

Ex post evaluation

Small-scale irrigation – Mali



Title	Contribution to implementing the national programme for small-scale irrigation		
Sector and CRS code	Projects A & B: Agricultural water resources (CRS code 31140); project C: 50% Rural development (CRS code 43040); 25% Agricultural water resources (CRS code 31140); 25% Food crop production (CRS code 31161).		
Project number	BMZ no. 2008 65 758 (project A); BMZ no. 2009 65 376 (project B), BMZ no. 2013 66 442 (project C)		
Commissioned by	German Federal Ministry for Economic Cooperation and Development (BMZ)		
Recipient/Project-executing agency	Ministère du Développement Rural (MDR), Direction Nationale du Génie Rural (DNGR)		
Project volume/Financing instrument	EUR 11.5 million (project A), EUR 10.5 million (project B), EUR 5 million (project C)		
Project duration	March 2009 to February 2016		
Year of report	2020	Year of random sample	2019

Objectives and project outline

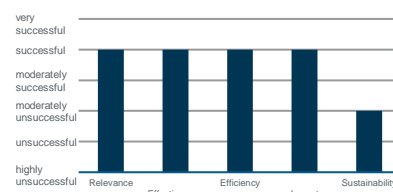
Projects A and B contribute to implementing the national programme for small-scale irrigation (Programme National d'Irrigation de Proximité, PNIP) in the Inner Niger Delta (IPRODI, Timbuktu and Mopti regions) and also in Dogonland and Bélé Dougou (IPRODB, Mopti and Koulikoro regions). The Sikasso region was added during the implementation period. During the crisis (from 2013), funds for an immediate measure supplemented the programme (project C). The objective at impact level of the three projects was to improve the living conditions in the project regions and improve the security of the national food supply (at impact level). The projects' goal at outcome level was to make the most of the agricultural potential in irrigation for a sustainable, self-sufficient agricultural sector and to increase the population's income.

Through the construction of perimeter pumps and small dams, an area totalling 12,030 ha was irrigated and smallholder farmers received advice on their usage. Supplementary measures were designed to make utilisation easier (storage for agricultural produce, earth roads).

Key findings

- In view of a growing population, low agricultural productivity and just one rainy period each year, the programme addressed the right area (relevance).
- It is worth noting that, despite an intense conflict within the country, the construction measures were largely implemented as planned (effectiveness).
- The yields per hectare in the main season were good in the first two years after completion (effectiveness).
- A positive developmental impact is likely. However, no information is available concerning the living conditions in the target regions.
- No structures are in place to ensure the monitoring and maintenance of the systems beyond a two-year period. Here, plans were in place for a handover from FC to a Technical Cooperation (TC) project, though these plans fell through. Sustainability therefore is not guaranteed.

Overall rating: moderately unsuccessful



Conclusions

- There is no monitoring of the projects' impacts. Furthermore, outcome indicators were only partially recorded for the first two years after the end of the project (important: the implementation consultant proceeded according to the agreement).
- The assessments in this report are based primarily on KfW documentation or documentation from the implementation consultant.
- Future projects should ensure medium-term follow-up support in the field of monitoring, maintenance and user supervision.

Rating according to DAC criteria

Overall rating: 4 (all three projects¹)

Ratings:

Relevance	2
Effectiveness	2
Efficiency	2
Impact	2
Sustainability	4

Breakdown of total costs²

The ex post evaluation covers projects A–C. The specific FC projects were financed by grants based on budget funds from the Federal Ministry for Economic Cooperation and Development (BMZ), as well as co-financing funds from other donors and the partner country's counterpart contributions.

		Project A* (planned)	Project A* (actual)	Project B* (planned)	Project B* (actual)	Project C* (planned)	Project C* (actual)
Total costs	EUR million	15.0	15.0	61.5	61.5	5.0	4.6
Counterpart contribution	EUR million	2.1	2.1	7.1	7.1	-	-
Co-financing	EUR million	1.4	1.4	43.9	43.9	-	-
of which BMZ budget funds	EUR million	11.5	11.5	10.5	10.5**	5.0	4.6

*) Projects in random sample 2019 **) Includes the EUR 0.2 million that had yet to be disbursed at the time of the final inspection in 2015.

Relevance

Agriculture is the most important sector in the country and employs over 80 % of the working-age population (CIA Factbook). In view of very rapid population growth, a low level of agricultural productivity and very unevenly distributed rainfall over the course of a year, irrigation is rightly one of the country's highest priorities. There is thus clear potential to significantly improve the country's food situation with these projects. This is reflected in numerous national strategies, such as the Politique de Développement Agricole. The projects are embedded in the Programme National d'Irrigation de Proximité (PNIP), implemented by the Malian government, and, as such, are generally coordinated with the partner country and other donors. Under the PNIP, potential assessments and regional requirements were collated at national level and recorded in detail within the scope of feasibility studies. Only projects with acceptable investment costs per hectare were then implemented. The project-executing agency was the Ministry for Rural Development (Ministère du Développement Rural, MDR) and the National Directorate of Rural Engineering, an office within this ministry (Direction Nationale du Génie Rural, DNGR). The structure of the project-executing agency was appropriate.

The core problem at the time – still an issue today – which was addressed by the intervention is the low level of agricultural productivity in rural areas and a growing population. One of the causes of this low productivity is the irregular rainfall, which only allows for one crop period without any artificial irrigation. The logic behind the project's intervention was to expand small-scale irrigation infrastructure in order to intensify agriculture – both during the main season and as a result of opening up additional cultivation

¹ The ratings for each category will not be listed for each project as it did not appear to make sense to rate each project separately for this evaluation due to the inter-dependent correlating effects.

² As per the final inspection.

periods – and thus to increase yields. Even from today's perspective, this logic appears completely suitable for addressing the core problem. The developmental objective (at impact level) of the three projects was to improve the living conditions in the project regions and to improve the security of the national food supply. The projects' goal at outcome level was to make the most of the agricultural potential in irrigation for a sustainable, self-sufficient agricultural sector and to increase the population's income. The projects also still conform to the German Federal Government's Policy Guidelines for Africa, which focus on food security, adaptation to climate change and crisis prevention, and are also in line with the BMZ's European Recovery Programme with Africa.

The conflict within the country heavily influenced the implementation of the measures; the project concept and its guidance were adjusted accordingly. A few locations could not be pursued due to the conflict, though they were replaced. For some locations that were physically inaccessible temporarily, the implementation consultant developed a remote management concept from Bamako. As a result, measures were ultimately only delayed and all projects could be implemented within the scope of the objectives, an achievement that can be attributed particularly to the implementation consultant and its local partners. Tasks were broadly distributed among other donors active in PNIP on a regional level. There is coordination between donors for the processes within the PNIP and as part of the cooperation with Canada. The co-financing measures are not implemented as basket funding even today; instead, funds are allocated on a regional, donor-specific basis because accountability and visibility are desirable for political reasons. Basket funding is still being assessed as an option as part of subsequent financing packages.

The projects were executed within the framework of three components, which differed in terms of the project region and the concept: IPRODI (river-water-based irrigation in the Niger Delta), IPROSI and IPRODB (both rainwater-based). There was no donor coordination concerning the shortage of water, though there was also no need for this at the time of the evaluation. According to a water availability study by the ministry, there is no shortage of water in the IPRODI regions in the Inner Niger Delta during the rainy season – when water-intensive rice farming takes place – because the river delivers sufficient water. While the quantity of water decreases considerably during the warm dry season, the vegetables grown during this time require less water than rice, while the cold dry season, which follows on directly from the rainy season, provides just about enough water for this type of farming. Consequently, water shortages only occur during the warm dry season in some villages (see below). Furthermore, there are no other larger irrigation projects within the Inner Niger Delta with whom coordination would be required. For the rainwater-based irrigation systems in the south (IPROSI and IPRODB), there is naturally no competition for water between regions and the building measures are aimed precisely at reducing water shortages in the target region.

In view of the country's water shortages, irregular rainfall, growing population and its food requirements, the selected approach was appropriate.

Relevance rating: 2

Effectiveness

The projects' goal at outcome level was to make the most of the agricultural potential in irrigation for a sustainable, self-sufficient agricultural sector and to increase the population's income. While the cross-regional conflict led to delays, it did not result in higher costs. Ultimately, most building measures could be implemented as planned, apart from some minor adjustments.

As a result of the projects, BMZ funds were used to create or rehabilitate 12,030 ha of irrigated land by 2014 through the construction of new structures or the refurbishment of existing ones. According to the project executing agency, the areas were still in effective use in 2019 (the time of the EPE), though there is no monitoring system that delivers up-to-date data. Furthermore, there is no information regarding the percentage of this area that is no longer in use. During the final inspection, the yield rate was 5 tons per ha, precisely at the target level. There is no more up-to-date information available here either.

As agreed in the contract, the indicators were monitored by the consulting company for the first two years, though only up to 2016 and on a component-specific basis instead of a project-specific one, i.e. the consultant monitors the development for IPRODI, which is made up of various BMZ numbers (i.e. BMZ financing packages). Therefore, the monitoring of IPRODB and IPROSI ceased in 2016. While there is a remote-sensing-based monitoring concept in place for IPRODI, it was not updated for the areas evaluated

here (only for IPRODI areas that are irrigated as a result of more recent BMZ financing). KfW also did not request or commission monitoring in this respect. For this reason and given the resources available for this evaluation, a status assessment at the time of the EPE is not possible without separate, extensive data collection. Based on the consultant's project completion report, it was only possible under this EPE to verify that the target achievement reported in the final inspection is in line with the data collected by the implementation consultant at that time for the majority of the indicators. However, the consultant's project completion reports do not contain any information for the following indicators (since this was not requested in the contracts with the consultant), meaning that their source in the final inspection is unclear:

- Use of developed irrigated area in % (i.e. main season + low season)
- Improvement to the food situation (in months with shortages in basic foodstuffs per year)
- Increase in women's income

Discussions with the target group and the implementation consultant held for the purposes of this EPE indicate a considerably lower usage rate of agricultural areas and lower yields in the dry season than originally planned (for IPRODI at least, these trends are also documented in reports). This is caused by the shortage of water in reservoirs or the river during the dry season, which was also reported by residents of the villages visited during the EPE for the IPRODB project.

The residents of villages visited by a local expert as part of the EPE (Kountou, Djidiè, Korikabougou; this non-representative random sample was selected by the project-executing agency and only depicts a very small part of the target group and regions) appeared to be very happy with the intervention and stated that the infrastructure was used a lot, even at the time of the EPE, for rice farming in the main season and for growing vegetables in the off season (mainly onions, garlic and potatoes). The measures for improving marketing channels were also implemented as planned: earth roads were improved, ferries were provided for transport in the Inner Delta, a pump workshop was established for repairing perimeter pumps, delivery options for vegetables were established, and basic and advanced training measures were implemented in relation to utilizing agricultural products, as well as in relation to repairing irrigation infrastructure and pumps.

Although there were delays as a result of the nationwide conflict and some project locations needed to be replaced so as not to be in the middle of the conflict, this ultimately did not have a negative impact on target achievement. According to the information provided, one of the two villages visited did experience individual land-related conflicts between newly settled and local farmers, though they are said to have been resolved with the help of local authorities. Nevertheless, the fields in question were still not in use at the time of the EPE due to this local conflict.

Indicator (project A)	Target level ³	Status 2016 ⁴
Use of developed irrigated area	85 %	Achieved; 85 %
Average yield on irrigated areas (rice)	5 t/ha	Achieved; 5 t/ha
Improvement to the food situation (in months with shortages in basic foodstuffs per year)	1.5	Not achieved: 2
Indicator (project B)	Target level	Status 2016
Average yield and use of the infrastructure in the Inner Delta	5 t/ha and 85 %	Achieved; 5.9 t/ha and 88 %

³ Based on the information in the project appraisal.

⁴ Based on data from the final inspections; it was not possible to collect or procure more recent data at the time of the EPE.

Growth in income from main farming produce and increase in size of farmland 2 years after completion of construction work (Dogonland, Bélé Dougou)	Dogonland: EUR 5,000 (potatoes), EUR 2,800 (onions) Bélé Dougou: EUR 3,200 (potatoes)	Not achieved; Dogonland: EUR 3,500 (potatoes) Not achieved; EUR 1,900 (onions) Achieved; Bélé Dougou: EUR 4,820 (potatoes)
Increase in women's income from farming Processing and preservation of agricultural produce	25 %	Achieved; 30 %
Production intensity and yield of rice (100 % equals full use of areas capable of being irrigated during the main season)	Prod. intensity: 150 % Rice yield: 2 t/ha in flood plains for cultivation 5 t/ha in dams 20 t vegetables in Sikasso	Not achieved: 110 % Target achievement unclear ⁵ ; rice yield: 5.9 t/ha
Indicator (project C)	Target level	Status 2016
Development of land for agricultural production	1000 ha	Achieved; 1,200 ha
Usage rate	85 %	Only just missed; 84 %
Average rice yield (in t/ha)	5 t/ha	Only just missed; 4.9 t/ha

Effectiveness rating: 2

Efficiency

In total, the BMZ funds for investments and consulting services amounted to EUR 26.4 million compared to a total irrigated area of 12,030 ha. For instance, the perimeter pumps used for IPRODI were considerably more cost-effective due to their size, standardisation and proximity to the Niger and are close to the costs documented in literature⁵. However, the small rainwater-fed dams in IPRODB and IRPOSI were much more expensive. In Dogonland, for example, the perimeters were set up on very rocky terrain, which meant that explosions had to be carried out and heavier-duty equipment had to be used, resulting in considerably higher costs (EUR 7,000–15,00/ha). Except for Dogonland, the costs are at a similar level to the Office du Niger, where around EUR 6,000/ha is invested for large-scale irrigation.

⁵ The final inspection does not break down the rice production quantity separately by irrigation technique, which means that it is impossible to make a statement concerning target achievement here.

⁶ See, for example Xie et al. (2017, 2018) and JRC (2019).

Depending on the size of the contract, international or national invitations to tender were issued for all construction measures, as well as for the procurement of equipment, vehicles and material, and the contracts were issued in a transparent manner.

From the FC funds in project A (B/C), 92 % (56 %/70 %) were used for infrastructure investments and 8 % (44 %/30 %) for consulting costs. Across all three projects, consulting costs make up an average of 26 %. Given the failure to assure sustainability (see Sustainability), it can also be questioned from an efficiency perspective whether the distribution of funds between infrastructure investments and consulting services was appropriate or whether more funds for consulting services (with less funding for infrastructure investments at the same time in view of the BMZ funds available) could have helped to achieve better or longer-lasting results and effects. The Malian partners expressed their preference for a high a proportion of infrastructure investments as possible. Within the scope of the consulting share, the user groups were able to receive support for just two years – a period that is clearly too short. With a higher share of consulting costs, this could have been extended to five years.

Efficiency rating: 2

Impact

The project's developmental objective is to improve the living conditions in the project regions and to improve the security of the national food supply. The country's food supply situation was critical at the time of the project appraisal and remains so today. The calorie consumption per capita is one of the lowest in the world. Just how marginal the supply situation is becomes clear when considering the national statistics: between 2010 and 2012, for example, gross domestic product contracted significantly due to conflict – and this is directly reflected in the key indicators for food supply. The number of underweight and stunted children rose sharply between 2010 and 2015. The prevalence of people with malnutrition fluctuates around the high level of 6 %.

In the target regions, too, almost the entire population relies on agriculture and most live off subsistence farming. Consequently, it can be assumed that the development of new farmland and the increase in agricultural area have significant positive effects on people's living conditions. However, no data has been systematically collected since the implementation consultant provided selective data on yield per hectare two years after the end of the construction work. No data was collected in relation to living conditions or the specific impact indicators. The people surveyed in the villages visited for this EPE appeared to be very happy with the intervention and emphasized that the small-scale irrigation programme had considerably improved their living conditions. According to the information available, the focus here is on the increased yields during the main season (rice), while the off season, in which vegetables are planted, presents a challenge to farmers. They complained about the low sales prices for vegetables and the generally high transaction costs for marketing.

Water availability in the rain-fed farming perimeters in the south generally improved. Here, conversations with project participants and village residents even noted that water tables had risen in the surrounding wells. In conjunction with the accompanying water- and soil-preservation measures, the dams contribute to the enrichment of aquifers, which not only benefits irrigation but also the drinking water supply.

It is not possible to accurately determine the extent to which the projects contributed to improving the food situation beyond the neighbouring villages in the respective region or even the entire country. However, if the total irrigated area (11,900 ha including the areas financed from Canadian delegated funds via FC) is put in perspective, a nationwide effect is unlikely given a total agricultural area of 6.4 million ha in Mali. However, within the regions themselves, the project areas visibly increase the total irrigated area. The IPRODI areas represent 9 % of the irrigated areas in Timbuktu and Mopti, while the IPRODB and IPROSI areas make up 5 % of the irrigated areas in the Koulikoro and Sikasso regions.

It is very difficult to make any statements concerning yield per hectare. On the IPRODI areas, which make up the majority of the project, 18,500 t of rice were produced in total in 2014 (according to the final inspection, this covers the basic carbohydrate needs of around 107,000 people), which is important for the project areas, but may not make a tangible impact beyond the project areas given an annual nationwide production level of 2.2 million t and an annual regional production level (Mopti and Timbuktu) of 650,000 t of

rice. Nevertheless, these yields could increase even further in subsequent years as several cropping cycles are needed to achieve the full potential for yield increases from irrigation.

Impact rating: 2

Sustainability

A critical factor for the project's sustainability is the organisation of repairs and, at least, medium-term support for the population through complementary agricultural measures. The user groups are responsible for operating the systems, though they do receive support in planning proper maintenance and are also supposed to be monitored to ensure compliance. There is no monitoring that goes beyond 2016, i.e. the two years of monitoring performed by the implementation consultant. For this reason, there is no systematic information concerning the condition of the structures and systems at the time of this evaluation. In the case of the IPRODI perimeter pumps, maintenance is slightly easier due to a standardised approach and primarily depends on the operation of diesel pumps, which seems to have been ensured through the establishment of an engine workshop. The creation of a perimeter pump workshop was confirmed in interviews with the target group in the project areas (see also Effectiveness). Furthermore, the visited representatives of the target groups stated that the usage fees are paid properly and used for replacement investments. Furthermore, the canals in IPRODI have to be dredged on a regular basis to prevent sediment from collecting. It is unclear whether this is ensured or not and it could not be definitively clarified during the EPE. However, it is assumed that this is not ensured since the users cannot do this themselves and no funds are available from the partners for this (see below).

The maintenance requirements are considerably more urgent for IPROSI/IPRODB. Due to the temporary large quantities of water, the structures are subjected to much higher loads during the rainy season than during the rest of the year, meaning that the concrete walls of the small dams quickly show signs of cracking. If these are not repaired quickly, larger-scale damage and failures will occur within just a few years according to the programme proposal and information provided by the implementation consultant. In fact, it appears that this maintenance has not been carried out outside of the period monitored by the implementation consultant, which ended in 2016. Despite the farmers receiving training on how to complete smaller scale repair work, a number of people spoken to questioned whether this work is actually carried out. Three small-scale dams in Djidiè, Kountou and Korokabougou visited for this EPE were still intact 4–5 years after completion and, according to the information provided by the user groups, no maintenance has been required so far. However, no usage fees are paid in the two villages visited, which means that there are no reserves for larger measures. More extensive maintenance and repair measures would exceed the user groups' financial power anyway and would have to be carried out by the DNGR and its regional offices. It is unlikely that this will happen (see below) even though the EPE cannot provide a conclusive assessment as this aspect has not been monitored since the end of the consultant's two-year supervision period (the project-executing agency and users are responsible for the infrastructure). Only selective information is available, for example if perimeters from this project are close to new perimeters monitored by the implementation consultant and give the impression of not being maintained properly. Monitoring reports from the PNIP also confirm that the majority of the systems in the PNIP are not in a satisfactory condition (albeit not specific to the projects evaluated here). Furthermore, systematic maintenance measures are unlikely because the local partners lack the funds for this (according to information from the PNIP and the implementation consultant).

The project-executing agency is formally responsible for monitoring and supporting farmers in relation to maintenance measures. During the course of the implementation, the project-executing agency changed from the Direction Nationale de l'Agriculture (DNA) to the Direction Nationale du Génie Rural (DNGR). In the course of the two-year follow-up support period, the DNGR and its regional authorities received support from the implementation consultant, but by its own admission, and confirmed by the implementation consultant, the capacities (staff and vehicles, fuel) are too limited to permanently monitor the perimeters, which are spread over a large area. Furthermore, the armed clashes in the context of the conflict also affect this situation, limiting mobility for security reasons, even for the DNGR.

At this point, the cooperation between the German TC programme, Programme d'Appui au Sous-Secteur de l'Irrigation de Proximité (PASSIP), and FC is worth noting in particular as the distribution of roles has not been clarified. PASSIP's tasks include supporting the economic potential in irrigation generally for a

sustainable, profitable agricultural sector and increased food security. From KfW's perspective, PASSIP has been responsible for development (mise en valeur) from the third year and for supporting DNGR and DNA in monitoring and maintenance since 2014/2015. With respect to the importance of monitoring for the supervision and completion of maintenance measures, as described above, PASSIP is therefore assigned a central role. In reality, PASSIP has a different definition of its own role and also refers to a shortage in capacities. For the structures evaluated here and built between 2012 and 2015, the distribution of roles is particularly unclear; it appears to have been contractually agreed since 2017, i.e. for the follow-up financing of the financing transactions evaluated here. In view of the projects evaluated here, however, it must be said that no particular attention appears to have been paid to the medium-term monitoring of the systems and their medium-term usage during measures planning by KfW, not least because the distribution of tasks with PASSIP was not adhered to and arranged to a satisfactory extent.

There is no coordinated and integrated water management, though an availability study was conducted for extraction from the Niger under IPRODI and is having positive results. According to this study, the irrigation projects were said not to have a tangible impact on water availability. In the Niger Delta, there are no other noteworthy irrigation projects of a similar magnitude to IPRODI. In the IPROSI and IPRODI regions, the projects' influence on water availability was said to be positive, and this even extended to the water table where possible.

Overall the sustainability is not satisfactory. While there is no precise data available concerning the condition of the financed irrigation infrastructure, the target group interviews and statements from the implementation consultant confirm that maintenance and repair work is not carried out to a satisfactory extent. Consequently, it can plausibly be assumed that the short-term usage has been sufficiently ensured, but not the medium- and long-term usage, though this depends on the condition of the infrastructure. This has a negative impact on the sustainability rating. Furthermore, the division of tasks between FC and TC was of central importance in this context in order to guarantee the regular appraisal of infrastructure on a permanent basis, though this was not implemented as planned.

Sustainability rating: 4

Notes on the methods used to evaluate project success (project rating)

Projects (and programmes) are evaluated on a six-point scale, the criteria being **relevance, effectiveness, efficiency** and **overarching developmental impact**. The ratings are also used to arrive at a **final assessment** of a project's overall developmental efficacy. The scale is as follows:

Level 1	Very good result that clearly exceeds expectations
Level 2	Good result, fully in line with expectations and without any significant shortcomings
Level 3	Satisfactory result – project falls short of expectations but the positive results dominate
Level 4	Unsatisfactory result – significantly below expectations, with negative results dominating despite discernible positive results
Level 5	Clearly inadequate result – despite some positive partial results, the negative results clearly dominate
Level 6	The project has no impact or the situation has actually deteriorated

Rating levels 1-3 denote a positive assessment or successful project while rating levels 4-6 denote a negative assessment.

Sustainability is evaluated according to the following four-point scale:

Sustainability level 1 (very good sustainability): The developmental efficacy of the project (positive to date) is very likely to continue undiminished or even increase.

Sustainability level 2 (good sustainability): The developmental efficacy of the project (positive to date) is very likely to decline only minimally but remain positive overall. (This is what can normally be expected).

Sustainability level 3 (satisfactory sustainability): The developmental efficacy of the project (positive to date) is very likely to decline significantly but remain positive overall. This rating is also assigned if the sustainability of a project is considered inadequate up to the time of the ex post evaluation but is very likely to evolve positively so that the project will ultimately achieve positive developmental efficacy.

Sustainability level 4 (inadequate sustainability): The developmental efficacy of the project is inadequate up to the time of the ex post evaluation and is very unlikely to improve. This rating is also assigned if the sustainability that has been positively evaluated to date is very likely to deteriorate severely and no longer meet the level 3 criteria.

The **overall rating** on the six-point scale is compiled from a weighting of all five individual criteria as appropriate to the project in question. Rating levels 1-3 of the overall rating denote a "successful" project while rating levels 4-6 denote an "unsuccessful" project. It should be noted that a project can generally be considered developmentally "successful" only if the achievement of the project objective ("effectiveness"), the impact on the overall objective ("overarching developmental impact") and the sustainability are rated at least "satisfactory" (level 3).