

UDC 338.43 (470.13)

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## Assessment of innovation and investment projects of municipality's development in the northern region\*

*The article reveals the dependence of the development of rural economy's basis branch – the agricultural sector – on innovation. It shows the role of cattle breeding in providing the people with low-transportable dairy and meat products, peasant employment and rational use of natural forage grasslands. The authors examine the evaluation technique of innovation and investment project efficiency and reveal the effective implementation of such projects in cattle breeding in the peripheral northern rural region in the case of the Republic of Komi. There is a calculation of commercial efficiency indices of constructing 100 and 200 head dairies with the use of innovative technologies in different variants of state support. The article proves that it is necessary to strengthen the state support to farmers' income and prolong the terms of concessional lending for the modernization of innovative cattle breeding.*

*Cattle breeding, innovation, technique of effectiveness, innovation and investment projects, peripheral region, the Republic of Komi.*



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*The urgency of cattle breeding development on the base of modernization and innovation technology*

The urgency and significance of cattle breeding modernization for the Northern Zone

based on the use of innovation technology is caused by the need of preserving and developing this important industry. The development of cattle breeding is constrained by the lack of investment and low level of their efficiency.

\* The article was prepared as a part of research projects of UB RAS No. 12-U-7-1013, and young scientists and postgraduate students No. 11-7-NP-399.

The research is aimed at assessing economic efficiency of innovation and investment projects in dairy and beef breeding in the Republic of Komi for making management decisions on attracting investment to the industry. Proceeding from the research objectives, the following tasks were solved:

1. To assess the recoupment of 100 and 200 head dairies construction in different variants of state support, using the indicators of commercial efficiency of innovative and investment projects.

2. To identify the eligibility of current terms of concessional lending and the level of state support for the construction and modernization of livestock houses in the North.

3. To develop practice guidelines for applying a differentiated approach to the terms of concessional lending and pricing support for the industry based on the analysis of innovation and investment projects effectiveness.

Cattle breeding is very important for rural areas of the North. It provides the population with low-transportable dairy and meat products, ensures the whole-year employment and allows peasants to use natural grasslands more efficiently. Northern hayfields and pastures are

the sources of the cheapest and complete feed. Huge meadow tracts, laying in high-water beds, are especially valuable from the economic point of view. For example, it is possible to gather more than 410 tons of fodder units from the flood meadows of the Northern Dvina, Pechora, Mezen, Pinega, Vychegda and their tributaries [1, p. 73].

The development of cattle breeding is highly dependent on investment growth and transition to innovative technologies. Investments have been substantially reduced over the years of market reforms. Over the period from 1990 to 2010 the investment share in the fixed capital of Komi agriculture declined from 5.7 to 0.8% when the share of agriculture in the gross regional product amounted to 2.6%. The investment decline rate in the agricultural sector was more than four times higher than in the whole republic [2, p. 26]. Naturally, this affected launching of production capacity, primarily for cattle breeding, and ageing of livestock house and equipment. If 2.8 thousand places for cattle were launched in 1990 due to new construction, expansion and renovation, in 2010 only 0.4 thousand places for cattle were built [4, p. 24].

Figure 1. Launching cattle production capacity in the Republic of Komi in 1995 – 2010, thsd. places for cattle

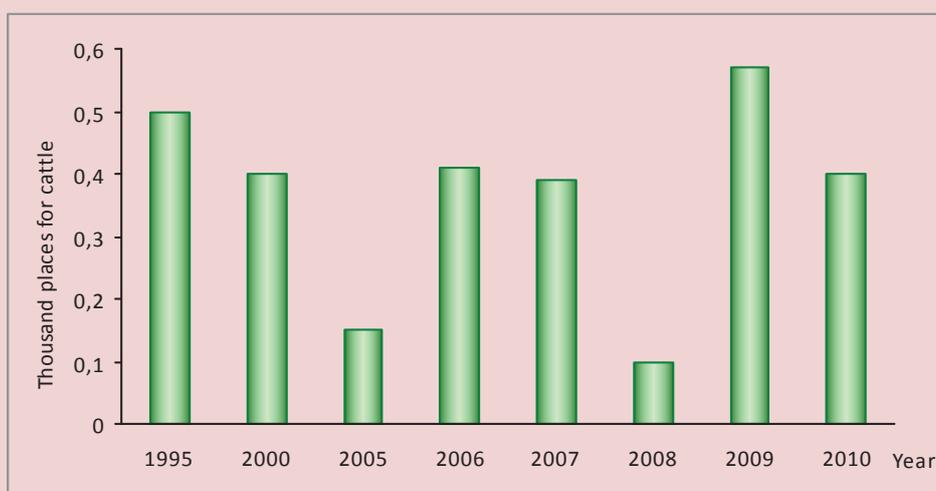


Figure 2. Dynamics of milk production on the farms of all categories in the Republic of Komi in 1990 – 2010, thsd. t

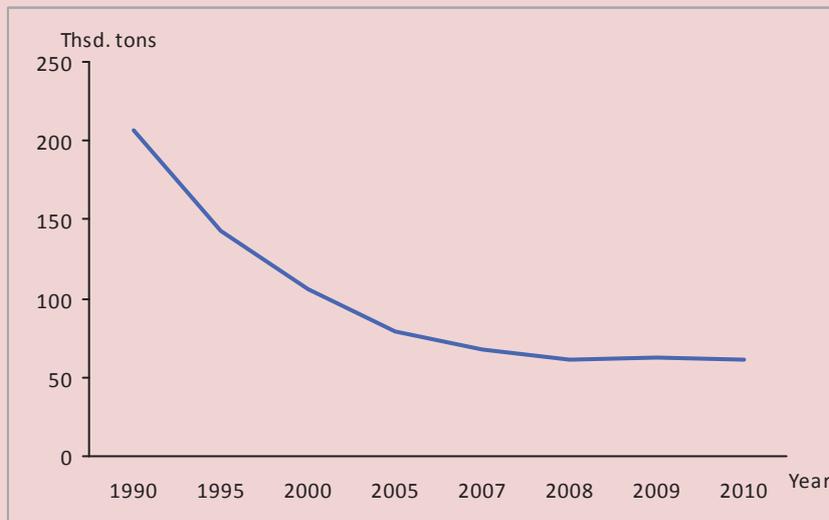
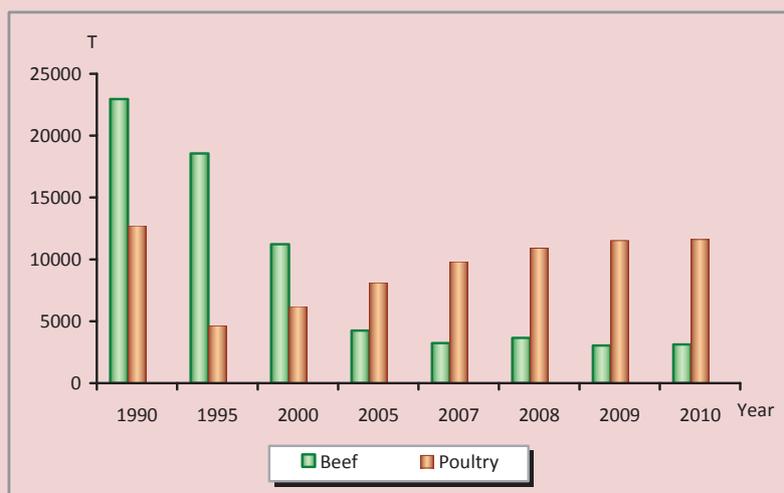


Figure 3. Dynamics of beef and poultry production on the farms of all categories in the Republic of Komi in 1990 – 2010, thsd. t



The implementation of the State Program for the Development of Agriculture and Markets Regulation of Agricultural Production, Raw Materials and Food for 2008 – 2012 slightly revived the innovation activity in the industry (fig. 1). Currently, however, investments are attracted by suburban areas. Peripheral agricultural organizations and farm enterprises are in special need of investments. Fixed assets of agricultural cattle-breeding enterprises in the remote areas are worn out by more than 70%.

The negative situation in the industry is characterized by statistical data (fig. 2, fig. 3). There has been 3.4-fold decrease in milk production and a 5.9-fold decrease in beef production for the period of twenty years [5, p. 45].

*Efficiency assessment method for innovation and investment projects*

Economic assessment of innovation and investment projects is especially important in connection with the modernization of industry and development of innovation technologies.

The foreign experience in investment calculations, which is based on the analysis of financial flows – dynamics of income and outgoings associated with the project, is significantly interesting. This approach is the basis of the Methodical Recommendations on Assessing Innovation Projects [3].

The Recommendations propose to divide innovation project's efficiency indices into the following types:

- commercial (financial) efficiency indices, taking into account the financial implications of the project for its direct participants;
- budget efficiency indices, reflecting the financial implications of the project for the federal, regional and local budgets;
- economic efficiency indices, taking into account the costs of project's implementation, but which go beyond the direct financial interests of innovation project's participants and allow cost measurement.

The effectiveness of an innovative project is characterized by a system of indices that includes net present value, profitability index, internal rate of return and payback period.

Net present value (NPV) is defined as the sum of present effects, reduced to the initial step, or the difference between discounted profits and costs at a fixed discount rate:

$$NPV = -I + \frac{P_1}{(1+d)^1} + \frac{P_2}{(1+d)^2} + \frac{P_3}{(1+d)^3} + \dots + \frac{P_t}{(1+d)^t}, \quad (1)$$

where  $I$  – investment costs that are required to implement the project;

$P$  – net cash flow at time  $t$ ;

$d$  – discount rate.

If  $NPV > 0$ , return on investment exceeds the minimum discount coefficient. If  $NPV < 0$ , project profitability is lower than the minimum coefficient and the project should be rejected.

Profitability index (PI) is the ratio of discounted profit amount to the amount of discounted cost.

The project is considered to be effective if its profitability index is greater than or equal to unity. Profitability index allows us to compare the projects of various scales and choose the most effective project.

$$PI = \frac{\frac{P_1}{(1+d)^1} + \frac{P_2}{(1+d)^2} + \frac{P_3}{(1+d)^3} + \dots + \frac{P_t}{(1+d)^t}}{I}, \quad (2)$$

The project is considered to be attractive, if  $PI > 1$ ; the project should be rejected, if  $PI < 1$ .

Internal rate of return (IRR) is a discounted rate that makes the net present value equal to zero. An innovative project is considered to be efficient if its internal rate is greater than or equal to the fixed discount rate, corresponding to opportunity cost of capital.

Internal rate of return (IRR) is calculated as follows:

$$IRR = d_1 + \frac{NPV_1}{NPV_1 - NPV_2} \times (d_2 - d_1), \quad (3)$$

where  $d_1$  – discount rate, corresponding to opportunity cost;

$d_2$  – discount rate for negative net present value (NPV2);

$NPV_1$  – net present value for discount rate  $d_1$ .

Payback period on investment defines the time from project's investment starting till the moment when net project income covers the initial investment. The payback period is determined by discounting. Simple payback period (without discounting) is calculated for approximate calculations. The project is considered to be effective when its payback period is less than the term of project's implementation.

*The effectiveness of innovation and investment projects implementation in cattle breeding in a peripheral region of the Republic of Komi*

Using this technique, we'll calculate economical construction efficiency of livestock buildings for the agricultural organizations that are situated in peripheral Udorsky District in the Republic of Komi – agricultural production cooperative (APC) Collective Farm Chernu-

tyevskiy and APC Vashka. Nowadays, APC Collective Farm Chernutyevskiy has 55 cows, and it is going to increase the total number of cattle up to 100 head. In order to fulfill this task, the farm should lease 45 Ayrshire heifers in the period from 2013 to 2015. They will cost 2.48 million rubles. The Ministry of Agriculture and Food of the Republic of Komi will refund their purchase in the amount of 1.44 million rubles. The construction of a cowshed, purchasing equipment and heifers will cost 18.28 million rubles. The Ministry of Agriculture and Food will refund 70% of construction and equipment costs.

The system of cattle housing in new buildings will be stall and pasturable in summer and stall and outdoor in winter. There will be untethered method of cattle housing on the farm. Cattle will be kept on deep litter. Cattle's food ration will consist of natural forage, mainly of grass from the meadows and pastures. Cattle breeding in these agricultural organizations meets the principals of organic production. It is planned to breed highly productive Ayrshire cows; fat content of their milk is 4.2 – 4.5%. All processes will be mechanized and automated.

In the scope of this project we calculated the current costs based on the following fact. Five people, two of them are milkmaids, will service cows. It is planned to increase average monthly wage up to 30 thousand rubles, which corresponds to the average level of the republic economy. Depreciation cost is calculated taking into account that cowshed will be exploited for 50 years, equipment – for 10 years and lifespan of cows will be 5 years. Depreciation cost will amount to 740 thousand rubles in 2013. It is planned to increase cow productivity up to 5500 kg per year.

It is assumed in the calculation that the current state support from the budget of the Republic of Komi will be saved. The forecast of cash flows of this innovation and investment project to APC Collective Farm Chernutyevskiy is based on these conditions (*tab. 1*).

The analysis of financial indicators shows that the net profit of project implementation is 16.9 million rubles, and net income (the difference between net profit and the amount of loan repayment) is estimated at 12.3 million rubles.

The simple rate of return on total investment costs (R) is calculated by the following formula:

$$R = \frac{NP + P/t}{I} \times 100\%, \quad (4)$$

where NP – net profit;

P – interests on loan capital;

I – overall investment costs;

t – investment period.

$$R = \frac{(16942 + 1281)/8}{18280} \times 100\% = 12.5\%.$$

Simple payback period (without discounting) is calculated by the following formula:

$$I = \sum_{t=1}^T (NP_t + D_t + P_t), \quad (5)$$

where T – payback period;

NP<sub>t</sub> – net income per year t;

D<sub>t</sub> – depreciation per year t,

P<sub>t</sub> – interests on loan capital per year t.

Simple payback period will be:

$$18280 = (425 + 740 + 184)_1 + (602 + 850 + 177)_2 + (748 + 960 + 170)_3 + (885 + 990 + 162)_4 + (971 + 990 + 156)_5 + (1075 + 990 + 150)_6 + (1173 + 990 + 144)_7 + (1368 + 990 + 138)_8 + 2252.$$

The components of the right-hand side of the equation allow us to determine the payback period that is equal to 8.93 years.

Return on investment (simple rate of return) is equal to 12.5%, and payback period on investment is 8.93 years, so it is longer than project investment period (8 years). Net profit of the project will be gained in more than 14 years.

Table 1. Cash flow forecast for the implementation of innovation and investment project "100 Head Dairy Farm" with the current state support to APC Collective Farm Chernutyevskiy, thsd. rub.

Indicator	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
1. Cash inflow - total	15300	8893	10166	11853	12559	13322	14212	15174	16091	16916	18015	18746	20153	21568	<b>212958</b>
Including:															
1.1. Sales revenues	-	7693	9066	10653	11809	12522	13362	14254	15096	15846	16855	17526	18843	20193	<b>183718</b>
1.2. Budgetary funds	10700	1200	1100	1200	750	800	850	920	995	1070	1150	1220	1310	1375	<b>26090</b>
1.3. Bank loans	4600	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>4600</b>
2. Cash payment, total	15800	7938	9094	10515	10594	11221	11731	12524	13171	13423	14190	15050	16100	16995	<b>178346</b>
Including															
2.1. Investment cost	15800	750	820	910	-	-	-	-	-	-	-	-	-	-	<b>18280</b>
2.1.1. Investment in fixed assets	15300	750	820	910	-	-	-	-	-	-	-	-	-	-	<b>17780</b>
2.1.2. Working capital financing	500	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>500</b>
2.2. Current costs (except for depreciation)	-	6244	7292	8590	9547	10136	10830	11584	12188	12833	13540	14350	15340	16180	<b>148654</b>
2.2.1. Wages with taxes	-	2400	2640	2850	2980	3100	3350	3480	3560	3796	3930	4120	4280	4430	<b>44916</b>
2.2.2. Material cost	-	3480	4250	5320	6115	6550	6940	7490	7950	8427	8930	9460	10200	10810	<b>106222</b>
2.2.3. Interest for loans	-	184	177	170	162	156	150	144	138	-	-	-	-	-	<b>1281</b>
2.2.4. Other costs	-	180	225	250	290	330	390	470	540	610	680	770	860	940	<b>1030</b>
2.3. Commercial expenses	-	100	115	125	140	165	185	210	235	260	290	320	350	365	<b>6535</b>
For reference only:															
Capital depreciation	-	740	850	960	990	990	990	990	990	990	990	610	610	610	<b>11310</b>
Product cost	-	7084	8257	9675	10677	11291	12005	12784	13413	14083	14820	15280	16300	17155	<b>162824</b>
Taxable profit	-	609	809	978	1132	1231	1357	1470	1683	1763	2035	2246	2543	3038	<b>20894</b>
Production profitability, %	-	8.6	9.8	10.1	10.6	10.9	11.3	11.5	11.8	12.6	13.8	14.7	15.6	18.4	-
2.4. Unified agricultural tax	-	184	207	230	247	260	282	297	315	330	360	380	410	450	<b>3952</b>
For reference only: Net profit	-	425	602	748	885	971	1075	1173	1368	1433	1675	1866	2133	2588	<b>16942</b>
2.5. Loan repayment	-	660	660	660	660	660	433	434	433	-	-	-	-	-	<b>4600</b>
3. Net cash flow (NCF)	-500	955	1072	1338	1965	2101	2481	2650	2920	3493	3815	3696	4053	4573	<b>34612</b>

In order to assess the economic efficiency of the project it is important to take into account the various values of funds for project's participants that are gained or spent by them at the different points of time. The flows taking place at different times are compared by discounting, i.e. by the reduction of flows (incomings and outgoings) taking place at different times to a single point of time.

Discount rate in our calculation is estimated at the rate of 8%. Net present value of the project is defined as follows:

$$NPV_1 = -18280 + \frac{955}{(1+0.08)^1} + \frac{1072}{(1+0.08)^2} + \frac{1338}{(1+0.08)^3} + \frac{1965}{(1+0.08)^4} + \frac{2101}{(1+0.08)^5} + \frac{2481}{(1+0.08)^6} + \frac{2650}{(1+0.08)^7} + \frac{2920}{(1+0.08)^8} + \frac{3493}{(1+0.08)^9} + \frac{3815}{(1+0.08)^{10}} + \frac{3696}{(1+0.08)^{11}} + \frac{4053}{(1+0.08)^{12}} + \frac{4573}{(1+0.08)^{13}} = 859.8 \text{ thsd. rub.}$$

A positive value of this indicator proves the economic attractiveness of the project.

Profitability index is calculated as follows:

$$PI = \frac{(884.3 + 919.4 + 1082.52 + 1471.9 + 1457.0 + 1593.5 + 1575.5 + 1607.0 + 1780.3 + 1799.5 + 1615.4 + 1640.2 + 1713.4)}{18280} = 1.04.$$

Profitability index is greater than unity, so the project is considered to be economically advantageous.

It is necessary to calculate negative net present value ( $NPV_2$ ) to determine the internal rate of return. A discount rate is 12%.

$$NPV_2 = -18280 + \frac{955}{(1+0.12)^1} + \frac{1072}{(1+0.12)^2} + \frac{1338}{(1+0.12)^3} + \frac{1965}{(1+0.12)^4} + \frac{2101}{(1+0.12)^5} + \frac{2481}{(1+0.12)^6} + \frac{2650}{(1+0.12)^7} + \frac{2920}{(1+0.12)^8} + \frac{3493}{(1+0.12)^9} + \frac{3815}{(1+0.12)^{10}} + \frac{3696}{(1+0.12)^{11}} + \frac{4053}{(1+0.12)^{12}} + \frac{4573}{(1+0.12)^{13}} = -188.6 \text{ thsd. rub.}$$

The internal rate of return is calculated by the formula 3:

$$IRR = 8 + \frac{859.8}{859.8 - (-188.6)} \times (12 - 8) = 11.3\%.$$

The internal rate of return is higher than the discount rate (8%), this fact indicates the economic attractiveness of the project.

It is necessary to calculate a cumulative cash flow in order to determine the discounted payback period of the project (tab. 2).

Discounted payback period ( $DP_p$ ) is calculated by the following formula:

$$DP_p = n - \frac{K_{nt}}{p(t+1)}, \tag{6}$$

where  $n$  – the number of years when a cumulative cash flow is less than zero;

$K_{nt}$  – the last year when the value of cumulative cash flow is negative;

$P_{(t+1)}$  – the discounted cash flow that follows the last negative cumulative cash flow.

$$DP_p = 12 - \frac{-853.5}{1713.4} = 12.49 \text{ years}$$

The discounted payback period of the project is equal to 12.49 years; it is longer than the loan taken (8 years). Therefore, this innovation project is considered to be ineffective.

Under the current support the profitability level of agricultural production at APC Collective Farm Chernutyevskiy will amount from 8.6% in 2013 to 18.4% in 2025; these figures are below the optimal rate of return (40 – 50%). In this situation this agriculture organization can start building a farm, if the period of long-term loan will be at least 13 years.

The efficiency of the innovation and investment project for APC Collective Farm Chernutyevskiy is defined in achieving the optimal level of livestock production profitability. It is planned to increase a profitability level from 7.2% in 2013 up to 38.5% in 2015 and up to 48% in 2020. This task will require a significant rise in the guaranteed prices for dairy products and beef.

Table 2. The calculation of a cumulative cash flow of the innovation and investment project for APC Collective Farm Chernutyevskiy in 2012 – 2025, thsd. rub.

Indicator	Cash outflow in 2012	2013	2014	2015	2016	2017	2018	2019
Cash flow	-15800	955	1072	1338	1965	2101	2481	2650
Discounted cash flow	-15800	884.3	919.4	1082.5	1471.9	1457.0	1593.5	1575.5
Cumulative cash flow	-15800	-15800 + 750 + 884/3 = -15665.7	-15665.7 - 820 + 919.4 = -15566.3	-15566.3 - 910 + 1082.4 = -15939.8	-15393.8 + 1471.9 = -13921.3	-13921.9 + 1457.0 = -12464.9	-12464.9 + 1593.5 = -10871.4	-10871.4 + 1575.5 = -9295.9

Indicator	Cash outflow in 2012	2020	2021	2022	2023	2024	2025
Cash flow	-15800	2920	3493	3815	3696	4053	4573
Discounted cash flow	-15800	1607.0	1780.3	1799.5	1615.4	1640.2	1713.4
Cumulative cash flow	-15800	-9595.9 + 1607.0 = -7688.9	-7688.9 + 1780.3 = -5908.6	-5908.6 + 1799.5 = -4109.1	-4109.1 + 1615.4 = -2493.7	-2493.7 + 1640.2 = -853.5	-853.5 + 1713.4 = 859.8

The calculation shows that the return on investment (simple rate of return) is equal to 22.4% and payback period is 4.52 years, which is less than the investment period of this project. The discounted payback period (7.1 years) is less than the period of project's implementation. Therefore, this investment and innovation project will be effective while maintaining the existing state support and ensuring the optimal level of livestock production profitability.

The economic evaluation of building 200 head dairy farm for APC Vashka was carried out similarly. The investment costs of building a cowshed, purchasing equipment and Ayrshire heifers will amount to 30 million rubles.

It is planned to have cattle housing conditions, production rates of cows and the form of state support that are similar to the Project for APC Collective Farm Chernutyevskiy.

With the current state support the net profit of project implementation is 28.8 million rubles and net income (the difference between net profit and the amount of loan repayment) is estimated at 19.8 million rubles.

The simple rate of return on total investment costs:

$$R = \frac{(28778 + 2510) / 8}{34810} \times 100\% = 11.2\%.$$

Calculations show that the simple payback period for this project will be 9.16 years.

Payback period on investment (without discounting) is longer than the investment period of this project. Net profit of the project will be gained in more than 15 years.

Profitability index:

$$PI = \frac{1949.1 + 2354.2 + 2540.5 + 2985.1 + 3034.7 + 3355.8 + 3290.7 + 3243.8 + 3732.9 + 3706.1 + 3701.5 + 3719.6 + 3856.1}{34810} = 1.19.$$

Discounted payback period is 11.25 years; it is longer than the implementation period of this project. Therefore, this innovation project is considered to be ineffective.

The calculation of investment and innovation project efficiency indicators for APC Vashka at the optimal level of livestock produce profitability shows that the net profit of project implementation is equal to 48.7 million rubles

and net income (the difference between net profit and the amount of loan repayment) is estimated at 39.7 million rubles (*tab. 3*).

Simple rate of return on total investment costs will amount to:

$$R = \frac{(48721 + 2510) / 8}{34810} \times 100\% = 18.4\%.$$

Simple payback period (without discounting) is calculated as follows:

$$34810 = (2009 + 1950 + 360) + (2780 + 2170 + 346) + (3607 + 2320 + 332) + (4995 + 2320 + 319) + (6100 + 2320 + 306) + (7417 + 2320 + 294) + 2576 = 5.26 \text{ years.}$$

Return on investment (simple rate of return) is equal to 18.4%, and payback period on investment is 5.26 years, and so it is less than project investment period.

Table 3. Cash flow forecast for the implementation of innovation and investment project “200 Head Dairy Farm” at the optimal level of produce profitability to APC Vashka, thsd. rub.

Indicator	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
1. Cash inflow - total	30000	21621	24399	26942	28536	31761	35188	40432	46307	285186
Including:										
1.1. Sales revenues	-	20321	22949	25372	28536	31761	35188	40432	46307	250866
1.2. Budgetary funds	21000	1300	1430	1570	-	-	-	-	-	25300
1.3. Bank loans	9000	-	-	-	-	-	-	-	-	9000
2. Cash payment, total	31500	18667	20404	21960	22526	24646	26276	29364	32572	227915
Including										
2.1. Investment cost	31500	1000	1100	1210	-	-	-	-	-	34810
2.1.1. Investment in fixed assets	30000	1000	1100	1210	-	-	-	-	-	33310
2.1.2. Working capital financing	1500	-	-	-	-	-	-	-	-	1500
2.2. Current costs (except for depreciation)	-	15640	17161	18496	20118	22086	24036	26873	29790	174200
2.2.1. Wages with taxes	-	5850	6435	6950	7576	8334	9085	10175	11294	65699
2.2.2. Material cost	-	8680	9550	10314	11242	12366	13480	15098	16760	97490
2.2.3. Interest for loans	-	360	346	332	319	306	294	282	271	2510
2.2.4. Other costs	-	750	830	900	981	1080	1177	1318	1465	8501
2.3. Commercial expenses	-	220	250	275	300	362	406	455	500	2768
For reference only:										
Capital depreciation	-	1950	2170	2320	2320	2320	2320	2320	2320	18040
Product cost	-	17810	19581	21091	22738	24736	26718	29599	32565	194838
Taxable profit	-	2511	3368	4281	5798	7025	8470	10833	13742	56028
Production profitability, %	-	14.1	17.2	20.3	25.5	28.4	31.7	36.6	42.2	-
2.4. Unified agricultural tax	-	502	588	674	803	925	1053	1260	1502	7307
For reference only: Net profit	-	2009	2780	3607	4995	6100	7417	9573	12240	48721
2.5. Loan repayment	-	1305	1305	1305	1305	1305	825	825	825	9000
3. Net cash flow (NCF)	-1500	2954	3995	4982	6010	7115	8912	11068	13735	57271

Net present value of the project is defined as follows:

$$\begin{aligned}
 NPV_1 = & -34810 + \frac{2954}{(1+0.08)} + \frac{3995}{(1+0.08)^2} + \frac{4982}{(1+0.08)^3} + \\
 & + \frac{6010}{(1+0.08)^4} + \frac{7115}{(1+0.08)^5} + \frac{8912}{(1+0.08)^6} + \frac{11068}{(1+0.08)^7} + \\
 & + \frac{13735}{(1+0.08)^8} = -34810 + 39498.5 = 4688.5 \text{ thsd. rub.}
 \end{aligned}$$

A positive value of this indicator proves the economic attractiveness of the project.

Profitability index is calculated as follows:

$$\begin{aligned}
 PI = & \frac{2735.2 + 34269.3 + 4030.7 + 4508.9 + \\
 & + 4934 + 5723.8 + 6580.3 + 7559.2}{34810} = 1.13.
 \end{aligned}$$

Profitability index is greater than unity, so the project is considered to be economically advantageous.

It is necessary to calculate negative net present value ( $NPV_2$ ) to determine the internal rate of return. A discount rate is 20%.

$$\begin{aligned}
 NPV_2 = & -34810 + \frac{2954}{(1+0.2)} + \frac{3995}{(1+0.2)^2} + \frac{4982}{(1+0.2)^3} + \\
 & + \frac{6010}{(1+0.2)^4} + \frac{7115}{(1+0.2)^5} + \frac{8912}{(1+0.2)^6} + \frac{11068}{(1+0.2)^7} + \frac{13735}{(1+0.2)^8} = \\
 & = -34810 + 23145.1 = -11664.9
 \end{aligned}$$

The internal rate of return is calculated by the formula 3:

$$IRR = 8 + \frac{4688.5}{4688.5 - (-111664.9)} \times (20 - 8) = 11.4\%.$$

The internal rate of return is higher than the discount rate (8%), this fact indicates the economic attractiveness of the project.

Cumulative cash flow, determining the discounted payback period of the project, is presented in *table 4*.

Discounted payback period will be:

$$DP_p = 8 - \frac{-2873.7}{7559.2} = 7 + 0.38 = 7.38 \text{ years.}$$

The discounted payback period of the project is less than its implementation period. Therefore, this innovation project is considered to be effective.

*Table 5* presents the performance of projects' efficiency with the different variants of state support.

In summary, we have drawn the following conclusions:

1. The sustainable development of cattle breeding in the peripheral regions requires a considerable increase in investing construction, reconstruction and launching innovation technologies. Therefore, economic assessment

Table 4. The calculation of a cumulative cash flow of the project for APC Vashka in 2012 – 2020, thsd. rub.

Indicator	Cash inflow in 2012	22013	22014	22015	22016	22017	22018	22019	22020
Cash flow	-31500	2954	3995	4982	6010	7115	8912	11068	13735
Discounted cash flow	-31500	2735.2	3426.3	4030.7	4508.9	4934.1	5723.8	6580.3	7559.2
Cumulative cash flow	-31500	-31500 - 1000 + 2735.2 = -29764.8	-29764.8 - 1100 + 3426.3 = -27438.5	-27438.5 - 1210 + 4030.7 = -24617.8	-24617.8 + 4508.9 = -20111.9	-20111.9 + 4934.1 = -15177.8	-15177.8 + 5723.8 = -9454.0	-9454.0 + 6580.3 = -2873.7	-2873.7 + 7559.2 = 4685.5

Table 5. Assessment of innovation and investment projects' efficiency

Project		Net present value (NPV), thsd. rub.	Simple rate of return (R), %	Simple payback period, years	Profitability index (PI)	Internal rate of return (IRR), %	Discounted payback period (DP <sub>p</sub> ), years
Constructing 100 head dairy in APC Collective Farm Chernutyeveskiy	1	859.8	12.5	8.93	1.04	11.3	12.49
	2	6642.2	22.4	4.52	1.36	16.3	7.1
Constructing 200 head dairy in APC Vashka	1	6660.1	11.2	9.16	1.19	11.6	11.25
	2	4688.5	18.4	5.26	1.13	11.4	7.38
1. With the current state support. 2. With the support to revenue, ensuring the optimum level of profitability.							

of innovation and investment projects is especially important.

2. Calculating the economic efficiency of 100 and 200 head dairies with the use of high technologies and highly productive animals shows that having the current state support to innovation and investment activity and farmers' incomes, the expenses on these projects will be covered in 12.49 and 11.25 years if the length of credit is 8 years. The payback period of these projects will be lower than the term of credit when agricultural organizations

reach the optimal level of profitability and the current state support to innovation projects is saved.

3. It is necessary to significantly increase the guaranteed price for milk and beef and strengthen the role of long-term credit in order to enhance innovation in the dairy industry. Soft loan for the construction and modernization of livestock houses in the North should be provided for 20 – 25 years, and the length of loans for purchasing machinery and equipment should be six or eight years.

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