DATA ECOSYSTEMS AND VALUE CHAINS IN THE AGRICULTURE SECTOR

ANALYSIS & EVOLUTION

Abstract

Organisations in the marketplace for agriculture data use a variety of different business models. This document provides background information on the categories of business models used and presents a number of case studies. The document concludes with sample questions and issues to help discussions on policy formation with respect to data ownership and the evolution of data markets in the Irish agriculture sector.

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1. INTRODUCTION

Transforming Europe's agriculture system requires a re-design of the agriculture data markets and business models to enable functioning and trustworthy data sharing ecosystems [Europe, 2021]. While there has been a large volume of research and literature emerging from the technical sciences on data ecosystems [Brewster, 2017], very little attention has been given by business researchers to the evolution of the agriculture data value chain and its implications for the industry [Kamble, 2020]. This is despite the acknowledgement of European Union that the adoption of the agriculture data value chain is no longer primarily a technical issue but a business issue, especially in terms of getting farmers and other value chain stakeholders to participate and trust in data sharing ecosystems. The purpose of this document, therefore, is to outline established business models in terms of the agriculture data marketplace. It is intended that such understanding will contribute to discussions on future policy in the sector around issues such as data ownership, sharing and revenue models, and the evolution of the Irish agriculture data marketplace.

Markets are often viewed from a lifecycle or evolutionary approach [Porter, 1980] and generally involve involving *embryonic*, *growth*, and *maturity* stages. Analysis shows that the marketplace for Irish agriculture and forestry data is currently considered to be in the growth phase [Lynch, 2020].

2. GROWTH PHASE

The growth phase typically sees a multitude of new technologies and new market entrants. It is characterised by two business model scenarios: competitive markets and vertical markets.

2.1 COMPETITIVE MARKETS

Competitive markets are characterised by closed business ecosystem. There is high farmer/forester engagement but low collaboration between the value chain stakeholders in the business ecosystem. Technology providers will attempt to protect their market position (e.g. prevent clients from switching to other providers) or to grow it (e.g. get new clients) [Peppard, 2006]. Large technology and software companies dominate this market. They create intricate technical infrastructure and data flows across products, machines, farmers, and external partners.

There are a number of issues and challenges with this market model:

a) **Benefit accruing to technology provider**: The technology provider, for instance, gets product usage data which allows them to develop more profitable products/services to sell to the farmer and create farmer lock-in [Jakku, 2019].

b) **Digital data divide**: Inequality of bargaining power between technology providers and farmers means large (often multinational) organisations control the landscape [Wiseman, 2019]

c) **Farmers' protection from licence agreements**: Since many large agri-businesses or technology providers are foreign-owned, the licence agreement regarding data sharing and use of farm data will be governed by the law of another country, thus creating uncertainty around the level of protection afforded to the farmers' data [Wiseman, 2019]

CASE STUDY 1: JOHN DEERE

JOHN DEERE is an example from the competitive data market. Over the past 20 years, it has been evolving from a machinery and equipment manufacturer into a data and technology company. The

company's data is largely structured; consistent with this business model, the data is mainly internal to the company – gathered via sensors located in their machines. This data is aggregated and made available to farmers via the MYJOHNDEERE.COM platform. The portal also connects to external datasets, such as weather data.

The more data collected, the more valuable it becomes to all stakeholders. For example, farmers benefit from more informed decision-making while the company benefits from predictive maintenance of their machines as well as the development of new value-added products and services. Issues and challenges remain however, as described above.

Source: www.johndeere.com

2.2 VERTICAL MARKETS

The vertical data marketplace is characterised by low farmer/forester engagement and the potential for high collaboration amongst the stakeholders in the business ecosystem. In vertical markets, consumers such as farmers have strong bargaining power, as the technology supplier generally depends on the narrow set of farmers that they produce for. This is the opposite for suppliers operating in a competitive data market, who have a wide range of customers to sell to and the farmer has little or no bargaining power.

Operating in a vertical market means the technology supplier is catering their product/service to a niche audience (e.g. milking parlours, animal feeds, animal health products). The key technology entering this marketplace are ICT platforms used to manage data. A number of business models are offered in the vertical data marketplace: subscription, data/information-as-a-service, community model

2.2.1 SUBSCRIPTION

The subscription-based model is a recurring revenue model that charges customers on a monthly or yearly bases to access a product or service on an on-going basis. As long as farmers see the value a company provides for them, they will continue to pay for it. There are a number of advantages to this business model:

- **Attracts more customers**: Subscription based pricing reduces the barrier to purchase compared to a large annual price.
- **Recurring billing offers predictable revenue**: Revenue is a recurring payment which has the significant benefit of predictability and life-time value
- **Subscription billing reduces customer acquisition costs**: One-time payment models cost five times more in terms of attracting new customers than long-term (subscription) models.
- **Facilitates up-selling and cross-selling**: The supplier has continuous contact with the customer and so they will be receptive to the added value provided by the supplier.
- **Easy to offer a proof of concept**: Subscription models allow the supplier to provide evidence through a trial period or even a freemium model

CASE STUDY 2: HERDWATCH

HERDWATCH uses a subscription model in a vertical data market. The company was founded in Ireland in 2012 out of a farmer-owned co-operative and has become a leading provider of farm management software in Ireland and the UK with over 10,000 farms using the platform. The HERDWATCH product is a farm management app and platform for arable, dairy, sheep and suckler farmers.

It allows farmers to record medicine usage (compliant with *Bord Bia's Quality Assurance schemes*), register calves and movements, and animal weights from their phone. The value proposition for the farmer is having all the information they need to run their farm more efficiently. The company offers a free sign-up with a month subscription.

Source: www.herdwatch.ie

2.2.2 DATA/INFORMATION AS A SERVICE

The Data-as-a-Service (DaaS) business models is focused on providing customers with a large amount of processed data that they can interpret themselves. The Information-as-a-Service (IaaS) model focuses on providing insights based on the analysis of processed data. Unlike DaaS, the IaaS customer does not want just the aggregation of raw data – rather they want the data interpreted and analysed to provide insights.

There are a number of advantages and disadvantages:

- **Lower up-front cost**: providers manage IT infrastructure that is running the software, which brings down fees for hardware and software maintenance.
- **Deployment is quick:** application is already installed and configured in the cloud.
- **Access to upgrades**: providers have all the responsibility and work associated with hardware and software updates and deploying upgrades.
- **Accessibility**: access to a DaaS/IaaS application requires only an internet connection, unlike traditional business software installations
- **Scalability**: most providers offer a wide range of usage options

The main disadvantage, however, centres on security and data ownership. Governance and privacy are also issues when integrating customer data or managing anonymised datasets.

CASE STUDY 3: VIRTUAL-VET

VIRTUAL-VET is an example of an IaaS business model. Its value proposition is that farmers' data is valuable and when digitised and aggregated, it should generate an economic value for the farmer. In return for providing information to VIRTUAL-VET, the farmer receives a free veterinary medicine usage service, with telephone support, designed to reduce the stress and increase the accuracy of on-farm medicines and animal treatments. It does this by building a farmer's remedy book whenever they treat an animal. In return, VIRTUAL-VET analyses the data, interprets and sells the insights to value chain stakeholders.

Source: www.virtualvet.eu

2.2.3 COMMUNITY MODEL

To increase negotiating power, community business models have emerged whereby small farms and foresters collaborate and form producer-type structures such as cooperatives. There are community-driven initiatives that directly link producers with consumer. They can also reinforce local and regional production systems, provide training in new technologies, and support sustainable data security and governance. Often these organisations act as an intermediary or broker between the farmer/forester and stakeholders in the value chain.

There are a number of advantages:

- **Community aspect creates deeper customer involvement**: producers interacting with customers builds trust in the provider and creates a sense of community.
- **Collaboration with customers leads to better offerings**: high customer engagement in the product increases the likelihood of feedback for new products/services; this is akin to an open innovation model.
- **Lower cost base:** strong customer relationships mean operating costs are significantly lower and high customer loyalty means lifetime and recurring revenue models

CASE STUDY 4: WESTERN FORESTRY CO-OP

A good example of a community-based business model is WESTERN FORESTRY CO-OP. Established in 1985 by ICOS and the then seven main dairy co-ops in the west of Ireland, it provides a support structure for farmers to afforest the marginal areas of their farms rather than selling the land to private investors. The co-op believes that forestry can complement farming rather than replace it by providing an alternative income for unproductive agricultural land.

Source: www.wesernforestrycoop.ie

3. MATURITY PHASE

The maturity phase can be thought of as the fusion of the competitive and vertical markets. It heralds the emergence of fully functioning data marketplace characterised by an open business ecosystems that encourages interactions among all participants. There is high business collaboration and high stakeholder engagement.

The introduction of collaborative smart technologies and governance sharing models will facilitate the introduction of market based platforms often referred to as multi-sided business platforms (MSPs) [Rochet, 2003]. These MSPs are high added-value *match-making* intermediaries whereby they bring together different sets of actors who might otherwise not get the chance to engage with each other. Indeed, actors will begin to truly collaborate. New business models will be reinvented around the value in data. Traditional business models will be disrupted and eventually become obsolete. The largest benefit actor could potentially be the farmer. In the agriculture and forestry context it is the farmer/forester who is the key customer; hence, their position within the value chain will shift from a passive participant to an active value chain stakeholder. There are a number of advantages to the multi-sided model:

- **Creates competitive advantage**: multi-sided models act as a central marketplace for other industry participants who depend on the MSP for their business.
- **Network effect creates ecosystems**: once the core of a multi-sided model is in place, the cost of adding other sides or marketplaces becomes relatively low.

Nevertheless, there are also challenges:

- **Successful MSPs are the exception:** building an MSP is extremely difficult, which is why there are many failed companies that attempted this path.
- **On-boarding dilemma:** often referred to as the chicken-and-egg problem. The MSP must be ignited by getting both sides of the model on board. The dilemma starts with which side comes first: the buyer or the seller?

- **Pricing mechanism:** in most MSPs, one side's services are free or subsidised while they derive their profits on the other side. Choosing how to orchestrate their pricing structures is challenging.
- **Governance**: the MSP value proposition is that they create value by facilitating interactions between third-parties. Governance is needed in order for each side to exploit the positive complementarities which might not happen if it was left to either side to design independently.

Two MSP cases studies are presented:

CASE STUDY 5: DataLinker

DataLinker from New Zealand allows organisations and solution developers to share agricultural data by creating a common data schema based on farm data standards. The project was a collaboration led by dairy, sheep, and beef farmers, the New Zealand Ministry for Primary Industries and various stakeholders across the value chain. Widespread alignment with the standards will mean that farmers can spend less time entering data for different farm solutions, and more time using the insights from these solutions to make better decisions on their farms.

The DataLinker platform supports all sides of the MSP: allows organisations to share "many to many" without developing anew for each integration partner; schemas allow developers to leverage modern tool sets; registry allows solution providers to discover other implementers, and the terms and conditions for access to their APIs.

Source: www.datalinker.org

CASE STUDY 6: Farmobile

Farmobile connects farmers with data buyers and allows farmers to earn recurring revenue by licensing single use copies of data to approved third-parties. Farmobile explicitly states that the farmer owns the data, and it is the farmer who choses whether or not to participate in the data exchange. The value proposition for the farmer is that the technology helps them utilise the data to both improve efficiency in their operations and generate profit through a collect-share-monetise strategy.

Equality between participants is made visible by naming participants as partners and peers. This is akin to a two-sided economic model or multi-sided business model. While there are numerous different types of revenue sharing models, they are conceptually consistent in that it allows actors to mutually use profits to develop efficiencies and innovate.

The MSP business model used by Farmobile has become a popular tool to promote engagement, increase sales, develop partnerships and share costs. It is used extensively within the marketing industry where organisations pay partnering stakeholders a certain percentage for recommending customers to the company and helping them to build business. This business model strategy can prove to be very cost effective as the partners are leveraging their individual competencies to co-create a more enhanced value offering.

Source: www.farmobile.com

4. SUMMARY OF CASE STUDIES

GROWTH PHASE

Case Study	Data market	Business model
	Competitive	
	Vertical	Subscription
	Vertical	Information-as-a-service
	Vertical	Community

MATURITY PHASE

Case Study	Notes
	Standards-based, collaboration among farmers, Government, and various stakeholders
	Connects farmers with data buyers, allowing them to get paid for licensing copies of their data

5. QUESTIONS FOR POLICY DISCUSSIONS

1. Do the current case studies and business models represent a functioning agriculture data market in Ireland?
2. Are farmers well-served by the current options open to them with respect to the data generated at farm level?
3. What needs to happen to increase the current market size?
4. Does current policy on data ownership/control enable or inhibit the case studies outlined?
5. What changes to policy would enhance the farmers' control over their data? How would any such policy change be made known to farmers? Who could help them act on their new "rights"?
6. How can policy assist the move from growth to maturity stages of the agri-data market?

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