UCC 639.3.003.13

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EFFICIENCY OF GROWING MARKETABLE CARP

Every year it becomes more and more difficult to provide the population with fish food. Resources of the seas and oceans are being exhausted due to intensive industrial activities. As a result of deterioration of the ecological situation, fishing in the inland waters is managed to be maintained at a rather low level.

All the above-mentioned factors have transformed into a problem that has led to a large-scale reduction in the biomass of commercial fish, and the most valuable species are on the verge of extinction. In such situation, the real sources of replenishment and growth of fishery products are the pond and industrial fish production, which allow to reduce the industrial load on the natural fish populations as well as to increase significantly the amount of fish in people's food assortment. Fish farming will not solve the food problem of Ukraine, but there is no doubt that to some extent it will be able to weaken it and give people a valuable dietetic product [2].

According to statistics, the catch of fish and other aquatic bio-resources in water reservoirs of Ukraine has amounted to 61.0 thousand tons, which is 10.6 percent more than in the same period of the previous year (55.2 thousand tons).

The total area of water reservoirs and ponds of Ukraine is about 1 million hectares, among them water storage reservoirs occupy about 800 thousand hectares, ponds 122.5 thousand hectares, lakes 86.5 thousand hectares, basins – coolers 13.5 thousand hectares, other categories 6 thousand hectares. Stocking of these reservoirs makes it possible to obtain a significant amount of marketable fish products without significant costs for expensive feed and fertilizers.

In this regard, the issues of fish farming development in the inland reservoirs, enhancement of the efficiency of fish production in ponds, reservoirs and lakes, expansion of the geography of fish farms of industrial type, resettlement of thermophilic pond fisheries in the northern and eastern regions with the use of warm waters of industrial enterprises are urgent and perspective [4].

To solve such a complex problem as overcoming the crisis that fish farms are experiencing and ensuring their further development, and therefore, implementation of priorities defined by the Government of Ukraine to ensure sustainable economic development of Ukraine as a precondition for enhancing the welfare of the population, it is necessary to develop and implement a state target program for fish farming development in Ukraine [5].

Keywords: *ponds, fish industry, carp, growing, fish stocking material, stocking*
Tab. 6. Ref. 5.

Formulation of the problem. Considering the current situation as well as trends and peculiarities of fish farming development in the region, there is need for intervention at different levels regarding the leasing of water bodies and development of the fish industry. The number of water basins causes the necessity to promote the development of commercial fish farming, provide a competitive environment and establish new fish processing enterprises.

Analysis of recent research and publications. The vast majority of research on the topic is an integral part of the scientific topic «Technology of Marketable Fish Production», which is currently being developed at the Department of Feeding of

Farm Animals and Aquatic Bio-resources of the Faculty of Technology of Production and Processing of Livestock Products of Vinnytsia National Agrarian University.
Scientific themes and programs on fish farming are focused on the priority solving of problems of supplying the population with fish products, improvement of fish production in pond farms, warm waters, adapted reservoirs, small storage reservoirs, optimization of production of food fish products.

Research methods and methodology. To conduct this research, there were used primary and secondary documents, namely, annual reports on the breeding and fishing of marketable fish in the ponds of «Magnolia» LLC, reports on the main indicators of the enterprise. Primary accounting documentation, e.g. acts on stocking and catching, was also used.

In the course of research, there were used ponds, implements, materials for catching fish, transport machines and mechanisms, as well as living material, namely, two-year-old carps and herbivorous fish.

The purpose of the research was to investigate the mechanism of marketable fish production in the local conditions.

Research results. The research was conducted in the fish farm «Magnolia» LLC in such categories of ponds as nursery ponds and finishing ponds. The farm specializes in production of marketable fish as well as production of fish stock.
The fish farm «Magnolia» LLC is located within the Local Council of village Ivanivtsi, Bar region. The farm is located in 5 km from the small town of Bar, Vinnytsia oblast. The territory of the village is located in the Forest-Steppe zone.
The climate of the region is moderately continental. Winter is mild with frequent thaws. The summer is somewhat arid. The average air temperature in January is – 4-6° C, in July + 20-+ 22°C. The period with the temperature of +10°C lasts about 140 days. The growing season, which is favorable for breeding thermophilic fish species, does not exceed 105 days. The rate of precipitation is up to 650 mm per year, the bulk of which falls during the warm season.

The typical soils of the region are gray forest, dark gray podzolized, sandy and clay-sandy, while lowlands are sometimes wetlands. The relief is flat.

The system of water supply in the ponds is combined. The ponds can be drained. The dams are in proper condition. Water outlets and inlets are reinforced concrete. Each pond has a filter system. The ponds are fertilized with mineral and organic fertilizers to improve the feed base, in addition, liming, land reclamation and nutrition are applied.

The source of water supply to the farm is the surface water formed by precipitation and water from the River Topirets. The ponds are filled by a natural stream. Indicators of water quality of the source of water supply to the farm are presented in table 1.

Analyzing the data presented in Table 1, it can be concluded that the hydrochemical indicators of water quality in the River Topirets meet the requirements

for the quality of water that should be supplied to fish farms. In particular, oxygen content in the water is 4.8-5.9 mg/l, hydrogen pH is 6.6-7.6, reaction of the environment is slightly alkaline, permanganate oxidation ranges within 6.0-8.2 g O_2/l indicating that the content of fast oxidizing organic matter is insignificant; bichromate oxidation is 34-45, which is within the normal range. Hydrogen sulfide dissolved in water has not been detected, and the content of free ammonia does not exceed the permissible standards [3].

Table 1

Basic water characteristics of the source of water supply to the ponds from the river Topirets

Indicators	Normative values of water quality in the ponds used for fish-farming	Hydrothermal indicators of water quality
Hydrogen index of water, pH	6.5-8.5	6.6-7.6
Soluble oxygen, mg/l	4.0-6.0	4.8-5.9
Free ammonia NH_3, mgN/l	0.05	0.01-0.02
Nitrates NO_3^-, mgN/l	up to 2	0.02-0.03
Phosphates PO_4^{3-}, mgP/l	0.3-0.5	0.15-0.2
Permanganate oxidation, mg O/l	up to 15	6.0-8.2
Bichromate oxidation, mg O/l	up to 50	34-45
Rate of mineralization, mg/l	up to 1,000	713-816

The nutritional regime of water in the river by the content of nitrates and phosphates is within the normal range.

Therefore, according to the data given above, it can be concluded that the natural climatic conditions in which the farm is located are favourable for fish production in this area. The total area of the farm is 43.5 ha. The structure water of resources of «Magnolia» LLC is presented in Table 2.

Table 2

Exploration of the water fund of Magnolia LLC'

Type, category of the water reservoir	Area, ha%	%
Ponds, total	43.5	100
including,		
• finishing	30	69
• nursery	8	18.4
• overwintering	1.5	3.5
• spawning	1	2.1
• quarantine	3	7

Depending on the time of snow and ice melting, stocking of the finishing ponds in the conditions of «Magnolia» LLC was conducted in spring from April 5 to April 12 when the water temperature was 7-9°C. Feed resources of the ponds, the average individual mass of marketable fish during the autumn catching, and a set of planned measures on the intensification of the growth and output of marketable fish were taken into account.

The main stocking was carried out at the expense of the farm's carp fish

stocking material and the purchase of herbivorous fish in other specialized fish farms. The finishing pond became stocked with carp fish stocking material in polyculture, namely, carp, silver carp, and grass carp.

Due to the fact that the stocking was carried out using farm's overwintering ponds and additional measures aimed to prevent the temperature shock were not taken, we compared the water temperature in the container with fish with the water temperature in the pond, pouring several buckets of water from the pond into the container. In 10-15 minutes, the fish adapted and was discharged into the pond. During transportation, the fish was treated with malachite blue for prophylactic purposes. It is better to discharge the fish into the reservoir from the non-windy side and when the water outlet is closed [4].

Drawing up a report on stocking the pond was carried out in the day of stocking having indicated the number of fish stocked, its average weight and condition as well as weather conditions during stocking (Table 3).

Table 3

Results of stocking finishing ponds

Indicators	carp	Finishing pond		
		No 1		No 2
Fish species		silver carp	carp	silver carp
Pond area, ha	1.2	1.2	1.5	1.5
Stocking density, fish/ha	1,500	500	800	800
Stocked annuals, fish number	1,800	600	1,200	1,200
Weight of 1 fish, kg	0.051	0.26	0.051	0.27
Total weight, kg	92	156	61	324
Total				
stocked, fish number		2,400		2,400
total weight, kg		248		385

The results of this table indicate that the finishing pond No 1 was stocked with one-year-old carps and two-year-old silver carps, totaling 2,400 and weighing 248 kg. Pond No 2 was stocked with the same fish, which amounted to 2,400 and had a total mass of 385 kg. In the farm one-year-old fish was calculated during stocking by volume using a weight method. Transportation of farm one-year-old fish in the feeding ponds was performed by live-fish machines.

The main indicators that affect the intensive nutrition and growth of fish are water temperatures of 15°C and above. The average monthly water temperature in the experimental ponds is given in Table 3.

According to the data presented in Table 3, the temperature regime of the water in the farm allows to achieve high weight gains by one-year-old fish during May – September.

When the water temperature was higher than 10°C, organic fertilizers (cattle and horse manure) were applied in the experimental ponds during the growing season to stimulate an appropriate level of development of feed hydro-bionts, avoid the

phenomenon of "shortness of breath" and improve the ecological status. The amount was close to optimal norms and depended on the specific pond and other factors [1].

In recent years, there is a tendency towards the increase in the water temperature in the first months of growing (Table 4).

Table 4

Average monthly water temperature of finishing ponds

Years	Month						Positive temperature
	May	June	July	August	September	October	(15°C and more) Number of days
Average monthly temperature, °C							
2016	18.5	19.1	20.2	21.3	18.0	16.2	120
2017	19.3	19.4	20.3	21.1	18.1	16.3	123
2018	22.3	20.9	21.1	22.4	18.0	16.4	129

The average annual number of days with the temperature of 15°C or higher averages 124 days over three years. When the water temperature is 8-10°C, nutrition and growth of fish decreases, and it stops at all when the temperature falls below 8°C. The oxygen regime is monitored in the farm throughout the growing period. The oxygen regime is an important factor that determines the growth and intensity of feed consumption by fish as well as the use of artificial feeds. The decrease in oxygen concentration acts as a signal for appetite deterioration. The decrease in oxygen content in water is often accompanied by changes in the values of other parameters, such as an increase in the concentration of ammonia, urea, nitrates that suppress the growth. Therefore, quicklime was purchased by the farm at the rate of 300 kg/ha in order to prevent a sharp reduction of the dissolved oxygen content in the water below permissible standards for carp fish species.

Table 5

The content of dissolved oxygen in water and water temperature in the finishing pond

Date	Content of O_2, mg/l	Water t°, °C
April 12, 2018	6.1	12
April 26, 2018	5.8	14
May 12, 2018	5.6	16
May 26, 2018	5.5	19
June 12, 2018	5.3	23
June 26, 2018	5.2	23
July 12, 2018	4.0	24
July 26, 2018	4.7	26
August 12, 2018	4.6	24
August 26, 2018	4.7	23
September 12, 2018	4.8	23
September 26, 2018	5.2	19
October 12, 2018	5.4	18

Having analyzed the research results on the content of dissolved oxygen in the

water and temperature (Table 5), we have concluded that the content of dissolved oxygen in water and water temperature are inversely dependent, i.e. when temperature increases, the content of dissolved oxygen in the water decreases. The studied indexes on the ponds did not decrease to critical values (the content of dissolved oxygen in water was 2.0-2.5 mg/l) under the optimum concentration of dissolved oxygen in water of 5-7 mg/l.

The water in ponds met with the requirements of GOST 15.378.87 throughout the growing season. The indicators ranged within normal values due to the terrain on which the ponds were located and the area of ponds, where aeration took place in windy weather.

The water in the ponds of the farm under research is of good quality and meets fishery requirements by a vast majority of chemical parameters, so that marketable fish can be grown in them.

The amount of basic biogenic indicators of nitrogen and phosphorus (ammonium ion, nitrites, nitrates and phosphates), total iron and silicates (silicon) meets the requirements of fishery standards.

The water in the ponds is of the hydrocarbonate class and the amount of chlorides and sulfates among anions is small (27 mg/l and 30-50 mg/l, respectively). Hydrocarbonates (330-347 mg/l) dominate in the water of the reservoirs, which is quite characteristic of the water reservoirs of the Forest-Steppe zone of Ukraine. In other reservoirs, these values reach the values of 500-550 mg/l, but by the effect of hydrocarbonates they have little impact on the biological characteristics and performance of fish.

As for herbivorous fish, phytoplankton is the basis of nutrition (excluding detritus) for white fathead fish, zooplankton for variegated fathead, macrophytes for white cupid, and zoobenthos for carp. In addition, many plankton and benthos organisms develop and live in different conditions, and therefore, they are indicators of water quality. That is why on-going aquatic biological control of reservoirs is conducted [4].

Due to a large amount of organic fertilizers applied, zooplankton of the ponds was characterized by insufficient quantitative development, which is typical for the spring period. The average number and biomass of organisms was 1,826 units/m^3 and 1.488 g/m^3.

Basic fertilizers were applied in the tributary, and therefore, in quantitative terms, zooplankton was at the top of the ponds; in the middle and subdam parts the total amount and biomass of zooplankton grouping were significantly higher (1.6-1.2 more in the amount and 4.3-3.7 times more in biomass, respectively) than in the top part. Among major taxonomic groups, rotifers dominated by biomass comprising 59-65% of the total biomass.

A rather high level of secondary production and significant nutritional value make zooplankton feed number one for many aquatic animals, including fish, namely

adult fish – planktophages and young fish of all species (benthophages and predators). Due to its high calorie content (4,640 cal/g of dry weight) and substantial nutrient content, zooplankton with the predominant development of rotifers is a valuable feed for many young fish species in the early stages of post-embryonic development.

As a result of the study of zoobenthos development in the experimental ponds, it has been established that the qualitative composition of the bottom fauna in all ponds was similar. The basis of biomass was presented by the larvae of *Chironomidae*, *Oligochaeta*. At the beginning of the growing season, biomass was low in most ponds. From the end of July till the end of the growing season, the biomass remained satisfactory only in some ponds, and in some ponds it was quite high. However, the bottom organisms were not found at all in many ponds.

In general, the biomass of zoobenthos in the ponds during the seasons varied within <0.01-3.28 g/m^2, and the average seasonal values were 0.10-1.49 g/m^2 (Table 6).

Table 6

Indicators of zoobenthos development in the experimental ponds, *g/m^2*

No of pond	Month				
	May	June	July	August	Average
1	0.11	0.32	0.24	0.08	0.14
2	–	1.13	3.12	0.09	1.36

Compared to zooplankton, the development of zoobenthos was much less intensive in pond No1, and biomass dynamics showed an outbreak, which is explained by the increased density of carp stocking. Approximation of zoobenthos development to satisfactory indicators was observed only at the beginning of the growing season, namely in June and July. By August and September, the bottom fauna was sharply impoverished, which could be substantially explained by the nature of the life cycles of the main representatives during the season and the impact of the carp press, which is a zoobenthophage [1].

The main zoobenthos of the water reservoir was represented mainly by the larvae of *Chrinomidae* and *Oligochaeta*, whil Dreissen dominated among molluscs and its biomass exceeded 10 kg/m^2 in some areas.

Higher aquatic vegetation in the water reservoir was developed satisfactorily and it was represented mainly by submerged vegetation, e.g. *Potamogeton* and *Ceratophyllum*, whil *Typhaceae* was destroyed along the banks. As for air-aquatic vegetation, *Phragmites communis* and *Typha angustifolia L.* prevailed.

These indicators show that, according to all the hydro-chemical and hydro-biological parameters studied, the water in ponds meets the fishery standards and it is suitable for production of marketable fish and further sale of live fish.

Conclusions and prospects for research. The farm feeds fish with farm-made feedstuffs having feed coefficient that ranges within 2.3-4.6 kg per kilogram of carp weight gain.

The growth of carps in ponds differs significantly in the second half of growing period. Control catches have showed that under the same weight of carp planted for cultivation (50 g), the final weight was 740 g in the case of semi-intensive technology of growing and 900 g when applying intensive production technology.

Analysis of cost-effectiveness has shown that it is more expedient to grow carp than herbivorous fish, since this increases the amount of products sold, enhances profitability rate, and therefore the profit.

To get maximum weight gains and use rationally natural feeds, it is suggested to grow marketable fish in polyculture, using predatory fish as natural biomeliorators. To stock the finishing ponds, the fish stock having increased weight (30-50 g) should be used to obtain the weight of marketable carp that is higher than the standard one because there is a higher demand for it and it has a higher selling price.

Список використаної літератури

1. Алхімова Ю.М. Незнамов С.О., Шерман І.М. Вплив абіотичних і біотичних факторів середовища ставів, побудованих на торф'яних і піщаних грунтах, на ефективність вирощування цьоголітків коропових. *Таврійський науковий вісник. Вип. 84*. Херсон, 2013. С. 238-242.
2. Калетнік Г.М. Планування діяльності підприємств: навч. посіб. для студ. вищ. аграр. навч. Закладів. *М-во аграр. політики України, ВДАУ*. Вінниця. Енозіс, 2008. 300 с.
3. Мушит С.О. Економічна ефективність нерестину, як стимулятора нерестового стану плідників білого амура. *Збірник наук. праць ВНАУ*. 2017. Вип. 4(98). С. 252-255.
4. Мушит С.О. Якісні показники молок білого амура при різних способах відтворення. *Збірник наук. праць ВНАУ*. 2013. Вип. 2(72). С. 120-124. (Сільськогосподарські науки).
5. Шерман І.М., Данильчук Г.А., Незнамов С.О. Екологія та технологія виробництва рибо посадкового матеріалу коропових в умовах півдня України: *Наукова монографія*. Херсон: Грінь Д.С., 2014. 228с.

References

1. Alkhimova Yu. M. Neznamov S.O., Sherman I.M. Vplyv abiotychnykh i biotychnykh faktoriv seredovyshcha staviv, pobudovanykh na torfianykh i pishchanykh hruntakh, na efektyvnist vyroshchuvannia tsoholitkiv koropovykh. Tavriiskyi naukovyi visnyk. Vyp. 84. Kherson, 2013. S. 238 – 242.
2. Kaletnik H. M. Planuvannia diialnosti pidpryiemstv: navch. posib. dlia stud. vyshch. ahrar. navch. Zakladiv. M-vo ahrar. polityky Ukrainy, VDAU. Vinnytsia. Enozis, 2008. 300 c.
3. Mushyt S. O. Ekonomichna efektyvnist nerestynu, yak stymuliatora nerestovoho stanu plidnykiv biloho amura. Zbirnyk nauk. prats VNAU. 2017. Vyp. 4 (98). S. 252–255.
4. Mushyt S. O. Yakisni pokaznyky molok biloho amura pry riznykh sposobakh vidtvorennia. Zbirnyk nauk. prats VNAU. 2013. Vyp. 2 (72). S. 120−124. (Silskohospodarski nauky).
5. Sherman I.M., Danylchuk H.A., Neznamov S.O., et al. Ekolohiia ta tekhnolohiia vyrobnytstva rybo posadkovoho materialu koropovykh v umovakh pivdnia Ukrainy: Naukova monohrafiia. Kherson: Hrin D.S., 2014. 228s.

АННОТАЦІЯ
ЕФЕКТИВНІСТЬ ВИРОЩУВАННЯ ТОВАРНОГО КОРОПА

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З кожним роком все важче стає забезпечити населення харчовою рибопродукцією. Ресурси морів і океанів у зв'язку з активним промислом вичерпуються. Вилов риби у внутрішніх водоймах внаслідок погіршення екологічної ситуації вдається підтримувати тільки на досить низькому рівні.

Все вище зазначене переросло у проблему, яка призвела до масштабного скорочення біомаси промислових риб, а найбільш цінні види опинилися на межі повного зникнення. У такій ситуації реальними джерелами поповнення та зростання рибної продукції є ставове та індустріальне рибництво, які дозволяють знизити промислове навантаження на природні популяції риби, а також значно збільшити кількість її в асортименті продуктів харчування кожного з нас. Звичайно, рибництво не вирішить продовольчу проблему України, але те, що у певній мірі воно зможе послабити її і дати людям цінний дієтичний продукт, є безсумнівним [2].

За статистичними даними вилов риби та інших водних біоресурсів у водоймах України склав 61,0 тис. т, що на 10,6 відсотка більше аналогічного періоду минулого року (55,2 тис. т).

Загальна площа водоймищ та ставків України становить близько 1 млн. га, з них водосховищ близько 800 тис. га, ставків – 122,5 тис. га, озер – 86,5 тис. га, водойм – охолоджувачів – 13,5 тис. га, інших категорій – 6 тис. га. Зариблюючи ці водойми, є можливість одержувати значну кількість товарної рибопродукції без особливих затрат дорогих кормів і добрив.

У зв'язку з цим очевидні актуальність і перспективність розвитку рибного господарства на внутрішніх водоймах, підвищення ефективності виробництва риби в ставах, водосховищах і озерах, розширення географії рибницьких господарств індустріального типу, розселення теплолюбних об'єктів ставового рибництва у північні та східні області з використанням теплих вод промислових підприємств [2].

Для розв'язання такої комплексної проблеми, як виведення рибного господарства з кризового стану та забезпечення його подальшого розвитку, та, відповідно, виконання пріоритетів діяльності уряду України щодо забезпечення сталого економічного розвитку України як передумови зростання добробуту її населення, є необхідним розроблення та виконання державної цільової програми розвитку рибного господарства України [5].

Ключові слова: *стави, рибна галузь, короп, вирощування, рибопосадковий матеріал, зариблення*

Табл.6 . Лит.5.

АННОТАЦИЯ
ЭФФЕКТИВНОСТЬ ВЫРАЩИВАНИЯ ТОВАРНОГО КАРПА

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С каждым годом все труднее становится обеспечить население пищевой рыбопродукцией. Ресурсы морей и океанов в связи с активным промыслом исчерпываются. Вылов рыбы во внутренних водоемах вследствие ухудшения экологической ситуации удается поддерживать только на достаточно низком уровне.

Все вышеперечисленное переросло в проблему, которая привела к масштабному сокращению биомассы промышленных рыб, а наиболее ценные виды оказались на грани полного исчезновения. В такой ситуации реальными источниками пополнения и рост рыбной продукции является прудовое и индустриальное рыбоводство, которые позволяют снизить промышленную нагрузку на природные популяции рыбы, а также значительно увеличить ее количество в ассортименте продуктов питания каждого из нас. Конечно, рыбоводство не решит продовольственную проблему Украины, но то, что в определенной степени оно сможет ослабить ее и дать людям ценный диетический продукт, является несомненным.

По статистическим данным вылов рыбы и других водных биоресурсов в водоемах Украины составил 61,0 тыс. т, что на 10,6 процента больше аналогичного периода прошлого года (55,2 тыс. т).

Общая площадь водоемов и прудов Украины составляет около 1 млн. га, из них водохранилищ около 800 тыс. га, прудов 122,5 тыс. га, озер 86,5 тыс. га, водоемов – охладителей 13,5 тыс. га, других категорий – 6 тыс. га. Зарыбливая эти водоемы, есть возможность получать значительное количество товарной рыбопродукции без особых затрат дорогих кормов и удобрений.

В связи с этим очевидны актуальность и перспективность развития рыбного хозяйства на внутренних водоемах, повышение эффективности производства рыбы в прудах, водохранилищах и озерах, расширение географии рыбоводческих хозяйств индустриального типа, расселения теплолюбивых объектов прудовых рыбных хозяйств в северные и восточные области с использованием теплых вод промышленных предприятий.

Для решения такой комплексной проблемы, как вывод рыбного хозяйства из кризисного состояния и обеспечения его дальнейшего развития, и, соответственно, выполнения приоритетов деятельности правительства Украины по обеспечению устойчивого экономического развития Украины как предпосылки роста благосостояния ее населения, необходимы разработки и выполнение государственной целевой программы развития рыбного хозяйства Украины.

Ключевые слова: *пруды, рыбная отрасль, карп, выращивание, рыбопосадочный материал, зарыбление*

Табл.6. Лит.5.

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