

>>> Ex post evaluation Office du Niger – Mali



Title	Office du Niger – Irrigation in Siengo; irrigation integration of marginal land users		
Sector and CRS code	Securing food supplies, agriculture / fishery 31140 (Projects A + B)		
Project number	BMZ no. 2008 65 089 (Project A); BMZ no. 2007 65 073 (Project B)		
Commissioned by	German Federal Ministry for Economic Cooperation and Development (BMZ)		
Recipient/project-executing agency	Office du Niger (OdN)		
Project volume/Financing in- strument	12.9 million (Project A), 7.7 million (Project B)		
Project duration	Project A: September 2008 to August 2015. Project B: November 2013 to June 2015.		
Year of report	2020	Year of random sample	2019

Objectives and project outline

The developmental objective (at impact level) of both 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. By expanding the irrigation infrastructure in the Office du Niger's (OdN) irrigation system, new areas of land were developed and areas previously irrigated informally were formalised. The smallholder users were advised on issues such as farming techniques, marketing and processing, as well as water management and the organisation of water user groups.

Key findings

Under the difficult circumstances of a heightening conflict, the implementation consultant was able to complete all construction measures on time. The systems are used as intended. However, the measures' sustainability is not guaranteed.

- In view of a growing population, low agricultural productivity and low rainfall, the projects addressed the right area.
- Demand for the newly developed farmland was greater than the amount of space available and the OdN's approach to allocating land was not transparent. As a result of this, the parcels of land allocated, at 0.5-3 ha per family, were significantly smaller than planned and the production yield per smallholder household was much lower than anticipated. Furthermore, the yield measured in tonnes per hectare remains below the expected 5.5 t/ha at 3.3-3.5 t/ha (4.5 in individual cases).
- The project's sustainability is not satisfactory as the capacities at the project-executing agency, the OdN, are weak and neither maintenance measures nor water management are implemented properly within the irrigation system.
- Continuing the cooperation with the OdN only appears sensible if its concept is further developed. In particular, more should be invested in the executing agency's operating capacity as well as in the infrastructure. Otherwise, the sustainability of future measures would be called into question too.
- Measures to cope with the high demand for land more efficiently are also essential (for example, in the form of complementary measures for more intensive use).

Overall rating: moderately unsuccessful



- The project did not monitor the impact nor did it systematically monitor the outcome. Outcome indicators were only measured in part and only for the first year after the end of the project.
- The assessments in this report are based (with a few exceptions) on KfW documentation or documentation from the implementation consultant, as well as on satellite data analyses created during the evaluation (data: FAO WaPOR)
- The central recommendation for subsequent measures is to improve monitoring and to focus more on the project-executing agency's structural weaknesses.



Rating according to DAC criteria

Overall rating: 4 (both projects)

Ratings:

Relevance	3
Effectiveness	3
Efficiency	3
Impact	2
Sustainability	4

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 clear potential for irrigation to significantly improve the country's food situation. This is reflected in Mali's numerous national strategies, such as the Politique de Développement Agricole. The advancement of the large-scale irrigation scheme, Office du Niger (OdN), remains one of the country's priorities to this day. Mali's irrigation law (Loi d'Orientation Agricole, 2005) provides for the expansion of irrigated areas and an increase in agricultural production through the conversion of abandoned agricultural land, previously used extensively, into irrigated areas that are used intensively for agriculture. Both projects were therefore in line with Mali's political priorities.

The core problem at the time – still an issue today – which was addressed by the intervention is a growing population and the low level of agricultural productivity in rural areas. One of the causes of this low productivity is the irregular rainfall, which only allows for one crop period without any additional irrigation. The logic behind the project's intervention was to expand irrigation infrastructure in order to intensify agriculture – both during the main season and as a result of opening up additional cultivation periods – and thus to increase yields. Even from today's perspective, this logic appears completely suitable for addressing the core problem. The areas irrigated as part of the projects were selected based on their proximity to the existing irrigation network, in particular to canals built during preceding projects, but also on the basis of potential yields per hectare¹. Another criterion was the observation that water was being informally diverted from existing irrigation or drainage canals, limiting their effectiveness.

Water availability is a central planning variable for investments in irrigation infrastructure, particularly on a large scale. This factor was taken into account from the outset, as documented by a water availability study from 2009. This study ascertains that there are no shortages during the rainy season, given certain investments in the primary network, but there may be water shortages in the hot months during the dry season. From the beginning, the implementation consultant planned that the areas would be used for more water-intensive rice farming primarily during the rainy season, and that vegetables at most would be grown during the dry season as they require much less water. Parts of the intervention also aim to achieve higher water usage efficiency by refurbishing infrastructure that was already being used sub-optimally, thereby improving water usage. Apart from this, there were no measures to increase water usage efficiency (for example, through increased vegetable farming or lower evaporation in the canals).

¹ The selection of the areas generally matches up with the master and development plan drawn up by the ZON, "Schéma Directeur de Développement Rural de la Zone Office du Niger 2005-2020 (SDD-ZON)" This document plans the entire gravity-fed irrigation system. The master and development plan covers both the extensive existing infrastructure, which was originally designed in the 1930s for cotton farming, and an expansion to the system to include the areas known as "new areas". The system enables around 960,000 ha to be irrigated; at present, only around 127,000 ha of this total have been rendered usable. Due to limited financing commitments, it has only been possible to implement parts of the overall concept so far.



The target group was the population already living in the project zone and immigrant families (1,139 families in total), a group made up of various ethnicities (Peulh, Bella Bambara). Ethnic conflicts played no role during the projects' implementation. For this reason, according to the implementation consultant, there was no reason to design the projects in a way that was sensitive to the possibility of conflict. According to the implementation consultant, the nationwide conflict played no role during the implementation phase as the measures were completed by the time the crisis reached the region. The allocation of land plays a central role in the conflict between immigrant families - many of whom are nomadic - and families based in the region. In the project under review, this aspect appears not to have been designed in a manner that was sensitive to the possibility of conflict. The allocation of land was discussed both in the project region and in the entire country on a cross-regional basis and was addressed by a German-Malian NGO. There is a consensus among all parties involved that the allocation of land was not transparent and was not possible to deal with the high level of demand. Furthermore, there are allegations that OdN officials enriched themselves as a result of the allocation of land, by managing to obtain land through false claims in liaison with local authorities and then leasing out this land. While the project and the implementation consultant tracked the processes for allocating land, they broadly left it to the OdN and did not exert a great deal of influence.

Relevance rating: 3 (both projects)

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.

The outcome-level indicators defined for the project are listed in the table below. They relate to intensity of use, yield per hectare and income in the target regions. The content of the indicators is appropriate, though the final inspections do not provide complete information concerning their achievement (a "0" is awarded to all aspects of project A). The yield per hectare and usage (as well as other indicators) were partially monitored by the implementation consultant during the first year, but this cannot be said for all indicators. There was no monitoring beyond the time under the implementation consultant, i.e. beyond the first year of operation. No provisions for this were included in the project's design. While the project-executing agency, OdN, received training, it simply did not have the human resources or logistical capacities to monitor the indicators. Due to this lack of monitoring, it was not possible to assess the status at the time of the EPE. The values listed in the tables below are therefore the indicators reported in the final inspections; however, for project A it was only possible to calculate values for two indicators using other sources.

In addition to the monitoring data from the project's implementation, satellite-based data analyses were also conducted for the evaluation. Map 1 shows the Zone N'Débougou in the Office du Niger with the areas financed by FC between 1995 and 2012, including the "Siengo Extension" and "N'Dilla" areas evaluated here.



Map 1: Zone N'Débougou in the Office du Niger and the FC-financed areas 1995–2012; evaluated here: Siengo Extension in the north and N'Dilla



Source: KfW project documents, 2012





Map 2: Annual maps of land coverage 2010-2018 on project areas in the Office du Niger

Source: MapTailor geodata report, commissioned for this evaluation 2020; data: FAO WaPOR Land Cover Classification 100m

Map 2 shows the annual development of agricultural areas in the Office du Niger between 2010 and 2018. The trapezium north of the areas shown corresponds to the "Siengo" project area. The annual maps reveal the transition from rain-fed farming to irrigated farming, particularly in the Siengo sub-zone (project A).

Chart 1 shows the change in area (in ha) over time in the various sub-zones. An increase in irrigated area is visible in the Siengo sub-zone (project A, official building inspection 2014) during the project period; the increases in the N'Dilla sub-zone (project B, building measures 2012–2014) are considerably lower (only N'Dilla 4c).





Chart 1: Changes in the agricultural areas irrigated each year in the Office du Niger, N'Débougou zone

Source: MapTailor geodata report, commissioned for this evaluation 2020; data: FAO WaPOR Land Cover Classification 100m

According to the implementation consultant, 1,722 ha (compared to 1,414.94 ha at the time of the final inspection) were newly developed or rehabilitated in project A during the first year of operation, and this area yielded 5,260 t of rough rice. This corresponds to an average yield of just 3.3 t per ha. The reason for the low yield is the users' poor organisation relating to the farming calendar and the timely use of fertilisers and pesticides. The extent to which yields increased in subsequent years was not followed up by the project. After the first year of operation, no training and consulting measures to improve organisation were implemented due to a shortage of capacity at OdN. No yield figures are available on usage during the low season, though the implementation consultant did document that just 10-15% of the areas were used during the first phase of the dry season (Contre Saison Froide) in the first year of operation. Rice, maize and onions are grown here². No farming takes place during the second phase of the dry season (Contre Saison Chaude).

The satellite data analyses performed during the evaluation provide some insight into the land productivity for the irrigated farming areas during the first and second crop cycles (crop cycles as per FAO WaPOR Phenology data). Maps 3 and 4 show the development of land productivity (measured by net biomass water productivity, NBWP³, FAO WaPOR data) compared to a benchmark⁴ between 2010 and 2018. This

² The first phase of the dry season, also known as the cold dry season, takes place directly after the rainy season. At this point, the areas do not require any additional irrigation as the volume of groundwater is sufficient for low-water vegetable farming.

³ "To calculate NBWP, the seasonal sum of transpiration as well as the total biomass production are required as input, TBP is scaled by the factor of 10, since they are stored as integers in the FAO database. No-data values were reclassified. NBWP was derived then by dividing the TBP by the sum of the transpiration for each season." (Source: MapTailor geodata report, commissioned for this evaluation, 2020)

⁴ Definition of the benchmark: "Number of years when maximum possible productivity has been achieved. Here, productivity (NBWP) of a given pixel at a specific year in the time-series is set in relation to the 95%-percentile of productivity values for all pixels for the entire



reveals a reduction in land productivity in the period under review, particularly during the second crop period (map 4). In the period from 2010 to 2013, there are several areas that show productivity levels above the threshold, primarily in the north-east and south-east. From 2014, a substantial reduction in productivity is evident for all areas in the Zone N'Débougou. In 2018 there is an increase in productivity in some areas, though this does not reach the level of productivity for the years 2010-2013. In the second crop period, this trend becomes even clearer: in 2014, just 35% of the global benchmark is achieved, while 60% of the global benchmark is reached in 2018.



Map 3: Land productivity (first season), measured as a percentage of a productivity benchmark, Zone N'Débougou in the Office du Niger, 2010-2018

Source: MapTailor geodata report, commissioned for this evaluation 2020; data: FAO WaPOR

time series. A value <1 represents pixels which showed a productivity smaller than the 95%-percentile, a value >1 represents pixels which showed greater productivity." (Source: MapTailor geodata report, commissioned for this evaluation, 2020)





Map 4: Land productivity (second season), measured as a percentage of a productivity benchmark, Zone N'Débougou in the Office du Niger, 2010–2018

Source: MapTailor geodata report, commissioned for this evaluation 2020; data: FAO WaPOR

Under the scope of project B, the aim was to restore the functionality of the main drainage canal (45 km) in the N'Dilla sub-zone in the east of the Zone N'Débougou (see Map 1) in order to increase the irrigation potential to the originally planned figure of 848 ha. In reality, the irrigation potential was restored for an area of 300 ha and, according to the information provided, a total of 270 ha was irrigated at the time of the evaluation. The yields per hectare reported for the first year were significantly lower than the figures planned in the project appraisal. The users surveyed for this evaluation in March 2020 reported yields of 4.5 t per ha. While yields have risen since 2015, they are still much lower than the 5.5 t per ha originally envisaged. According to this information, around 1,050 t of rough rice were produced in the first year after commissioning and 1,215 t were produced in 2019. The majority of users are subsistence farmers. Only a small number of families have enough land to generate excess yield to be sold. Further barriers appear to be a lack of storage options, particularly for vegetables, and a lack of water during the dry season. However, it is not possible to provide a conclusive appraisal of this within the scope of this EPE. According to surveys of the target group, the user groups set up in 2015 still exist, though no further information concerning their functionality is available. Furthermore, some of the families were relocated to new villages to develop land (in consultation with those affected according to the final inspection) and are supplied with project infrastructure there (houses, roads, school, latrines, central water pump), which is also broadly used.

Attempts were also made to reinforce the OdN's capacities through training measures (in relation to water management, maintenance and user training). These training measures were implemented and, according to the implementation consultant, demonstrated some short-term success, i.e. the measures took place for as long as the consultant provided the logistics and there were staff responsible for the project within the OdN. However, these measures did not lead to a permanent improvement to the OdN's capacities, mainly because the OdN lacks resources, a fact commonly known for many years. Essentially, there is a sufficient number of staff but there is a lack of vehicles and funds for fuel and per diems. However, this not only affects the structures and areas in this project, but also the majority of other OdN projects.



Indicator	Target level	Status at final in- spection
Project A		
Average rice yield after the 4th year of operation [t/ha]	5.5	Not achieved: 3.3
A. Onion yield after the 4th year of operation [t/ha]	25	n.a.
Cultivation intensity [%]	110	Not achieved: 80%
Female heads of household in the target group with access to irrigated land [%]	95	n.a.
Project B		
Increase in the rice yield [t/ha]	5.5	Not achieved: 3.5
Area in which no or limited water usage fees can be collected due to drainage problems	0	0

The project was successfully executed by the implementation consultant under some partly very difficult circumstances. However, no statements concerning the achievement of indicators can be issued due to a lack of information. While the targets for the yield per hectare may not have been achieved, this could also be down to a lack of sound foundations in the indicator's definition. Due to the high demand for irrigated land, allocating larger plots of land would have led to fewer people having access – which in turn would have been questionable from a pro-poor perspective. These trade-offs should be weighed up more in the planning phase in future (for example, with an indicator that also acknowledges the number of families benefited).

Effectiveness rating: 3 (both projects)

Efficiency

The construction costs (excluding consulting costs) per hectare amount to EUR 6,040 per ha for project A. In general, calculating the costs for this type of irrigation is complex because there is a network of primary. secondary and tertiary networks, whereby the first two bear the base irrigation load so to say, and consequently can be used for areas in a range of projects. For project B in particular, the construction costs per hectare are difficult to calculate because sections of the constructed or refurbished primary and secondary canals not only serve the newly irrigated areas but also the tertiary canals, and therefore also improve the irrigation or drainage of other areas. Breaking down these costs is impossible. If these primary and secondary canals are taken into account, the construction costs amount to EUR 19,700 per ha; however, if only the tertiary canals are taken into account, they amount to around EUR 6,200 per ha. Comparisons with costing information in literature are very difficult because the included costs do not have to be calculated (e.g. dams, consideration of primary canals). Furthermore, the costs depend heavily on the environmental conditions and the technology used. In the case of Mali, the assessment would also have to take into account the fact that farmers who probably used to have to farm on extremely infertile land are supplied with irrigated land. In this regard, a simple comparison of costs per hectare falls too short in view of the adverse conditions in a country like Mali. The information needed to conduct a more appropriate efficiency assessment is not available (e.g. accurate data regarding users' yield per hectare before and after the intervention).



National or international invitations to tender were issued for all procurement and construction measures. Consulting services made up 19.5% of the total costs for project A and 24% for project B. In view of the difficulties with implementing maintenance measures on a sustainable basis, a higher prioritisation of consulting services making up a higher proportion of the total costs would have been desirable to ensure longer-term support for the user groups and the systems built.

Some other donors express general concerns as to whether investments in the OdN infrastructure are cost-effective, particularly in view of the limited water volume in the dry season, which heavily restricts the extent of vegetable farming. However, this perspective is questionable as infrastructure investments are rarely cost-effective in the narrower sense, particularly for smallholders without scaling effects. In the case in question, the decisive factor in the first step is whether land productivity increases and, in the second step, whether such an increase in productivity could be achieved for less money using other technology or investments. In the Office du Niger region at least, this appears not to be the case.

However, one aspect that must be regarded as critical in terms of efficiency is the non-transparent process for allocating land, which not only led to conflicts in the target group, but also resulted in very small plots being allocated, one of the reasons for the low production quantity. The plot sizes themselves do not deserve criticism, as they of course also enable a larger number of very poor families to access better land; however, this aspect should have been anticipated in the project design – for example, in the form of complementary measures that provide for increased use for vegetable farming.

On the whole, it is difficult to provide an assessment of cost efficiency given the information available; nevertheless, the construction costs appear appropriate.

Efficiency rating: 3 (both projects)

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 the lowest in the world in a global comparison. 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% (World Development Indicators).

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. In particular, the high demand for parcels of land in the OdN, also among people from other regions, shows how low agricultural productivity is elsewhere in the country. Compared with this baseline, it is likely that the project very much improves farming and, as such, people's living conditions. However, this cannot be substantiated during this EPE as no data was collected in relation to living conditions or more specific impact indicators. The target group representatives surveyed for this EPE emphasised that the project significantly improved their living conditions, despite several barriers for vegetable growing, such as a lack of storage and transport options. Beyond the target region, regional or even national impacts on the security of food supply are unlikely, though this would also be an inappropriate expectation given the size of the irrigated areas relative to the size of the country and the ZON.

Impact rating:2 (both projects)

Sustainability

The key risk to sustainability is the capacity at the project-executing agency, the OdN. For many years, if not decades, deficits have been raised in a number of dimensions (mainly by other donors, only marginally in KfW reports). Criticism concerning mismanagement and corruption is repeatedly discussed in public in Mali and is not disputed, even by the OdN itself. This is obviously significant to the sustainability of the project evaluated here because these deficits in terms of management and trustworthiness are also



directly related to maintenance, usage fees and water management. The OdN is mainly financed by fees paid by users as the Malian government has failed to provide the agreed grants. The OdN is supposed to use these usage fees to finance the maintenance of the secondary network. Although the majority of users pay their fees correctly, estimates from a variety of sources state that these do not cover the costs for this maintenance work. At the same time, there were also allegations from users at the beginning of the project that the usage fees were too high. In general, the OdN has too few staff and not enough vehicles. While the project did not collect any information concerning the condition of the infrastructure, it is likely, according to other reliable sources, that the maintenance is not being performed or not to a satisfactory extent, even though the OdN has said in discussions that it is maintaining the infrastructure. It is therefore also very likely that the condition of the systems will deteriorate very quickly. The Malian government is responsible for maintaining the primary network. Maintenance is also neglected or rarely carried out in this case, too.

The user groups themselves are responsible for maintaining the tertiary network and received training in this area from the implementation consultant. Nevertheless, both the consultant and the OdN state that this maintenance work is not performed or is not performed to a satisfactory extent. In 2015, an evaluation team from the Dutch embassy noted in a general memorandum on the OdN that, in theory, land should be taken away from users who fail to maintain their network, but that there would be no users left if the OdN were to apply this rule.

A further problem for sustainability is the deficits in water management. In the project region, water has so far only been in short supply in the second phase of the dry season; water-intensive rice farming is not possible at this time without additional irrigation, and even the less water-intensive vegetable farming is heavily restricted as a result. On large sections of the land it actually becomes impossible. There is no explicit donor coordination in terms of water usage, though international treaties are in place between the countries along the Niger. The neighbouring countries are subject to quantity regulations related to flow volumes. While there are no shortages during the rainy season and main season, the flow volumes in the dry season are already very close to or even fall below the agreed minimum flow volumes. The OdN itself is responsible for overseeing water management inside the ZON, though it does not really monitor this aspect. It is not for this evaluation to assess how the project has influenced this water shortage; however, given the small area in relation to the size of the ZON, it is unlikely that the project plays a noticeable role. With regard to integrated water management within the ZON, the OdN and some donors are making an effort to improve this situation, though the bottleneck here seems to be the OdN with its ineffective implementation. It is therefore doubtful whether this problem will be handled in a satisfactory manner in future.

At the user level, the technology in the tertiary network has been designed so that individual farmers are only able to extract a certain quantity of water. However, this system is circumvented by canals being manipulated and water inlets being created illegally. This is not a problem during the rainy season as there is sufficient water in the system. During the dry season, however, the water shortage triggered by this situation also leads to disputes between users, though this has nothing to do with the country's ethnic conflicts.

Sustainability rating: 4 (both projects)



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).