

## Some Notes to Income Disparity Problems of Agriculture

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### Anotace

Cílem článku je ověřit platnost některých hypotéz, které vysvětlují příjmovou disparitu zemědělství v podmínkách současného evropského modelu zemědělství a dále navrhnout možný přístup ke kategorizaci tohoto fenoménu. Nejedná se o všechny hypotézy, které byly v souvislosti s příjmovou disparitou vysloveny, ale pouze o hypotézy, které jsou orientovány nákladově. Poptávkově orientované hypotézy budou předmětem dalšího výzkumu. Na základě dosaženého stupně poznání je analyzována současná platnost hypotéz, které vysvětlují příjmovou disparitu zemědělců pomocí zvláštností zemědělské výroby, alternativních nákladů a zaváděním technického pokroku (Teorie šlapacího mlýna). Tam, kde hypotézy v současné době nejsou zcela platné, je upozorněno na příčiny, proč tomu tak je.

### Klíčová slova

Zemědělství, příjmová disparita, nákladově orientované hypotézy, zvláštnosti zemědělské výroby, alternativní náklady, teorie šlapacího mlýna, kategorizace typů příjmové disparity.

### Abstract

The aim of paper is to verify validity of some hypotheses which explain income disparity of agriculture under conditions of the current European agricultural model, and further to suggest a possible approach to categorization of this phenomenon. It is not dealt with all hypotheses which were expressed in connection with the income disparity, but also with those oriented to costs. Demand-oriented hypotheses will be a subject of further research. On base of the reached grade of knowledge, the present validity of hypotheses explaining farmers' income disparity by the help of specialities of agricultural production, alternative costs, and introduction of technical progress (Theory of treadmill) is analyzed.

### Key words

Agriculture, income disparity, cost-oriented hypotheses, specialities of agricultural production, alternative costs, theory of treadmill, categorization of types of income disparity.

### Introduction

An income disparity can be defined in a very general way as a disparity in achieved incomes. In case of agriculture, the income disparity is currently monitored as a ratio of incomes in agriculture and incomes in other branches of the national economy (so called external income disparity). This procedure then becomes very often an argument for adoption of agrarian-political measures, mainly in the area of support financial tools used in agriculture.

From the monitoring and analyses of income disparity, an existence of several significant problems results. Among the most important

of them are: causes of genesis of income disparity of agriculture (in connection with other departments it not spoken so much about the income disparity), delimitation of disparity, and methodology of its monitoring, and last but not least possibilities and tools of its reduction.

Since the 1950's agrarian economists have been concerned with the income disparity of agriculture as an empirical phenomenon. It means that they looked for causes why production factors in agriculture, above all labour force and capital, do not bring a comparable effect – an income in comparison with other branches (Cochran, 1958, Johnson, 1958, Schmitt, 1972). In other words, they looked for an explanation why the target

behaviour of agricultural producers, i.e. to achieve the maximal effect (profit), does not correspond with revenue (effectiveness) of the above mentioned production factors just as it is in other departments. Older works of agrarian economists from the 1950's (see above), but also newer ones (Koester, 1981, Blanken, 1981) start in principle from a presumption that for farmer (just as somewhere else) the priority is maximization of sale. If the efficiency of production factors does not represent a support element, vice versa the effect from their use decreases, then, they look for factors which are the cause of it. The second opinion stream which tries to explain causes of the income disparity of agriculture (Dalton, 1961, Vergopoulos, 1978, Gardner, 1992) refuses the priority of maximal sale and tries to explain the income disparity by the help of various behaviour models. It sees the cases in a degree of adaptability of agricultural producers to changing market condition and in a speed of reaction to these changes.

If we start from the current degree of knowledge in the area of theories explaining the income disparity of agriculture, regarding the above mentioned we can respect a traditional dividing of theoretical approaches into two kinds of hypotheses, a supply-oriented hypothesis, and a demand-oriented hypothesis. In this already classical division, on the supply-oriented hypotheses explaining the income disparity of agriculture are introduced above all: special features of agricultural production (e.g. Henrichsmeyer, Witzke, 1991, Gardner, 1992), already a classical Theory of "Treadmill" – Technological Treadmill Thesis formulated by Cochran already in 1958 (Cochran, 1958), a Theory of Alternative Costs (Johnson, 1972, and an explanation is searched also in the course of inversion supply curve. The side of demand-oriented hypotheses includes then above all well-known findings of German statisticians E. Engel formulated in so called "Engel's law" and "the Theory of imbalance of farmers' position on the market compared to supplier and customers" A complex "Hypothesis of market-economic explanation" tries to then explain the demand and supply (Koester, 1972, 2011). Also other authors were concerned with income disparity (for example Hermann, 2000; Stejskal, 2010; Becu, 2012),

The contribution does not deal with all hypotheses explaining the income disparity. It is focused only to hypotheses oriented to the supply, i.e. special

features of agricultural production, the theory of alternative costs, and the Theory of Treadmill.

### **Special features of agricultural production**

It is unquestionable that agricultural production in contrast to other branches of national economies is influenced by specific factors resulting from both its biological character, and the environment in which it takes place. Some authors (Henrichsmeyer, Witzke, 1991) distinguish specific features of the production and social-economic specific features. Among the specific features of agricultural production for example the following are introduced: dependence on natural conditions, dependence on land, a significantly associated character of agricultural production, dependence on the weather, and others. The authors consider as social-economic specific features for example a close interconnection of enterprises and households on family farms, obstacles in labour mobility (special education, unfavourable age structure), branch-specific capital estates etc. The mentioned specific features are a centre of gravity of problems invoking, among others, the income disparity. According to Gardner (1992), the classical agrarian economics works with a consensus that the specific features of agriculture lead to a creation of "agrarian problem" and it is projected also in low and instable incomes. The classical economics (neoclassical standard models) works with several limiting factors. These are entrepreneurial behaviour with the aim of profit maximization, a free competition, a mobility of production factors, and sector homogeneity. Newer views of these problems orientate above all to production factors and their role in relation to income generation. A Theory of fixed factors (called "High profit trap") is well-known. The subject of this theory is an explanation of inelastic aggregated supply (in price decrease) in connection with investment and non-investment behaviour of agricultural producers. In investment behaviour the expected revenue from the investment is higher than acquisition costs. In non-investment behaviour the expected revenue is lower than a value of resale (salvage value). If the expected revenue is lower than the acquisition costs, but higher than the resale value, then capital investment can be considered fixed in such sense that the capital is "entrapped" in agriculture (Johnson, 1972).

### **Theory of opportunity costs**

The Theory of opportunity costs, closely connected with the above mentioned theory, orientates

to production factor labour. A conception of opportunity costs relates not only to agriculture, but is generally applicable (Hagedorn, 1996). An opportunity load of production costs is considered revenue in its alternative use (Hentichmeyer, 1978). The Theory of opportunity costs in relation to labour forces in agriculture starts from the fact that labour forces which stay in agriculture are not appreciated (rewarded) to reach a high of average reward in the national economy. A cause of that is considered above all a specific qualification of agricultural labour forces. Labour forces with agricultural education are not demanded in other departments and moreover possibilities of obtaining employment outside agriculture are limited. To this it is added also an information deficit, financial costs connected with the change of employment (housing, transport) as well as also psychological factors can take effect (leaving a family enterprise and so on). Even if the Theory of opportunity costs is introduced most often in connection with labour forces, it can be also applied to the production factor capital and the production factor land.

### **Theory of treadmill (Technological treadmill thesis)**

Price development of American producers showed generally a permanent decreasing trend and the income disparity deepened in the twentieth century. Causes and connections why this happened were searched. W. Cochran brought a theory, today already classical, when he described a connection between a long-term decrease in prices and consequent growth of income disparity and technical progress (Cochran, 1958). He starts from the fact that technical innovation will reduce costs per unit of output. If it is moreover connected with an increase in production volume (however, the increase is not essential), in constant prices it lead to the following effects. The first users of technical progress achieve a temporary profit (windfall profit). A pressure on decrease of prices appears on agrarian markets. Other producers stay in front of a decision, they will either also accept the technical progress or they will refuse it. In the first case they stay able to compete; in the second one they can have living problems. In time the first users lose the advantage of "primacy" and achieve no longer higher profits against the others. The situation repeats with other technical or technological innovation. Cochran's theory has been developed by Koester (Koester, 1972). A technical progress was defined and categorized (new production procedures, creation

of a new product; improvement of quality of product in unchanged exercise of production factors) and a relation of technical progress was analyzed on one side and of price changes of agrarian products on the other side.

### **Materials and methods**

**The main aim of the paper** is validation of the mentioned supply-oriented hypotheses explaining the income disparity of agriculture. As it is obvious from the above mentioned degree of knowledge, the first hypotheses come into being in the 1950's, some of them were completed later, enlarged, but also criticized, or partially refused. It is evident that their authors expressed them under certain conditions of a country, under certain condition at this time existing agrarian policy, within a certain agrarian structure, in a certain development of supply, demand, producers' behaviour etc. Therefore it is interesting to analyze whether the mentioned theory are applicable also in current conditions of "European agriculture" defined e.g. for state of the European Union by the Common Agrarian Policy. In this connection, a secondary objective is to define and categorize the income disparity as a social-economic phenomenon. The reason for this aim is a fact that some theories trying to explain the income disparity are not generally applicable for all entrepreneurial forms in agriculture today. What was framed for family farms cannot be completely applied to enterprises of cooperative type and trade companies.

Considering the methodological side, above all elementary analytical methods are used – a horizontal analysis (trend analysis) and a vertical analysis (analysis of structures). Also, a method of comparison was used. Quantitative and comparative analyses stem from Eurostat, the Czech Statistical Office, Reports on state of Czech Agriculture, and German and Austrian "Grüner Bericht" in time series.

### **Results and discussion**

#### **Specialities of agricultural production**

Specifics of *agricultural production* which results from the own character of production and from conditions under which the production is realized are unquestionable. Regarding the significance of agriculture for nutrition of inhabitants and considering the fact that agriculture has very close relation

to creation and maintenance of landscape and the countryside, it is really necessary to approach this sector “protectively” concerning the incomes of agricultural producers. Under the term “protection” it is possible in simplified way to imagine specific financial tools connected with biological and climatic influences, and which have a character of income support. Without these tools the farmers’ incomes would be exposed to fluctuation and the disparity would deepen both in the relation to other branches and mutually among farmers.

In the case of *social-economic* specialities the situation is not so unambiguous. Authors started here partly from specific properties of agricultural labour forces and specifics of agricultural farms. In labour force the role is played by low qualification, unfavourable age structure, conservatism, a difficult requalification and so on. In agricultural farm in connection with the income disparity, an interconnection between the own business and farmers’ household is pointed out.

Concerning the *specific character of labour forces*, it is possible to agree with the above mentioned.

Agricultural population grows old more quickly than other groups of inhabitants; a generation exchange is still more and more difficult. A relation between young (up 35 years) productive labour forces and post-productive workers in agriculture (over 65) is more favourable in “old” member countries of the EU-15 than in “post-communistic” member countries of the EU-12. While in countries which accessed the EU in 2004 and 2007 one farmer in post-productive age is at average “replaced” by a young farmer in height 0.2, in countries of the EU-15 it is in the height 0.60. Hereat, there are significant differences among the countries (from 0.07 – Italy, Bulgaria, 0.08 Great Britain, to 1.1 Germany, 0.8 Poland) (Boháčková, 2011). The cause of more favourable situation in the EU-15 is the different structure of agricultural businesses in favour to family farms where the property is inherited “from father to son” and where there are closer emotional ties to the family property also in the next generations. In the EU-12, where the base (except Poland and Romania) is cooperatives and other trade companies, these businesses are moreover employers and the interest of employees in their sustainability has a personal character (to keep the job).

Also it holds that an education structure is different in that partly it is dealt with a specific type of education (except economic orientation

a difficult requalification and possibility to find a job of the labour market) and regarding the character of work the education structure in relation to the income disparity is incomparable with other sectors of the national economy. A problem in this connection is obtaining quantitative data about the education structure in agriculture. In the CR, the last year providing its data is 2003; in Eurostat this information is not available. However, it is possible to assume on base of older data that the unsatisfactory situation has not significantly changed.

Regarding an *interconnection of a farm with a household*, it is not possible to generalize this interconnection in the connection with income disparity. It concerns only family agricultural businesses; it is not hold in case of trade companies of any type. As it was pointed out by Sokol (Sokol, 1994), an account of family business and family is identical; moreover, within determination of income disparity would be necessary to adjust methodology of income calculation. In this methodology the incomes should take into account also the fact that the family has not costs for some foods, partially for housing, etc. The incomes should be higher by these sums.

Speaking about the influence of specialities of agriculture (production and social-economic) on the income disparity, at the first sight it can be seen insufficiencies in the present approach to classification of the income disparity:

- production agricultural specifics concern all agricultural enterprises without difference;
- the specific character of labour forces refers to the wage disparity, not to the income disparity of businesses (the relation between education of labour force and costs of the business on this labour force);
- a problem of determination of incomes of a family farm and working members of the family in this enterprise with interconnection of the management, of “wages” of owners and family members and, a budget and costs of the family.

#### Theory of alternative costs

The Theory of alternative cost reacts to problems of production factors in agriculture regarding their alternative use and working of production factors on agricultural producer’ incomes. Also here the authors do not distinguish much whether it is dealt with a disparity in relation to the labour

force (wage) or the disparity of business incomes. The theory deals above all to labour force and compares the evaluation (wage) of labour force in agricultural businesses with a wage in other sectors. It sees the causes of wage disparity in specific properties of agricultural labour forces (see above).

It can be assumed that a basic mistake of this approach is that the wage disparity is watched as a **disparity of average wages**. Hereat, it is obvious that various sectors of national economy have regarding to various character of work also various demand for education structure, so inevitably the employees have to have also a different height of wages. In this connection there is a justified question why incomparable is compared? If we consider an extreme: what sense does it have a comparison of monthly or yearly average wages in agriculture (18 092 CZK) with an average wage in information and communication activity (43 513 CZK), in banking and insurance business (45 638), in water supply and waste management (39 928 CZK) and other economic activities which are not included in the average wage and influence it significantly? The character of work is different; demands for the education structure are different; the higher education degree is evaluated with higher wage and so on. It is possible to take the amount of wages as information, but decisively it is necessary to refuse conclusions from their comparison. If we want to compare purposefully, then a comparison of wage according to profession is offered (e.g. by the help of CZ-ISCO) where it is possible - for example a repairman in agriculture with an average wage of repairmen, a wage of bookkeeper in agriculture with the average wage of bookkeepers, a wage of managers in agriculture with managers in other branches and so on.

This approach would then confirm (or would not confirm) an existing wage disparity in those professions which are applicable both in agriculture and other departments. In professions which are not applicable outside agriculture, there only a requalification is possible in connection with alternative use. However, such professions are also in other branches and we cannot see in it only agriculture speciality.

Alternatively it is possible to use also other production factors – land and capital. With respect to the main production mean for agricultural business – land, an inequality is known in prices of this factor in various usage. In the alternative use, in some cases it is dealt with a one-shot

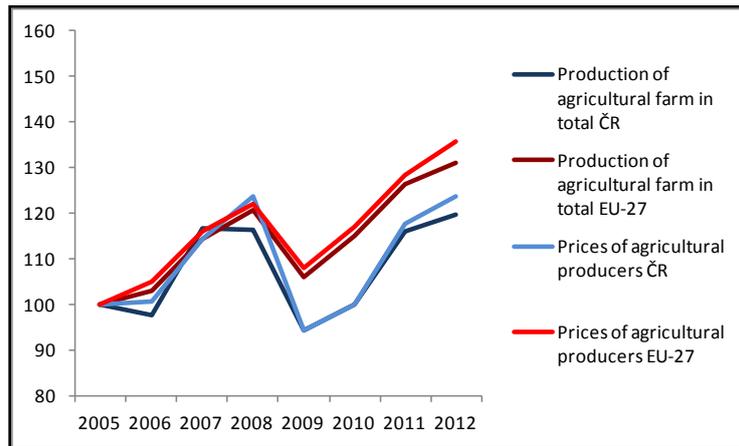
income e.g. from sale; in other cases with incomes from alternative business which can serve for a comparison within monitoring of the income disparity. However, it is essential to be aware of that it is not dealt with incomes of an entrepreneur who changed a field of its business. In case of success, these incomes can be higher than from agricultural enterprise, however, they can be also lower. The alternative usage by itself does not have to always bring higher incomes than the original incomes from agricultural activity were.

In alternative use of capital it is necessary to distinguish whether it is dealt with tangible capital or financial one. The tangible capital is in some extent specific in that a part of it is usable only in agriculture (sprayers, silos, milking equipment etc.) However, agricultural enterprises have also a tangible capital (buildings, means of transport and so on) which can be used alternatively. Even here it is necessary to approach a statement that capital is agriculturally specific, and it is actually one of causes of the income disparity, very carefully. It is proved also by the present rational approach of agricultural enterprises in looking for an alternative use of property when within the agricultural business so called inseparable secondary gainful activities are introduced. The financial capital can be used both for agricultural activities, and alternatively outside agriculture. Hereat, again it is not possible to assert that investment outside agriculture will always bring higher revenue.

The theory of opportunity costs (it would be more suitable marking of opportunity revenues) as an explanation of income disparity in agriculture cannot be confirmed in the whole extent, it is hold only in certain connections and it is referred only to a concrete type of production factors.

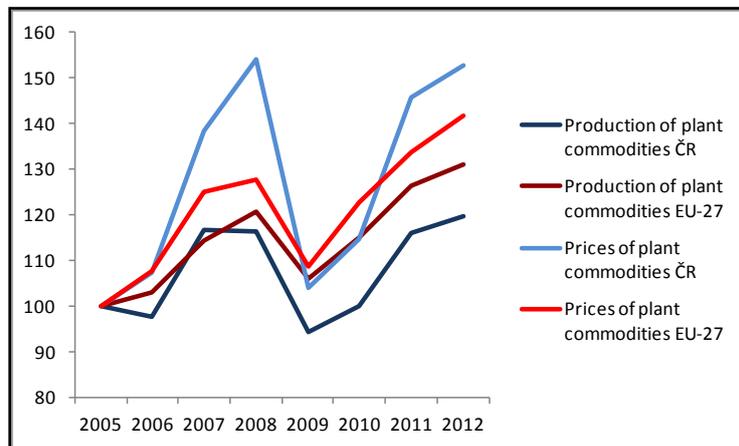
### **Theory of treadmill**

Maybe, the most widely known theory is Cochran theory of “treadmill” which gives in connection the technical progress, prices and volumes of agricultural commodities, and the income disparity. Growth of the income disparity is explained by price decrease. A defence against this is introduction of progress technologies decreasing costs or increasing production volumes. The theory arose at half of the last century on example of situation in American agriculture. If we apply it for example to the present EU agriculture we would have to take into account differences which can be seen in graphs 1 to 3.



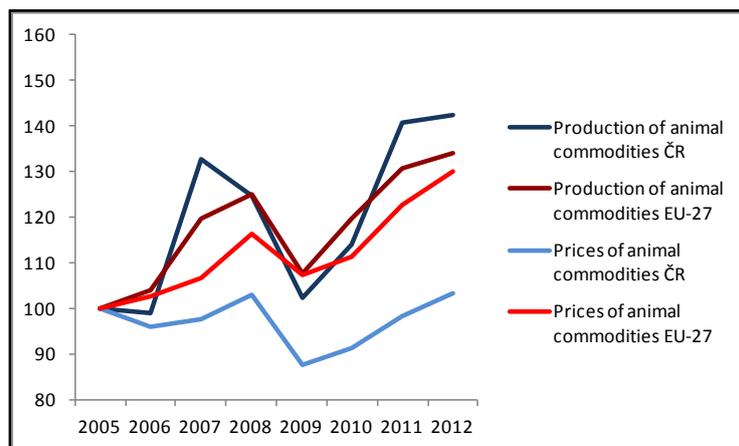
Source: Eurostat

Graph 1: Development of production of agricultural farms and prices of agricultural producers (index, 2005 = 100) in the CR and the EU-27.



Source: Eurostat

Graph 2: Development of production of plant production and prices of agricultural producers (index, 2005 = 100) in the CR and the EU-27.



Source: Eurostat

Graph 3: Development of production of animal production and prices of agricultural producers (index, 2005 = 100) in the CR and the EU-27.

It not hold in the EU agrarian sector that in growth of demand prices decrease and vice versa with decreasing supply prices grow. The cause of this phenomenon is agrarian-political interventions of regulation type both of production volume and a price policy within the Common Agricultural Policy. As it is obvious in the graphs, except a sharp decrease in prices and production volumes in 2008 – 2009, both the production volumes and price of agricultural producers grow (for agricultural farm generally, and separately for products of plant production and agricultural production). The influence of technological process is not insignificant. Still it is hold that a new engineering and new technologies lead to cost savings and thereby also to growth of financial effect. However at present, investments are not for European farmers so difficult to reach like in American agriculture when the theory of “treadmill” arose. Within the Common Agricultural Policy and Rural Development Policy there are many financial supports which enable farmers entrepreneurial activities for which they would not have means without the supports. Thereby their competitiveness grows. Cochran theory unambiguously deals with the income disparity of “internal type”, i.e. a disparity among producers.

## Conclusion

From the above mentioned two relevant conclusions result, among others:

1. It is necessary to carry out clear and factually correct categorization of particular types of income disparity.
2. It is necessary to re-value validity of some traditional approaches to explanation of income disparity causes.

With regard to *categorization of income disparity*, at present an already traditional classification to the internal disparity and the external disparity. The internal income disparity is monitored within agriculture, the external disparity regards the relation agriculture and average values of the national economy as the whole, or a relation between agriculture and selected branches. In this division other dividing border often disappears; whether it is dealt with an income disparity of character of wage disparity, so the difference in the level of wages, or an income disparity among enterprises. And, there is other problem, a problem of factual comparability.

In categorization of income disparity (e.g. according to the scheme 1) it is necessary to proceed according to the following steps:

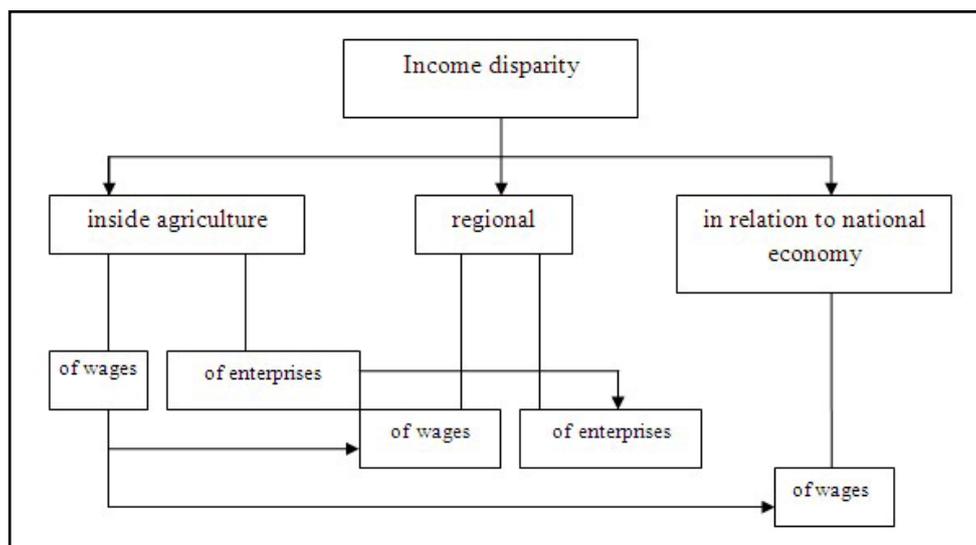
- *to delimit what is the subject of income disparity*, so to determine whether it is dealt with a wage of employees in agriculture, or with an income of agricultural enterprise (for comparison re-calculated e.g. per one employee, per an area unit, and other possibilities). If the subject of income disparity is *evaluation of labour force*, then it is necessary to distinguish whether it is dealt with a wage of labour force or a reward of owner of the agricultural enterprise or members of his/her family. In comparing wage, it is not possible, as it has been mentioned above, to accept the present approach and to compare the average wage in agriculture and the average wage in the national economy on base of branch approach because the character of activities in particular branches differs and also demand for labour forces differ. It would be possible to compare only comparable profession. If the subject of comparison is a reward of owner (eventually of family members), the situation is complicated regarding the fact that the household of the owner and the enterprise are an aggregated unit; financial means are spent both for the enterprise, and the needs of family members. Moreover, as it has been mentioned, even if the amount of reward is determined (even this it is hardly realizable because e.g. the owner carries out both the managerial and a simple manual work), it is necessary to add to this reward also financial benefits resulting from owns foods, own housing and other. If the subject of monitoring is *the income disparity of agricultural enterprises* (in the form of indicator an income per a unit of comparative base), then it is necessary to methodically delimit this income (all income, income from agricultural activity). The compared enterprises can be divided according to an entrepreneurial orientation (oriented to animal production, to plant production, mixed, or specialized and so on), or according to a legal form of enterprise, or according to regions. Regional approach is preferred also by some other authors (Sakamoto, 2010; Tamasue, 2013; Itoh, 2011). Decisively it is not purposeful to compare with enterprises outside the agricultural department.

- **To determine a level at which the monitoring of income disparity will take place.** In this context it is dealt with to decide whether it will concern monitoring of incomes in agriculture at the level of agriculture as a branch, or at the level of national economy. At present, a regional dimension is marginalized, although it would be very interesting to found out whether the situation in regions is moreover identical or differs. If it is dealt with a disparity within agriculture (internal disparity), it is possible to monitor both the wage disparity and the business and regional ones. If the comparison is realized at the national economy level, then only “comparable” can be compared, it means wages of professions which occur both in agriculture and in other branches.

In *the analysis of validity of traditional hypotheses explaining* the income disparity of agriculture, the subject of analysis were supply-oriented hypotheses. In the hypothesis stemming from a presumption that a cause of income disparity are specialities of agriculture a division of these specialities to production and social-economic character can be accepted. Specialities influencing production process are unambiguous. As well as the influence of specific character of labour force. Nevertheless, the interconnection of enterprise and owner’s household is typical only for a form of family farms; it is not possible to argue in this way in the case of trade companies.

The hypothesis of alternative costs arises from that the income disparity results from a lower evaluation of production factors in agriculture. In the case of labour force (wage disparity), a widespread mistake is that average wages in agriculture are compared with average wages in other sectors, or with the average of national economy regardless the fact that incomparable is compared in this way (branches factually differ, demands for labour forces – education differ). It is possible to compare only wage in the same professions. The separate problem is also a determination of entrepreneurial reward of the owner of the enterprise or family members working here. In the case of capital and land the alternative use is certainly possible; however, not always it is sure that alternative revenues will exceed the original revenues. Moreover, in land the alternative possibilities of usage outside agriculture are limited (scheme 1).

The theory of treadmill is valid under condition when farmers’ incomes depend on production volumes, commodity prices, and expenses for these commodities. Than a technological progress is a factor which can invoke, moderate or deepen the income disparity. However, it has only a temporary effect for the given enterprise or enterprises. At present in European agriculture, volumes of most commodities are influenced by quotas or restrictions; an influence of commodity verticals shows in the price height. Then the technological progress shows mainly in the cost area. Within the present support



Source: own processing

Schema 1: Possible categorization of income disparity.

of investment activities from the side of Common Agricultural Policy and the Rural Development Policy, introduction of technological process in agricultural enterprises is available moreover for all producers.

From the analysis of cost-oriented hypotheses an unambiguous conclusion results. Factors which are presented as causes of income disparity in agriculture are not all constant. Some, like for example influence of production specialities, have permanent validity, other change in dependence

above all on agrarian-political measures. Search for factors which invokes the income disparity today will be the subject of next research.

### **Acknowledgements**

The article elaborated within the institutional research intentions MSM 6046070906 „Economics sources of Czech agriculture and their efficient use in the context of multifunctional agri-food systems“.

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