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Е.Ю. Бобкова[1], ✉
Д.И. Воробьев[1],
А.В. Воробьева[1],
С.А. Авдошкина[1],
М.В. Темербаева[2],
Т.И. Урюмцева[2]

[1] Московский государственный университет технологий и управления им. К.Г. Разумовского, Москва, Российская Федерация
[2] Инновационный Евразийский университет, Павлодар, Республика Казахстан

✉ *vica3@yandex.ru*

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Оценка экономической эффективности освоения производства продуктов функционального питания

РЕЗЮМЕ

Актуальность. Экономическая эффективность является важнейшим фактором при внедрении в производство новых видов продукции. В статье представлена оценка экономической эффективности при внедрении продуктов функционального питания в массовое производство. Проведена оценка затрат на запуск продукции в производство; отпускная цена единицы продукции составит 67,70 руб. за штуку. Установлено, что за счет внедрения в производство новых видов продукции выручка увеличится за 3 года на 623,88 тыс. руб., что составляет более 8%. Рассчитано и доказано, что инвестиции в этот проект будут достаточно прибыльными, что подтверждается положительным значением чистой приведенной стоимости. Расчетный срок окупаемости проекта составит 4 месяца. Инвестиции в этот проект помогут увеличить рентабельность затрат с 21,21% до 21,39% и рентабельность продаж с 17,50% до 17,62%.

Результаты анализа экономической эффективности реализации проекта по производству функционального хлебобулочного изделия подтверждают рентабельность данного проекта.

Ключевые слова: функциональные продукты питания, запуск производства, рентабельность, чистая текущая стоимость

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Research article

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Elena Y. Bobkova[1], ✉
Dmitry I. Vorobyev[1],
Alla V. Vorobeva[1],
Sofia A. Avdoshkina[1],
Marina V. Temerbaeva[2],
Tatyana I. Uryumtseva[2]

[1] Moscow State University of Technologies and Management named after K.G. Razumovsky, Moscow, Russian Federation
[2] Innovative University of Eurasia, Pavlodar, Republic of Kazakhstan

✉ *vica3@yandex.ru*

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Assessment of economic efficiency of putting the functional food products into production

ABSTRACT

Relevance. Economic efficiency is the most important fact when introduction the new types of products into production. The article represents an assessment of the economic efficiency in case of introducing of the functional food products into mass production. An assessment of the costs of launching products into production has been conducted; the selling price of a unit of production will be 67.70 rubles per one piece. It has been established that due to the introduction of new types of products into production, the proceeds will increase in 3 years by 623.88 thousand rubles, which is more than 8%. It has been calculated and proven that investments in this project will be quite profitable, as confirmed by the positive value of the net present value. The estimated payback period of the project will be 4 months. Investment in this project will help to increase the return on costs from 21.21% to 21.39% and the return on sales from 17.50% to 17.62%.

Results. The results of analysis of the economic efficiency of implementation of project for the production of a functional bakery product, confirm that this project is cost-effective.

Key words: functional foods, start-up, profitability, net present value

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Введение / Introduction

The modern concept of nutrition considers food products not only as a means of supporting human body functions, but also as an important component of health [1–6]. Many years of research experience shows that effective nutrition can influence the health of a nation and enhance it in a given direction [7–11]. Modern food production is a high-tech industry both from the point of view of production technologies and from the point of view of modeling the useful properties and characteristics of the manufactured food products [12–16].

One of such high-tech areas of food production is the production of functional food products [17–18].

When developing and launching the new types of functional products, an important factor is the financial benefit of the manufacturer's enterprise; an assessment of the economic efficiency of introducing a product into production can serve as an effective tool for assessing the financial benefit of an enterprise [19–21]. Analysis of this aspect will make it possible to predict the further development of the enterprise within the framework of the new products launch for one year ahead.

The main indicators for assessing the efficiency of the project include net present value (NPV) — the amount of the expected profit from the calculation of the cost of the product at the moment. Discounted income shows the potential return on investments invested in a business, calculated for 1–2 years in advance.

Reasons for NPV change: investments bring the predicted profit; inflation; risks of losing the investments.

Let's consider the assessment of the economic efficiency of the introducing the functional food products into industrial production.

Материалы и методы/Materials and methods

During the research a range of indicators will be used, which are calculated by the following formulas:

Return on investment:

$$К_{ROI} = \frac{NWC}{CA} \times 100\% , \quad (1)$$

where *NWC* — net working capital,
CA — current assets.

Profitability ratio:

$$R_{sales} = \frac{NP}{ER} \times 100\% , \quad (2)$$

where *NP* net profit,
ER — enterprise revenue.

Return on assets:

$$R_a = \frac{RA}{A} \times 100\% , \quad (3)$$

where *RA* — return on assets;
PP — profit for the period;
A – average value of the assets for the period.

Profitability of production:

$$R_{ск} = \frac{NP}{EC} \times 100\% , \quad (4)$$

where *NP* net profit,
EC — equity capital.

Net present value (Npv) is calculated, using the projected cash flows associated with the planned investment, by the following formula:

$$NPV = \sum_{i=1}^{n} \frac{NCF_i}{(1+r)^i} - lmv , \quad (5)$$

where NCF_i — net cash flow for i^{th} period,
Inv — initial investment,
r — discount rate (cost of capital raised for the investment project).

Discounted present value (present value):

$$PV = FV \times \frac{1}{(1+R)\times n} , \quad (6)$$

where *PV* — discounted present value (present value);
FV — future value;
r — rate of discounts;
n — number of accounted period.

$$FV = PV \times (1 + R) \times n , \quad (7)$$

where *R* — is the rate. It is specified as a fraction of unity;
n — number of years of investments.

Discount coefficient:

$$P = \frac{1}{(1+d)^n} , \quad (8)$$

where *n* — number of years till the moment of reduction,
d — rate of discount.

Total investments:

$$S = S(Y) = Y - C(Y) , \quad (9)$$

where *S* — amount of savings;
S(Y) — function of dependence of savings on the amount of income;
Y — yield;
C(Y) — consumption function.

Результаты и обсуждение / Results and discussion

For the production of new products the enterprise planned to use the existing equipment, including: dough-raising chamber (power consumption is 1.6 kW/h, product capacity — 144 pcs.); convection oven (power consumption is 29 kWh, baking area is 4.32 m^2); planetary mixer (power consumption is 0.6 kW/h, bowl volume is 10 l).

The service life of this equipment according to the technical documentation varies from 7 to 10 years.

The production costs will include the depreciation of the equipment — "Photon 4.5" convection oven (the service life of the equipment is 10 years).

Suppose the annual depreciation rate as follows: 453 000 ÷ 10 = 45 300 rubles, and the depreciation per month will be: 45 300 ÷ 12 = 3775 rubles.

This equipment is supposed to load 54 cassettes of bread forms.

The average time for baking bread is 60 minutes, thus in one business day it makes 7 hours.

It is supposed to bake bread in amount of:
54×7 = 378 pcs.

For a year in case of 6-day working week (299 business days per year, according to the production calendar for a 6-day working week), the following quantity is obtained: 378 × 299 = 113 022 pcs., and 113 022 ÷ 12 = 9418 per month.

The commissioning of new equipment implies an increase in utility costs for water and electric power; so, the total costs will amount to 26 324.03 rubles.

The cost of production will also include utility costs for heating. The company spends 756 491 rubles per year for heating. These costs will be taken into account in proportion to the area occupied by the production line for the new product: 20 m^2 ÷ 580 m^2 = 0.035.

Then the annual costs of heating and lighting, included, the cost of production will be the following:

756 491 × 0.035 = 26 477.19 rubles, and per month: 26 477.19 ÷ 12 = 2206.43 rubles.

Now we should determine the cost of raw materials for the production of a new product. The annual consumption of raw materials required for the production of bakery products will amount to 261 095.21 rubles.

In connection with the launch of a new production line, additional employees are required. So, three (3) more employees will be hired. Let's determine the cost of the employees' wages as 78 120 rubles per year.

The calculation of the cost of production will also include the remuneration for the director, chief accountant and other service staff and auxiliary employees (drivers, cleaners, sales managers, etc.). The monthly wage fund (with deductions) for these employees is 425 570.76 rubles. The volume of these costs will be taken into account in proportion to the monthly production volume:

9418 ÷ 117 725 = 0.08.

The amount of additional costs to pay wages will be as follows:

425 570.76 × 0.08 = 34 045.66 rubles.

We will also include advertising costs in the amount of 30 000 rubles for off-site tastings.

Let's make an estimate of the costs of producing one unit of production (table 1). For its products, the organization sets a margin of 30% of all costs. Manufactured products are classified as goods with VAT of 10%.

Table 1. **Estimates of the costs for production of functional products**

Cost item	The amount of expenses for 1 month, rub.
Wages	94 045.66
Payroll deductions	28 401.79
Depreciation of equipment	3775.00
Selling expenses (advertising)	30 000.00
Communal expenses	28 530.46
Raw materials and basic materials	261 095.21
TOTAL costs	445 848.12
Total costs for 1 unit of bakery product	47.34
Profit (30%)	14.20
VAT (10%)	6.15
Total, selling price	67.70

Table 2. **Calculation of sales proceeds**

Index	Project implementation period, years		
	2020	2021	2022
The number of products sold in kind, pcs.	113 022	113 022	113 022
Unit price, rub.	67.70	70.41	73.22
Proceeds from product sales, rub.	7 651 589.40	7 957 879.02	8 275 470.84

Table 3. **Estimates of the cost for production of functional products in 2020–2022**

Cost item	2020	2021	2022
Wages	94 045.66	96 961.08	99 966.87
Payroll deductions	28 401.79	29 282.24	30 189.99
Depreciation of equipment	3775.00	3775.00	3775.00
Selling expenses (advertising)	30 000.00	30 000.00	30 000.00
Communal expenses	28 530.46	29 414.90	30 326.77
Raw materials and basic materials	261 095.21	268 928.07	277 264.84
TOTAL costs	445 848.12	458 361.29	471 523.47
Total costs for 1 unit of bakery product	47.34	48.67	50.07
Profit (30%)	14.20	14.60	15.02
VAT (10%)	6.15	6.33	6.51
Total selling price	67.70	69.60	71.60

Table 4. **Planned financial results from the production and sale of products in 2020–2022**

Index	2020	2021	2022
Revenue	7650 645.38	7 866 001.05	8 091 718.28
Cost of sales	6 045 614.88	6 215 791.04	6 394 155.00
Profit from product sales	1 605 030.50	1 650 210.01	1 697 563.27
Income tax (20%)	321 006.10	330 042.00	339 512.65
Net profit	1 284 024.40	1 320 168.01	1 358 050.62

Thus, the selling price of a unit of production will be 67.70 rubles. per unit of production. Retail stores can set a markup on goods in the amount of 15% of the cost of goods, which will amount to 77.86 rubles.

Analysis of the regional market showed that the price for a similar product ranges from 70 to 100 rubles per unit of product. Consequently, the new product will be competitive in the market.

Let's calculate in table 2 the volume of proceeds from the sale of a new product in the future for 3 years. In our calculations, we will adjust the price for an inflation rate of 4%.

According to the presented calculations, over 3 years, the proceeds from the sale of products will increase by 623.88 thousand rubles, or 8.2%.

Let's present a forecast of the production cost in the future for 3 years. To do this, we will adjust the calculation of the unit cost for the inflation index (3.1%). The calculations are presented in table 3 below.

We will calculate the planned financial results from the production and sale of functional products in 2020–2022, the results will be represented below in table 4.

Based on the results of the calculations, it can be seen that the net profit in 2022 compared to 2020 will increase by 6%. Consequently, the introduction of a new production line helps to increase the profitability of the enterprise.

Now we should determine the net present value (table 6). First, you need to determine the amount of investment for the new product launch (table 5). These costs will only include costs incurred in connection with the start of production of a new product (i.e., they do not include the wages of administrative and management officers, do not include heating costs that were present before the production of the new product).

Table 5. **Investments for the project development**

Cost type	Amount, rub.
Communal expenses	26 324.03
Raw material costs	261 095.21
Payroll expenses with deductions	78 120.00
Advertising	30 000.00
Total costs	395 539.24

Table 6. **Net present income and payback period of a functional bakery products**

Index	2020г.
Income	7 650 753.80
Expenses	63 66711.20
Discount rate	0.055
Discounted income in the period	1 217 101.99
Initial investment and cost capital	395 539.24
Net present value	821 562.74
Payback period	0.31

The project to introduce new types of functional bakery products into production will start pay off after 4 months of the enterprise operation. The positive value of the net present value suggests that the investment in the project will be profitable.

Based on results of the analysis of economic efficiency of project for the of the functional bakery food items, we can confirm that this project is cost-effective. Investment in the project in the amount of 395.5 thousand rubles are profitable, the company investing in the project will fully recoup its investment and increase profits.

The investment of funds required for implementation of this project will help to increase the return on costs from 21.21% to 21.39%, will increase the return on sales from 17.50% to 17.62%.

Выводы / Conclusion

According to the presented calculations, over 3 years, the proceeds from the sale of products will increase by 623.88 thousand rubles, or 8.2%. The cost of production in the first year of production is of greatest importance. Based on the results of the calculations, it can be seen that the net profit in 2022 compared to 2020 will increase by 6%. Consequently, the launch of a new production line helps increasing the enterprise profitability.

Assessment of economic efficiency showed a positive value of net present value, which proves the profitability of the project.

The project of putting the new type of functional bakery products into production will begin to pay off after 4 months of the enterprise operation. The project investments in amount of 395.5 thousand rubles are mathematically confirmed to be profitable. Over the next three years the company will increase its profit. The payback period of the project will be 4 months.

The investment of funds for this project implementation will help to increase the return on costs from 21.21% to 21.39% and the return on sales from 17.50% to 17.62%.

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All authors bear responsibility for the work and presented data.

All authors have made an equal contribution to this scientific work.
The authors were equally involved in writing the manuscript and bear the equal responsibility for plagiarism.
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ОБ АВТОРАХ:

Елена Юрьевна Бобкова,
кандидат экономических наук, доцент,
Московский государственный университет технологий и управления им. К.Г. Разумовского (первый казачий университет), 73, ул. Земляной Вал, Москва, 109004, Российская Федерация
E-mail: vica3@yandex.ru
https://orcid.org/0000-0002-8934-1842

Дмитрий Игоревич Воробьев,
кандидат экономических наук, доцент,
Московский государственный университет технологий и управления им. К.Г. Разумовского (первый казачий университет), 73, ул. Земляной Вал, Москва, 109004, Российская Федерация
E-mail: d.vorobyev@mgutm.ru
https://orcid.org/0000-0002-8429-5752

Алла Викторовна Воробьева,
кандидат экономических наук, доцент,
Московский государственный университет технологий и управления им. К.Г. Разумовского (первый казачий университет), 73, ул. Земляной Вал, Москва, 109004, Российская Федерация
E-mail: avorobiova@mail.ru
https://orcid.org/0000-0003-3897-9560

Софья Александровна Авдошкина,
Магистр, Московский государственный университет технологий и управления им. К.Г. Разумовского (первый казачий университет), 73, ул. Земляной Вал, Москва, 109004, Российская Федерация
E-mail: s.avdoshkina@mgutm.ru
https://orcid.org/0000-0002-2246-2885

Марина Викторовна Темербаева,
Кандидат технических наук, профессор,
Инновационный Евразийский университет, 45, ул. Ломова, Павлодар, 140008, Республика Казахстан
E-mail: marvik75@yandex.ru
https://orcid.org/0000-0001-9796-8031

Татьяна Игоревна Урюмцева,
кандидат ветеринарных наук, профессор,
Инновационный Евразийский университет, 45, ул. Ломова, Павлодар, 140008, Республика Казахстан
E-mail: vbh2@mail.ru
https://orcid.org/0000-0002-7980-8242

ABOUT THE AUTHORS:

Elena Yurievna Bobkova,
Candidate of Economic Sciences, Associate Professor,
K.G. Razumovsky Moscow State University of technologies and management (The First Cossack University), 73 Zemlyanoy Val, Moscow, 109004, Russian Federation
E-mail: vica3@yandex.ru
https://orcid.org/0000-0002-8934-1842

Dmitry Igorevich Vorobyev,
Candidate of Economic Sciences, Associate Professor,
K.G. Razumovsky Moscow State University of technologies and management (The First Cossack University), 73 Zemlyanoy Val, 109004, Moscow, Russian Federation
E-mail: d.vorobyev@mgutm.ru
https://orcid.org/0000-0002-8429-5752

Alla Viktorovna Vorobeva,
Candidate of Economic Sciences, Associate Professor,
K.G. Razumovsky Moscow State University of technologies and management (The First Cossack University), 73 Zemlyanoy Val, 109004, Moscow, Russian Federation
E-mail: avorobiova@mail.ru
https://orcid.org/0000-0003-3897-9560

Sofia Aleksandrovna Avdoshkina,
Master,
K.G. Razumovsky Moscow State University of technologies and management (The First Cossack University), 73 Zemlyanoy Val, 109004, Moscow, Russian Federation
E-mail: s.avdoshkina@mgutm.ru
https://orcid.org/0000-0002-2246-2885

Marina Viktorovna Temerbaeva,
Candidate of Technical Sciences, Associate Professor, Innovative University of Eurasia, 45 Lomov str., Pavlodar, 140008, Republic of Kazakhstan
E-mail: marvik75@yandex.ru
https://orcid.org/0000-0001-9796-8031

Tatyana Igorevna Uryumtseva,
Candidate of Veterinary Sciences, Associate Professor, Innovative University of Eurasia, 45 Lomov str., Pavlodar, 140008, Republic of Kazakhstan
E-mail: vbh2@mail.ru
https://orcid.org/0000-0002-7980-8242