DETERMINATION OF RESERVES
FOR AGRICULTURAL PRODUCTION

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The paper evidences the essence of land potential in agriculture as well as the methodology of determining the potential levels of land fertility during the production of different crop types based on an example of an existing agricultural enterprise. A method of calculating the coefficient of using the potential land productivity in this field and an index of a potential level of land resources' productivity as a sum of the actual crop yield and its real reserve of growth is suggested. Presented graphics show the activities of actual and potentially possible gross yield of grain, winter and spring crops, corn and sunflower for the given enterprise.
    Key words: potential, land resources, crop yield, gross output, reserve.

În articol este demonstrată esenţa potenţialului funciar în agricultură, precum şi metodologia de determinare a nivelului potenţial al productivităţii terenurilor în procesul de producere a diferitelor culturi, având ca exemplu o întreprindere agricolă existentă. A fost propusă o metodă de calculare a coeficientului de utilizare a potenţialului de productivitate a terenurilor în domeniu şi a indicatorului nivelului potenţial al productivităţii resurselor funciare ca suma randamentului real şi rezervelor reale de creştere. Graficele prezintă, în mod clar, indicatorii productivităţii brute efective şi potenţiale de recoltare a culturilor de cereale de iarnă şi de primăvară, porumb şi floarea-soarelui pentru întreprinderea cercetată.
    Cuvinte-cheie: potenţial, resurse funciare, rentabilitate, productivitate brută, rezervă.

Показана экономическая сущность земельного потенциала в сельском хозяйстве, представлена методика определения потенциального уровня производительности земли при производстве продукции различных культур на примере конкретного сельскохозяйственного предприятия. Предложен вариант расчета коэффициента использования потенциала продуктивности земли в отрасли и показателя потенциального уровня продуктивности земельных ресурсов как сумма фактической урожайности и реального резерва ее роста. На графиках наглядно представлены показатели фактического и потенциально возможного валового сбора зерна озимых и яровых культур, кукурузы и подсолнечника для данного предприятия.
    Ключевые слова: потенциал, земельные ресурсы, урожайность, валовой сбор, резерв.

    Introduction. The impact of scientific and technological progress on the development of the economy is extremely important in modern conditions and is determined by many factors. The degree of this effect depends mainly on industry opportunities, whereby companies are actively involved in the process of scientific and technological development, contributing to it, while taking into account local conditions, and making a maximum use of its results in practice in order to improve the efficiency of land use. These features are in turn determined by a set of terms, which are the general concept of "land potential" [1, c.80-81].

    From the standpoint of economic theory, land potential can be expressed as the estimated maximum possible performance of the main means of production in agriculture, based on a proven set of scientific and technological achievements under actual prevailing climatic conditions of the region, area, business.

    Thus, on the one hand, the scientific and technical potential characterizes the real possibilities of

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the industry to use the objective achievements of scientific and technological progress, on the other hand defining the degree of direct participation in it. In agriculture, this process contributes to a more efficient use of land resources, improvement of soil fertility, creation of new high-yield plant varieties and hybrids of plants.

The economic evaluation of land expresses its relative value as a means of production in agriculture, based on the objective conditions in the certain natural and economic areas. The evaluation of land is performed using a system of natural and value indicators. The evaluation information is recorded in the cadastral documents. However, the economic evaluation of land has not been practically applied.

In a market economy, owners or users of land determine themselves the structure of production, its volume and quality indicators. However, this freedom of action, unfortunately, often leads to a retreat from science-based rotation of crops, which, as a rule, is crucial for the conservation of soil fertility and compliance with the rules of alternation of crops. In this regard, there is a need of introducing the new concept – "Land potential", instead of the currently used economic evaluation. The new introduced concept would reflect the potential of land productivity in real production conditions. It is important to make calculations of land potential on an annualized basis, for example, for three to five years in a row.

Indicators of potential land productivity can be calculated for an individual sector, district or region of the republic as a whole in natural and cost estimates. In an agricultural enterprise of a smaller area, all other things being equal, it is easier to provide a higher crop yield than ensure it on a scale of a whole country.

Consider the methodology for determining the potential level of land productivity in an example of «CumnucAgro» Ltd. from Ceadir – Lunga district. The main crops are presented in Table 1.

Table 1

Production of major crops in the «Cumnuc Agro» Ldt. for 2004-2015

Year	Winter crops			Spring crops excluding corn			Corn			Sunflower		
	ha	cwt	cwt/ha	ha	cwt	cwt/ha	ha	cwt	cwt/ha	ha	cwt	cwt/ha
2004	593	25959	43,8	53	1706	32,2	626	23219	37,1	497	7 780	1 5,7
2005	656	17701	26,7	175	3554	20,9	386	13927	36,1	485	57 06	11,8
2006	658	18991	28,9	167	4801	28,7	334	7103	21,3	489	10438	2 1,3
2007	702	22591	32,2	237	2857	12,1	335	6035	18	363	4 006	11
2008	794	26542	33,4	61	2170	35,6	376	11856	31,5	389	10 121	26
2009	696	15728	22,6	61	1304	21,4	311	8432	27,1	508	8 395	16,5
2010	682	20721	30,4	86	1043	12,1	405	18214	45	510	12 269	24,1
2011	665	22215	33,4	89	2519	28,3	380	10607	27,9	504	10 852	21,5
2012	697	13647	19,6	105	1937	18,4	390	7343	18,8	516	8 908	17,3
2013	678	24324	35,9	91	1955	21,5	400	17120	42,8	542	12 032	22,2
2014	695	28360	40,8	153	4683	30,6	294	10676	36,3	557	13 950	25
2015	684	23254	34	149	4262	28,6	321	7507	23,4	705	15 252	21,6
Average	683	21669	31,7	119	2733	23,0	380	11837	31,2	505	9976	19,7

Source: Form number 9 – AIC «Cumnuc Agro» Ldt. for the relevant years.

We calculate the average yields (for 3 consecutive years) of major crops, established in the investigated company during the last 12 years (2004-2015). The results are shown in Table 2.

Moving average yields of major crops at «Cumnuc Agro» Ltd, 2004-2015

Year	Winter crops			Spring crops excluding corn			Corn			Sunflower		
	ha	cwt	cwt/ha	ha	cwt	cwt/ha	Ha	cwt	cwt/ha	ha	cwt	cwt/ha
2004	-	-	-	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-	-	-	-	-	
2006	635,7	20883,7	32,6	131,7	3353,7	25,5	448,7	14749,7	32,9	490,3	7974,7	16,3
2007	672	19761	29,4	193	3737,3	19,4	351,7	9021,7	25,7	445,7	6 717	15,1
2008	718	22708	31,6	155	3276	21,1	348,3	8331,3	23,9	413,7	8 188	19,8
2009	730,7	21620,3	29,6	119,7	2110,3	17,6	340,7	8774,3	25,8	420	7 507	17,9
2010	724	20997,7	29	69,3	1505,7	21,7	364	12834	**35,3**	469	10 262	21,9
2011	681	19554,7	28,7	78,7	1622	20,6	365,3	12417,7	34	507,3	10 493	20,7
2012	681,3	18861	27,7	93,3	1833	19,7	391,7	12054,7	30,8	510	10 676	20,9
2013	680	20062	29,5	95	2137	22,5	358	11690	32,7	520,7	10 597	20,4
2014	690	22110,3	32	116,3	2858,3	24,6	361,3	11713	32,4	538,3	11 630	21,6
2015	685,7	25312,7	**36,9**	131	3633,3	**27,7**	338,3	11767,7	34,8	601,3	13 745	**22,9**

Source: based on data in Table 1.

In economics, production potential of land resources means the highest possible yield in quality and quantity in a most efficient use of all available means of production and labor. Using the data of Table 2, we find the maximum values of indicators of productivity. In the production of winter crops, spring crops without corn and sunflower, highest rates were reached in the past 3 years – for 2013-2015 – 36.9 cwt/ha, 27.7 and 22.9 cwt / ha respectively. The cultivation of corn reaches its maximum yield of 35.3 cwt/ ha in the period of 2008-2010. We take these indicators as normative as actually produced under the specific conditions of the enterprise. They are marked in the table.

The estimated reserves of increase in the productivity of land is characterized by the difference between the production potential and the achieved level of its use.

The coefficient of utilization of the potential land productivity in agriculture is determined by the ratio of the actual level of productivity to the potential one [2, p.103-104].

$$К = \frac{q_f}{q_p} \qquad (1)$$

The potential level of land productivity is defined as the sum of the actual yield and its real reserve of growth (∆q):

$$q_p = q_f + \Delta q \qquad (2)$$

Based on the data from Tables 1 and 2, we find the real reserves increase of land productivity of «Cumnuc Agro» Ldt. in the production of winter crops, spring crops without corn, corn and sunflower. The results are graphically presented in Figure 1. We can see that the shortfall of production per hectare ranges from 13.2% in the production of corn to 20.5% in the cultivation of spring crops without corn.
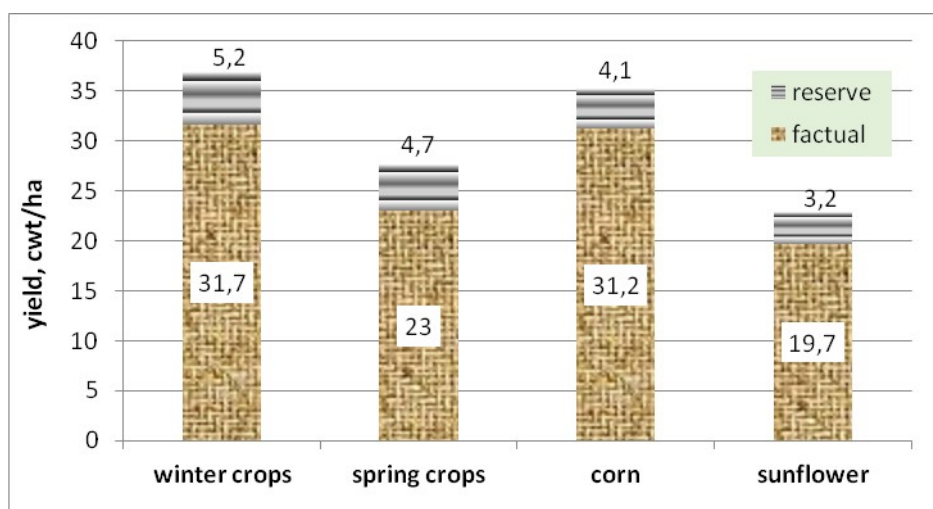
**Fig. 1. Indices of average actual yield and growth reserves for major crops
at SRL «Cumnuc Agro» during 2004-2015**
Source: based on data presented in Table 1 and Table 2.

Over the last five years the average annual yield on sowings of winter crops at the studied enterprise has been equal to 32.7 cwt/ ha (683.8 ha and 22,360 cwt), for spring crops without corn – 26.2 cwt. / ha (117.4 ha and 3,071 cwt), corn – 29.8 cwt / ha (357 ha and 10,651 cwt) and sunflower – 21.6 centner / ha (564.8 ha and 12,199 cwt). By calculating the difference between potential and actual yields indicators, we find the real reserve of production for each type of crop. Thus, the shortage of grain average during 2011-2015 makes up 2,872.2 cwt (683.8ha* 36.9 cwt. / ha – 22,360 cwt) or 12.9% for winter crops, for spring crops without corn constitutes 181 centners (5.9%), for corn – 1,772.6 cwt (16.7%) and for sunflower – 735 cwt (6.1%). Only in 2015 the potential gross harvest for the winter grain crops amounted to 25,239.6 centner (684 ha* 36,9cwt / ha), which is 1,985.6 cwt. or 8.6% less, corn – to 366.1 centners less that is 4.9%), for sunflower – on 892.5 cwt. or 5.9%. Gross harvest of summer grain crops without corn exceeded the potential level of 134.7 centners, which is 3.2%

Comparing actual and potential values of production of sunflower and crops in the enterprise we can detect a difference in each year of cultivation. The calculations in the dynamics of the considered 12 years of winter grain crops and corn are shown in Figure 2.
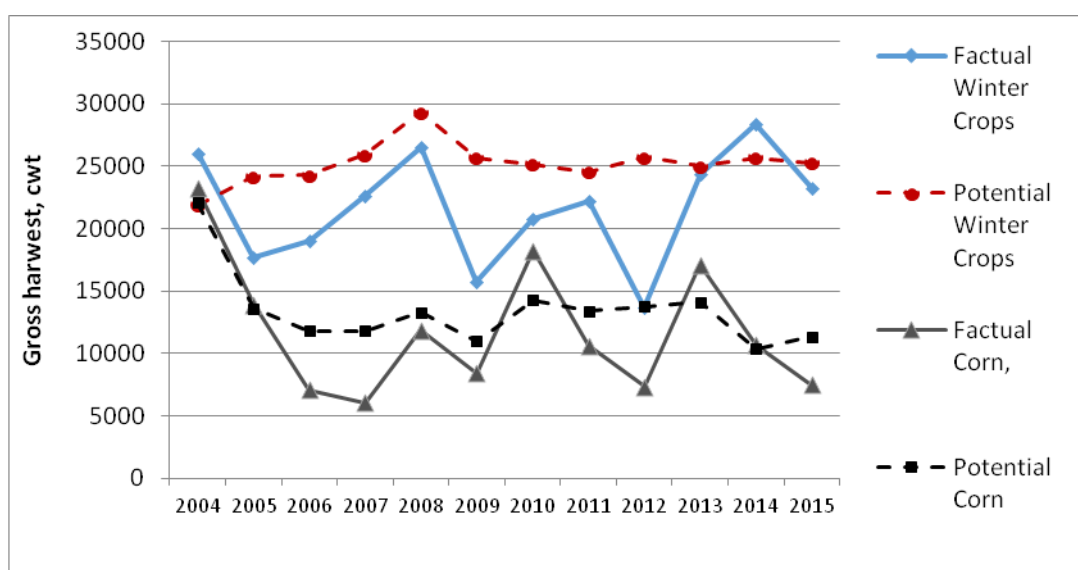

**Fig. 2. Indicators of the actual and potential gross harvest of winter crops
and corn for «Cumnuc Agro» Ltd, 2004-2015**
Source: based on data from Table 1 and Table 2.

The ratio of the actual and potential gross harvest of summer grain crops without corn and sunflower is presented in Figure 3.

The analysis shows that in the production of winter crops for the studied period of 12 years the gross grain harvest reached the potential values only two times (in 2004 and 2014), whereas in the production of spring crops it was observed every other year (2004, 2006, 2008, 2011, 2014 and 2015) for corn it was 5 years (2004, 2005, 2010, 2013 and 2014), sunflower – only 3 years (2008, 2010 and 2014).
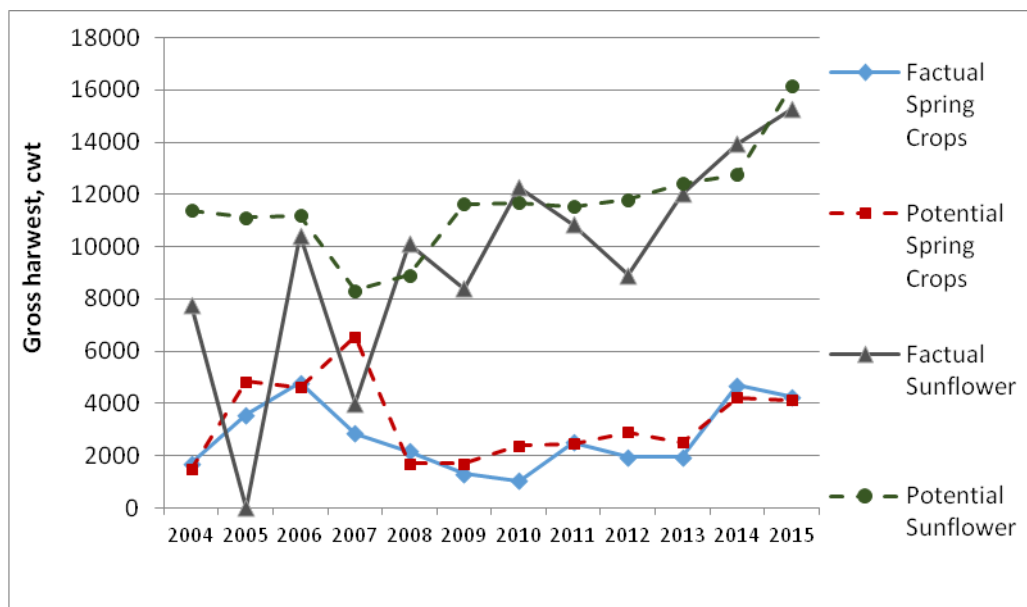

Fig. 3. The indicators of actual and potential gross grain harvest of spring crops and sunflowers in «Cumnuc Agro» Ltd, 2004-2015
Source: based on data from Table 1 and Table 2.

The production shortfall during the sample period of 12 years amounted to 4933 tons in the production of winter crops, 2750 tones in the production of corn, whereas for summer grain crops except corn it reached 826 tons and for sunflower seeds – 2218 tones.

Using the above method every agricultural enterprise can determine its levels of productivity for each crop in order to improve their production planning. Based on these calculations they can also plan the gross grain crop yield for sunflower, grapes, fruit and other products.

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