

## **PRODUCT DATA INTERCHANGE IN AGRICULTURE: A TECHNOLOGY ASSESSMENT STUDY**

Ilona A. M. A. Jahae and George Beers

*Agricultural Economics Research Institute (LEI-DLO)*

*Burgemeester Patijnlaan 19, P.O. Box 29703*

*NL-2502 LS The Hague*

*Tel: 070 - 330 8 339 / 337 / 360*

*Fax: 070 - 361 5 624*

*e-mail: I.A.M.A.Jahae@LEI.DLO.NL*

*e-mail: G.Beers@LEI.DLO.NL*

**Abstract:** As a result of progresses in Information Technology (IT) considerable changes in information flow, management and organization of companies take place. This contribution presents an inventory of the consequences of introducing Product Data Interchange in agriculture using a technology assessment approach. As empirical case the rump steak (beef sector) as a product was chosen. PDI contains data related to specific product features. Data requirements, opportunities, barriers and restrictions as seen by different actors in the beef sector of PDI are presented. By combining this collected information - scenarios for further development of PDI have been designed and were discussed in a plenary workshop.

**Keywords:** Information Technology, Technology Assessment, Product Data Interchange, Scenarios

### **1. INFORMATION TECHNOLOGY IN PRODUCT CHAINS**

Information Technology (IT) has become an increasingly important issue in society and seems to be an important instrument to realize a customer directed production and dis-

tribution, which appropriate business management nowadays requires. On this issue a research project, classified as a Technology Assessment (TA) study (Smits and Leyten, 1991), has been carried out at LEI-DLO. This project resulted in a contribution to broaden the platform for introducing new

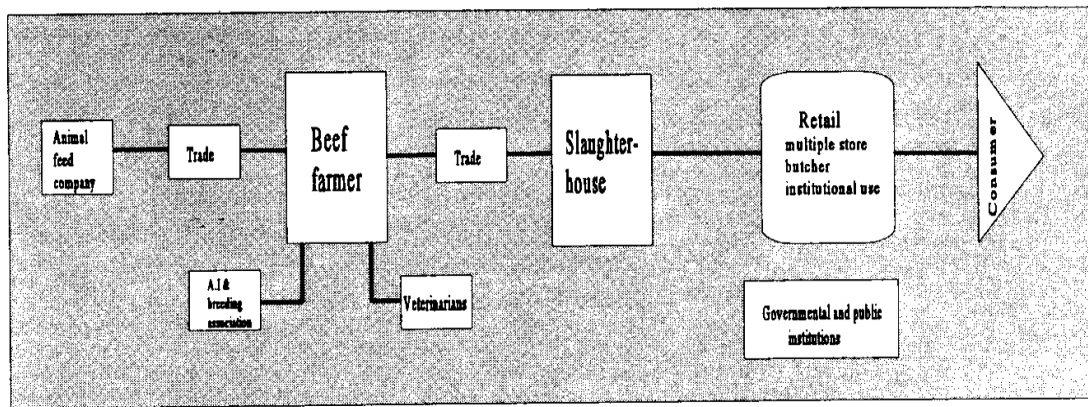


Figure 1: Actors rump steak chain

technology. In other words, besides the traditional policy makers, also other parties involved should participate in defining strategies for further development of IT. Moreover not only technical and economical, but also social aspects and various controversies between parties need to be discussed. Today developments in IT make more data available. Especially data exchange between actors in a product chain can be profitable for the participating parties. When considering integral chain management, logistics, total quality management etc., IT applications will also play an important role in agriculture in the next decade.

## 2. PRODUCT DATA INTERCHANGE

### 2.1 Setting

Until now Electronic Data Interchange has been used in some sectors of agriculture (van der Vlist et al., 1993). EDI interchanges transaction data, like invoices (amounts, prices etc.). But also specific product features could be exchanged electronically (van Koetsveld et al., 1992). In this project PDI is defined as: "a system for exchanging all relevant data describing a unique agricultural product on consumer level in a product chain". This implies the existence of a computer supported system which can provide all kinds of data from a specific product as the consumer buys it to all involved actors

creating this product. For example, with such a system one could trace what feed the animal has eaten for each individual steak at the counter of the retailer.

A TA study is future oriented and the results are to be used in development of R&D policy. Therefore the assumption was made that there are no technical limitations and the implementation of PDI will be possible in the future. Because of this assumption there was no attention paid to technical aspects. Various social aspects of a PDI system were emphasized and have been the main scope. A PDI system basically will be able to contain an infinite amount and variety of data. For a lot of data interchanging can lead to controversies (privacy, dependency, etc.). To gain more insight into these aspects some questions needed to be answered:

- \* Which product data can potentially be used in PDI?
- \* What are opportunities and barriers of introducing PDI?
- \* What are restrictions of PDI?
- \* Which scenarios have to be designed for further development of PDI?

### 2.2 Interviews and workshop

After literature research empirical information was collected. The rump steak chain (beef sector) has been chosen as an empirical case. From this product chain 26 representatives of different actors were questioned; animal feed producers, artificial in-

semination and breeding associations, beef farmers, veterinarians, slaughter houses, retailers (multiple stores, butchers, institutional users), consumer organisations, governmental and public institutions (figure 1). Because of different backgrounds of the actors no clearly defined questionnaire was used. Depending on their main tasks the questionnaire was specified. Globally the following issues of PDI were discussed during the interviews:

- current data interchange
- need for more additional data
- advantages and disadvantages
- conditions.

From this information opportunities, barriers and restrictions were extracted.

With the results of the interviews three scenarios were designed and discussed at a plenary workshop. The objective of the study is to stimulate a social discussion and does not pretend to give a full representative description of the PDI environment.

### *2.3 The actors talking*

#### *Overall impression*

It was remarkable that although business activities are increasingly demand driven, this is not the impression the interviews show. It was expected that consumers want to know as much as possible about a product they buy, especially when it is a more luxurious product, such as rump steak. But the interviews show that the majority of consumers require that rump steak 'only' has to be tasty, healthy and safe. So the general idea is that consumers trust their supplier (butcher or retailer) and the safety control activities of the government. Moreover consumers are unqualified to interpret all specific (technical) data. Often the comment was made that Dutch meat buyers are (still) 'price buyers' and that they are not willing to pay for additional information. A minority of consumers wants to know more (origin etc.) about the meat they buy (for example ecologically produced meat).

#### *Current data interchange*

In general the current product data interchange between beef farmers and slaughterhouses takes place in the shape of indications described on invoices. The interchange between the slaughter houses and the retailers is in most cases accomplished by using handbooks with product specifications. Other data (feed, medication etc.) is usually exchanged on paper. In this sector few attempts are made to interchange product data electronically.

#### *Required additional data*

It was notable that the actors that are involved in the production (i.e. beef farmers, veterinary surgeons, governmental control institutes and slaughter houses) showed more interest in additional data than the actors that are concerned with the distribution (retail) of the product. With more data (medication, genetics, feed composition, slaughter classification etc.) the 'production part' of the chain can guide their production more efficiently. Moreover the control (by government) and responsibility can be better guaranteed. The 'distribution part' does not deny that information and specific data should be available (if necessary, the product should be traceable), but it does not necessarily have to be completely transparent. They hand over the responsibility to their suppliers. Besides this their customers do not ask for more information.

#### *Opportunities*

PDI could make controlling, tracing (mainly by government) and data interchange more efficient and cheaper. The number of inspection activities could be diminished and be organized more efficiently. The rules could be simplified, because of a better guarantee. PDI could contribute to better health, chain, and quality management and increase the competitive position of the Dutch chain compared to the competing chains. The demander-supplier relationship will be reinforced and logistic advantages could occur, e.g. lower overall cost, increased flexibility

and differentiation. On the other hand a longer delivery time at retail level can influence meat quality positively.

### *Barriers*

A distinction has to be made between beef as a byproduct of dairy farm activities and cattle especially held for meat production. Their production goals differ, so will their interest for more data. Moreover the traditional culture of the Dutch beef sector, the small scale and the low grade of automation will not stimulate PDI. Generally the beef farmer will have to provide most of the data and this means considerable administrative pressure. Also the gains the beef farmer (and other actors) will get from it are very unclear (profits are hardly quantifiable). Another problem may occur at the authorization and input control of the data. Faulty data and overflow can lead to wrong decisions and misinterpretation.

Some reserve is in order using data concerning competition. Introducing an electronic system in a business most likely causes organizational changes. Employees can feel threatened because of their position.

In contrast to the pork or poultry sector the Dutch beef sector operates on a very limited scale on a contractual base and actors can be defined more as competitors than as colleagues. The main tasks and objectives of the 'production-oriented' and 'distribution-oriented' actors differ. So does their requirement of additional data. Production oriented actors need additional data to guide their production (feed amount, medication, slaughter weight, etc.). After the slaughter house, additional product data is of less importance and logistic data gets priority. Some actors get uneasy if all data would become transparent, especially cattle dealers, since it is their profession to live by margins. Product specifications (between slaughter houses and retailers) documented in handbooks are sufficient enough. Moreover product specifications do not differ frequently, so the on-line requirement is minimal. Providing data can sometimes lead to a

conflict within one actor; for example; should the veterinary surgeon please his client (the farmer) who pays him or should he meet national interest and security (i.e. diseases). Consumers do not require all information. They trust on logos, retailers and butchers. Too much information (on labels) only creates confusion.

### *Restrictions*

PDI must not become a goal on its own and only incorporate data of high frequency. PDI is intended to identify and interchange data that might vary for each individual product at consumer level. If necessary some conversions of data have to be made before using them (e.g. cooking time derived from the age of the animal). Benefits should overcome costs and adequate guarantee and authorization rules should be incorporated. It should be possible that only users with a special code gain access to specific protected data. Any (already existing) relation between actors can stimulate the PDI introduction, but participation should be voluntary. Initiatives should originate from the market and should not be imposed by the government. Also the automation arrears (both on farm level as well as on retail level) have to be made up. A central PDI introduction can overcome disadvantages of 'island-automation'.

## *2.4 The actors discussing*

To obtain some understanding of how further development of PDI will take place, it is necessary to think about which actors will take the initiative and what will be their driving forces. From this perspective three scenarios were designed and discussed. The scenarios differ from their basic objective, namely PDI for:

- Chain optimization
- Product differentiation
- Integral chain care (animal health care, environment and safety).

### *Scenario A: Chain optimization.*

Basic assumptions:

- rump steak = bulk
- chain = driving force
- logistic advantages (e.g. cost reduction)

Consumers are price buyers and do not require additional information, rump steak is bulk. Consumers trust their supplier and rump steak should be tasty and safe.

Despite low prices (cost leadership followed by producers) the rump steak has to conform to some requirements in order to provide a basic meat quality (homogeneous supply). Therefore the I&R system (Dutch Identification and Registration system) which registers the personal numbers of all the animals, should be extended with technical data concerning the production process (feed conversion, breeding quality, slaughter classification etc.). Moreover, attempts should be made to give feedback to the beef farmer about flavour aspects at consumer level. Until now it has not been possible to give reliable indicators on this. PDI can support the connection of supply and demand, delivering basic quality at the right time, at the right place, at the lowest price.

More registration especially on farm level will only be satisfactory when profits can be generated (e.g. less cost of medicines). Additional data should be useful, not become a goal on its own, and should be transformed if necessary so that it is accessible for the user.

PDI could be an instrument for the small-scaled Dutch beef sector to compete with other countries, although the (too) small Dutch volume still remains a problem.

### *Scenario B: Product differentiation.*

Basic assumptions;

- rump steak = identifiable
- consumer = driving force
- added value through information

PDI is a useful instrument to adapt to the pluriform market where stores and consumers require different quality. Some stores

profile themselves with prices, others with rump steak that is identifiable (added value through information). The already existing I&R system could be the 'technical' backbone of the PDI system, but besides this product differentiation requires more than only (additional) technical data (e.g. data concerning the environmental surrounding of the animal). Thus in addition to more efficient logistics PDI enables the anticipation of separate quality classes at consumer level, although the low price elasticity could obstruct this. The measure in which consumers want to be informed is unclear. On the one hand consumers do not want to be confronted with the animal, on the other hand they want to pay attention to animal welfare. Until now the majority has not wanted to be fully informed, and if, then there has to be a translation from technical data to data which is understandable for consumers (preparation method) and only necessary data should be incorporated. PDI distinguishes rump steak from dairy and rump steak from beef farms. The motivation for PDI in the dairy sector will probably be less, because of the different main goal (milk production) and therefore less willingness to put a lot of energy in data concerning meat quality. PDI introduces new forms of distribution (logistic service companies). Also tasks of the already active actors in the beef sector could change, just as much as some internal transformations can take place within organizations.

### *Scenario C: Integral chain care.*

Basic assumptions:

- government is driving force
- rump steak = reliable and traceable
- animal health care, safety, environment
- guarantees and simplified control

PDI can support the sharpened activities which are carried out by the government to guarantee health, safety and environment. To guarantee the safety of rump steak is a governmental responsibility. The government will create an environment by law,

research etc., while business has to adjust and take care of the implementation. PDI can solve customer questions about health, safety and the environment and provide more (technical) data to increase the recognition of beef farmers. For example for each individual product its effect on the environment can be made clear.

This scenario is based on the IKB system (Dutch Integral Chain Control), which inspects the production activities from supplier of the beef farmer to the retailers. If they act according to the IKB rules they are allowed to handle the IKB logo. However, until now retailers are reluctant to use this logo, because of difficulty of communicating that 'this' meat is safe and reliable (what was wrong with the previous meat?) and the unprofitable price. Moreover, retailers pay more attention to logistics than to safety, health and environment. This should change.

### 3. PDI PROSPECTS

#### 3.1 Actors' opinions

Attitudes towards PDI in the rump steak chain differ. Actors that are involved with the production of meat seem to require more additional data (on-line) than actors whose most important task it is to sell the beef (marketing). It was remarkable that despite the more consumer oriented approach in business, it was stated by various actors that consumers do not want to be fully informed. If the actors are willing to make some adjustments to cope with some restrictions and barriers (e.g. traditional culture, low level of automation) PDI can become viable, considering the opportunities. Sector specific characteristics on the other hand (small scale, dairy versus meat) are hard to rectify.

#### 3.2 Future developments

Discussion on scenarios in the workshop

shows that the best perspectives of PDI can be found in taking scenario C as a starting point with scenario B as a supplement. Continuing on the Dutch IKB system, more additional data should become available for product differentiation to accomplish added value.

#### 3.3 Overall

Most of the concerned parties in the rump steak sector were consulted and besides technical and economical aspects, social aspects and controversies were considered. The results contribute to discussion of the strategy required for introducing PDI. The viability of PDI can be acknowledged, but the exact performance of the system needs further analyses and discussion.

This project used rump steak as a case. It is not allowed to generalize the conclusions of this sector for all agriculture sectors, because each agricultural sector has its specific characteristics. On the other hand the more general remarks about opportunities, limiting conditions and bottlenecks of PDI (such as profits > costs, avoiding data overflow, adequate authorization and input control), are valid for most agricultural sectors.

### REFERENCES

- Koetsveld van, M.J., A.A.M. Vermeulen en J.D.I. Wouters (1992). *PDI Product Data Interchange een introductie*. Kluwer, Deventer / Antwerpen
- Smits and Leyten (1991). *Technology Assessment, waakhond of speurhond?* Kerckebosch BV, Zeist
- Vlist, van der, P., W.J. de Jong, A.E. Kolff, D.J. van der Net, A. van Overbeek, A.T.C. Siebbeles (1993). *Electronic Data Interchange; EDI in de agrarische sector*. Samson, Alphen a/d Rijn