



agri benchmark Cash Crop

A standard operating procedure
to define typical farms

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Yelto Zimmer (Coordinator agri benchmark Cash Crop)
Claus Deblitz (Coordinator agri benchmark Beef)

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A Standard Operating Procedure (SOP) to define Typical Farms

1 Summary

The process to define typical farms described in this paper refers to farm data collected for the purpose of the analysis of competitiveness and potentials of typical farms and regions. Other purposes of the analysis and the consequences for the definition of farms are briefly touched upon in chapter 9. In the following a brief description of the necessary steps for the definition of typical farms is provided. All steps are based on the assumption that all required statistics are available. In case statistics are not available, chapter 7.4 provides a minimum standard to define farms.

Select regions and locations

In this step the most important regions and locations for the raw-production of the product considered are identified. For this purpose, maps showing the spatial distribution of production are created. Different regional reference units of the production are considered to come to a conclusion.

Identify the prevailing production systems

Once the regions are identified, the relevant farm population, the production systems and farm types to be analyzed must be determined. This step can be done by a scientist based on literature and statistics analysis and/or together with local advisors. For this purpose a check list is used to identify the degree of specialization, the capital and labor structure and organization, yield levels, cropping patterns and technologies, intensity levels and further indicators.

Define the size and management level of the typical farms

Size is defined as hectares used for arable farming. As a standard, **agri benchmark** defines a moderate size and a large size farm in the region identified. This allows to reflect a large number of farms and a major share in production. Both farms should represent an average level of management, which means with an average profit level. Regional statistics on farm size distribution are used to determine the position of the farms in the distribution of the farm population or representative surveys. In order to reflect the region's potential further to the two farms a third farm with top management will usually be defined.

Data collection, cross-checking and updating

Data are collected in so-called full panels or pre-panels with participation of farmers and advisors. A standard questionnaire is used and for each figure it is checked and made sure that it reflects the typical situation. All yield and cost data are three years averages. Once the data are collected, they are computed and the results are returned to the panel for cross-checking. Further, their economic performance is cross-checked against other economic analysis. Updating of prices and yields is done annually; the whole data set is updated every 2-4 years, depending on the speed of structural change and productivity increase.

2 Introduction

This paper describes the approach used in the International Farm Comparison Network for the identification and definition of data sets of typical farms in cash crops. It is based on the experience gained in the **agri benchmark** and questions raised by **agri benchmark** partners and supporters during the existence of the network.

The purposes for this SOP are:

1. Make transparent to the network and the outside world, **how** typical farms have been selected.
2. Make transparent to the network and the outside world, how typical farms can be **described** relative to the rest of the farm population.
3. Make sure that irrespective of the availability of statistical data a minimum level of scientific standard in selecting farms has been respected.
4. In the long run: allow to draw conclusions regarding the entire sector based on results derived on farm level analysis.

In order to keep it simple, the SOP refers to (a) the standard situation, in which data from the farms selected will contribute to the global network and (b) to the presently less frequent situation where data have to serve specific purposes, which go beyond the scope of the overall standard within **agri benchmark**.

This paper will not answer all potential questions. Therefore every partner is kindly invited to get back to **agri benchmark** Center in Braunschweig and ask for advice.

3 Define the purpose of your exercise/analysis

Since the purpose of an international farm comparison analysis has a major impact on the selection process for typical farms, it is assumed that **competitiveness and potentials of regions** are the objectives of the research.

In section 9 of this paper we will talk about other purposes of the comparison and their implications for the selection criteria regarding farms and regions in greater detail.

4 Select regions and locations

This step can be done by the **agri benchmark** scientist using statistics available. You need to know which regions in your country

- produce most of the product (wheat, soy etc.) you are looking for

i.e., you are looking for the **spatial distribution of the product** and/or the farms producing it. You are probably looking for regions with a substantial size and a relatively high density of the respective crop. For this, you have to use the appropriate reference unit for the indicator.

Identification of the relevant region has to be based on a defined reference unit (acreage, arable land, square kilometer). Each reference unit has some pros and cons which will be explained hereinafter. For illustrative purposes, wheat as the selected crop is used.

- Amount of wheat production (e.g. in 1,000 t) **per region**: This indicator can be misleading if sizes of regions differ substantially. Large regions appear important whereas small regions appear unimportant although the latter might have a higher wheat density (higher relative importance of wheat production). The same applies if the share of a region in total wheat production in a country is chosen as an indicator.
- Wheat production **per ha arable land**: This indicator comes closer to farming. It does not take into account non-agricultural land where wheat production does not take place. However, a region with a very small share of agricultural land and just a few but large farms (which are producing wheat) will appear to be very important for wheat production whereas regions with more agricultural land and a higher diversity of products appear less important.
- Wheat production **per square kilometer**: This is an absolute density measure taking the different sizes of regions into account and avoiding the disadvantages of using agricultural land as a reference unit. It does however, not measure the importance of wheat production relative to other farming systems and it might be misleading in cases when the region is relatively small and surrounded by non-wheat producing areas. However, using square kilometers probably provides the best indicator for the standard **agri benchmark** analysis as defined in section 3.

Due to the pros and cons of each indicator, it is advisable to produce tables or maps for all three reference units.

An example for Germany is provided in Figures 1 and 2. The maps show the regional density of wheat cultivation measured in terms of share of wheat per square kilometer and per 100 ha agricultural area respectively. The dark areas can be described as the “Kornkammer” of Germany.

Figure 1: Share of wheat acreages per 100 ha total acreage in 2003

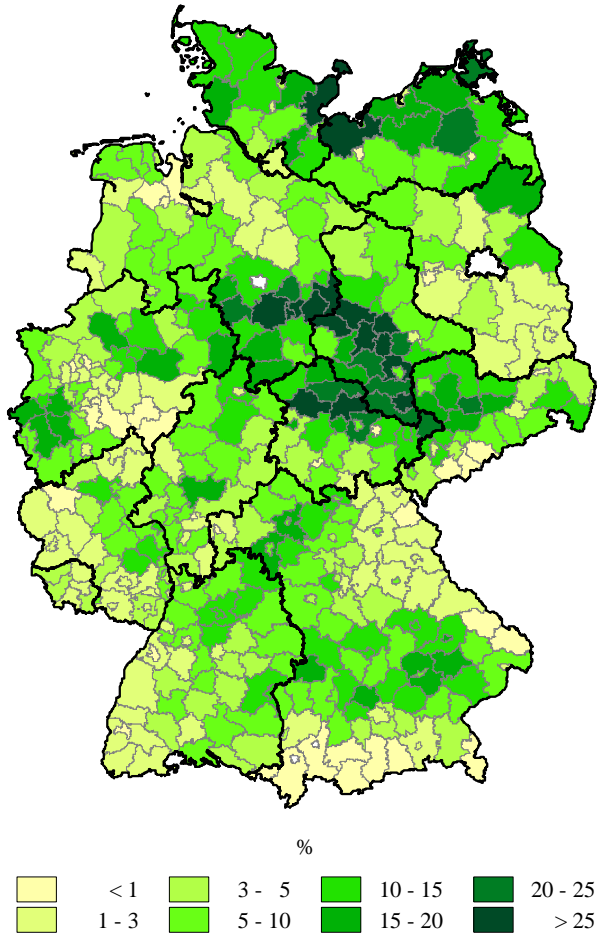
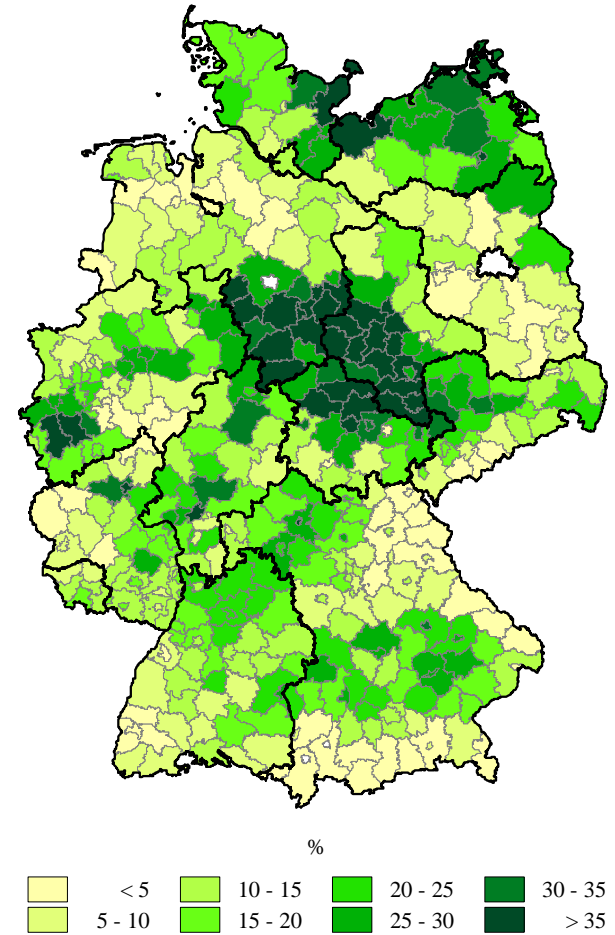


Figure 1: Share of wheat acreages per 100 ha agricultural land in 2003



5 Define the relevant farm population

Once the relevant regions have been identified, it needs to be checked whether the entire population of farms is considered to be relevant for the analysis. Because **agri benchmark** is aiming to focus on those farms which are producing the bulk of products, the relevant farm population is characterized by the ability to generate at least 50 % of the farm income or to feed at least one person/family.

6 Identify the prevailing production systems in the country and the regions chosen

The next question is, what type(s) of farm(s) should be selected from the relevant part of the farm population in the relevant region(s). In order to make sure that the most important production systems are represented in the typical farm network, a number of different systems need to be checked whether or not they make a difference in the data base.

This step can be done by the scientist based on literature and statistics analysis and/or together with local advisors. A stepwise approach appears to be appropriate, starting with a rather rough classification and refining it in the next steps.

The following list of criteria is meant to be a proposal for a check list, which should be amended depending on the regional conditions in the different member networks. In many cases a number of these criteria will be meaningless for the selection procedure and should therefore simply be ignored.

- Specialized arable farms vs. mixed systems
- Capital and labor-intensive vs. low capital/low labor input systems (e.g. no-till)
- Multi-product vs. one product farms
- Storage of grain on-farm vs. grain is sold to the elevator immediately after harvest
- High yielding farms vs. low yielding farm (in terms of physical output)
- Family labor vs. hired labor farms

The result of this clarification procedure could look like this: We go for a farm with a mixed system which runs a low yielding system based on a capital and labor extensive system. This typical farm in region xyz has established a hired labor regime, the manager uses to store the grain on-farm.

This characterization of the typical farm identified will be communicated to the network in order to allow a better understanding of the cost calculation and cost comparison as well as gross margin based analysis.

7 Define the size of the typical farm(s)

Once the relevant type of wheat producing farm and respective production system are identified, a decision regarding the size of the typical farm has to be made. **Size** in the course of this paper shall be measured in terms of **hectare** used for **arable farming**.

Following there is a list of issues that must be addressed when defining typical farms and collecting their data. We should be aware that due to the voluntary participation in **agri benchmark** we will – irrespective of the specific sampling rules – probably get a **bias** towards farms with above average size, management and performance.

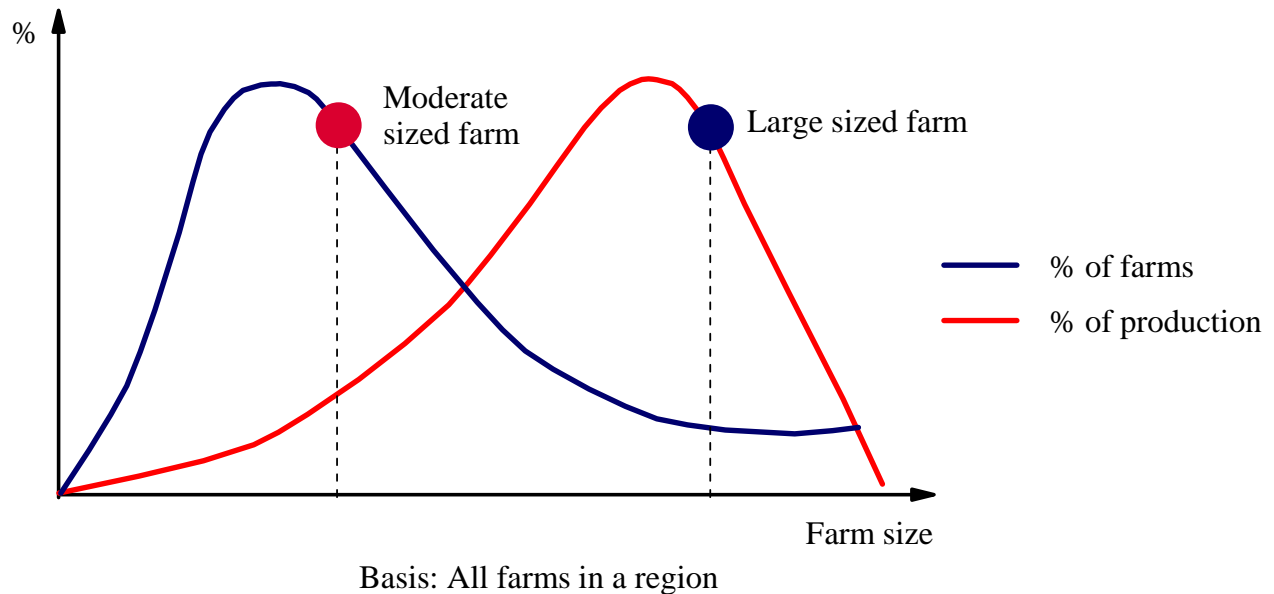
Further, we should make the **position of our typical farms** in the total farm population transparent: How many farms are in the same size category and how many are larger or smaller than the typical farm? This can be done by using data of the farm population (which will usually not be available to the detail required) or using representative random samples providing key indicators to measure the frequency of certain farm types and sizes (like the Farm Accountancy Data Network of the EU).

7.1 Different farm sizes and different production systems

As time and resources are usually limited, it is not always possible to reflect all farm sizes and production systems in a region. Based on the experience of **agri benchmark** work, the following recommendations can be given:

- In a region with **minor differences between production systems** (for example in the Paris Basin region in France), **two different farm sizes** with the same production system should be chosen. One farm should have a moderate size (usually slightly above average), the other farm should have a large size. This should be reflected by the fact that this farm belongs to the about 20 % largest farms of the whole farm population. Given the typical distribution of farm size classes (many small farms with relatively little share in production and few large farms with relatively high share in production, see Figure 3), this allows to reflect a large number of farms and a major share of production. Further it allows showing size effects.
- If possible, **agri benchmark** uses **regional statistics** regarding farm size distribution to assist the definition of appropriate farm sizes. It is obvious that the availability of reliable statistical data is a precondition for this step. Problems occur in parts of Central Europe, in Eastern Europe as well as in some countries in Asia and the Southern Hemisphere.
- In a region where a) size differences are either not pronounced or appear to be of less relevance for the results and b) there are significant differences in production systems (e.g. intensive and low-input systems), two farms of rather the **same size** reflecting the **different systems** should be chosen.

Figure 3: Farm size distribution and selection of typical farm sizes



Source: Own illustration

7.2 Management, performance and yield levels

The typical farm should have an **average level of management**; this allows us to draw conclusions regarding the **bulk of the output** generated in a given region.

In order to explore the **potentials of a region/country** we strongly recommend to add one large farm with **top management** to the set of farms, if possible. These additional farm data from a producer which probably will dominate in future tells us a lot about the perspectives of a region in the respective global crops sector. The standards these top farmers realize today provide some inside view into structures and procedures (especially when data for the production system are available as well) which are technically possible when limitations caused by average management are lifted.

The quality of management is measured in terms of profitability. That means the two farms with average management should exhibit an average level of profit whereas the top management farms are ranked in the upper 10 % of large farms in terms of profit. In case profit data are not available, gross margins or the physical productivity per hectare are used as a proxy.

It is foreseen to reflect the latest available data in the analysis. This means that data generate a most recent picture of the economic situation of the typical farms. In case these figures are caused by rather unusual yield and/or price variations it will be highlighted by the partner and in the report. Once sufficient data are available, the report will cover both, most recent data and three years average data.

7.3 Number of farms required per country

The question of how many typical farm models are required to represent the crop production of a country given is frequently asked. In quantitative terms, there is no general answer to this question. Own experience from the IFCN Dairy Network in Germany indicated **diminishing returns of knowledge and discoveries** with increasing typical farm numbers.

In order to allow participation in the global **agri benchmark** analysis three farms are defined to be the standard: one average farm and one large farm both with average management and one large farm with top management.

Beyond this general rule the number of farms required per country mainly depends on

- Diversity of **production systems** (natural conditions, economic conditions, infrastructure conditions) – usually the more diversity the more farms required.
- Diversity of **farm size structure** – usually the more diverse the more farms are required.
- **Size** of the country – usually the smaller the country, the less farm types required.
- On the other hand, very big countries with a great variety of farming systems might be **subdivided into different regions**, to be probably required in the U.S., Brazil, Russia, China and Australia.
- **Spatial level of analysis** – usually the more international, the less farms are required (usually 2-4 farms per country, exceptions see previous point).
- **Type of analysis** you perform – usually the more farm adjustments you analyze the more farms you need.
- **Financial resources** to set up and maintain (!) a network of typical farms in a country (feasibility)

Experience so far revealed that establishing a **national network of typical farms** in each country is the best way to generate a larger number of farms and by doing so to get a more detailed picture of production systems and production cost.

7.4 Minimum standards to define typical farms

In case statistics and resources to define typical farms are not available, a minimum criteria-list is defined here to allow the first steps in defining a typical farm.

1. Select the **region** with the **highest importance** of wheat production in terms of tradable volume produced.
2. In the region identified, select the **production system** with the highest share in regional wheat production.
3. Select the **farm size** that produces the highest share of wheat within the production system identified.
4. In any case, try to make **transparent** where on the **distribution function** the typical farm is located (in the sense of points 6.1 and 6.4).

It is obvious that this procedure must be revised over time to improve accuracy and relevance of the farm data.

8 Data collection and updating

Data collection is done together with a local advisor and farmers knowing the region, the farms and the production systems. **agri benchmark** uses the so-called '**panel**' consisting of the responsible scientist, an advisor and one to six farmers. The panel is a round table meeting where all required farm data are collected based on a **standard questionnaire** available in 11 languages and used in all **agri benchmark** countries. The panel creates a **consensus** on each figure to properly describe how a typical farm looks like. The most frequent question raised in the panel is: "**Can this figure be considered typical for the type of farm we want to describe?**".

Depending on the aim of the analysis, there are different intensity levels of farmers' participation:

- A so called '**pre-panel**' with only 1-2 farmers appears to be sufficient for status quo analysis of economic performance and production cost. Often it is also possible to base the typical farm data on individual farm data. In any case it is necessary (a) to identify and correct the particularities of individual farm data (to make individual farm data typical farm data) and (b) to make farm visits to two to three farms coming close to the typical farm.
- A '**full panel**' with 4-6 farmers is required when farm adjustments to changes in the framework conditions or farm strategies are to be discussed and defined. The main reason is that probably more options to act can be captured with a larger group. For this purpose, the data and the analysis derived from the pre-panel can be used as a basis for discussion.

In any case, farmers involved have to run farms themselves which are similar to the envisaged typical farm.

The **panel procedure is strongly recommended** because in mid-term perspective existence and experience with a full panel will allow **agri benchmark** to fully benefit from our interaction with the farming community and hence to come up-to-date projections. However, in case a full panel is not manageable, a **pre-panel is a prerequisite** for any farm data that enters into the **agri benchmark** network. Whenever this was not the case in the past, the **updating of farm data** has to be based on a **pre-panel** at least.

Once the data are collected, they are **computed** with the analysis tools used in **agri benchmark** (mainly the simulation model TIPI-CAL) and results are returned to the panel and the advisor. This process is repeated until the panel agrees on the results obtained. At the end of this process there is a typical farm model.

In a final step the results have to be confronted with results from other economic analysis, for example by comparing the whole-farm profit of the typical farms with representative survey results. By doing this cross-check we can make sure that our calculation and the selection of the typical farms are in line with other scientists' results.

Updating of typical farms must be done annually according to changes in prices and productivity levels. These adjustments – like the initial description of the typical farm – are based on three years averages. Updating (= projecting the farm into the next year) is to be done in two different ways:

1. Prices for inputs and outputs of the farm as well as yield increases reflecting the usual technical progress are updated annually. This is to be done by using regional or national statistics on price and yield developments. **Indices** are calculated and the first year's values are indexed to achieve the current year prices and yields. This kind of update can be done by the scientists involved.
2. Depending on the speed of **structural change** and the extent of **technical progress** a complete update of the entire farm data set is necessary. Usually such an update has to take place every 2-4 years.
3. In case the updated typical farm is not derived from an existing former one but is a totally new one this has to be communicated to the **agri benchmark** Center in order to manage respective data in time series analysis. In any case the updated farm reflecting a change in size has to be documented to the network by using a new farm code.

9. Advanced studies based on typical farms

Up until now it has been assumed the purpose of the selection process is to contribute standard data to the **agri benchmark** network, focusing on competitiveness and potentials. However, the concept of typical farms and the respective model TIPICAL is able to tackle a number of other analytical issues. A selection of these other issues is displayed in table 1.

Table 1: Analytical questions suitable for typical farm based methods

Type	Purpose	Farm
1	Income or social problems of farms	<ul style="list-style-type: none"> • Small family farms • Commercial farms with cash problems
2	Policy analysis	<ul style="list-style-type: none"> • Farms mainly affected by policy under analysis
3	Farm strategy analysis	<ul style="list-style-type: none"> • Reactions of farms that are faced with new technological or organizational options
4	Production potential of regions / farms	<ul style="list-style-type: none"> • Non-typical farms with features indicating substantial future growth in output

In these cases selection of relevant farms has to be made in a different way. Suppose a study on the competitiveness of a new harvester has to be made. Like in the standard routine for the farm selection process the relevant region has to be identified. Regarding the size of the farm the “average” criterion probably won’t work because such a farm will usually not buy such technology. On the other hand for Type 2 kind of project the spatial distribution and the selection of a certain region might be of less relevance in case the specific policy under review is not linked to certain crops or products.

Annex

How to specify a typical farm

How to Specify a Typical Farm ?

III. Step: Processing and cross-checking phase

Compute results for the virtual typical farms

Cross-check with advisor (farmers); make improvements



II. Step: Data collection phase (scientist, advisor, farmers)

- Contact farmers who operate such farms („panel“)
- Collect full set of economic and physical farm data



I. Step: Identification phase (scientist + advisor)

- Select important regions / reference units
- Identify relevant farm population
- Identify relevant production systems
- Specify relevant farm sizes
- Specify average and top management figures