The Two-dimensional Concept of Quality
- a Potential Strategy for Sustainability and Revitalization of Agriculture

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Abstract
Danish farmers have developed a notion of their chronic income squeeze. The notion states that the squeeze is maintained in spite of a considerable growth of productivity. In this article it will be argued that income squeeze rather is maintained due to the growth of productivity. This because the Danish farmers - like farmers in most western countries - have chosen a strategy of production based on industrialization of farming which implies simplified mass production of standard goods. Consequently, the value added has been seriously decreasing. At the same time the farmers have put themselves into a growing clash of interests in relation to the rest of society regarding for instance environmental protection.

The introduction of ‘the two-dimensional concept of quality’ is here claimed as a potential key to solve this clash of interests and indeed a potential key to a revitalization of the agricultural sector and at the same time an important contribution to a fundamental solution of environmental side effects caused by industrialized production of farm goods.¹

The efficient farm
Until the 1870's Danish agriculture primarily produced cereals for export. The major importer was the UK. Besides the exports of cereals Danish farmers exported living cattle to Germany. But an international crisis made it impossible for Danish farmers to make a living of producing cereals, and that is why a major restructuring took place. Danish farmers switched the production to milk and pigs. From milk the primary commodity became butter, while the primary commodity from pigs became bacon. It was necessary to process the milk and pigs-meat, and for that reason the co-operatives were founded to manage manufacturing, marketing, and the supply of raw materials (Bjoern 1982, 1992).

¹ It is of importance to the reading of this article to bear in mind that Danish farms are almost only family farms owned by the farmer. Most Danish farmers are a member of at least one co-operative. The co-operatives cover dairies, slaughterhouses, grain-companies etc. As a member of the co-operative farmers are obligated to deliver all products (e.g. milk and pigs) to the cooperative where the products are worked up and sold. The members get a fixed price, and at the end of the year they share the profits according to their deliveries. The co-operatives are mostly very old (the first was founded in 1882), and they are all founded at an democratic idea where every member has one vote regardless of his amount of production.
The strategy chosen to meet the income squeeze was based on the production and marketing of high quality food for export especially to the UK. And in the early 1950’s the agricultural sector still provided more than 60 percent of Danish exports (Ingemann 1998b).

In the late 1950’s Danish farmers found themselves in an income squeeze partly due to an increasing protectionism on major export markets. The solution was then, besides introduction of massive governmental subsidies, formulated as ‘the efficient farm’. This notion is still the foundation of the farmers’ organizations as well as the governmental agricultural strategy. In the notion it is stated that the farmer’s income must be insured by increasing his volume produced and by ensuring reduction of the number of farmers sharing the limited factor of production, namely land (Ingemann 1998a).

As indicated in fig. 1 and 2 the strategic goals of increasing volume and reducing number of farms have been accomplished. The number of farms have decreased to less than a third from 1951 to 1996 while productivity has increased dramatically (Ingemann 1998b).

**FIGURE 1**

As indicated above a strategy was derived from the notion. According to this strategy the farmers staying in business should increase their volume of production by increasing the use of real capital. The fixed costs would then
increase, but average costs would decrease because it could be divided by a larger amount of units produced. The way to increase the volume produced has been - and still typically is - industrialization of the production process. This implies that labor is substituted by real capital - as indicated in fig. 3 (Ingemann 1998 a) - along with an increasing use of industrial inputs, - e.g. various chemicals.

**FIGURE 2**

The notion seems in an immediate sense intelligible: When income is insufficient fewer farmers must produce more. However, this way of reasoning implies *ceteris paribus*, and the experience from the last decades shows that this assumption is rather difficult to claim when it comes to the real world. Due to the industrialization of the production process on the farms several negative side effects have occurred.

*Firstly*, the total volume produced has increased which has caused the income squeeze to be maintained. *Secondly*, qualified labor has been substituted by real capital and industrial inputs while the value added has declined. *Third* of all serious external effects have occurred in relation to the environment. These effects seem to cause increasing economic as well as social problems while farmers at the same time are brought in an opposition to the rest of society.
Increase in volume produced
In figure 4 it is illustrated that the volume produced is more than doubled while at the same time the farms' Gross Factor Income in fixed prices is reduced to about 60 percent of the 1951 level. This seems to be an anomaly because the volume produced has increased and the income decreased.

To explain this contradiction it is essential to underline the lack of distinction between business, sector, and national economic optimization according to the notion. Competitiveness on the sector and national level are induced from the farm level. This leads to an atomistic error of induction because one or even some farms can increase the volume of production without notably affecting relative prices. But when all farms increase the volume of production then the total national volume is increased, and due to the limits of the human capacity to digest the price level must decrease. The produced surplus can then be sold for exports, but in the western world - where there are effective demand - most consumers must be assumed to be satiated with food.
These points are in line with the concepts of ‘the threadmill’ and ‘cannibalism’ as originally introduced by W.W. Cochrane (1958, 1965, 1979). Although the Danish agricultural sector is not on its own able to seriously affect international food prices the volume supplied from Denmark is not without importance to some markets. But most important at all the experience indicates that it is not possible to solve the income squeeze by raising output on the standard goods market.

Decreasing value added
A commodity contains inputs and an amount of real capital used in the production process. The value added is then an expression of the increase in value caused by “the building up” from inputs to final commodity, or to put it in other words: Value added is the difference between value of production and the resources used from outside the firm. In that sense value added is the part of the commodity price left to pay capital, land, and labor. The industrialization of farming has caused the percentage of value added in relation to value of

2 Cochrane has shown that the aggregate supply curve is shifting rightwards due to technological advance. While the demand curve is rather inelastic, the rightward shift imply the equilibrium price level to decrease.
production to decline. Comparing 1951 and 1994 the percentage for Danish farms at total was 87 in 1951 while it in 1994 had decreased to 46. Comparing the value added in Danish manufacturing industry aggregated for the same two years shows an increase from 39 to 46 percent. At same time the percentage of value added in the process industry of food in 1994 were low compared to Danish manufacturing industry aggregated as shown in figure 5. (Ingemann 1998 b)

**FIGURE 5**

![Value added percent of value of production, 1994](image)

The more difficult and hence qualified work process the more qualified labor is needed, which again means that more value is added. This relation is reflected in the international division of production. When work processes become relatively simple and standardized they tend to move to so-called 'less developed' countries while the developed countries constantly are developing higher standards of qualifications. These are then spread to less developed countries etc. That is why habitants in Denmark can maintain a high standard of living even though thousands of jobs are transferred to other nations. Though most jobs in textiles and electronics have disappeared from Denmark Danes are certainly not in lack of clothes nor electronic merchandise. And - one could add - they neither have serious troubles when it comes to the balance of payments.

The industrialization of Danish farms has implied production of standard goods. This has lead to lack of flexibility and lost opportunity to meet
differentiated demands from discerning consumers. Competitive strength is - due to the notion of the efficient farm - made only a question of reducing costs in the production of standard commodities by substituting labor by real capital and industrial inputs as indicated in fig. 3. And from that follows a relatively decrease in value added.

**External effects**
The Brundtland Commission Report (World Commission on Environment and Development) has certainly brought the environmental effects to the international agenda and has for a great part related them to the intensive food production in the developed countries. With the report the concept of sustainability was indeed broadly recognized. Similar attention has recently been brought to the effects of the industrialized farming on rural development as well as on ethical standards of animal production.

These external effects are for a great part caused by the introduction of the industrial mode of farm production. Food is based on living organisms and living processes which imply differences. With the ongoing industrialization of farming it has been necessary to introduce methods of production where animals somehow are reduced to machinery. In that way farmers are able to produce increasing amounts of goods using a high degree of real capital and a low degree of labor. For instance it is said that no special skills are needed to produce eggs when the hens are in cages, because the routines then are scheduled and automated. But when it comes to egg production by means of free range hens - as in organic farming - the production manager must necessarily have great skills and experience to understand the behavioral signals of the herd and to be able to respond quickly to these signals. So, the farmer is more in the center in organic and alike modes of farming.

The natural based response to the unnatural uniformity of the animals in the industrialized farming systems has been controlled as symptoms as for instance docking off piglets tails, trimming the bill of hens, medicine in feed and pesticides on the fields. Similarly methods like fixation of sows and slatted floor without straw has been introduced to produce as much as possible - and markedly standard goods - at as low costs as possible.

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3 A minor Danish survey has estimated the benefits of the industrial crop production to 1.500 DKr. per hectare and the social costs to 4.879 DKr. per hectare. The social costs are primarily caused by the pollution (nitrogen and pesticides) of drinking water and fishing waters (Anders Borgen ).
The costs of the external effects are not shown in the commodity prices. In some cases these costs are paid by government or external private agents such as the consumers of drinking-water. This does not give rise to further sympathy amongst non-farmers.4

The development of the concept of quality
As mentioned above Danish farmers went into a transition from about 1880 leading to intensive production of animal goods. The strategy was then based on the one-dimensional concept of quality and it is important to acknowledge that Danish animal goods before the 1880’s had a very bad reputation for low quality. So to secure success cooperation between farmers, co-operative plants - like dairies and slaughterhouses - and the public units of control were institutionalized. By means of these joint efforts it was possible to produce and sell food that could meet high standards of quality when it came to sensory parameters as taste, looks, smell etc. and a high level of veterinary control. Consumers in Denmark and abroad developed confidence to the level of quality represented by symbols like the LURPAK brand and the royal crown.

In the last two decades the concept of quality has developed towards the incorporation of new aspects which makes it two-dimensional, as illustrated in fig. 5. The concept now, besides the former parameters, includes moral values related to the production process. So the concept of quality is no longer solely related to the product itself but also to the process under which the commodity is made. In that way the new concept of quality includes a dimension of consciousness related to questions like: Are you able to eat the food without worrying about your grandchildrens’ ability to find pure drinking water? Did the steak have a decent life when it was a cow or a pig? Did the farmers - and their neighbors - risk their health to produce the food?

4 According to a survey made in Denmark in 1997 more than to third of the Danes found it necessary that the total food production should be organic (Ugebrevet Mandag Morgen 1997-19, p. 26).
Confidence is essential in relation to the two-dimensional concept of quality as well as it was in relation to the one-dimensional. When it comes to the two-dimensional concept of quality the consumers confidence to the production process is determinant. The consumers should be convinced that the production takes place in accordance with the expected standards to substantiate a surplus price in relation to standard goods.

**The choice of strategy**

For the last four decades the strategy of Danish agriculture known as “efficient farm” has been defensive, and the political and economic actions taken have been directed towards maintaining *status quo* in spite of signals from independent experts, consumers, and even from several politicians.

For the time being Danish agriculture has a chance to *choose* an offensive strategy just like a hundred years ago, but this time by understanding and implementing the *two*-dimensional concept of quality. A minor group of Danish farmers have already as pioneers done so by introducing organic farming and
food processing plants based on a high quality level of craftsmanship. And they have succeeded in introducing the Danish Ø brand\(^5\) with the royal crown. This brand, which is common for all Danish organic farmers, food companies and retailers, is the symbol of authorization and control all along from the farm to the consumer. The organic farmers have proven it possible to create a higher degree of flexibility and to add increasing value\(^6\) to food by understanding the actual two-dimensional concept of quality. In 1997 organic milk for instance covered 16 percent and oats meal 15 percent of the Danish home market (Nyt om oekologio).

It can be questioned whether there were any alternatives to the treadmill and cannibalism in the 1960's if the Danish agricultural sector was to be maintained as an important part of the Danish economy. In this case the political choice was made to preserve and even increase capacity of production by means of the strategy of the efficient farm along with massive governmental subsidies. But at present the strategy is conflicting with the actual priorities on the political and the social agenda. This is a challenge to agriculture but also an opportunity to change the strategy from defensive to offensive by using the insight of the two-dimensional concept of quality. By that mean agriculture will have a key once again to play an essential part in Danish economy, slow down the speed of the treadmill,\(^7\) and to repair the damaged relations to rest of society.

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\(^5\) The Danish letter ‘Ø’ is the first letter in the Danish word for ‘ecology’ which in Danish is used instead of ‘organic’. In Denmark the government authorize organic farmers after which they can use the brand. To be authorized and maintained as organic the farmer must abandon chemical pesticides and chemical fertilizers. Similarly the farmer must keep the animals under specific ethical conditions. An Act of The European Union has specified minimum demands mutual to farmers in the member states.

\(^6\) Based on a minor survey from The Danish Agricultural Advisory Center comparing organic and conventional milk producing farms with similar capacity etc. it is possible to show, that the value added on organic farms are about 51 percent of the production value while it on conventional farms are about 39 percent (Landbrugets Raadgivningscenter).

\(^7\) There is even a unique chance for once to shift the supply curve to the left.
References:


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