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RECOMMENDATIONS FOR THE 2020 AGRICULTURAL CENSUS RESEARCH IN HUNGARY BY COMPILER EXPERIENCES

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Abstract
Nowadays, the use of IT tools in research is becoming more and more actual. Not only in data processing, formulation of research results, but also in data collection. Shifting from personal data collection with high research cost to online data collection with low research cost is essential for the competitiveness, effectiveness and efficiency of agricultural research. In the case of personal data collection, informatics can not only help to rationalize research costs and increase time management, but also to achieve the goal of census data collection. Taking into consideration all of these facts we have formulated proposals for the findings of the 2020 Agricultural Census research.

1 Introduction

The added value of agricultural research mostly remains in the country, however it would not only target the expansion of foreign export markets of the agricultural industry and the its income would also strengthen the domestic economy. [7].

The demand for agricultural products will dynamically grow over the next few decades, and this can be satisfied by a more efficient production. Precision farming is a really important tool in this process. Precision farming is a set of technics, informatics, technological and cultivation technology applications that make production and agricultural machinery management more efficient. Agricultural economics has undergone a significant development in the last few years. Precision farming is a practical form of digitized agriculture, it means the adaptation of digital solutions in agriculture, where developments aim at competitive farming, efficiency increase while also insisting a great emphasis on environmental sustainability. Agricultural digitalisation enhances stability and predictability, increases efficiency and thus provides competitiveness and higher level of income. Precision farming is now an indispensable part of competitive agricultural production by facilitating the rationalization of production. [1].

Our aim is to increase the efficiency and effectiveness, cost rationalization and time management by taking advantage of agricultural research and informatics with a special emphasis on Agricultural Census.

2 Agricultural Research

One of the critical points of economic development is innovation based by research and technical development. The institutional network of Hungarian R&D doubled in a quarter of a century,

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while the number of research institutions hardly changed. However, the number of university research institutions has increased by a third and the number of enterprise research places has increased from 174 in 1990 to 1570 in 2016. The number of employees working in the field of agricultural research decreased the most: from 7.8 to 3.6 thousand. [9].

According to LXXVI law of 2014, a research place is an institution, organizational department or enterprise carrying out research and development activity as a basic or main function. Research places can be distinguished by the following groups: research-development institutions and other research places, higher education research-development places and business research-development places. [10].

In the period of 2010-2019 the amount of the R&D funds paid (GBARD) of state budget for agricultural purposes can be evaluated fluctuating by the data of CSO. Compared to the base period of 2010, it felt by less than half by 2011, by 7% by 2012, and then more than tripled in 2013. Subsequently, in 2014 it fell short of the value of 2010 by almost 5%, by 2015 it reached the base value, in the following period it almost doubled or more than doubled. In 2019, it is almost 2.5 times the 2015 value. For the previous year, the largest decline occurred from 2013 to 2014, declining to less than a third, the largest increase from 2012 to 2013, almost tripling. Of the total value of funds paid from the R&D budget of the state budget (GBARD) for social and economic purposes, in 2010, 2014 and 2015, agriculture only gain slightly more than 5%, in 2011 just over 3% share. From 2016, the share increased steadily, to almost 10% in 2019 (increased by 1 percentage point from 2018). This is illustrated in Table 1, own edited based on HCSO data.

Table 1. Amounts paid from the R&D budget of the state budget (GBARD) by agricultural objective in the period 2010-2019 (in HUF million and ratios in%)

Social-economic goal	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Agriculture	5 168	2554	5 529	16 036	4 930	5 228	9 956	11 037	11399	12 606
Base ratio (%)	100,0	49,4	107,0	310,3	95,4	101,2	192,6	213,6	220,6	243,9
Chain ratio (%)	-	49,4	216,5	290,0	30,7	30,7	190,4	110,9	103,3	110,6
Partition ratio (%)	5,4	3,1	5,7	8,2	5,4	5,4	7,1	8,1	8,8	9,8

Source: Own data edition based on KSH

The progress efforts are essential for the development of the agricultural economy. The increase in R&D expenditure per capita - with a very strong positive correlation - significantly increases the GDP per capita accompanied by the increase in agricultural R&D expenditure per agricultural labor force. With the increase of agricultural R&D expenditure per hectare, the agricultural GDP per hectare also increases, so the increase of the intensity of research and development plays a key role in the agricultural economy. [12].

Agricultural production and agricultural research have undergone a significant change over the past nearly half a century. More and more products have been produced, many plant and animal varieties have been bred. Parallel, production methods and techniques have been developed, including in the fields of animal husbandry, tillage and plant care, which have made the production process economically feasible. [2].

On January 1, 2014, the National Center for Agricultural Research and Innovation (NAIK) started operating. The center, established in Gödöllő, was established by merging and coordinating thirteen research institutes related to the agricultural and food economy, and four more research institutes have joined it as economic companies. The main task of the NAIK is to help administrative decisions with laboratory tests, instrumental tests and the preparation of expert reports. These expert institutes also provide service and research tasks. Through the new institution, an integrated agricultural research network has been established, which is able to develop and implement practice-oriented research and development and innovation programs that enhance the increase of the competitiveness and sustainable development of the Hungarian agricultural economy. [3].

The agro-innovation system plays an important role in the spread of innovation in the production of agricultural raw materials, in which, besides the actors of the micro-environment

(farms, food consumers, processors, input suppliers, financing and credit organizations and producer organizations) the national agricultural training and further training system are important elements. [8].

Another important factor is the level of development of national consultancy, business development and coordination organizations (World Bank, 2012). In the future, co-operation and co-ordination between research institutes involved in agricultural research, higher education institutions, the civil sphere and producers will be even more important than before. Present day agriculture can only be competitive on its own if in the background there are effective basic and applied ongoing researches in the interest of producing a quantity and quality product that will be on the table of final consumers. [11].

3 Agricultural Census 2020

Out of the actors of the microenvironment, research among farms and producers came into focus.

3.1 The Necessity and Purpose of the Census

Data collection is required by law in EU Member States. Every 10 years, as advised by the Food and Agriculture Organization of the United Nations (FAO). The 2020 round will be conducted under the World Program for the Agricultural Census. The decennial Agricultural Census is complemented by sample data collections organized every 3-4 years in-between. [5].

The aim of the census is to provide a realistic, objective picture of Hungarian agriculture, about changes in the sector with high-quality statistical data for farmers, the private sector, state and non-governmental organizations and EU institutions. Providing accurate data is very important for agricultural operators and their interest groups, as well as government decision-makers - taking into account the interests of farmers and on the basis of good quality data- in order to be able to make right decisions and plan the different support policies at national and EU level. and also assess their impact. [5].

The Central Statistical Office (CSO) conducted a comprehensive agricultural census entitled "Agricultural Census, 2020". The aim of the survey was to monitor changes in the structure of agriculture and to provide accurate and credible data for the Hungarian economic governance, the EU and farmers, to which data providers contribute greatly with their participation and accurate data. [5].

Data provision is mandatory for the appointed pursuant to the law 2016 CLV. Sections 24 and 26 of the Act. Taking into consideration the emerging epidemiological emergency situation, the Central Statistical Office (CSO) transferred the censuses to non-personal channels, keeping in mind the protection of the health of data providers and employees. Thus, unlike previous plans, the time for online completion were modified from 5 June to 30 June and the census tasks for data collection from 19 September to 22 November. The first session of the Agricultural Census, the agricultural survey of the Central Statistical Office (CSO), ended on June 30. Those who did not have the opportunity or did not take the opportunity were visited by census compilers between 19 September and 22 November 2020. [5].

3.2 Agricultural holding threshold

The agricultural holding threshold is a specific threshold for certain indicators, by reaching it individual farmers must complete a questionnaire. At the beginning of the questionnaire, simple questions (e.g., size of production area and livestock, whether it provides agricultural services) were used to examine whether the size of the farm exceeded the threshold. If so, the full questionnaire was queried, if not, it was over. The pre-2020 economic structure census was carried out by the CSO under the name Agrárium 2016 with an ideal date of 1 June 2016. In the case of the census, the definition of the economic threshold differed from that used for the Agricultural Census 2020, however, for the sake of comparability, the data were reprocessed with the farmland threshold classification used for the AC2020.

On this basis, those meeting at least one of the following criteria were considered to be agricultural holdings:

- in use
  - production area (arable land, kitchen garden, orchard, vineyard, lawn (meadow + pasture), forest, fishpond, reeds in total) at least 1 ha (10,000 m^2), or;
  - potato area of at least 0.25 ha (2,500 m^2) or;
  - area of vegetables and strawberries 0.25 ha (2,500 m^2) or;
  - area of seeds and seedlings, nurseries, essential oil plants, medicinal and spice plants, flowers and ornamental plants 0.2 ha (2,000 m^2) or;
  - the area of fruit trees, berries, citrus trees, other permanent crops, excluding nurseries, vineyards and olive trees, is 0.25 ha (2,500 m^2) in the open air or;
  - the area of vineyards is 0.1 ha (1,000 m^2) or;
  - the total area of the walkable greenhouse or foil tent / house is at least 100 m^2, or;
  - the area used for growing mushrooms is at least 100 m^2, or;
- holds at least
  - 1 bovine;
  - 10 sheep;
  - 10 goats;
  - 30 pigs up to 20 kg;
  - 2 pigs over 20 kg or;
  - 50 hens;
  - 30 turkeys;
  - 100 ducks;
  - 50 geese;
  - 3 ostriches;
  - 50 rabbits.
- provides agricultural services

3.3 Content of the survey (topics)

According to EU legislation, the following data sets are compulsory to be compiled. In the case of basic indicators, a comprehensive sample is used, while in the case of module indicators only a smaller one.

Comprehensive data sets:
- identification data of the holding: name (company name), type of the company, location of the company, manager information, identification data registered in other databases related to farming;
- characteristics of land usage by branches, rights of use;
- characteristics of crop production on the farm;
- livestock on the holding by age and gender

Module data sets:
- characteristics of those working on the holding;
- other non-agricultural activities of the holding;
- livestock buildings, manure management;
- the agricultural production methods used.

In order to reduce the reporting burden, the CSO takes information on organic farming and rural development support from an administrative database, so it no longer appeared in the questionnaire. [5].

3.4 The sample

The census concerned all individual holdings which, on the basis of previous surveys and / or administrative data, carry out or have carried out production for sale. In addition, it concerned all economic organizations engaged in agricultural activities, which were recorded in the agricultural register of the CSO on the basis of administrative data.

3.5 Section 2 of the Agricultural Census (CSO) Agricultural Census with compilers

Performance of compiler interviewer's activity took place in the settlements of more than 1000 inhabitants, in the downtown area. Preparation for the census took place first with a 10-page e-learning curriculum and exam based on the census guide, and second with personal, group training and the provision of a 34-page census guide. For further assistance, the regional organizer (by mobile phone) was available. According to the preparatory training, one compiler received between 40 and 270 census district addresses, an average of 170. From 19 September to 19 October, 130 address lists (registers) had to be visited and managed, by 12 November 230, and by 22 November address above 230. The task of the compiler is to visit the addresses in the address list (register) where the farmer or legal successor had to be interviewed. The list of names and addresses of individual farms and agricultural organizations and the questionnaire were provided in a tablet. The first problem was that there was no contact (neither e-mail nor telephone number) for a personal interview at which a date could be arranged. However, for an organizational market sampled arranging a date is essential for a personal interview.

The second problem is that while in the case of panel or condominium flats, a residential name line helped to visit the address, although there was an exception that only the number of floors and flats was given in the residential name list. In the case of detached houses, it was not possible to know that the respondent with the name to be visited still lives at the given address. As a result of weekday evening and weekend address visits, for the first time less than a quarter of the questionnaire could be queried. In the case of unsuccessful address retrieval, a notice had to be placed in a mailbox with the date (month, day and hour) of the next scheduled visit, the name and telephone number of the compiler. As a result, most of the respondents had already called the compiler, and nearly one-fifth of the questionnaires could be queried at an agreed time. After three unsuccessful visits, which meant leaving a notice twice, the regional organizer had to be contacted. Name and address had to be provided to which a registered letter of formal notice was sent by the Central Statistical Office. Nevertheless, the query failed at several addresses. The most unpleasant experience was caused by the deaths of those in the address book, where the outrage of relatives was caused by the visit. In case of a successful address visit, it was difficult to give the size of the land and the topographical number. For this reason, a subsequent re-visit was requested. If the size of the land was only a few acres, it was typically leased. On the other hand, if the tenant was an entrepreneur, they were mostly unable to tell the professional education of the manager of the tenant and their participation in professional training in the recent period. The customer ID (s) for which the Hungarian State Treasury has requested agricultural and rural development support, the primary producer's certificate (s) and the National Chamber of Agriculture identification (s) have already been made available by clicking on the address list. This has already helped the compiler as a result of IT development. In settlement on the lower level of hierarchy (village, large village and small town), the work of the compiler could be helped by acquaintance, but on settlements over ten thousand inhabitants, the interviewers no longer had this advantage. In some target groups, the willingness of respondents is higher than average, while in others it is lower than average.

3.6 Recommendations

Our recommendations were based primarily on our experience of nearly two decades of researcher and lecturer work in higher education (marketing research, market research) and on the observations of 2020 agricultural census research We have narrowed down the compilation problems to the possibilities provided primarily by IT databases.

As the most important cost-rationalizing and time-saving factor, we recommend out of the of the data collection methods to encourage data collection with computer assisted web interviews (CAWI). The cost of research is low for online data collection, compared to the cost of research with a computer assisted personal interview (CAPI). The advantage of online quantitative research is the complete lack of interviewer error. The subjective elements of data collection do not affect data quality. For example, respondents with higher education and status typically have a greater willingness to respond, but we can also find different completion rates for each age group. [13].

By Kurucz (2015) after roughly 20 minutes, the proportion of those who drop out of the questionnaire - or those who do not start because of its length - increases significantly, and it is easy to see that 10-15 minutes on a smartphone can be the upper limit.

For first we made the following suggestions for boosting online completion:

- Suggestion 1 Agricultural census questionnaire optimized for mobile phone (smartphone)
- Suggestion 2 Based on Kurucz (2015), a questionnaire that can be filled in and saved by question (module) on both mobile phones and computers (desktop, laptop, tablet)
- Suggestion 3 Contact by e-mail and SMS (first call, reminder) about the mandatory feature and deadline for completion
- Suggestion 4 Achieve at least the fulfillment of the economic threshold (filter data)
- Suggestion 5 Encouraging completion, sanctioning non-completion, for example, should not apply for funding

Secondly, we formulated the following suggestions for the personal interview made by the compilers (interviewer):

- Suggestion 6 Run the address book in the address data database of the Central Office for Public Administration and Electronic Public Services. Thus, those who had moved or were previously only living in apartments could be visited at the correct address.
- Suggestion 7 To run a database with an IT register of the population in order to avoid the inclusion of the deceased in the address book.
- Suggestion 8 by giving a telephone availability Interviews can take place at a time and place agreed Suggestion 9 Data on the size and topography of the land owned by the respondent should have been available from the Land Registry database belonging to the Government Office.

4 Summary

The use of information technology is essential not only to satisfy the growing demand for agricultural products with more efficient production, but also for agricultural research. It would make agricultural research more efficient, which, taking into account its research results, can be managed in a competitive way, increase efficiency, while also placing great emphasis on environmental sustainability. Decision-making based on the results of agricultural research enhances stability and predictability, increases efficiency, and thus provides competitiveness and higher income levels. We hope that we have formulated efficiency-enhancing proposals for conducting agricultural research using the opportunities provided by informatics.

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