, and container carriers levy harvest-season premiums for nuts or citrus. These mechanisms are built into the business models: providers must generate sufficient revenue during the harvest peak to cover idle and preparation costs in the remainder of the year.

DISCUSSION

Seasonal logistics services in the U.S. agricultural sector exhibit a variety of business models tailored to the specific needs of different farming segments. What unites them is the imperative to adapt to pronounced demand fluctuations over time. Economically, these services operate under uneven capacity utilization: weeks or months of overload are followed by lulls. This creates two primary business challenges: how to deploy—or mothball—assets efficiently off-season, and how to mobilize adequate resources (equipment and labor) at peak.

In the United States, market responses reflect classic economic theory. During peak harvest, the market approximates perfect competition: many providers enter, balancing supply and price (for example, the refrigerated-truck market in summer, when even occasional truck owners join at higher rates). Off-season, the market contracts to a few large players who can afford to maintain idle infrastructure (such as elevators owning railcars used only part of the year). To navigate this cycle, firms have adopted hybrid structures: a blend of long-term contracts and spot operations, equipment leasing and rental with monthly rates, and hiring seasonal labor. For instance, many farm cooperatives now lease trucks only during harvest months rather than purchasing them outright—leasing companies in the U.S. offer products designed specifically for agricultural clients [5].

Historically, synchronizing capacity with demand during the season was hampered by information gaps: trucks might sit idle in one county while farmers in a neighboring county faced shortages. Modern digital platforms have dramatically reduced this mismatch by creating seasonal-logistics marketplaces. Online freight exchanges allow carriers to reallocate capacity by the day or even hour: once the watermelon harvest ends in Georgia, a trucker can instantly secure a tomato haul in Florida, rather than returning empty or waiting out the year. This “seamless” transition boosts overall resource efficiency in agriculture and reshapes business models: companies now plan with such multi-crop, multi-region shifts in mind. For example, a reefer operator might haul berries in California in spring, cherries in Michigan in summer, and apples in New York in autumn—wrapping each leg in short-term contracts. Such multi-season strategies are supplanting the older, region-locked model.

From a theoretical standpoint, these seasonal-logistics models exemplify flexible-systems theory and real-option asset management: firms effectively hold the option to deploy or retire resources. Custom harvester contractors operate like project-based enterprises, assembling a “portfolio” of harvest contracts along their migratory routes—diversifying risk across time and geography. Their success hinges on selling services to different clients at different times to minimize downtime. Cooperative models, in turn, distribute risk among multiple members.

Practically, these business models generally succeed in moving the harvest. Narrow gaps remain, however—most notably, seasonal labor shortages. Not every driver is willing to work 16-hour days during harvest or to reposition equipment across the country. Young professionals often prefer stable, year-round employment to several months of intense work followed by uncertainty. Consequently, some seasonal services recruit foreign temporary workers under the H-2A agricultural guest-worker program (which, while primarily for field labor, can also cover drivers). Certain states have introduced local incentives—such as Illinois’s CDL-training grants—to bolster their domestic workforce.

Truck transport, owing to its flexibility, dominates peak periods, though rail and barges also play roles for bulk commodities (grain, sugar beets). In the U.S., the USDA’s weekly Grain Transportation Report tracks tariffs and volumes by rail, barge, and truck, revealing clear

seasonality: autumn barge freight rates on the Mississippi rise by roughly 50 percent due to export demand [7]. Carriers in each mode have adapted their business models accordingly: barge operators, for instance, pre-position "grain convoys" ahead of the fall export surge. Yet for most farmers, truck remains the closest and most responsive option—hence our study's focus on road transport.

CONCLUSION

Seasonal logistics services are a cornerstone of the U.S. agricultural infrastructure, their business models finely tuned to the rhythms of planting and harvest. This study has shown that, despite dramatic swings in demand, the industry has forged highly effective strategies for organizing transport and related services during peak periods. From a theoretical perspective, these models illustrate remarkable flexibility and adaptability—firms operate in "variable geometry" mode, scaling capacity on demand. This validates economic theory that markets can achieve equilibrium through price signals and mobile factors of production, even under uneven utilization.

Key practical insights include:

1. Forecasting and Planning Are Critical. Leading firms leverage historical data on yields, weather patterns, and price trends to pre-deploy assets across regions and time. Those that act proactively capture the lion's share of seasonal margins and sidestep the chaos that afflicts less prepared competitors.

2. Cooperation and Resource Sharing Mitigate Seasonality. Small operators benefit from cooperative models—shared trucking fleets, joint storage facilities, and centralized dispatch centers—that drive down costs and bolster reliability. Grain cooperatives, for example, have reduced harvest-hauling times and eased rate burdens by co-owning railcars and trucks.

3. Public and Industry Support Strengthens Resilience. Visa programs and driver-training grants for seasonal labor directly bolster harvest logistics. Likewise, investment in infrastructure—expanding elevator capacity, improving rural roads, and enhancing cooling systems—prevents critical bottlenecks during peak demand.

Ultimately, the practical value of these seasonal-logistics models lies in their ability to keep the agricultural sector running smoothly: minimizing crop losses and optimizing supply-chain costs from farm gate to consumer. Even under extreme stress—record yields or crop failures, labor shortages, fuel disruptions—these models have proven resilient thanks to their built-in flexibility.

From a global standpoint, the U.S. experience offers transferable lessons for any country with seasonal agriculture: the principles of resource mobility, cooperative risk-sharing, and digital coordination are universally applicable. In essence, U.S. seasonal-logistics business models achieve a harmonious blend of economic efficiency and natural cycles—ensuring both farm-level productivity and broader food-security goals.

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