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Linking levels of production

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Building an information system that links levels of production within modern, large-scale pork production companies is easier said than done. There are several key business process requirements necessary to make it happen. These include:

1. Development of a single underlying production system database that includes all pyramids, pods, sow complexes, sow units, contract growers, and nursery-finishing-wean-to-finish sites and barns.
2. A destination-source animal movement ticket process that feeds a database of movements and shipments.
3. A data collection process for tracking mortalities, pig transfers (between groups, between sow farms, etc), and all sales (lights and culls in addition to market hogs; breeding stock; weaned pigs; feeder pigs; non-select weaned pigs; non-select feeder pigs).
4. An integrated, robust underlying calendar function that allows tracking by production week (user-defined start date of the week and user-defined start day of the year), calendar week, and fiscal week.

Defining levels of production and production system flow is not easy. Hank Harris is the only one who has attempted to do it in a formal way. At MetaFarms, as part of our product development process, we've implemented pig flow tracking in our software and applied it to our customer base, which includes more than 10 large-scale (> 20,000 sows) pork production companies in North America. We've learned a lot, and I'll summarize it for you.

Pig flow: Overview

Flow is a key component of the organization of large-scale pig production systems. Flows have constraints, sometimes called "levels" or "priority" by production companies. These constraints guide decisions made by the logistics team especially when things change (health status changes, building burns down, etc). The actual constraints are specific to each production system but you must be able to define and associate the constraints to locations, e.g. "these flows are Priority 1; if you have to switch pigs to a different flow, you can move them within the number 1's." A flow's level or priority may change at any time.

Other hierarchical grouping characteristics exist and are independent of flow although sometimes used as proxies for flow. Examples: The term "pyramid" usually refers to a genetic flow but can be used as a grouping characteristic for any combination of production facilities; it usually includes genetic and commercial sow farms and ends at the sow farm level. The term "pod" refers to a geographic grouping attribute (e.g. Eastern pod, Western pod). It may also be a proxy for "Division" in an accounting or financial reporting sense.

Flow is used in several ways within large-scale production systems. It is a key component of the logistics – planning and scheduling functions -- for a pig company. Flow becomes a reporting variable (dimension or filter) especially for inventory tracking and projections. Flow becomes an analytic variable, useful for making performance comparisons between flows.

Pig flow: Details

At the detail level, flow is an attribute of locations, with locations defined as (a) producers (farms, contract growers, sow complexes), (b) sites (nursery, finishing, wean-to-finish, individual sow farms), and (c) barns. Rooms inherit flow from the barn level but are not independent parts of a flow. Flow tracking is based on pig movement tickets (records).

Flows are dynamic. Flows can be turned on and off (made active or inactive). Locations (producers, sites, and barns) can be moved in and out of different flows. Locations can be removed from a flow. Flows can be renamed. Flows have a history, and locations have a history relative to the flows they have participated in. It is best practice to maintain a flow's history, and also a location's history of participation in each flow. This allows for proper retrospective analysis of performance by flow. Flows can be straight-line (no mixing of pigs from different sow farms as they are placed in nurseries and finishers, or wean-to-finish sites/barns) or mixed (allow for co-mingling of pigs). This attribute of flow is used in reporting and determined from movement records rather than being hard-coded into a category variable like "flow type." Flows may (many times do) have a health status. Health status of a flow may (many times does) change.

There are two basic types of flows: (a) production flow (commercial sow farms, isolation units, nurseries, finishers, and wean-to-finish sites/barns) and (b) genetic flow

(nucleus, daughter nucleus, multipliers, gilt developers, isolation, genetic farm nurseries). To define flows within a production company there must be a single, underlying enumeration (database) of locations to which flows can be associated. Descriptive items that create a formal definition for flow include the following: Name; Type (production or genetic); Health status; Characteristics (for reference rather than reporting: expected number of weaned pigs per week, weeks in nursery, weeks in finisher, weeks in wean-to-finish, etc); Comments (for reference, useful for understanding why someone created this flow, what it means, what it's used for, etc.); Start date (of flow); End date (of flow)

Tracking pig movements and sales

At MetaFarms, we have focused on building a Movements and Sale capability in our software that revolves around product codes and pig flow attributes. For production system levels, we use a combination of a fixed hierarchy and a set of independent grouping attributes. The fixed hierarchy is Company > Producer (syn: Farm) > Site > Barn > Room > Pen > Stall (syn: Crate). Independent grouping attributes include (1) Pyramid, (2) Pod, (3) Business Unit, (4) Flow, (5) Supervisor –first level, (6) Supervisor – second level, and (8) Feed Mill. Product codes represent various types of pigs and are unique to each customer; they typically will tie out to product sales codes used in the General Ledger of the company's accounting system.

One advantage to linking production levels: Pig flow projections

There is a premium today for more accurate projections because more producers are selling market hogs without a long-term packer contract. As packer contracts expired over the past few years in the United States, many producers did not renew; instead, producers have established working relationships with packers (a delivery relationship) and a risk management approach (hedging) for price protection. This change is a big one (but not the only one) in driving the need for more accurate pig flow projections.

By setting up an underlying projections model using the concepts discussed above, not only does the accuracy improve but a rolling forecast allows for dynamic pig flow decisions as well as dynamic product sales decisions. It also provides accurate pig delivery projections to packers.

We have found that the fundamental component of accurate and flexible pig projections is a weekly rolling projection – sometimes called a rolling forecast— that uses weekly actual production statistics to drive a recalculation of weekly forward projections. Projecting pig flow within a single production segment – weaned pig flow within a sow system, for example, or nursery pig flow within a nursery system -- is straightforward. More challenging is to link the production phases by creating assumptions for inter-phase transfers (e.g. what % of weaned pigs move to the nursery, what % are sold as non-selects; what % of feeder pigs move to finishing, what % sold, etc).

Our projections model uses historic breeding/gestation data, historic farrowing data, historic nursery data, historic finishing data, and historic wean-to-finish data to populate an underlying projections assumptions matrix. Producer-specific historic data sets are organized by calendar breed week, calendar farrowing week, and calendar placement week for pigs started in nurseries, finishers, and wean-to-finish units. For nursery and finishing pigs, both week and age on feed are tracked because changing wean ages as well as a range of nursery flow rates (6, 7, 8, 9-week) within any single large-scale production system means that week on feed does not equal age on feed.

Conclusions

Little to nothing has been published which describes pig flow in a formal way. I hope this paper helps start the process of creating a more formal description and definition of the characteristics of pig flow. More should be done to elaborate on what we've reported here and build a generic industry vocabulary that describes the concepts and details of pig flow and production system logistics. In addition, there is a great need in the industry for more formal documentation on pig projection methodology as well as follow-on research that assesses the accuracy of various projections models or algorithms.