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UNSOLVED PROBLEMS OF SOIL TILLAGE IN UKRAINE

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Disadvantages of the soil tillage combined technology that is widespread in Ukraine are considered, namely: deterioration of physical properties, excessive losses of organic matter, soil propensity to the erosion, insufficient water protection ability and others. The proposals on improvement of technology and conducting stationary field experiences on soil tillage are made.

Key words: *the combined tillage, disadvantages, improvements of technology and experiences*

Introduction. The combined technology of soil tillage received the greatest distribution in Ukraine, it provides the use of moldboardor unmoldboard instruments and different depth according to the soil-climatic conditions and requirements of agricultural crops. The share of deep plowing tillage in the system of the prime tillage remains significant almost in all natural zones under clean-tilled cultures and in fields where it is necessary to close up manure. There are certain differences in tillage of erosion dangerous, overmoistening soils and also separate cultures which demand specific ways of tillage (dipdigging, cresting and others).

The science and practice established both positive and negative characteristics of the combined system. The positive ones are:

- the differentiated tilled layer created by this system on density enables to satisfy the needs of different plants to optimum development of root systems and use of mineral fertilizers;
- deep entering organic fertilizers provides their raised humification;
- an opportunity of a field clarification from weeds under condition of observance of the recommended technology.

The negative ones are:

- loss of structure, erosion and excessive losses of organic substances as consequence of that the soil top layer is tilled too often and also it is in an aerobic condition for a long time;
- overcompaction of underarable and underseed (spring) layers as consequence of use of heavy energisaturated and wheel tractors when the named layers of soil have, as a rule, low density and the humidity close to physical ripeness and consequently they are the most sensitive to overcompaction;
- theoverexpenditure of fuel due to a plenty of separate technological operations.

The combined system as researchers and production workers are assured, in the best way reflects significant diversity of both natural and economic conditions and a variety of cultures grown up in the country. The combined system, we repeat, distinguishes a plenty various, mainly deep loosening, especially during the spring period and separate operations. In the spring, depending on a level of humidifying and conditions of winter, the soil top layer can be in any condition - from firm, cemented, that hardly is exposed to braking, up to friable, practically not demanding tillage and ready to crop. Usually because of insufficient or superfluous humidifying to prepare a qualitative sowing layer by means of braking is impossible. In droughty conditions blocks, in overmoistening – stick of instruments are inevitable. Therefore it is practiced not a minimization, and, on the contrary, number of operations is increased, during which the sowing layer is improved, andunderseed one is compacted, that, certainly, is undesirable.

Further, depending on weather the spring can be cold and long or rapid, with approach it is literally during several days of summer temperatures. In those and other cases the sowing layer undergoes significant changes of a physical condition (and contaminations also) and it is necessary to till it again and again.

As a result the spring becomes extremely intense period for the farmer (actually the soil needs to be tilled continuously) and difficult test for the soil. There are not simply a lot of tillages, but their performance is stretched in time and certainly, carried out quite often at humidity which differs from humidity of physical ripeness.

Numeroustillages in the spring cause ecologically adverse consequences and are a principal cause of physical soil degradation as during this period the soil is characterized by the minimal parameters of durable properties and is deprived an original protective barrier against significant anthropogenous press.

Numeroustillagesin the spring have the direct consequence economically adverse results as raise the cost price of production and make it not competitive.

Numeroustillages in the spring considerably raise volumes of the field mechanized works, raise wear process of working bodies, complicate the organization of performance and the control of works and as a result reduce their quality.

Numeroustillages in the spring - an anachronism which needs to be overcome or, at least, significally to lower their obvious negative consequences for soils and economy of managing.

Not better is a situationin the autumn when, as a rule the prime mainly deep plowed land is carried out (at least, under half of cultures of a crop rotation). The area of an arable land with humidity of optimum loosening is even less, than in the spring. Therefore it is beside the purpose to expect qualitative loosening, considering even that requirements to them are less rigid. Ifwe add to this excessive friability of the tilled layer, a being reason of the strengthened mineralization and decrease in stability to erosion and overcompaction, there is absolutely clear a necessity of perfection of the combined system of soil tillage.

So, ecological (deterioration, first of all, a soil physical condition) and the economic reasons have led to necessity of revision of modern methodology of soil tillage. The purpose of article - in detail to consider the negative sides of traditional soil tillage to prove application of other technologies with the improved soil-protective characteristics.

Loss of structure - process of deterioration of mainly granular isotropic form of the aggregates, inherent in natural soil, and also dispersion, formation of blocks, crust and cracks on a surface of soil practically became characteristic for an old arable land. It is necessary to pay attention to that circumstance, that large soil aggregates if they are present on a virgin soil, their durability does not exceed 2-3 кPa, while durability of blocks on an arable land is frequent (in conditions of the lowered humidity) reaches 30-40 kPa. Owing to the raised mechanical durability and low porosity of a block of an arable land are less penetrated for roots and a moisture that's why they are capable to be kept long practically without any changes.

As criteria of loss of structure the size, water stability of structural aggregates and various indices of structure andothers are used. All the listed criteria in coordination have shown appreciable deterioration of structure in soils which are for a long time plowed [1]. Even in humusifiedchernozems after plowing tillage lands can be form up to 30 % of blocks. Almost all arable lands of the country have such blocks. And if in the autumn with this quantity of blocks it is possible to reconcile, as in the winter they promote to snow saving on fields, and till the spring their quantity becomes usual less or they disappear at all, in the spring even the small amount of blocks is inadmissible. As blocks do not allow to lead qualitative sowing, brake occurrence of shoots and promote unproductive losses of a soil moisture. That circumstance that blocks are formed even in chernozems at the humidity close to physical ripeness, with obviousness proves presence of processes of physical degradation in soils.

By the greatest propensity to formation of blocks are characterized solonetzic soils of heavy texture on the south of Ukraine which during the prime tillage are mainly in the dried condition, solodized and solonetzic soils of Average Pridneprovja, eroded soils of Right-bank Forest-Steppe, gleyed soils of Predkarpatja and Zakarpatja.

Crust as a kind of physical degradation also is widespread on an arable lands of Ukraine. Besides there is a danger of its further distribution at an intensification of agriculture or under condition of possible changes of a climate (in particular, increase of humidifying in the winter, heat in the summer and its contrast as a whole).Soils in which formation of crust is possible, are concentrated in the western and northwest parts of Ukraine. That is where from 20 up to 60 % of an arable lands have such disadvantages, and a degree of their display - from strong up to weak [2]. Formation of crust is mostly marked in the beginning of vegetation of cultures.

In chernozems typical crust appears as a result of destruction of structure under influence of both long and intensive plowing and some increase in the factor of dispersiveness (on Kachynsky) which, as is known, characterizes potential ability of soils to form micro-and a macrostructure.

After drying the crust is cracked, forming cracks, which diameter is 5 cm and sometimes it reaches more over. It is easy to imagine how much adverse are their consequences for root layer, plants, their root systems and quality of the subsequent autumn prime tillage. The more cracks, the more loss of a moisture, morphologyless perfect and productive is the root system, resistance to tillage increases and becomes more than the consolidated aggregates as a result of loosening. Cracks are the usual phenomenon in second half of vegetative period practically on all arable lands of Forest-Steppe and Steppe.

Occurrence of blocks, crust and cracks in a superficial layer of an arable lands is a consequence of deterioration of processes of structurization and water-stability of soil aggregates in contrast conditions of the water-temperature mode inherent to soils ploughed up. Unfortunately, the combined ways of tillage which dominate over Ukraine, practically do not reduce display of adverse consequences of loss of structure in a tilled layer of soils.

Overcompaction and consolidation are the most dangerous consequence of intensive soil machining of the Ukraine. In spite of the fact that with 2007 in Ukraine operates the standard limiting loading on soil, machine-tractor units with inadmissible specific pressure have been using still in the country. Threat of overcompaction exists on 75 % of an arable land of Ukraine [3]. The reason of wide development of these negative processes are also, except for MTU, numerous soil factors which promote them, in particular, mainly loamy texture, low initial (before tillage) bulk density and the humidity in the spring close to physical ripeness. Owing to the big number of the separate technological operations which are carried out by energisaturated tractors and heavy combines, the overcompaction is quite often shown even on the light badly susceptible soils to compaction. There are data [4] which have shown the overcompaction on depth of 1 m where it is accumulated and can be kept for a long time. It is fixed also the new phenomenon - consolidation when aggregates of agronomical useful size are exposed to compaction. Thus from them the productive moisture is squeezed out, intramodular porosity sharply decreases and by that agronomical value of soil as inhabitancies of plants roots worsens.

The factorial analysis of the reasons which cause the overcompaction of soils, has shown the greatest importance of design features of running systems and quantities of passes MTU on a field [5]. Therefore for overcoming of overcompaction it is rather important to improve MTU and technology of performance of the mechanized field works. Such strategy gradually becomes popular in northern European countries, the USA and Canada where even more often it is possible to see on fieldsMTU with dual and even threefold pneumatic tires of low pressure.

It is important to note, that in the countries with the developed agricultural specialization are actively discussed or specifications of admissible specific pressure upon soil are already entered approximately same, as well as in Ukraine [6, 7, 8, 9]. Moreover, it becomes more popular routing and the careful control of movement MTU over fields on sowing, application of fertilizers, means of protection and harvesting which defines minimization of the area of compaction of fields [10] as the purpose. Ukraine, though initiated (one of the first) acceptance of the specification of admissible specific pressure upon soil, continues to apply multioperational separately carried out tillage by means of mainly energisaturatedMTU. That and another demands more active modernization. Such means and technologies gradually should leave in the past owing to their obvious degradated influences on soil.

Excessive losses of organic substances owing to active loosening (too frequent and deep) is almost the main reason because of which the combined system of tillage demands change. Clearly: losses of humus occur not only owing to intensive tillage, but also because of absence of sufficient indemnification of organic substances of the soil spent during a mineralization. Directions of improvement of tillage for a long time are found and, moreover, regionated practically for any natural and economic conditions. They include wider application of the minimal ways of tillage down to refusal of soil tillage in general, that is stipulated by no-till technology. The minimal technologies of tillage become more and more popular and extend on all continents. Soils, their properties, water-temperature conditions, agricultural crops which promote of minimization to the prime, preseeding and interrow tillage are established. Opportunities of reduction of depth of tillage are found, soil-cultivating instruments by which use mechanical loading decreases for soils and decrease expenses of resources. But still various innovations could not eliminate of humus loss in ploughed up soils in the Ukraine.

According to agrochemical certification of humus loss in arable lands during last 40-50 years have occured to average speed about 1 t/hectares per year with the tendency of decrease in losses to the end 80 – years of the last century. Last years humus losses are proceed, however their speed makes about 0,5 t/hectares per year [11]. However, according to these data exact estimations of temporary dynamics of the humus contents in soils are hardly probable possible because the sites in certification in each next round were different, and the routing way of sampling in comparison with regular way owing to spatial heterogeneity of a soil cover gives obvious errors [12].

More reliable proofs of humus losses at application of the combined system of tillage are received in long stationary field experiences, and to compare expediently not efficiency of different systems of tillage on yields of cultures, as it is accepted in the majority of experiences [13], and bioefficiency virgin and arable soils. According to V.V.Degtyaryov [14], bioefficiency of the arable lands tilled by the combined way, was almost in 4,5 times less, than bioefficiency of a virgin soil. We shall note, that the humus content on these variants (in the top horizon) was accordingly 10,05 and 5,88 %, i.e. for 120 years (duration of a variant which plowed was such) the chernozem typical middle loam has lost almost half of humus contents. Clearly, that humus loss has occured owing to its scarce balance, but, indoubtedly, and tillage promoted it. Not casually, therefore already for a long time there was a negative relation to a plough, a being basic instrument of tillage, and there were different variants of the minimal and no-till, at which humus loss do not occur, and even its gain in due course is marked. Generalization of a plenty of experimental data on an example of the American and European continents with obviousness prove it [15, 16].

Erosive soil losses. The combined tillage which leaves even for a short time a surface of soil in a friable condition of compaction and without a vegetative cover, thereby promotes sharp decrease in its antierosion stability and occurrence of water or wind erosion. Soil ability deposits to formation of a firm drain is much less than similar soil parameters of arable lands (accordingly 0,071 and 0,78 gr/s/m), received by artificial overhead irrigation [17]. At the same

time it is enough to leave on a surface of soil 13-20 units/м pieces of stalks of corn in length of 15 cm or 200-300 units/m^2 of grains cover residues that it is reliable to protect soil from blowing [18]. To raise antierosion soil stability and by that to prevent erosive losses is possible, if on a surface not washed away by atmospheric precipitation crumbs would be created which would not be involved in a wind stream, or a constant protective vegetative cover would be supported. Clearly, that such offers became possible after carrying out of numerous research works and their successful introduction. Using approximately such approaches with different regional specificity appreciably have overcome catastrophic displays of erosion in the USA, Canada, Argentina, Brazil, Russia, and Kazakhstan. The ideal decision of a question would be replacement in Ukraine the traditional combined system of tillage by conservative one or no-till. The urgency of this action for Ukraine is extremely important if to consider, that about third of arable land is eroded by water and on 19 million in hectares there is a threat of wind erosion. And more because soil stability to erosion and other displays of physical degradation, long time exposed of plowing tillage, in due course decreases [2], and erosive losses, means, can increase.

Insufficient efficiency in droughty conditions. The combined technology of tillage depending on dryness of a climate offers many technological ways and means for improvement water supplying of plants. Soil perceives better atmospheric precipitation with deep plowing tillage in the autumn. Same formation of artificial crotovinas and other similar actions which raise a moisture soil capacity promotes to chinking. Unmoldboard loosening and leaving of residues on a surface not only serve as reliable protection against erosion, but also detain a snow, filling up water stock in soils in the spring. It is much developed agriways for preservations of the autumn-winter moisture which has been saved up by soil. As a matter of fact, the complex of spring and summer agritechnical operations is directed not only on clarification of a field from weeds, but also on more effective utilization of a moisture. It would seem, it should reduce dependence on weather. But, unfortunately, it is necessary to recognize, that efforts are obviously insufficient. Even in Polissya (central and east provinces), Forest-Steppes (except for the Western province), let alone Steppe grown up agricultural crops suffer constant deficiency of a moisture.

In our work [19] was shown, that deficiency of a moisture promptly increases from northern territories of the country on the south and a southeast, and also during vegetation of field cultures. So-called spatial-temporary deficit of a moisture is formed. For example, at cultivation of a winter wheat, barley and a sugar beet in Left-bank Forest-Steppe temporary deficit of a productive moisture increases on the average on 10-15 mm for a month. Approximately on the same size spatial deficiency of humidifying increases to the south and a southeast on everyone of 100 km. Feature of a mode of humidifying consists that root layer practically all second half of vegetation does not contain energetically most easily accessible moisture. In other words, in soil there is no moisture above humidity of break of capillary connection. This disadvantages of an arable land does not allow to realize high potential of soil fertility, especially for cultures which ripen in the end of the vegetative period (for example, a sugar beet).

It proves necessity of increase of efficiency of an atmospheric moisture due to improvement of technologies and means of tillage. It seems, to these requirements satisfy the newest technologies - conservative and no-till.

Diversity of a field: to ignore or consider? Diversity (heterogeneity) of a soil cover concerning its properties which could define differentiation of a way, depths and amounts of tillage in space of a field, practically does not take into consideration at designing soil-cultivating techniques, technologists during performance of operations on soil tillage. Technologies of

tillage on the soil area today are not differentiated, though the expediency precise tillage is completely justified, as, for example, spatial variability of blocks at preseeding tillage exceeds 25 % that makes such tillage effective on soddy-podsolic and chernozemic soils [3]. At the same time soils on a part of the researched plots had an insignificant level of blocks and it would be possible not to till them. Similar supervision over penetration resistance, structural of aggregates of a sowing layer and density of a layer under sowed seeds in case of their deviation from necessary parameters also allowed to prove necessity additional loosening and to improve starting conditions of ability to live of plants in those parts of a field in which there was such necessity. For the differentiated (precise) tillage of the land area it is not so obligatory to have the soil technical equipment, capable to perceive the instruction in the cartographical form, and to carry out tillage only there where there is a necessity in it. For this purpose the contours revealed as a result of inspection with adverse parameters need to be straightened to as much as possible justified rectangular form and to show the machine operator contours of a site which demand additional loosening. Benefit from this operation will be that greater, than greater area of not till part of a site.

For this reason on a question put in heading of this section, it is possible to answer so: the more diversity of the land area, that less it is necessary to ignore it.

Ambiguity rather of plow pan. It is known about plow pan only that it is formed as a result of soil tillage on the same depth owing to extreme high pressures in a contact zone between an edge of a plough and soil [20]. Despite of taken preventive measures (basically by periodic change of depth of a plowing), the condensed layer on border between arable and underarable layers is present practically always.

Basing on collected by us data [21], it is possible to approve, that if penetration resistance in plow pan exceeds 35-40 kg/cm^2, growth of roots in depth is limited. It means that at such penetration resistance adaptive opportunities of cultures, especially in conditions of disadvantages of an accessible soil moisture decrease. In fact growth of roots in depth of soil where always there is moisture, in these cases is extremely important. Simultaneously this means, that with plow pan it is necessary to struggle not only by preventive means, but also by means of deep loosening.

The combined technology, as a rule, does not provide to carry out of soil tillage more deeply 27-28 cm as the majority of field experiences were not accompanied by appreciable benefit of a deepening of a plowed land [13]. Really, the increase in a crop from a deepening of a plowed land in most cases was small, often astable in time, very much depend on quality of observance of other elements of technology. At the same time it is necessary to pay attention that in conditions of experiences technological recommendations are observed, energisaturatedMTU of the raised weight are seldom used and in general a standard of farming is higher.

Therefore, apparently, it is expedient to lead experiences with a deepening of a plowed land in conditions of manufacture at the careful control of soil penetration resistance in plow pan.

Precisely also, possibly, it is justified to investigate a role of underarable layer, especially in conditions of short soil profile, in a nutrition of plants. In fact this question till now is practically ignored by science officers and production workers. In this connection pertinently to remind, that in soils with superficial illuvial horizon, at presence of overcompaction, caused by alkalinization or the residual phenomena of mechanical action on soil heavy texture, and in some cases and on light soils deep ameliorative, mainly unmoldboard, loosening appears useful enough [22]. In conditions of wide application of heavy MTU and frequent presence of overcompaction in underarable layers activization of these works is represented actual enough.

Uncertainty concerning no-till. Unfortunately, in Ukraine, basing mainly on experiments with direct sowing which results were inconsistent and are not convincing, the negative attitude

to no-till was generated. However it is impossible to consider these experiments because direct sowing does not answer to no-till technology as it interrupts by superficial or deep plowing tillage, and constant upsoil cover is not supported. But just the majority of positive changes in soil on a background of no-till also is explained by accumulation of the vegetative rests on a surface and in a superficial layer. Owing to upsoil cover the superficial and intrasoil drain decreases, the balance of organic carbon and other biogenic elements improves, processes of degumification, issues of the gases, descending redistribution of substances are braked.

Last years no-till in the world promptly extends. The total area with such a way of tillage exceeds 100 million in hectares. Basically there are countries of the American continent. Interest to no-till increases in Asia and Africa. Only in Europe the rates of introduction of this way remain minimal. Even in France where field experiences with no-till have been conducted from 70-years of last century with mainly positive results, in manufacture it is no more than 100 thousand in hectares. There are quite a few reasons - the small size of farms, significant grants to farmers who do not stimulate them to innovations, absence of effect at the first stages of introduction, significant expenses for techniques and means of protection of plants, and, eventually, there are simple stereotypes of thinking and conservatism. Besides there is overproduction of agricultural products in the western European countries which also does not promote introduction of new technologies affects.

The European experience has given many bases for the cautious attitude to no-till. In particular, the basic soil-climatic conditions which constrain its wide circulation have been established:

- Heavy, sandy, stony on texture, overmoistening, gleyed and weak structural, forming crust, soils;
- The cold damp spring constraining of nitrification and causing nitric starvation of plants;
- A contamination, presence of mouse rodents and illnesses.

Thus, no-till is accompanied with paradoxical collisions. On the one hand, impressing results in the countries of South America which for short time have transferred archaic backward agriculture on rails of modern highly technological and productive managing, and on the other hand - almost full ignoring of this technology by the countries of the Europe.

According to our estimations [16], the majority of Forest-Steppes and Steppes soils of Ukraine are entirely suitable for development under no-till technology. It confirms quite long experience «Agrosojus» of the Dnepropetrovsk region. But, certainly, to overcome uncertainty concerning this technology it is necessary to lead field experiments and by that to develop adaptive to our soil-climatic and economic conditions variants of the technology, capable to eliminate it's her unresolved aspects.

Similar decisions are necessary and for introduction of other soil-protective technologies – conservative, precise, maintaining, organic, contour-ameliorative. In our opinion, the greatest attention is deserved with conservative technology and the balanced agriculture which soil-protective effect is obvious and at the same time they are underestimated in Ukraine.

Conservative agriculture is the technology of land tenure directed on the greatest possible preservation of a biodiversity, structure and soil properties, protection from degradated processes (erosion, humus losses, overcompaction, etc.). This technology dominates over the USA, Canada, western – and central European countries. It foreseesuse of soil-protective crop rotations, the minimal ways of tillage, others agriways, directed on preservation of a surrounding environment, and also the grant to farmers who stimulate its introduction. Conservative agriculture assists preservation of soil physical properties. A lot of components of conservative agriculture are perspective for improvement of the combined technology of tillage in the Ukraine.

The balanced agriculture is essentially new type of steady land tenure which provides a harmonious ratio between anthropogenous loading and natural potential of soils to restoration both high-grade productive and ecological functioning. Though the balanced agriculture is focused first of all on creation all over again simple, and then expanded reproduction of soil fertility and gradual formation of preconditions for steady agriculture, the prevention of physical degradation and, in particular, nonadmission of excess of mechanical loadings, usually considers.

The contents and the organization of skilled affairs on soil tillage. We shall remind, that the choice of tillage technology in Ukraine is on the basis of long, stationary field experiences which are conducted practically in each region. Researchers are carried out in a crop rotation with application of different levels of fertilizers. Results are a basis of zone (regional) technologies of the prime, preseeding and interrow tillage under grown up in the field of agricultural crops.

The condition of researches on soil tillage in Ukraine, unfortunately, today is characterized by a number of disadvantages. Among them:

- the quantity of stationary experiences is insignificant, it does not cover a variety of soil-climatic and economic conditions, and last years in general is reduced;
- practically there are no experiences on studying new technologies of tillage (no-till, precise, conservative and others), of new soil-cultivating instruments and the combined machines;
- the list of accompanying researches in experiences is quite small, limited only by modes of humidifying, of soil humus and a nutrition of plants, the account of a crop and less often than its quality. Supervision over changes of soil physical properties is carried out under the reduced program, physic-mechanical soil properties are not studied in general;
- coordination of researches is carried out only within the limits of National Academy of Agrarian Sciences. Only in establishments of this academy schemes of experiences and programs of supervision are discussed. In educational institutes which are carried out many experiences, similar work is not spent;
- in schemes of experiences modern methods of mathematical planning of experiment that does not allow to develop technologically, ecologically and economically proved systems of soil tillage are not used.

But the following circumstance is more important, apparently: by results of the lead field experiences it is difficult enough to establish an orientation of soil anthropogenous evolution, speed of properties change and processes, especially in conditions of application raised and complex (mechanical + chemical + ameliorative) loadings.

Even dominating soils are not captured by experiments (for example, chestnut solonetzic in Steppe, flooded, declivity, peat and others). There are no experiences on not arable lands. Experiences on the tasks are badly compatible among themselves, various their schemes, in them it is very difficult to select variants which simulate different (especially perspective) loadings. There are few complex experiences in which different technologies - instruments of tillage are simultaneously tested, fertilizers; means of protection, ameliorative ways, i.e., intensive technologies with the maximal anthropogenous influence are simulated.

At the same time in the country, almost in each scientific institute and high school of an agrarian structure, the huge quantity few factorial experiences which have the limited scientific value (at the best for dissertational works or with the purpose of improvement separate agriways) is conducted. These experiences, as a rule, are not registered, their schemes are not considered by competent researchers, the coordination commissions by experiences have narrow departmental character and even within the limits of one department, it has not succeeded yet to achieve the agreement of the coordination commission, for example, on agrochemical questions with other commissions (on tillage, agrienvironment,).

As a rule, interpretation of the fruitful data received in experiences, is insufficient. The reasons of the lowered crops usually full do not reveal the references most widespread in these cases to a bad weather. To draw conclusions about dynamics of soil processes of such experiences is quite difficultly. Besides, experiences are conducted only in automorphicconditions on the most widespread soils, to develop a high-grade control system of fertility of all arable lands on their basis is impossible. The recommendations are limited usually to the general notes which do not cover all possible situations in a concrete facilities.

In this connection it is necessary to note, that in the countries with old experience of conducting field experiments (for example, in England, Denmark, Sweden) there is a corresponding council on experiences which conducts all scientifically-organizational work: it considers and approves schemes of experiences, generalizes the information received in experiences and gives out recommendations. Any field stationary experience cannot be incorporated and lead without the decision of Council in the country. In Sweden to provide independence and objectivity of results the special association on agreement of Council carries out experiments. Conducting experiences is paid from the state budget.

Skilled business on soil tillage in Ukraine demands reorganization:

- It is necessary to make detailed inventory of all field experiences and to range them, at least, on 2 levels: the state and regional value;
- Within the limits of Ministry of Agrarian Policy and Food and National Academy of Agrarian Sciences to create Council on experiences with the rights of the legal person for the organization of all scientifically-organizational work and conducting experiences of the state level. Under such it is necessary to consider the multifactorial experiences incorporated in view of primary factors of natural both economic value and having the purpose development of conceptual parameters new agritechnologies, and also supervision over changes of the basic parameters of fertility;
- Experiences which have received the state status, it is necessary to finance Council from the central budget. Conducting such experiences it is possible to charge to establishments NAASU, the State Center of Soil Fertility Protection and to its regional branches (now Institute of Soil Protection);
- As experiences which pursue the purpose of improvement local agritechnologies, it is expedient to conduct regional experiences due to local budgets or unappropriated means, but their schemes and the program need to be coordinated and agreed and registered in Council.

It is necessary to believe, that when experiences of the state level will be placed in view of agrisoil divisions into districts, kinds and levels of anthropogenous loadings and besides their schemes will answer modern methods of planning of experiment and their opportunity will subject to universal ways of mathematical processing, there will be a real opportunity to use all advantages which stationary field experiment has.

It is necessary to note, that, for example, 18 stationary experiences are carried out in France only within the limits of National Institute of Agronomical Researches (analogue NAASU) on soil tillage, almost in each soil province. In them cycles and issue of carbon, other biogenic elements, risks of erosion and a drain, pollution of soil and superficial waters, biological properties and a biodiversity, physical, chemical properties, social and economic aspects are studied.

In connection with the stated experience of studying of tillage technologies wider program of accompanying supervision is important which should answer, at least, on following questions:

- an estimation (forecast) of an acceptability or unacceptability of soil-climatic conditions for introduction of new technologies;
- optimum management of weeds and illnesses (speech should go about as much as possible to lower expenses for chemical ways at a satisfactory level of crops);

- harmonization of relations between cover and basic cultures (under condition of approbation of no-till technology);

- the adapted regional crop rotations;

- systems of technical maintenance;

- an estimation of antierosion efficiency;

- optimization of water and nutritious modes, increase of efficiency of the brought fertilizers, decrease in their losses;

- an objective estimation of accumulation (sequestration) of organic carbon.

The majority of unsolved agronomical questions in this or that way is connected with ecological and economic consequences. Therefore they in any way cannot be neglected.

Conclusions. Formation of blocks, reduction of the contents of agronomical useful fraction of structure, overcompacion and consolidation of soils, excessive losses of organic substances, erosion, and low efficiency in conditions of a drought - here are the incomplete list of negative consequences of the combined technology of soil tillage most widespread in Ukraine. Besides in the country there is uncertain an attitude to no-till, conservative, precise and to another soil saving systems of tillage. Skilled business in soil tillage requires modernization.

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