We present the stochastic-dynamic inbound purchasing inventory routing problem with perishable products (SD-IB-PIRP-PP) for agri-food supply chains in the context of e-commerce. This problem considers integrated purchase, inventory, and transportation decisions regarding the procurement from a distributed set of suppliers (farmers) to satisfy stochastic demand of agricultural products. The decisions are made in a dynamic environment wherein suppliers at different locations offer subsets of a set of perishable products, with time-dependent prices and available quantities. Products’ demand is realized at the beginning of every period and only forecasts are known ahead of time. We adopt an approximate dynamic programming approach, based on a mixed-integer programming formulation embedded within a rolling-horizon procedure, and aided by metaheuristic subroutines for routing. We also develop an instance generator that extends the logic of existing sets of instances to the stochastic and dynamic features of our problem, and evaluate the benefits of the proposed approach (a lookahead approximation) in contrast to myopic decision strategies. Computational experiments on the generated instances evidence the benefits of the lookahead approximation to address stochasticity in the proposed variant of inventory routing planning. These results motivate further research on the application of approximate dynamic programming in the context of integrated supply chain management. Ongoing work is devoted to adding more realistic problem features (e.g., stochastic prices and availability of products), and developing solution algorithms that mitigate the computational burden that comes with extending the modeling horizon.