

# DANIA database for selecting irrigation investments in coherence with WFD and DNSH principle: A case study within Next Generation EU funds\*

Marianna Ferrigno<sup>1,\*†</sup>, Veronica Manganiello<sup>1,†</sup>, Raffaella Pergamo<sup>1,†</sup>, Luca A. Folino<sup>1,†</sup>, Massimo Tropeano<sup>1,†</sup> and Marica Furini<sup>1,†</sup>

<sup>1</sup> Council for Agricultural Research and Economics, Research Centre for Agricultural Policies and Bioeconomy, Via Barberini, n.36, 00187 Rome, Italy

## Abstract

This work aims to describe the use of DANIA (National Database on Investment for Irrigation and Environment) as the implementation tool in the projects' selection procedure of Italian National Recovery and Resilience Plan (NRRP) (I4.3 - M2C4) for funding irrigation network improving according to WFD objectives and DNSH principle. DANIA was the instrument through which irrigation boards submitted their projects for funding, then selected by Ministry of Agriculture according to eligibility and selection criteria defined and automatically applied to submitted projects basing on information collected in DANIA. The efficacy of this selection procedure in term of reduction of procedural times and data reliability have been analysed. Comparing the time of the different evaluation steps with that of the previous investment Programs, the use of DANIA has allowed to significantly reduce the time needed for the completion of all evaluation procedure, both in terms of days occurred per funded project (70% less than the previous procedure) and in terms of funded amount per days of evaluation (approximately double of the previous one). About data reliability, the information inserted in DANIA, and then the relative score assigned to projects, were confirmed by expert evaluation for the 69% of the funded projects and none of these differences is related to technical feature of the project. This allows us to argue that the applied selection procedure is reliable and that, in general, the irrigation boards enter accurate information.

## Keywords

DANIA, irrigation investments, funding procedure, water management in agriculture, WFD DNSH

## 1. Introduction

Over the last ten years, Italian Ministry of Agriculture (MASAF) has implemented a long-term strategy for the adaptation and efficiency of irrigation networks, to reduce risks related to water scarcity and floods in agriculture. Several investments Programs have been funded with European and domestic funds to apply this strategy, starting from the National Rural Development Program (NRDP 2014-2020) financed by the European Agricultural Fund for Rural Development (EAFRD), which was complemented by a similar measure with national funds from the Development and Cohesion Fund (DCF 2014-2020), particularly dedicated to the Regions of Southern Italy. Off-farm and collective irrigation investments were also financed with national funds made available by budget laws for five subsequent years, from 2016 until 2020. More recently, a measure dedicated to improving the efficiency of existing irrigation infrastructure has been implemented within the National Recovery and Resilience Plan - NRRP (Investment 4.3) funded by Next Generation EU. This

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† Corresponding author.

† These authors contributed equally.

✉ marianna.ferrigno@crea.gov.it (M. Ferrigno); veronica.manganiello@crea.gov.it (V. Manganiello); raffaella.pergamo@crea.gov.it (R. Pergamo); lucaadolfo.folino@crea.gov.it (L. Folino); massimo.tropeano@crea.gov.it (M. Tropeano); marica.furini@crea.gov.it (M. Furini)

ORCID 0000-0002-5347-0984 (M. Ferrigno); 0000-0003-0348-6600 (V. Manganiello); 0000-0002-0770-2633 (R. Pergamo); 0009-0002-5490-8914 (L. Folino); 0009-0002-9655-4173 (M. Tropeano); 0009-0002-4171-8599 (M. Furini)



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measure is part of Italian commitment within the Water Action Agenda of United Nations (PNRR – Investments in the resilience of the irrigation agro system for better management of water resources | Department of Economic and Social Affairs (un.org)).

The planning of these investments was aimed at improving water management, for the sustainability and competitiveness of the agricultural sector, with a focus on environmental issues.

The coordinated implementation of this plans was supported by two different national information systems, SIGRIAN and DANIA, realized by Research Centre for Agricultural Policies and Bioeconomy (CREA PB), on behalf of the Italian Ministry of Agriculture (MASAF).

SIGRIAN (National Information System for Water Management in Agriculture) is a WebGIS platform (<https://sigrian.crea.gov.it/>) providing an overview of the Italian irrigation system [1]. It is the reference database to which irrigation boards must transmit information on measured or estimated water volumes for collective irrigation (withdrawals, uses, return flows) [2].

DANIA (National Database of Investments for Irrigation and Environment) is an online database (<https://dania.crea.gov.it/>) collecting projects on irrigation networks implemented by irrigation boards, both planned and funded. For each project, technical, financial, and environmental data are collected in four homogeneous sections of information, allowing the projects to be catalogued (and thus selected) and monitored basing on objective criteria and parameters, useful in the programming and in the monitoring phase of the funded projects, to evaluate the efficacy of the policies, through the quantification of appropriate indicators. The database model and the data stored in DANIA were outlined in a previous work [3].

DANIA and SIGRIAN have their own specific application for which they were designed but their jointly use improved the quality of policy programming and monitoring, in the pursuit of sustainable development [4] [5].

From the procedural point of view, over the time MASAF projects' financing procedure has progressively moved from the political agreement between the Ministry and the Regions to multi-criteria selection through public tender, with direct application of projects by potential beneficiary (irrigation boards) [6].

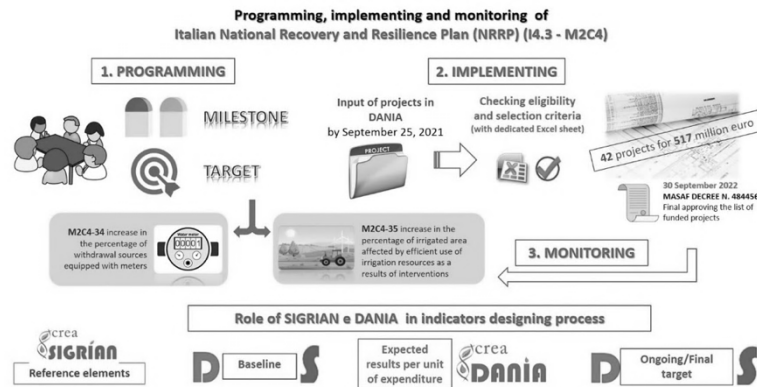
This path was helped by the use of DANIA over time in all phases (programming, implementing and monitoring) of plans implementation.

## **2. Programming, implementing and monitoring irrigation investment programs within National Recovery and Resilience Plan**

Within the Mission 2 – Component 4 of Italian National Recovery and Resilience Plan (NRRP), Ministry of Agriculture planned the investment *4.3 - Investments in the resilience of the irrigation agro system for better management of water resources*, providing for infrastructural interventions on the irrigation networks in order to improve water management, reduce water losses and promote the measurement and monitoring on collective networks (through the installation of meters and remote control systems) (PNRR – Investments in the resilience of the irrigation agro system for better management of water resources | Department of Economic and Social Affairs (un.org)).

Part of the available budget was used to select new projects, according to the new call for funding in 2021 for about 520 million euro; other 360 million euro were used to guarantee the progress of projects already funded with other domestic funds, which were included in the timeline of the measure because of their coherence with its aim and timing.

DANIA, jointly with SIGRIAN, was applied in programming and implementing the measure and will also apply in monitoring phase (Figure 1).



**Figure 1:** Application of DANIA e SIGRIAN in programming, implementing and monitoring I4.3 - M2C4 of Italian National Recovery and Resilience Plan (NRRP)

In the programming stage, for the evaluation and monitoring of measure, two performance indicators have been set up:

1. Increase the percentage of withdrawal sources equipped with meters from 24% (baseline) to at least 26% in 2024, and 29% in 2026 (M2C4-34);
2. Increase the percentage of irrigated area that benefit from efficient use of irrigation resources from 8% (baseline) to at least 12% in 2024, and 24% in 2026 (M2C4-35).

The value of baseline and target (ongoing and final) was defined by DANIA and SIGRIAN information. In the monitoring stage, the actual value achievable for these indicators will be assess at the medium term (2024) and final deadline (2026) by DANIA information on funded projects.

In the implementation of the measure, DANIA was also the instrument through which the projects were submitted by irrigation boards and selected by Ministry of Agriculture according to eligibility and selection criteria defined by MASAF.

For the funding of new projects, eligibility and selecting criteria (Fig. 2 and 3) were settled down in order to select interventions able to guarantee water saving and water use efficiency, in line with the objectives of the Water framework directive (WFD), the “do no significant harm” (DNSH) principle and the implementation deadlines set by the NRRP.

Figure 2 summarises the 23 eligibility criteria for accessing the call for funding. Figure 3 shows the 11 selection criteria for ranking projects.

Willingness to apply for funding	Strategicity	Compliance with volume monitoring obligations	Coherence with eligible actions	Level of design and timing coherent with deadline of the measure
A1 Source of Funding = Recovery Plan Mipaaf A2 Phase= Submitted for funding	A3 – Project amount= >2 MLN € A23 – Regional Priority = High	A22- “Compliance with SIGRIAN”= YES	A4 – Prevailing purpose= Irrigation A5 – Prevalent first type of intervention and A6 – Specific prevailing purpose= coherent A7 – Meters at the supply source installed as part of the investment= >0 A8 – Efficient area= > 0 A9 – New irrigated area = 0	A10 and A11 Project level and date of project= executive and recent A12 – Duration of works= < 30 months A13-A14 Technical approval by Competent Authority= YES (if required) A15 and A16 – Technical verification= YES A17 – Water abstraction permit= Acquired and valid A20- Status of the authorisations= Acquired and valid or renewable in 6 months. A21 – Environmental impact assessment= acquired or not applicable

**Figure 2:** Eligibility criteria of M2C4 – INV. 4.3 published (if otherwise specified, the name of the criterion corresponds to the name of the DANIA field) (Source: our elaboration on MASAF Ministerial Decree of June 2021)

Theme	Criterion / DANIA field	Maximum score for the criterion	Maximum score for the theme	% of the theme on the total
Workability level	S1 - Water abstraction permit	2	4	10%
	S2 - Status of the authorisations/opinions required for the feasibility of the intervention	2		
Project effectiveness in achieving targets	S3 - "Project amount" in relation to the "contractual duration of works/supplies foreseen in the project schedule" (euro/month)	5	15	38%
	S4 - "Area equipped area under the intervention" in relation to the "contractual duration of works/supplies foreseen in the project schedule" (ha/months)	5		
	S5 - "Project amount" in relation to the "Area equipped area covered by the intervention" (euro/ha)	5		
Impact on environmental objectives - efficient use of water and Adaptation to climate change	S6- Water saving (%)	3	18	45%
	S7 – WFD Objective	4		
	S8 - Level of potential desertification	4		
	S9 - Recurrence of drought events (in the last 15 years, Standardized Precipitation Index - $SPI_{(lag)} < -0.5$ )	4		
	S10 - Other environmental protection aspects (insert keyword "environmental protection" in DANIA Field "Brief Intervention Description")	3		
Territorial context	S11 - Interventions concerning territorial contexts dedicated to typical agri-food production with high value and quality production (PDO and PGI) (insert keyword "PDO and PGI" in DANIA Field "Brief Intervention Description")	3	3	8%
<b>Maximum total score</b>		40	40	100%

**Figure 3:** Selection criteria of M2C4 – INV. 4.3 published (if otherwise specified, the name of the criterion corresponds to the name of the DANIA field) (Source: our elaboration on MASAF Ministerial Decree of June 2021)

All these parameters were defined by MASAF on the basis of some DANIA fields and published with a Ministerial Decree in June 2021, when the call for funding was launched. Even the score of some selection criteria was defined according to statistic elaboration of DANIA information.

From June to September 2021, irrigation boards submitted their projects in DANIA, declaring their willingness to apply for funding within the measure using two specific fields of DANIA: "Phase = Submitted for funding" and "Source of Funding = Recovery Plan".

For a successful application, irrigation boards had to compile in DANIA all the information necessary to evaluate the eligibility and selection criteria.

DANIA does not currently provide any data processing functionality, as the possibilities for processing information are potentially infinite and variable depending on the methods of allocating funds, both by Ministries and Regions. Therefore, the verification of the eligibility and selection conditions was conducted "outside" DANIA by implementing a specific Excel spreadsheet to process the data declared in DANIA.

### 3. Results and discussion

After the submission deadline (25 September 2021), the data of the 249 projects submitted by 97 irrigation boards were downloaded by DANIA and imported into the aforementioned Excel spreadsheet for the purpose of checking the eligibility and selection criteria, as well as for the allocation of provisional scores.

Then, a list of 159 eligible (respecting all the eligibility criteria) and ranked (basing on the score assigned through selection criteria) projects was immediately produced and published by MASAF in only five days (MASAF Decree n. 0490962 of 30/09/2021).

Basing on the available budget, MASAF started a verification procedure by asking only the beneficiary of the first 57 projects in the ranking to produce documentation supporting the data declared in DANIA. These documents were analysed by a group of 12 experts who concluded the investigation in 3 months.

In September 2022, one year after the end of the selection process, MASAF published a list of 42 projects selected for funding, with an allocated budget of 517.4 million euro.

The effectiveness of this procedure can be analysed considering the reduction of verification times and the declared data reliability.

First of all, it is possible to compare the time taken for each evaluation stage with that taken for previous investment programmes, such as the NRDP and CDP: with regard to the eligibility check phase, the efficacy of evaluation, in terms of the number of days occurred per eligible project, can be estimate in 0.03 days/projects, which is considerably less than the previous value of 5.4 and 8.9, respectively (Table 1).

**Table 1**  
Efficacy in eligibility check phase

Program	Project submitted to call for funding (n.)	Days occurred for eligibility check (n.)	Eligible projects (n.)	Efficacy 1 (n. days per n. eligible project)
	A	B	C	B/C
NRDP 2014-2020	84	245 (Committee)	45	5.4
DCP 2014-2020	52	295 (Committee)	33	8.9
I 4.3 M2C4 NRRP	249	5 (team DANIA Excel sheet)	159	0.03

Furthermore, an efficacy evaluation can also be applied to the whole projects selection, from the deadline of call for funding to the publication of the list of funded projects, both in terms of days occurred per funded project (70% less than the previous procedure) and in terms of funded amount per day of evaluation (up to seven times the previous one) (Table 2).

**Table 2**  
Efficacy in the whole phase of projects selection

Program	Days occurred for the whole evaluation (n.)	Funded projects (n.)	Funded amount (Meuro)	Efficacy 2 (n. days per n. funded project)	Efficacy 3 (funded amount per day)
	A	B	C	A/B	C/A
NRDP 2014-2020	572	19	272.6	30.1	0.48
DCP 2014-2020	456	15	85.9	30.4	0.19
I 4.3 M2C4 NRRP	368	42	517.4	8.8	1.41

The results show that the use of DANIA for the selection process markedly reduced the time required to identify the project's eligibility for funding and to complete the evaluation process. The evaluation by an expert committee requires that all eligible projects must be analysed in order to be included in a ranking, even if the budget is sufficient for only a small percentage of them. Conversely, the automatic application with DANIA was utilised to submit only those projects that were in useful position for funding and eligible for ranking by an expert committee evaluation.

In terms of the reliability of the data, the group of experts appointed by MASAF to carry out the project appraisal corroborated DANIA's data for 69% of the projects in question (29 projects out of a total of 42), thus confirming consistency with the data provided by the irrigation boards themselves in the project documentation. For the remaining 13 projects, 14 incorrect data were found regarding some selection criteria (S8, S9 e S11 in Fig. 3) whose evaluation by the irrigation boards was susceptible to a certain degree of subjectivity and/or error (see Fig. 4).

This allows us to argue that the applied selection procedure is reliable and that, in general, the irrigation boards enter accurate information, so that in the subsequent investigation phase a good correspondence between the data was found.

	Unfulfilled criterion	Cause of the error of the inserted data	N. of projects involved
Impact on environmental objectives - efficient use of water and Adaptation to climate change	S8 - Level of potential desertification	The irrigation boards made reference to documentation produced at the regional level in lieu of the national reports that had been employed in previous programmes and on the basis of which the criterion itself had been constructed	7
	S9 - Recurrence of drought events (in the last 15 years, Standardized Precipitation Index - SPI <sub>3(99)</sub> <-0.5)	The reading of maps available online was foreseen only at a very small scale, which made it difficult to correctly locate the intervention and therefore to classify the intervention area	3
	S8 and S9	See above	1
Territorial context	S11 - Interventions concerning territorial contexts dedicated to typical agri-food production with high value and quality production	The irrigation boards failed to insert specific "keywords" in a specific field of DANIA	4

**Figure 4:** Causes of the error for the incorrect data

However, some critical issues can be highlighted. First of all, this multi-criteria procedure proves suitable for the evaluation of projects whose technical validity and coherence with territorial objectives have been previously assessed, so that their compliance with the specificities and objectives of each funding programme in terms of admissible actions and intervention objectives can be verified. That is why projects in DANIA must be previously accepted by the reference Regions, which characterise them by an intervention priority (from *high* to *low*).

Furthermore, although some procedures are in place to ensure the completeness, accuracy and consistency of the information, the verification of project data is not completely automated, but requires formal verification by the Funding Body (in this case MASAF). A procedure for verifying and formalizing the data entered is currently under consideration with a view to making it more official.

Another crucial aspect of this process is the potential for duplication of projects within DANIA, whereby individual projects may be grouped or split on occasion to meet the specific requirements of funding calls. One potential solution that could be explored in the future is the development of application masks that are linked to, but independent of, project data.

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## Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

## References

- [1] R. Zucaro, G. Giannerini, A. G. Pepe, F. L. Tascone, M. Martello, Water Data Sharing in Italy with SIGRIAN WebGIS Platform in: M. Salampassis, T. Bournaris (Eds.), Information and Communication Technologies in Modern Agricultural Development, volume 953 of Communications in Computer and Information Science, Springer Cham, Switzerland, 2017, pp. 110-117. doi: 10.1007/978-3-030-12998-9\_8.
- [2] R. Zucaro, M. Ferrigno, V. Manganiello, Italian approach to quantify water for irrigation, in: Proceedings of 11th World Congress on Water Resources and Environment, EWRA 2019, IAEA Press, Vienna, 2019, pp. 315-316.
- [3] M. Ferrigno, R. Lorenzetti, L.A. Folino, R. Zucaro, The new Italian web database to support irrigation investment policies: DANIA, International Journal of Sustainable Agricultural Management and Informatics, 8 (2022) 64-83. doi: 10.1504/IJSAMI.2022.123047.

- [4] R. Zucaro, V. Manganiello, R. Lorenzetti, M. Ferrigno, Application of Multi-Criteria Analysis selecting the most effective Climate change adaptation measures and investments in the Italian context, *Bio-Based and Applied Economics*, 10 (2021) 109-122. doi: 10.36253/bae-9545
- [5] V. Manganiello, M. Ferrigno, SIGRIAN and DANIA to promote measurement of agriculture water use, in: *Proceedings of 12th World Congress on Water Resources and Environment, EWRA 2023, Thessaloniki, Greece.*
- [6] M. Ferrigno, L. A. Folino, N. Crisponi, S. Capone, V. Manganiello, SIGRIAN and DANIA to support water related policies for efficient and sustainable irrigation, in: *Proceedings of 14th European Conference on Precision Agriculture, ECPA 2023, Bologna, Italy.*