WP2.
Implementation and investment plans in case areas.

Kutno County Case Area, Poland

Action Plan for improvement of water retention in the Bedlno commune

(Version 2.0)

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Title	Waterdrive case areas. Implementation and investment plans in case areas. Kutno County Case Area, Poland
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1. Goal

To develop an Action Plan to improve water retention for Bedlno commune together with suggested investments, and funding sources. The action plan will include 3 groups of actions:

(1) joint creation of a controlled drainage system,

(2) promotion of selected good agricultural practices, and

(3) optimization of landscape structure.

The Action Plan will be developed in collaboration between the main actors: water authority, farmers associated in water company, local and regional authority.

2. Description of Bedlno Commune

Bedlno Commune is one of 10 communes in the Kutno County (Polish Waterdrive Case Area), district which has been selected for testing Waterdrive approach in the catchment scale.

The choice was determined by 3 factors: (1) there is main stream and the river catchment is located in central part of commune area; (2) 90% of the land is agricultural land, mainly drained, and finally (3) Bedlno Water Company (association of farmers) is the most effective water company in the Lodzkie Province.

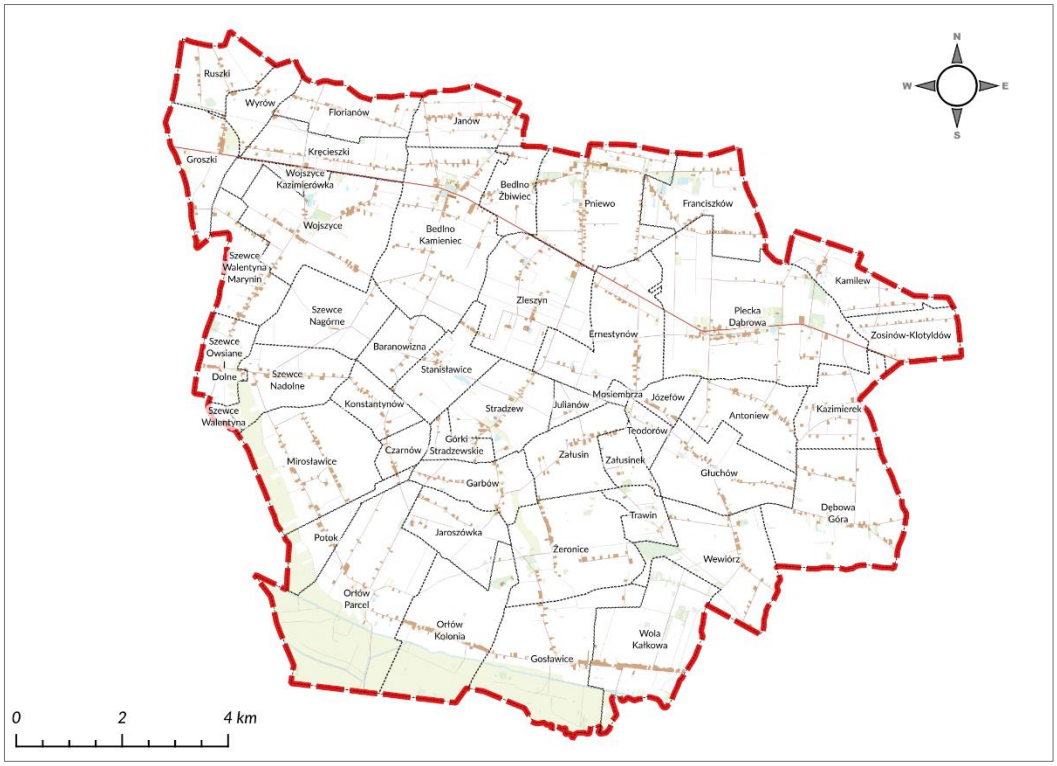

Fig. Bedlno Commune

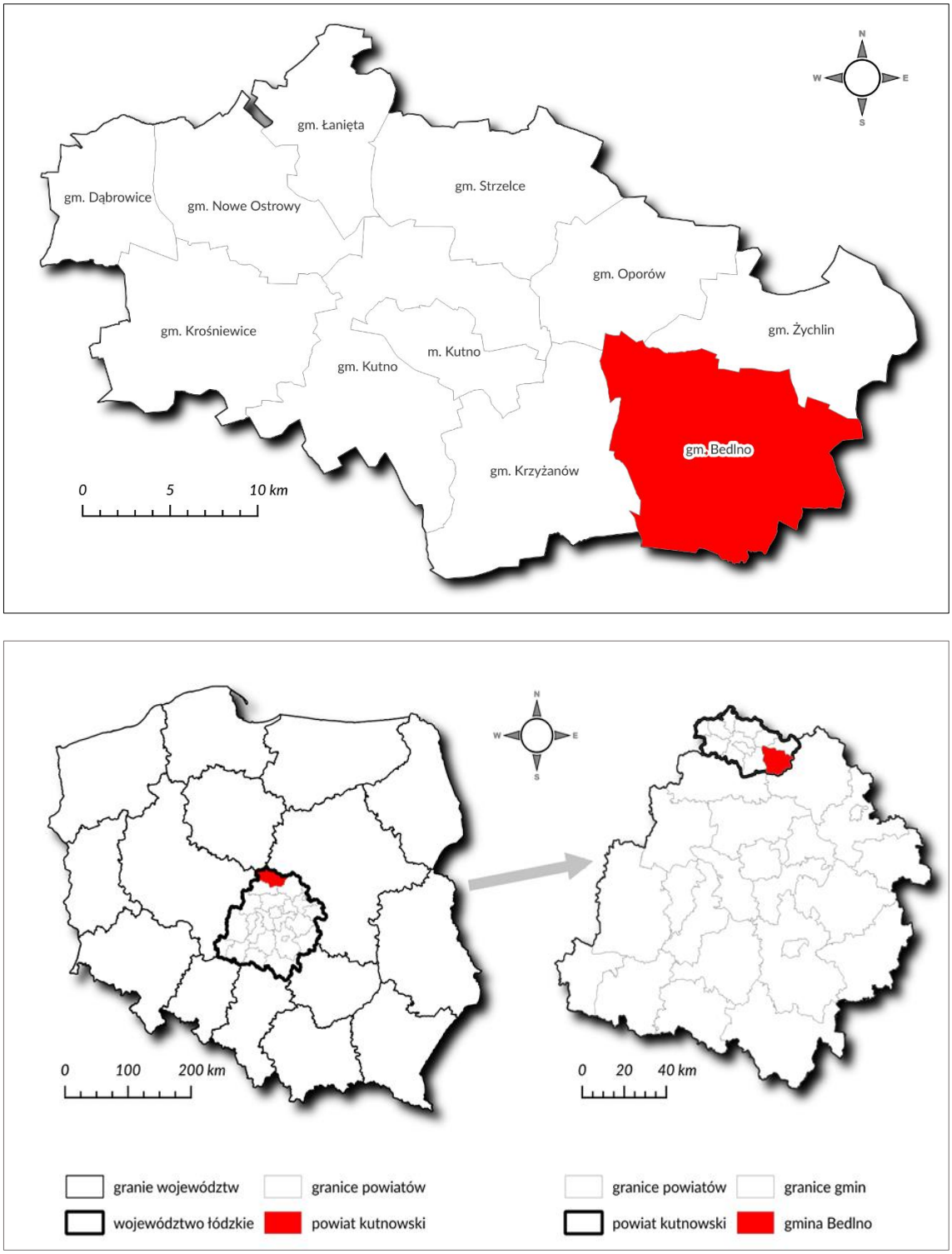

Fig. Location of Bedlno commune in Kutno county (top map) and in Lodzkie in Łódzkie voivodship and Poland (bottom map)

2.1. Climate

The climate is similar to the climate prevailing in the entire lowland area of Poland. Temperatures are influenced by both continental and oceanic air. The annual temperature amplitude is 21.7 °C, and the 30-year average in January: - 3.3 °C; in July: 18.4 °C.

Bedlno commune lies in the zone of the lowest precipitation in Poland. Their average annual sum is 550 mm, but in individual years it can be much lower. Lack of precipitation causes the phenomenon of agricultural steppe. This process is aggravated by small forest cover and very intensive agriculture carried out in the whole Kutno district. Most precipitation occurs in the summer, especially in July, when it falls about 17% of all rainfall in the year. The least amount of precipitation is recorded in winter months and March.

2.2. Terrain topography

The Bedlno commune is situated on the Kutno plain - a physico-geographical mesoregion in central Poland, forming the north-western part of the Central Mazovian Lowland. The mesoregion is a flat, south-sloping denudation plain situated at an altitude of 90-100 m above sea level. In the western part of the plain there are moraine hills in the form of monadnocks (the so-called Kutno moraines) with heights of up to 160 m.

Elevation in the Bedlno commune varies from 130 m a.s.l. in the North and in the spring section of the Stradzewski Cannel to 90 m a.s.l. in lowland area in the South, in the valley at the mouth of the river to the Bzura River

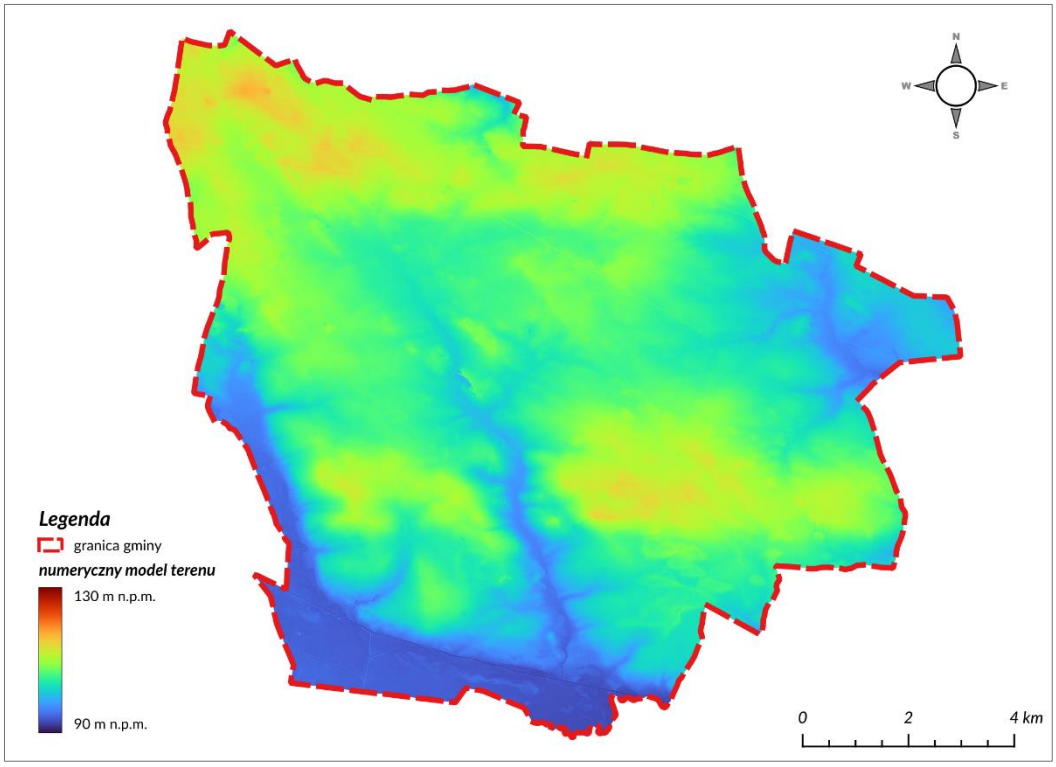

Fig. Elevation in Bedlno commune.

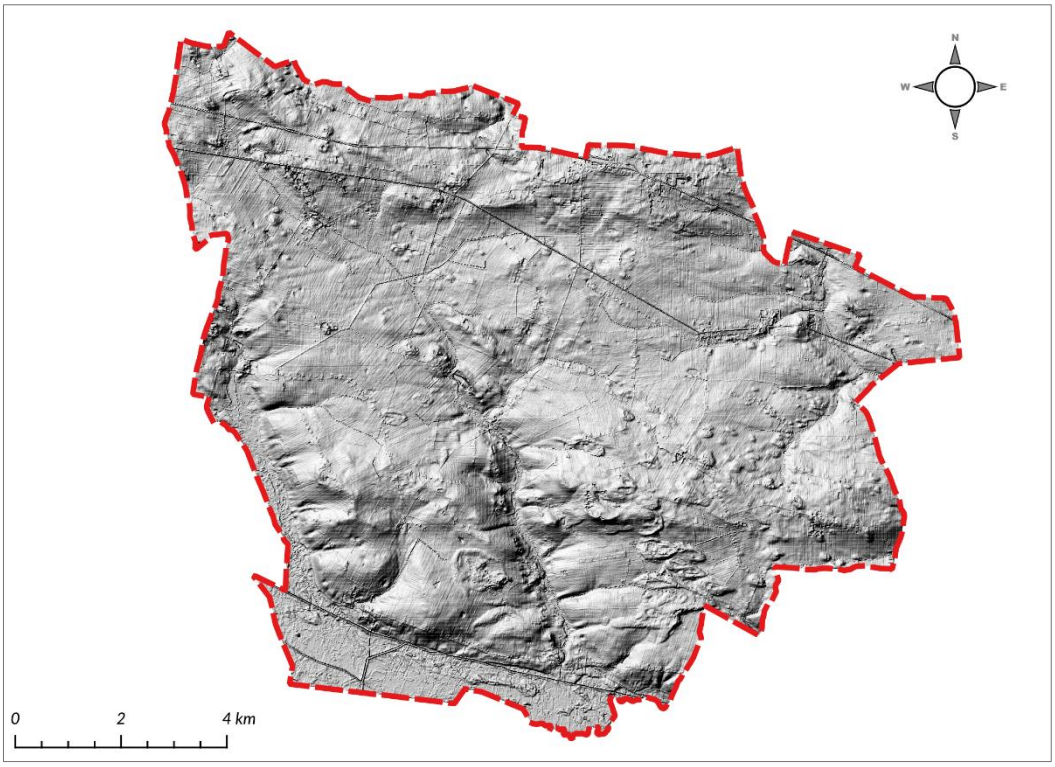

Fig. Digital terrain model of Bedlno commune

2.3. Soil

Good and very good soils (77.54%) prevail in the area structure, which naturally became a factor in the development of agriculture in these areas.

The soil cover is dominated by loamy sands, which occur on 59% of the commune's area. In the analysed area there are also sands (21% of the catchment area) and sandy loams (12%), . Peat soils, which are rich in organic matter and retain a great deal of moisture, occur on about 7% of the catchment area, mainly in the valley of the Bzura River.

Analyzing the soils from the point of view of the soil agricultural usefulness complex, two dominant complexes can be distinguished: very good rye complex (4), which is predominant (43% of the commune's area) and good wheat complex (2), which occurs on 18% of the commune's area. The very good wheat complex (1) occurs on 2% of the municipality area.

- Very good wheat complex (1) - the complex of agricultural usability of soil covering the best soils in Poland, which are characterized by: high abundance of nutrients, good structure, airiness, permeability, deep humus level and large possibilities of storing moisture.
- The good wheat complex (2) - the soil agricultural usefulness complex includes soils which are slightly less fertile and fertile than the soils of the very good wheat complex. Lower fertility of these soils results from a less favorable granulometric composition, which translates into worse soil tillage and changes in groundwater level, which causes periodic poorer drainage and moisture deficiency.
- Very good rye complex (4) - agricultural soil use complex, which includes the best light soils, made of strong loamy sands or loamy sands, which lie on looser ground. The soils

in this complex are structural soils with proper water relations and a well-developed humus horizon.

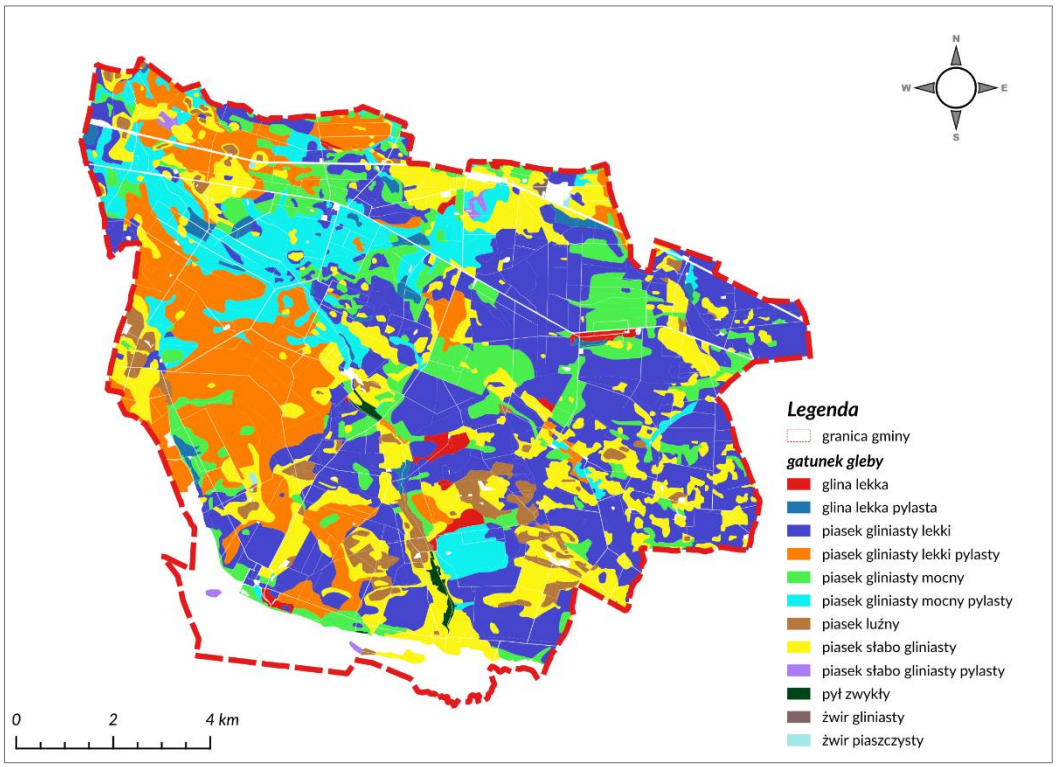

Fig. Soil in Bedlno commune (granulometric classification)

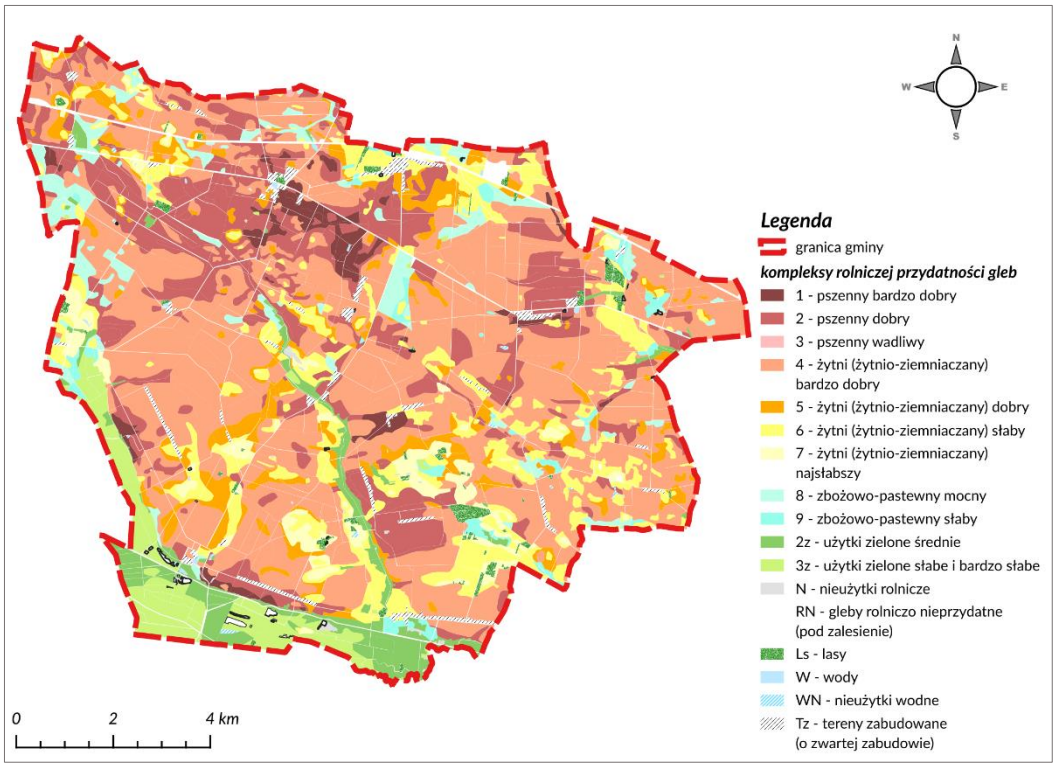

Fig. Soil in Bedlno commune (Soil agricultural suitability complexes)

2.4. Drainage system

The Bedlno commune is located in the basin of the Bzura River, a 166 km long left tributary of the Vistula River. The Bzura River valley passes through the southern part of the commune. Three left tributaries of the Bzura River flow parallel to each other through the commune: from the western part of the commune the Ochnia, the Stradzewski Channel and the Igla Rivers flow. On the edge of the northern part of the commune the river Słudwia flows.

The Waterdrive project activities focused on the Stardzewski Channel, whose catchment area is located entirely within the commune. The Stradzewski Channel is 14 km long and its catchment area is 5331 ha. The second analysed basin was the Igla river basin, which is located almost in half within the Bedlno commune. The left-bank tributary of the Bzura River, 15.2 km long, has its headwaters here and then flows through the neighboring Zduny commune to reach the Bzura River.

Stradzewski Channel (RW200017272329) and River Igla (RW200017272369) are designated as two river waterbodies (RW) for the requirements of the river basin management plans and implementation of the Water Framework Directive. The Stradzewski Channel (RW200017272329) and the River Igla (RW200017272369) are designated as two surface water bodies (RW) for the requirements of the RBMP and the implementation of the Water Framework Directive. They are reported to be in less than good ecological potential, and also their chemical status is assessed as bad (2018 and 2017 data for each RW, respectively).

An important element of the drainage network in the Bedlno commune is a drainage network covering almost the majority of the commune's area. Underground drainage system together with open ditches is a connected system with natural rivers. This is connected with the occurrence of hydro-technical facilities.

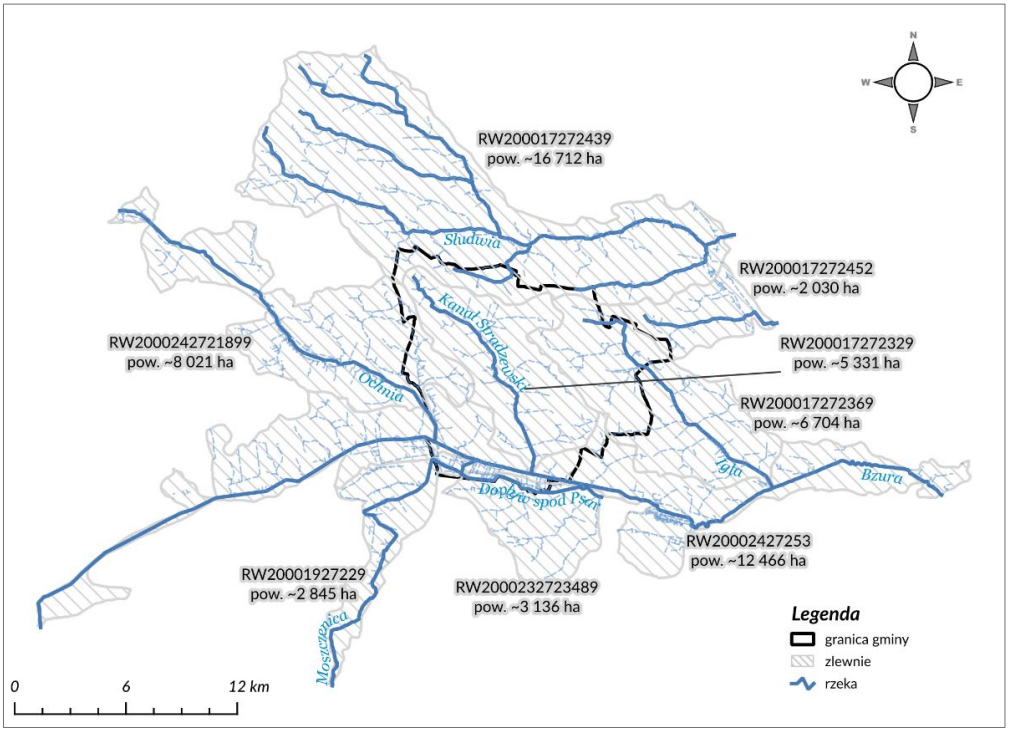

Fig. Drainage system of Bedlno Commune

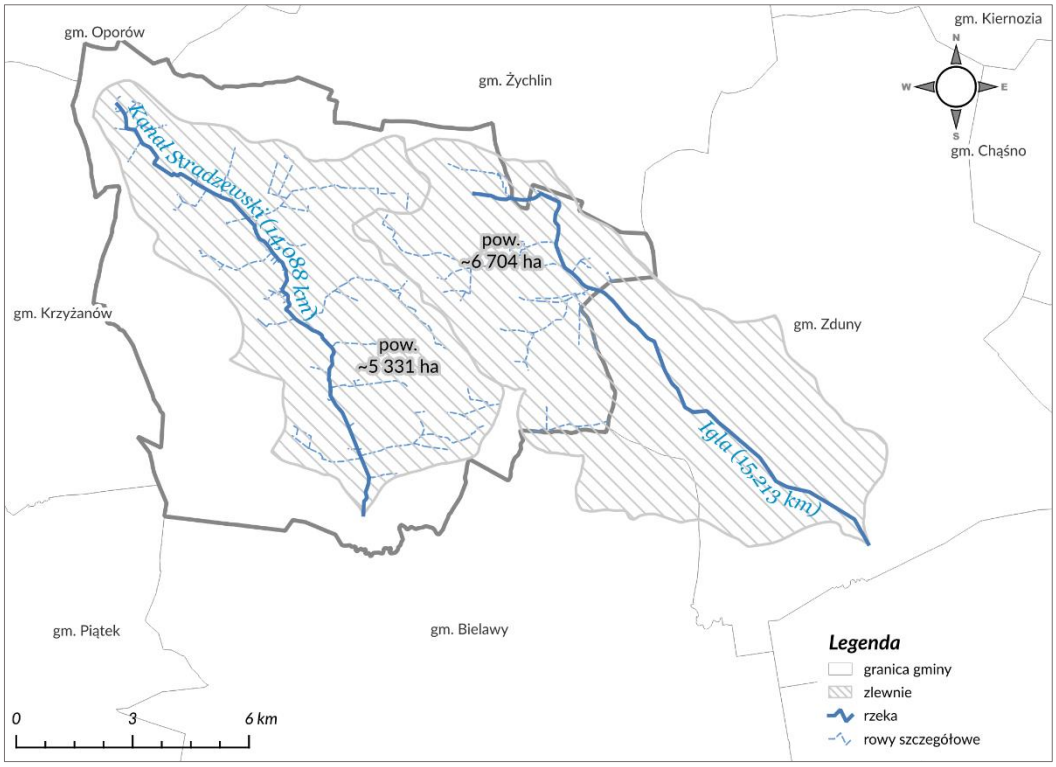

Fig. The area of two main catchments (the Stradzewski Channel and the Igla River) within the Bedlno commune

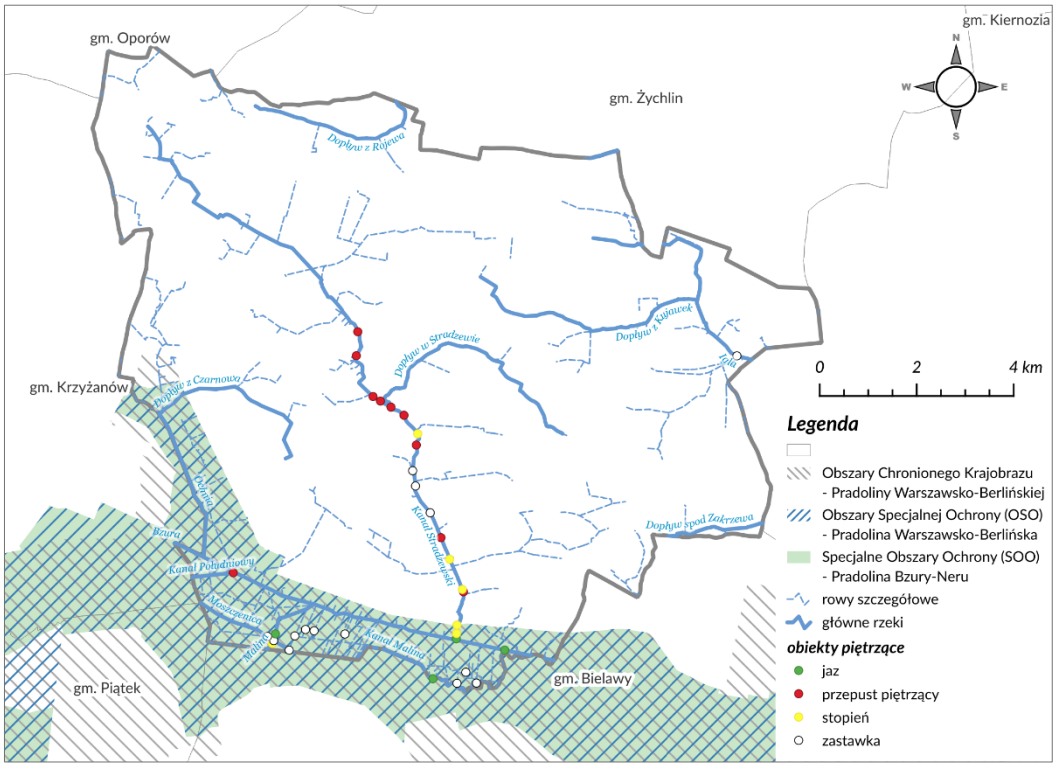

Fig. Hydro-technical facilities in the Stradzewski Channel.

2.5. Land cover and land use

The Bedlno commune is a rural commune with an total area of 12,596.56 ha.

The dominant type of land cover is arable land (94%), the largest share of which is used for the cultivation of cereals (Table 4). Pastures and heterogeneous agricultural areas with a high proportion of natural vegetation with a high proportion of natural vegetation constitute 3.4% of the area. They are located mainly in the Bzura valley in the southern part of the commune. Forests occupying only 1% of the total basin area. Urban areas do not exceed 1% of the total surface area

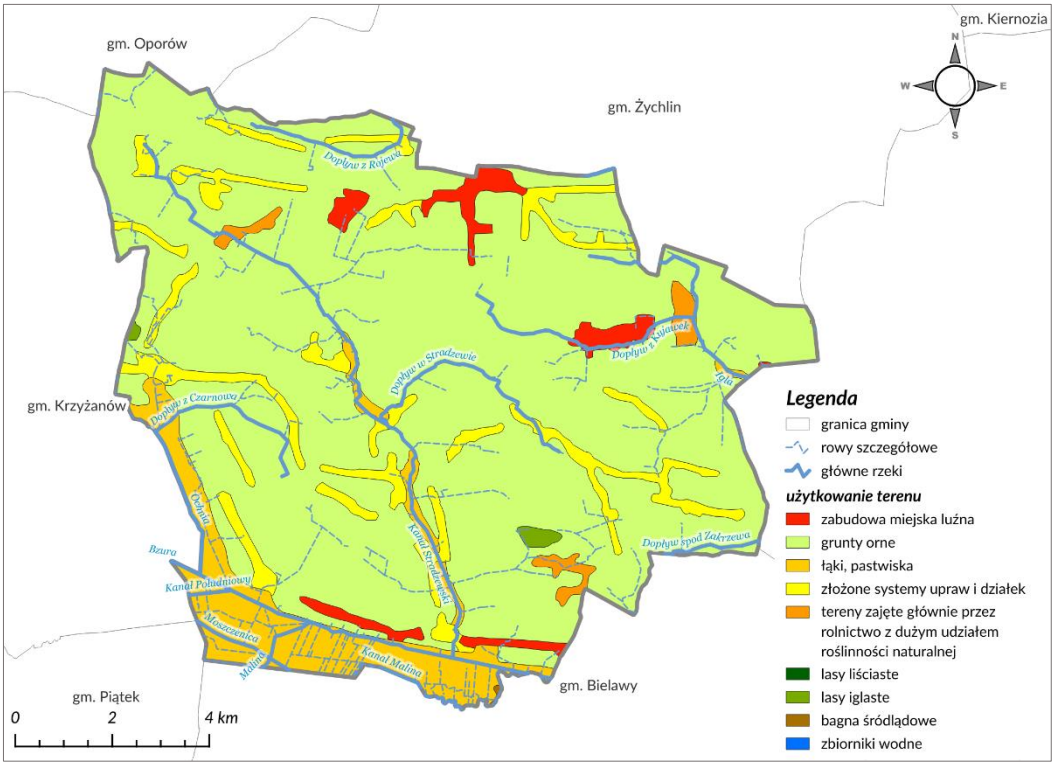

Fig. Land cover of Bedlno Commune: domination of arable land (marked light green)

2.6. Environmental/ecology

Valuable natural areas covered by forms of conservation protection are primarily Bzura river valley in soth part of Bedlno Commune with the capacity to adapt to changing hydrological conditions.

There are:

- the Warsaw-Berlin Proglacial Valley Protected Landscape Area
- the Warsaw-Berlin Proglacial Valley Special Area of Conservation
- the Bzura-Neru Proglacial Stream Valley Special Protection Area

2.7. Economic characteristic

The Bedlno commune is one of the most important areas for agricultural production in the province of Lodz.

In total, in 2020, according to tax units, 2,260 farms were managed in the commune, with the largest share being small farms up to 1 ha - 832 entities.

The ARMA data in 2020 shows that 717 beneficiaries applied for direct payments for 10,750 ha. The structure of crops reported for direct payments was dominated by maize, winter wheat and triticale. It should be emphasized that the area occupied by these crops has been gradually increasing over the last five years.

In the case of maize, from 2015, the area increased from 1,855 ha to 2,353 ha. In 2015, winter wheat covered 1,224 ha and in 2020 as much as 2066 ha, while winter triticale increased its acreage from 693 ha to 960 ha. Overall, the share of cereals (including maize) in crops increased from 53 to 60%.

Industrial crops (root crops and oilseeds) did not constitute a large percentage of crops, but their area also increased in recent years. This increase took place at the expense of reducing the area of forage crops and reducing the number of species cultivated in the commune (reducing the species biodiversity of crops).

It should be noted that the area intended for the cultivation of papilionaceous plants was quite stable (the area ranged from 330 to 380 ha). Unfortunately the share of these crops (having a significant impact on nitrogen management in the soil) was only about 3% in the commune.

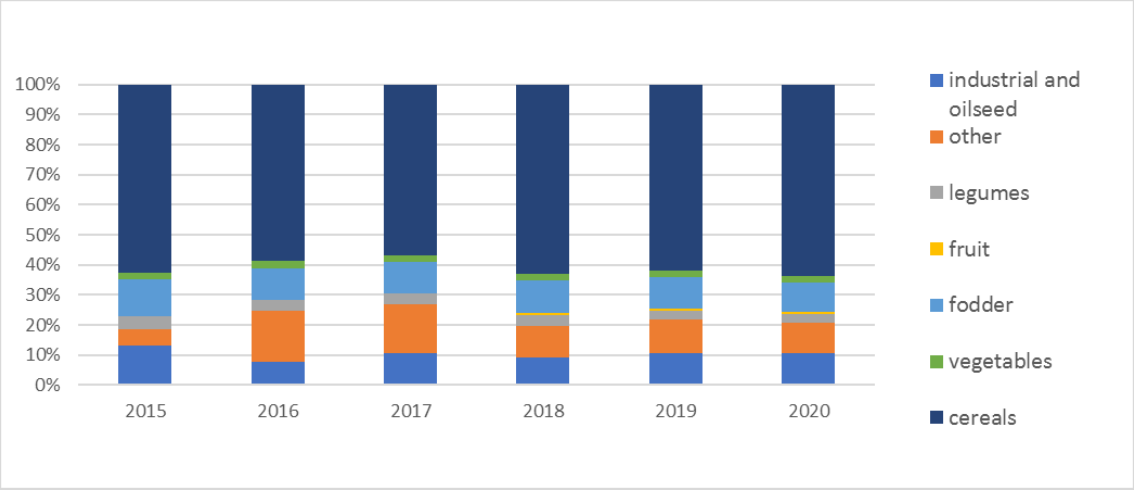

Fig. Structure of crops area

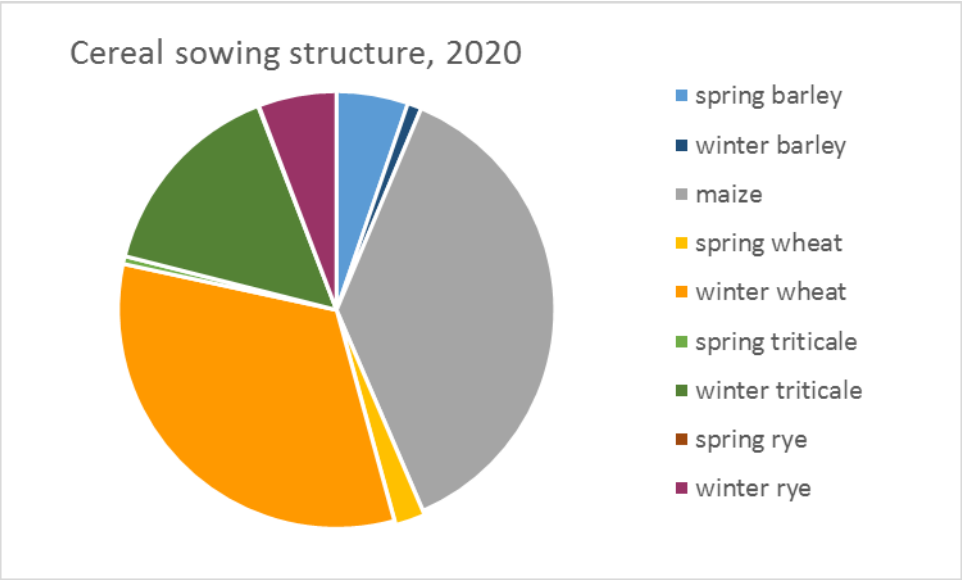

Fig. Structure of cereal area in 2020

The number of kept beef cattle slightly increased from 1086 head in 2014 to 1128 in 2020, while the number of dairy cows decreased from 3543 in 2014 to 3195 in 2020 - this is partly explained by the decrease in the area intended for the cultivation of fodder crops.

The pig population decreased significantly from 7,074 in 2015 to 4,797 in 2020 - this fact, however, should be associated with the limitations resulting from ASF disease rather than with a change in the structure of crops in the commune.

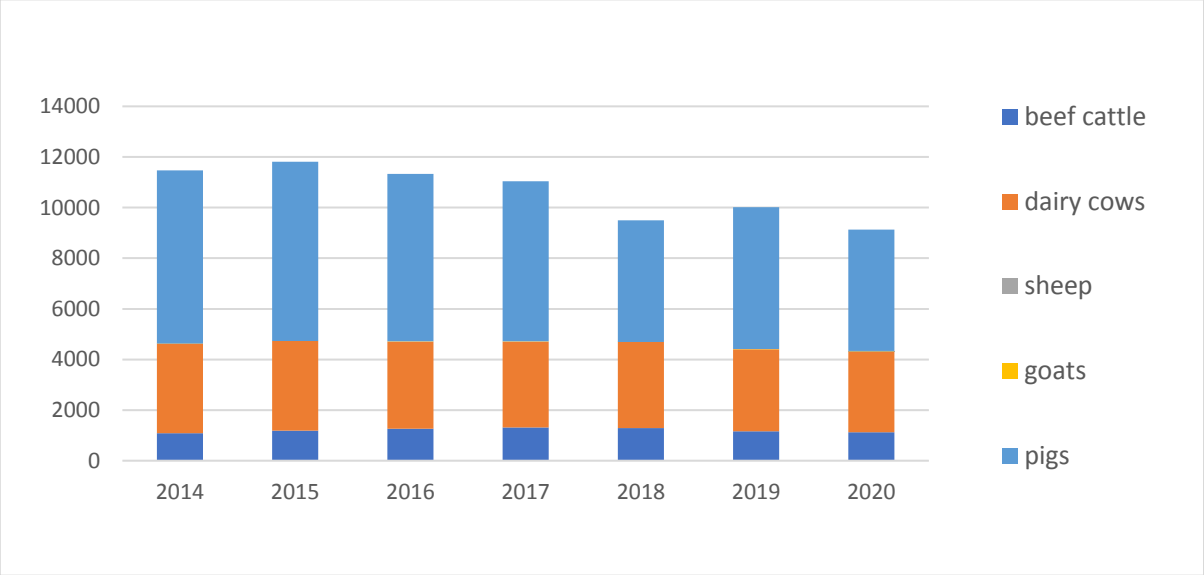

Fig. Changes of livestocks units

2.8. Current risks and hazard types

Drought is a hydrometeorological phenomenon, the frequency of which has increased significantly in Poland in the last decade (2010-2019). In the last decade, they occurred on average every 2.5 years.

As part of the The Drought Effects Counteracting Plan (in Polish: Plan przeciwdziałania skutkom suszy) the degree of drought risk in the commune (the smallest administrative unit) level has been classified. The degree of drought risk was estimated for three types of drought: hydrological, agricultural and hydrogeological.

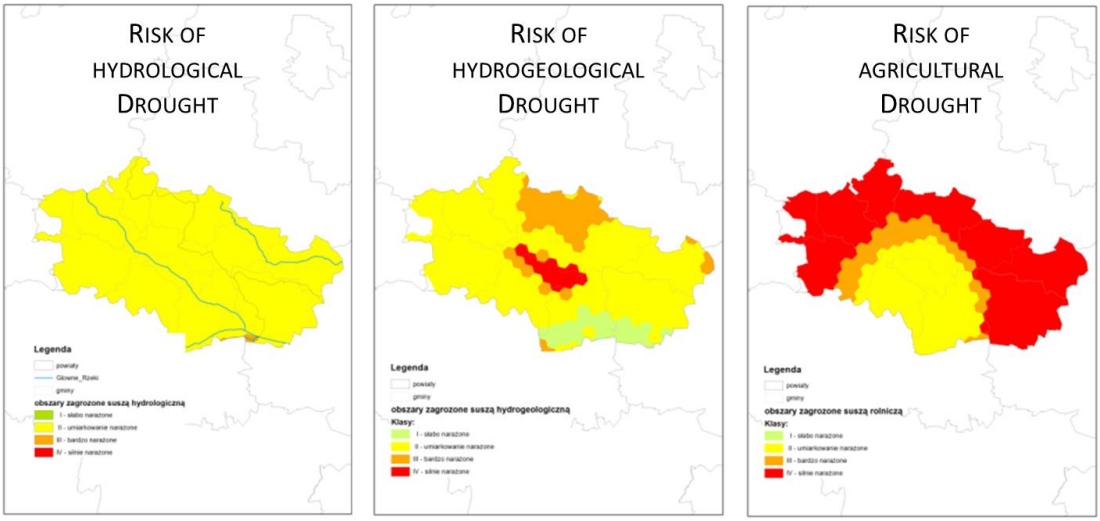

Fig. The degree of drought risk in Kutno County

The whole areas of Bedlno commune have been classified as areas of very high risk of agricultural drought. This can be a significant limiting factor for crop production if water resources used for agricultural production depend primarily on precipitation.

In 2016-2020, farmers struggled with a series of droughts that resulted in a significant reduction in the level of yields. In 2015, aid was granted to 113 entities for the amount of 227 769 PLN, in 2016 to 104 entities for the amount of 204 271 PLN, however, the greatest losses were recorded in 2019, when 424 decisions were issued for the total amount of 2 620 453 PLN due to drought losses

Also in this period, support for disaster loans for a total amount of PLN 51,107 (in the period 2015-2020)

3. Mapping of stakeholders

The stakeholder mapping process carried out in 2018 corresponded with the reorganisation of the water management system in Poland. National Water Holding Wody Polskie was set up, which involved transferring responsibilities and competences from a number of entities into one hand. The conclusion of the regional meetings and informal discussion was that the main problem was the lack of communication between the two main actors: the water authority and water companies. They did not cooperate in planning and implantation of work, especially in the drainage area. Facilitating communication between them by implementing a pilot program "Multi-stakeholder cooperation to increase water retention in an agricultural catchment area in the Bedlno commune" was one of the objectives of the Waterdrive project activities.

Main actors:

- Water companies (*in Polish*: *Spółki wodne*), - voluntary association of farmers, who are owners of land through which a drainage system passes. Voluntary contributions paid by farmers set up their budget. A municipality may also be a member (a public-private structure). They can raise funds for investment.
- Catchment and Regional Water Management Authorities (*in Polish. Zarzad Zlewni* and*, Regionalny Zarząd Gospodarki Wodnej*) ‑ parts of National Water Holding Wody Polskie (*in Polish: Państwowe Gospodarstwo Wodne Wody Polskie*). Responsible for water resources management (surface water and underground water), e.g.: flood and drought protection, coordination of the implementation of investments in water regions,
- Local authorities in case area (communes and county)
- Regional authorities (lodzkie province)
- Network of agricultural advisors
- Financing agencies
- Experts & researchers

4. Joint identification of problems and solutions with farmers and water authority

The 1st Local WATERDRIVE Meeting (6th Feb. 2020, Bedlno) focused on identifying local problems and solutions. Farmers and water authority had an open space for discussion.

The meeting was organized by the Department of Agriculture and Environmental Protection of the Marshal's Office of Lodz Voivodship and the European Regional Centre of Ecohydrology of the Polish Academy of Sciences in cooperation with the Head of Bedlno Commune

45 participants: ab. 20 farmers from Bedlno Commune area (water company, farmers, community council), 5 representatives of National Water Holding Wody Polskie (local,

catchment, regional and national level), water companies and local authorities from Kutno County, regional authorities, agricultural advisors, experts.

Photos: The 1st Local WATERDRIVE Meeting (6th Feb. 2020, Bedlno), opening by Andrzej Górczyński, Member of the Board of the Łódź Voivodeship.

Goals of interactive workshops:

- the selection of the area to demonstrate water retention increase through controlling the outflow from drainage system (the so-called river channel retention)
- the possibilities and limitations of the implementation of targeted agricultural practices (catch crops, deepening, selection of the sowing direction) and landscape shaping measures (buffer zones, afforestation, mid-field bushes and trees, wetlands).

Photos: The 1st Local WATERDRIVE Meeting (6th Feb. 2020, Bedlno), interactive workshops

During the workshop, the selection of the area to be piloted was discussed together. The planned pilot actions are to cover both watercourses owned by Polish Water and Bedlno Water Company. The local knowledge about the catchment area, existing drainage facilities, as well as places where these facilities existed in the past was gathered. Stakeholders showed the hot spots in the river basin, as well as the area with the potential to increase water retention. It was pointed out that it is necessary to develop guidelines for joint actions including water retention in the catchment scale as well as to make an inventory and assessment of the condition of existing water melioration facilities or to indicate the location of new damming up places including private land. It was stressed that effective management of the drainage system requires cooperation and coordination of activities but first of all understanding and acceptance of adjacent land owners.

The possibilities and limitations in the implementation of appropriate agricultural practices (catch crops, deep loosening, choice of sowing direction) and landscape management measures (buffer strips, mid-field woodlots and shrubs, wetlands) were also discussed from the point of view of farmers. Among the conclusions reached was the need to raise awareness among farmers, as well as to develop financial instruments to encourage farmers to cooperate within catchment areas.

Follow-up of the Bedlno meeting:

1. The joint operation on existing hydrotechnical infrastructures by the Bedlno water company and Wody Polskie – about 10 weirs on the Bzura river tributaries, located in the Bedlno Commune, were dammed between 30 April 2020 and 14 May 2020 storing the water on the commune meadows.
2. The Water Partnership signed by the Marshal's Office of the Łódzkie Voivodeship and National Water Holding Wody Polskie. The river basins selected for the pilot area: Stradzewski Channel, Igla, Słudwia, located within the communes of Bedlno and Zduny.
3. Contribution of the Bedlno meeting outcomes to newly run national program of “River Channel Retention”.

5. Recognising the acceptability of environmental measures by farmers

Acceptance of inhabitants for particular measures, hierarchy of measures for increasing retention and administrative capacities of local authorities (commune office) were the subject of the 2nd Local WATERDRIVE Meeting on 21 May 2020 organised by the Department of Agriculture and Environmental Protection of the Marshal's Office of Lodz Voivodeship and the European Regional Centre for Ecohydrology of the Polish Academy of Sciences within the framework of the WATERDRIVE project.

8 participants: 5 farmers (water company, community council, local authority) and regional authority, experts. Limited number of people due to covid.

Photo. The 2nd Local WATERDRIVE Meeting (21 May 2020, Bedlno)

The selected measures that took place in case area were discussed:

- the effective use of channel retention in drainage areas is most widely accepted by the residents uof In the Bedlno commune and is crucial for the retention of water in the landscape. However, investments in this field are necessary both on the side of Polish Water Authorities and farmers/water companies: to renovate the drainage system and switch to a controlled drainage system and to enable water collection in open ditches and underground pipes by water damming facilities.
- There are many small mid-field ponds, farm ponds and small retention reservoirs in the municipality. Due to water shortages, some of them are not filled up; some of them functioned as flow-through. It is necessary to invest in their reconstruction, repair/construction e.g. of damming devices
- Bushes/shrubs in fields, along ditches, along roads: unwillingness to obstruct agricultural machinery; also in the case of maintenance work on watercourses; in the case of mid-field/municipal roads, it must be taken into account that in the case of their modernisation/reconstruction, their widening is necessary and part of the currently existing trees may be removed. Farmers expressed their interest in planting old species of fruit trees, which are now being carried out by the Complex of Landscape Parks of the Lodz Voivodeship. They are open for protection/ renovation of wetlands, meadows;
- More knowledge is needed on optimising /adapting cultivation techniques to local soil and water conditions, e.g. is the effect of catch crops on the water cycle beneficial for a given soil type and hydrological conditions? Awareness of the possibility of using the experience/results of the Experimental Station of Variety Evaluation in Sulejów should be increased

Measures	Farmers's acceptability
Establishing shelterbelts	-/+
Afforestation of selected, unproductive lands	--
Establishing and protection of ecotone meadows and wetlands	+
Cultivation of catch crops and soil embedding crops (intercropping)	++
Protection / establishing small water bodies	++
Reconstruction of drainage systems towards amelioration of soils - controled drainage system	+++

6. Local Water Partnership in Kutno County

The initiative to create Local Water Partnerships was taken by the Ministry of Agriculture and Rural Development and the Agricultural Advisory Centre in Brwinów in cooperation with the Provincial Agricultural Advisory Centres.

Pilot Local Water Partnerships are being created throughout Poland. In the province of Lodzkie as a pilot county was selected the Kutno County.

On July 10, 2020 in Bedlno there was held the first meeting within the ministerial project for Kutno district (https://ekutno.pl/pl/11_wiadomosci/43586_lokalne-partnerstwo-ds-wody-w-powiecie-kutnowskim.html) . The partnership aim is to diagnose the condition and principles of rational water management and drought prevention in the county.

The meeting was attended by farmers, including water companies, chambers of agriculture, representatives of commune, county and voivodship self-governments, Wody Polskie and companies and institutions having significant impact on the use of water resources in the Kutno district. The aim of the Local Water Partnerships is to activate all the institutions which need water and manage it so that they get to know each other and cooperate.

Subsequent meetings were held on September 4, 2020 and June 21, 2021 (https://woda.cdr.gov.pl/index.php/lokalne-partnerstwa-ds-wody/aktualnosci/kraj/lodzkie/lokalne-partnerstwo-ds-wody; https://ebr24.net/wiadomosci/lodzkie/w-starostwie-powiatowym-rozmawiali-o-gospodarce-wodnej).

PHOTO: Participants of the first meeting of Local Water Partnership in Kutno County [sources: https://ekutno.pl/pl/fotorelacje/inne/-lokalne-partnerstwo-ds-wody/17436,8

7. Modernization of existing drainage system to convert to controlled drainage system (drainage and irrigation system)

In the past, the main task of the drainage system was to increase the outflow. There are damming facilities on the main stream (Kanal Stardzewski and Igla River), however they are often destroyed. There are no damming systems in the tributaries of main streams.

The small water damming facilities are manually operated wooden gates. The damming water is accumulated in open ditches and influences on water level in underground drains. It raises the groundwater level in arable lands and increases the water retention in the soil.

The second group of damming facilities are larger construction with damming water in main riverbad, and then the water is redirected to drainage ditches. In this way, the neighboring meadows are irrigated.

However, the location, level and time of water accumulation in basin scale is crucial for agricultural practices and yields. Therefore, first of all, the analysis of the possibility of regulating drainage water outflow should be developed by an design office related to drainage in cooperation with a water authority, water company and local authority.

7.1. The joint operation on existing hydrotechnical infrastructures

As follow up of The 1st Local WATERDRIVE Meeting in Bedlno, the joint operation on existing hydrotechnical infrastructures by the Bedlno water company and Wody Polskie was started. About 10 weirs on the Bzura river tributaries, located in the Bedlno Commune, were dammed between 30 April 2020 and 14 May 2020 storing the water on the commune meadows. It was done as part of new national program of "River Channel Retention" (in Polish: retencja korytowa). https://www.wody.gov.pl/mala-retencja/retencja-korytowa

PHOTOS: Joint operation on existing hydrotechnical infrastructures by Polish Waters and Bedlno water company facilited by the Lodzkie Marshal Office, April/May 2020

Photos. Damming water by hydrotechnical facilities, Moszczenica River, Bedlno Commune; the water is redirected to irrigation ditches

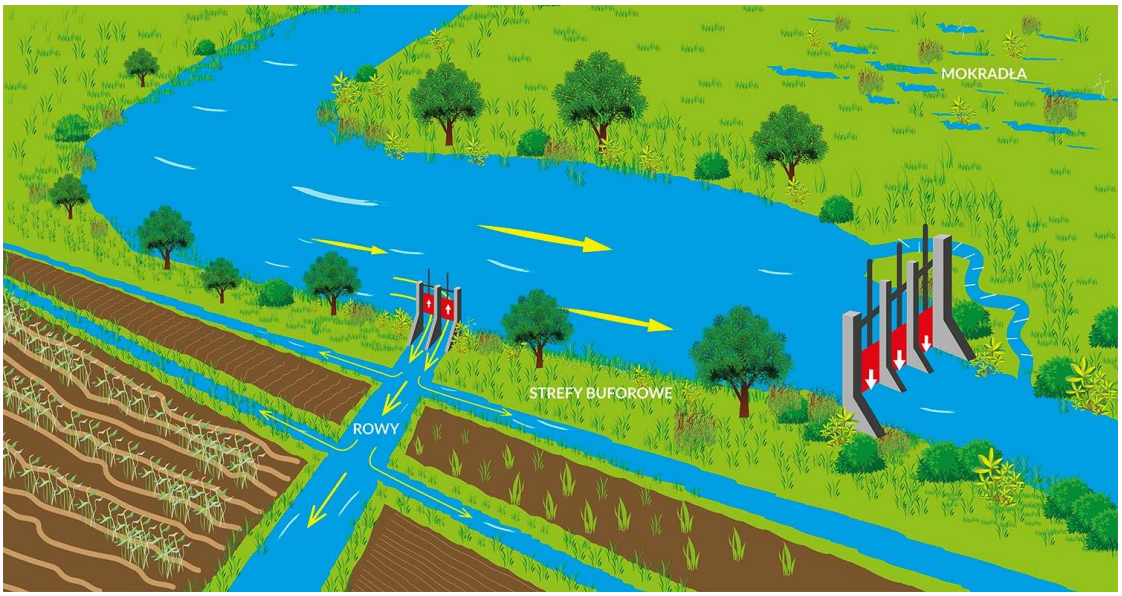

Fig. New national program of “River Channel Retention” (in Polish: retencja korytowa). https://www.wody.gov.pl/mala-retencja/retencja-korytowa

7.2. Determining details of cooperation

Determining the details of cooperation within the of the pilot program was the main subject of the working meeting, which took place on 23 July 2020 in the headquarters of the Catchment Water Management Authority in Łowicz.

The meeting was organised in cooperation with the Department of Agriculture and Environmental Protection of the Marshal's Office of Łódzkie Voivodeship, the Regional Water Management Authority in Warsaw and the Catchment Water Management Authority in Łowicz.

12 participants: regional water management authority, local water management authority, farmer from water company, local authority, regional authority, experts

During the meeting there was a discussion on the joint design of a new water damming system both for ditches and rivers managed by water authority and for ditches managed by farmers.

Remarks/problems:

- Data collection: Widely available maps are not sufficient for drainage-related technical documents. Paper maps, which are included in the old documentation (1: 2 000) are needed. They are spread out in different places.
- Now the legal issues connected with damming facilities and water damming are changing. The point is to simplify them, but at the moment it requires individual analysis what technical documentation is needed.

- The analysis and technical documentation will be developed by an external design office. The number of persons with skills to perform technical documentation related to drainage is decreasing.
- Generally there are no financial programs to support the stage of preparation of technical documentation at the moment.

Arrangements:

1. Maintenance and investment plans for the following years for activities within the pilot catchments will be agreed so that Wody Polskie and water companies can plan complementary activities.
2. Within the framework of the Waterdrive project ERCE PAN in cooperation with the stakeholders will undertake activities to develop an analysis of the possibility of regulating the outflow of water from drainage facilities for the Stradzewski Channel and the Igla River in order to increase water retention in the landscape and to restore gritty waters. Developed concepts and necessary documentation will be handed over to PGW WP and water companies in Bedlno and Zduny. For the purpose of carrying out the above mentioned analysis an agreement will be signed on the use of the developed documentation by the interested entities.
3. Wody Polskie will provide access to documentation (including as-built reports) for hydrotechnical facilities. Water Company Zduny provided paper maps of water devices (collectors) under their management (1:5000) for scanning. The Bedlno Water Company also has documentation which it will make available for scanning.


Photos. The 3rd Local WATERDRIVE Meeting (23 July 2020, the Catchment Water Management Authority in Łowicz)

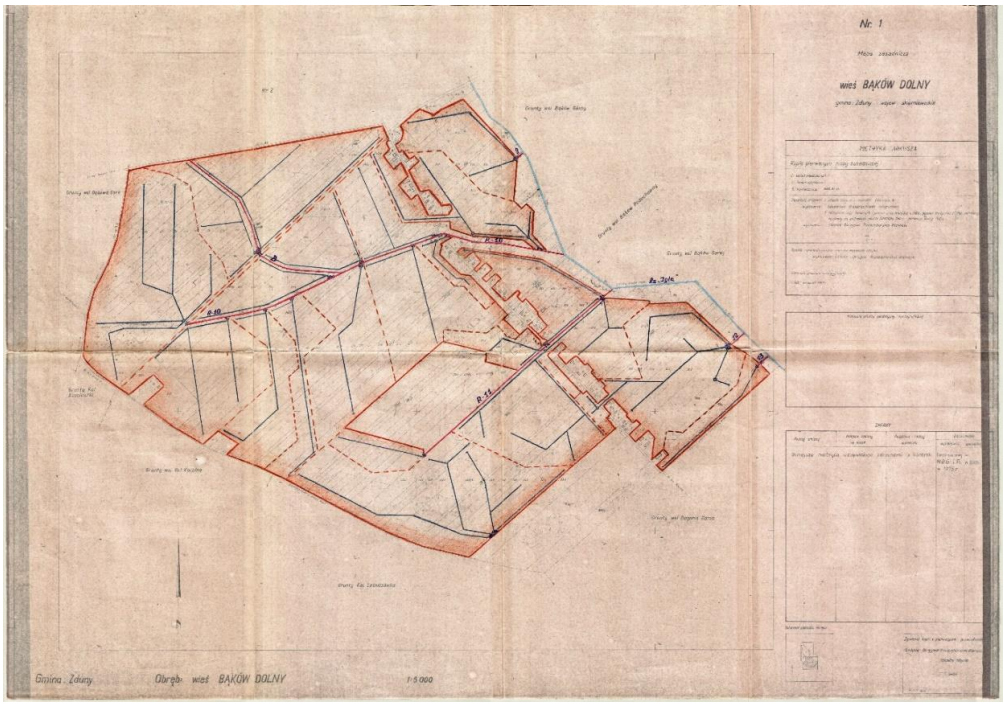

Fig. Old map (1:5 000) of drainage facilities in Igla Stream provided by the Zduny Water Company

7.3. Notification investments to Drought Effects Counteracting Plan during public consultation

The key planning document in Poland for increasing water retention and counteracting the effects of drought is Drought Effects Counteracting Plan (DECP) (*in Polish: Plany przeciwdziałania skutkom suszy, PPSS*) (https://stopsuszy.pl/en).

The main goal of the DECP is clarified by four specific objectives: (1) effective water resources management to increase available water resources, (2) increasing water retention (storage), (3) drought education and coordination of drought related activities, (4) creation of implementation and funding mechanisms for actions counteracting drought effects. DECP is developed for a period of 6 years (2021–2027). The legislative process is currently underway (https://legislacja.rcl.gov.pl/projekt/12342551/katalog/12757857#12757857).

During the public consultation, the investments /proposal "Restoring water damming facilities on the Stradzewski Channel" was submitted. Additional the proposal of "Increasing the possibility of water retention in the basin of the Bzura River in the Kutno, Łowicz and Łęczyca Counts", which is more general was submitted. It include (1) development of the water retention concept for the area of particular communes in the Kutno, Łowicz and Łęczyca Counts taking into account channel retention, using green infrastructure and optimising landscape structure. (2) preparation of an inventory of the technical condition of hydrotechnical facilities together with a conception for repair and an alternative analysis of the environmental impact (3) preparation of project documentation for new hydrotechnical facilities (weirs, barrages) and modernisation of the existing ones indicated in the concept of

water retention (developed under point 1); (4) construction works, including construction of weirs and gates, repair of existing damming facilities, reconstruction of drainage facilities in the scope of changing their function from drainage to retention (slowing down the outflow).

The investments are included in Annex 1 of the draft DECP containing proposals for the construction and reconstruction of water facilities. It is included in Table 1C - investments of external entities submitted during the public consultation, which passed the preliminary assessment (multi-criteria assessment taking into account, inter alia, compliance with the provisions of the DECP and preliminary cost-benefit analysis of a given investment). Inclusion in DECP allows for investment and fundraising. However, the list of investments is an open set, which makes it possible to implement investments that are not included in the document.

7.4. „Analysis of the possibility of regulating the drainage outflows for the Stradzewski Channel in order to increase water retention in the landscape and groundwater restoration" – preparatory work for submitting a grant application

Collection of the maps of drained infrastructure in Kanal Strudzewski basin, which are crucial for targeted location of measures in drainage area was finished. Paper maps (1: 2 000) being part of 1960-1970 documentation, they were spread among archives of water authorities and farmers.

On the basis of the materials obtained, a preliminary estimate of the costs associated with the preparation of „Analysis of the possibility of regulating the drainage outflows for the Stradzewski Channel in order to increase water retention in the landscape and groundwater restoration" was made.

The cost of the analysis includes e.g. preparation of maps for design purposes, hydrological and hydraulic calculations and spatial concept development. Preliminary estimated cost is ab. 200 000 PLN.

In 2020, ERCE PAN with cooperation with Bedlno local authority, Bedlno Water Company and Polish Water prepared the application to be submitted to the Voivodship Fund for Environmental Protection and Water Management in Łódź as part of scientific research. As part of the application, 'Analysis of the possibility of regulating the drainage outflows for the Stradzewski Channel' was carried out by the project office. Unfortunately, formal issues (own financial contribution) disqualified the application. The application will be submitted as application from Local Water Partnership of Kutno County, new financial mechanism.

7.5. River Channel Retention in 2021

In the spring of 2021 Wody Polskie carried out activities aimed at water retention in river beds and drainage ditches in order to retain water in agricultural areas. In total 220 weirs were used to dam up water in Lodz Voivodeship.

In the Bedlno commune, due to high water levels in both the Stradzewski Channel and the Igla River, this measure was not implemented in winter and early spring. However, as of June 1, when the water level dropped to the level allowing to carry out field works, in order to maintain the optimal level of underground water, water company and Wody Polskie dammed the water using 6 small hydrotechnical facilities (weirs) located in Stradzewski Cannel.

Fot. Stradzewski Channel (February 2021, May 2021)

7.6. Planned modernization of weirs on the Słudwia River

The launching of the River Channel Retention program by Wody Polskie in 2020 indicated the need for investments consisting in reconstruction of damming facilities connected to drainage systems in agricultural areas. Non-functional weirs primarily cause drainage of water from adjacent fields during periods of low flows.

Among the investments submitted by citizens, water companies and local authorities, the reconstruction of weir on the Sludwia River, whose drainage basin includes the Bedlno commune, is to be realized. Information about the necessity of reconstruction of the weirs on the Sludwia River was given by a farmer from the Zduny commune during 1 local Waterdrive meeting in the Bedlno commune.

On May 13, 2021 the Marshal of the Lodz Voivodeship Grzegorz Schreiber, the President of the State Water Management Company Wody Polskie Przemysław Daca and the Head of the Zduny Commune Krzysztof Skowronski met at the weir on the Sludwia River in Zlakowicki County. It was a visit of the weirs damming up water and checking the condition of these objects in the Lodzkie region (https://www.lodzkie.pl/strona-glowna/aktualnosci/2-mln-z%C5%82-dla-sp%C3%B3%C5%82ek-wodnych).

The planned investment will involve the reconstruction of the weir at km 15+593 of the river Sludwia. Scope of works: construction of new hoisting devices, completing concrete defects in the structure, repair of slope reinforcement, as well as obtaining required documentation and administrative decisions, including those regarding the construction of a fish passage. Reconstruction of the weir will contribute to a 7-fold increase in water retention: current water retention 8 000 m^3, planned water retention 55 000 m^3. Estimated cost 580 000 PLN. The investment is planned to be implemented under RDP funds (see Chapter 7.7).

The reconstruction of two weirs on the Sludwia River at km 8+540 and 10+780 is also considered. The cost of the reconstruction is estimated at 7 million.

PHOTOS: The non-functioning weir causes drainage of water from adjacent drainage systems. Note the water level in the riverbed during the dry (2019) and wet (2021) years.

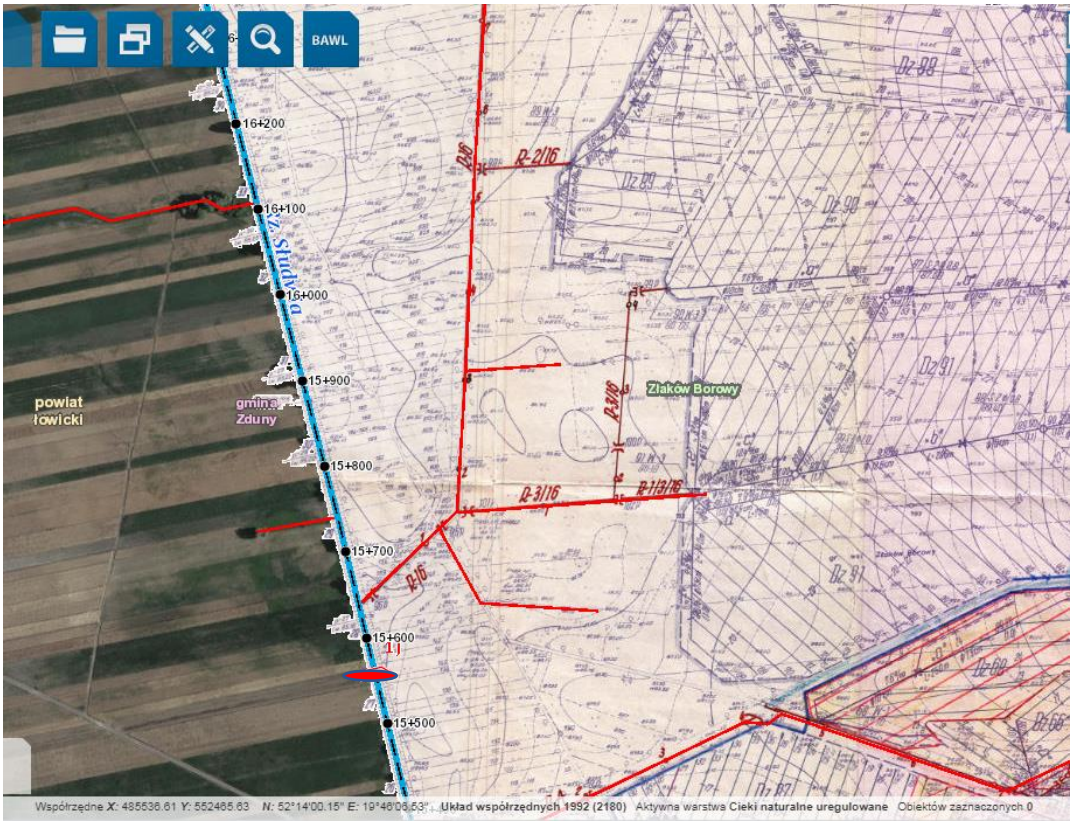

Fig. Location of the weir on the old map of the drainage system

PHOTO. The deeply cut riverbed of the Słudwia River, high water level in May 2021

PHOTO: Press conference of Marshal of the Łódzkie Voivodship Grzegorz Schreiber, and President of the State Water Management Company Wody Polskie Przemysław Daca on investments in wiers reconstruction and regional cooperation in water management in agricultural areas

7.7. Analysis of available funding sources for modernization of existing drainage system

Until 2022, the resources allocated to maintenance work and investment in area of water retention in agricultural area are insufficient.

Maintenance work is mainly related to ditch mowing and minor repair work. These are covered by Wody Polskie and/or funds acquired by water companies and/or local authorities. In 2020, Wody Polskie allocated PLN 4 million (890 000 euro) for maintenance works in area of the Catchment Water Management Board in Łowicz. Water companies are beneficiaries of regional (marshal's office, provincial office) programmes financing maintenance works. The Marshal's Office of Łódzkie Voivodeship supports the activities of water companies in maintenance works of drainage systems in agricultural areas. In 2020 it allocated the amount of approx. PLN 2 million (440 000 euro).

Investments in water management are mainly the responsibility of Wody Polskie and are financed either from their own budget (state budget) or from external sources (European and national funds).

There are no financial programs to support the stage of preparation of technical documentation at the moment.

In 2021, the Ministry of Agriculture held negotiations with the European Commission as a result of which the Commission agreed to modify the provisions of RDP and to introduce the provisions of the so-called transitional RDP for the years 2021-2023. As part of the modification, the possibility of financing investments in increasing retention in rural areas was introduced.

There are 2 groups of activities depending on the type of beneficiary.

1. beneficiary - Wody Polskie. The measure will finance works related to construction or reconstruction of hydrotechnical equipment on water courses. The budget amounts to 215.3 million euro. Not more than PLN 10 million/investment
2. beneficiary - water companies or unions of those companies. As part of the measure the costs of reconstruction or renovation of the existing drainage facilities from drainage functions to irrigation and drainage functions (drainage ditches, dams, culverts) will be financed. The measure introduces lump sums for specific undertakings.

Table. Examples of activities including lump sum price

Activities	Costs*
Reconstruction or repair of the drainage ditch, including: a) mowing the slopes and bottom; b) removal of bushes and trees, c) de-silting of the bottom together with scattering the excavated material, d) sloping, e) cleaning of culverts, f) cleaning of drainage outlets	price depends on width and depth of ditches: 19-37 PLN/ running meter
Construction, reconstruction or repair of the culvert	price depends on the diameter of culverts: 1 100 -3 300 PLN
Construction, reconstruction or repair of hydrotechnical facilities for water damming	Construction new: 9 000-30 000 PLN Reconstruction: 5 000 -14 400 PLN

*sources: https://www.gov.pl/web/rolnictwo/xiii-posiedzenie-km-prow-2014-2020-z-16-17022021-r

Another financial mechanism launched by the Ministry of Agriculture is the financing of activities under the National Recovery Plan, which forms the basis for applying for support from the EU's Recovery and Resilience Facility (RRF). During negotiations.

Within the framework of support for sustainable water management in agriculture and rural areas, MARD prepared the project: B3.3.1 Investments in increasing sustainable water management potential in rural areas. The objective of the programme is to (1) increase the resilience of agriculture to droughts and prevent floods in agricultural areas, (2) improve the

rationality of water management through appropriate regulation of water relations in agricultural areas and reduction of water runoff, (3) increasing water retention. The budget amounts to 667 mln EURO.

Areas of support:

(1) investments related to reconstruction, reconstruction, expansion of water melioration devices, modernization of small water facilities, in particular limiting water outflow, taking into account water retention, including accompanying cultural infrastructure in the form of water mills;
beneficiary - water companies through commune authorities
(2) functioning of Local Water Partnerships, including preparation of investment plans, expert opinions indicating solutions to improve water management;
beneficiary - Local Water Partnerships through provincial agricultural advisory centres;
(3) inventory of water melioration devices, including creation of a database of water melioration devices and meliorated land;
beneficiary – Wody Polskie.

7.8. Action Plan for modernization of existing drainage system to convert to controlled drainage system in Bedlno Commune

The action plan presented below will be discussed with potential beneficiaries, and will be modified after negotiations with the European Commission are completed, contracts with the Commission are signed, and implementing regulations are published.

1. As part of the development of the "Plan for the development of rural water management for 2022 - 2030" by the Local Water Partnership of Kutno County, the investment notification in November/December 2021:
   - Increase water retention capacity by upgrading existing drainage systems to convert to controlled drainage system (e.g. repairing damming facilities) in the Stradzewski Canal catchment;
   - Increasing the possibility of water retention by building damming facilities in drainage ditches in the Stradzewski Canal catchment
   - Increasing the water retention potential through modernization of the existing drainage systems in order to transform them into drainage and irrigation systems (e.g. repairing damming facilities) in the basin of the River Igla - cooperation with the Zduny commune.
   - Increasing the possibility of water retention through building damming devices in drainage ditches in Igla River catchment
   - Renovation of small water reservoirs in the Bedlno commune

2. Analysis of the possibility of regulating the drainage outflows for the Stradzewski Channel in order to increase water retention in the landscape and groundwater restoration - spatial concept development by the project office.

   Beneficiaries: Bedlno Water Company through Bedlno Commune Office, in collaboration with Wody Polskie

   Estimated cost: 200 000 PLN

   Funding sources: the National Recovery Plan/ Functioning of Local Water Partnerships

3. Development of drainage-related technical documents for building damming facilities in drainage ditches in the Stradzewski Canal catchment - by the project office.

   Beneficiaries: Bedlno Water Company through Bedlno Commune Office

   Estimated cost: 150 000 PLN – 200 000 PLN

   Funding sources: the National Recovery Plan/ functioning of Local Water Partnerships

4. Modernization and construction of small hydrotechnical facilities for water damming in the Stradzewski Canal catchment

   Beneficiaries: Bedlno Water Company through Bedlno Commune Office

   Estimated cost: above. 10-15 facilities, 200 000 - 250 000 PLN

   Funding sources: transitional RDP for the years 2021-2023/ Sub-measure 5.1.

5. Analysis of the possibility of regulating the drainage outflows for Igla River in order to increase water retention in the landscape and groundwater restoration - spatial concept development by the project office.

   Beneficiaries: Bedlno Water Company through Bedlno Commune Office, in collaboration with Zduny Water Company through Zduny Commune Office, and Wody Polskie

   Estimated cost: 200 000 PLN

   Funding sources: the National Recovery Plan/ functioning of Local Water Partnerships

6. Development of drainage-related technical documents for building damming facilities in drainage ditches in the Igla River catchment - by the project office.

   Beneficiaries: Bedlno Water Company through Bedlno Commune Office, in collaboration with Zduny Water Company through Zduny Commune Office

   Estimated cost: 150 000 PLN – 200 000 PLN

   Funding sources: the National Recovery Plan/ functioning of Local Water Partnerships

7. Modernization and construction of small hydrotechnical facilities for water damming in the Igla River catchment

Beneficiaries: Bedlno Water Company through Bedlno Commune Office, in collaboration with Zduny Water Company through Zduny Commune Office

Estimated cost: above. 10-15 facilities, 150 000 - 200 000 PLN

Funding sources: transitional RDP for the years 2021-2023/ Sub-measure 5.1.

Summary:

Estimated cost of modernization of existing drainage system to convert to controlled drainage system in Bedlno Commune	1 050 000 PLN – 1 250 000 PLN (230 000 euro - 270 000 euro)
Compensation for drought losses paid to farmers in Bedlno Commune in 2019	2 620 453 PLN (580 000 euro)