Beyond farmers willingness to adopt the System of Rice Intensification: Role of Management Institutions and Physical Conditions in Mali

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Abstract

Upon SRI successes and its expansion globally, the SRI was introduced in West Africa in recent years. The system was simultaneously introduced in both Baguinéda and Sélingué irrigated schemes, in 2018, by the German Society for International Cooperation (GIZ) through its Green Innovation Centre (CIV). While adoption studies commonly focus on factors at farmers' level, this paper aimed to treat the role of the institutional environment and the physical conditions of the schemes in the adoption of SRI in Baguinéda and Sélingué, Mali. Purposive sampling technique was used to select hundred and twenty-one farmers in the two locations for individual interviews. The interviews were conducted through a questionnaire including questions on physical and institutional constraints preventing farmers to adopt SRI. In addition, two focus group discussions with farmers in each location and key informant interviews with management staffs and extension officers were also conducted. Results revealed the existence of operational problems withing farmers' organizations as well as management offices. They also indicated that none of the parties, including government, plays its full roles as indicated in the governing documents of the schemes and, these combined factors negatively affect SRI adoption. These results help understand that interventions aiming at SRI adoption should not be limited to targeting only farmers but should also address the management institutions and physical conditions of the intended locations.

author

1. Introduction

Upon SRI successes and its expansion globally (Katambara et al., 2013; Noltze et al., 2013), the SRI was introduced in West Africa in recent years (Uphoff, 2016). According to Styger et al. (2011), the SRI was first tested in Mali in 2007, through 2009. The test program was implemented by an NGO named Africare which was intervening in Goundam and Diré circles. The NGO helped the communities to establish village-based small-scale irrigation schemes (*Périmètre Irrigué Villageois*, PIV) of 30-35 ha each and irrigated by motor pumps to tackle food insecurity experienced by the local communities (Styger et al., 2011). On these PIV, the yields were higher than that of deep-water rice production system that farmers were practicing (4.9 t/ha compared to 750 kg/ha) but the land area allocated to households were still small (1/3 ha per household) (Styger et al., 2011). Therefore, it was necessary to find means to further increase the yields. It was in that context and perspective that the SRI was tested in Goundam and Dire circles. In 2007, the NGO Africare first tested the SRI with one farmer in the Douegoussou village, in Goundam Circle; the results were outstanding (9 t/ha of paddy compared to 6.7 t/ha in the control plot), farmers in the area therefore expressed great interest in larger scale testing of the SRI (Africare Mali, 2008).

Based on the first results and farmers' interest, the Better U Foundation of Los Angeles, California, made a grant to Africare for a larger project: to assess the performance of SRI in 12 villages during the 2008–2009 growing season in the circles of Goundam and Diré. The main objectives were to: (a) adapt SRI principles to the local rice cropping system conditions, and (b) compare SRI practices with farmer practices in 12 sites within two administrative circles of the Timbuktu region.

The SRI continued its expansion and involved different partners and NGOs. In 2015, the German Society for International Cooperation (GIZ) through its Green Innovation Centre (CIV) engaged in the promotion of the SRI. In 2018, CIV simultaneously introduced the SRI in both Baguinéda and Sélingué irrigated schemes. They trained some farmers and government agents on the application of the six SRI principles and the Deep Urea Placement (DUP) technique. The trained farmers were also provided both required chemical and industrial organic fertiliser for the test plots. The used diffusion method was Farmer Field School (FFS) technique and the test program initially lasted for three years. This paper aimed to treat the role of the institutional environment and the physical conditions of the schemes in the adoption of SRI in Baguinéda and Sélingué, Mali.

2. Materials and Methods

2.1. Study locations

This study was conducted in Baguinéda (12°37'00" N, 7°47'00" W) and Sélingué (11°38′18″ N, 8°13′47″ W), in Mali. Sélingué is located in the North-Guinean zone (1000-1200 mm) of Mali and Baguinéda in the North Soudanian zone (800-1000 mm). Sélingué is a rural area located 140 km from Bamako, the capital city while Baguinda is a peri-urban area located some 30 km from Bamako. The overall area covered by Baguinéda and Sélingué irrigated schemes are respectively 3000 and 1350 ha.

The economic activities in Sélingué are structured around agriculture (rice production mainly), fishing and artisanal gold mining-developing in recent years. The construction of the dam and the irrigated scheme boosted several small businesses around rice production. In Baguinéda, which is closer to Bamako, in addition to agriculture as main activity of most of the population, the influence of the big city has settled. This brings many people in small businesses and spread land speculations.

SRI was introduced in Sélingué and Baguinéda by a project lead by the Green Innovation Center (CIV) of the German Corporation for International Cooperation (GIZ), in 2018. Farmers were selected across villages covered by the two irrigation schemes to participate in trials through Farmer School Approach (FSA). Several farmers were trained on SRI techniques and those chosen to accommodate the trials were given seeds and both chemical and industrial organic fertilizers required for their plots.

The management institutions of the two irrigated schemes dedicated trained fields technicians to accompany farmers on the trials. The trials were financially supported by the project for three initial years. The promotion of the system to all the other farmers was led by the respective management institutions.

2.2. Management institutions of the irrigated schemes

2.2.1. Sélingué

The management of the irrigated scheme is jointly assured by the *Office de Développement Rural de Selingué* (ODRS) created in 1996 (by the law "Loi n°96-042/AN-RM of august 7th, 1996"), the Government and the producers. Two management institutions preceded ODRS, the authority for the construction "*Autorité d'Aménagément de Sélingué*, 1977-1982", in charge of the resettlements and the construction activities, and the "*Office pour l'Exploitation des Ressources Hydrauliques du Haut Niger* (OERHN), 1982-1996", with the double purpose of electricity production and the rural development of the whole area including the management of the irrigated scheme. In 1996, the two missions were split, the dam and the electricity production were assigned to the national company of energies "*Energie du Mali*, EDM-SA" and the rural development and the management of the irrigated scheme to ODRS, created for the very purpose.

For the current management, it is jointly assured by the *Office de Développement Rural de Selingué* (ODRS), the Government and the producers. The three parties, ODRS-Government-Producers are bound by a contract document named "*Contrat-Plan*". This document which is renewed every three years stipulates the roles and responsibilities of each party for the operationalisation, extension and maintenance of the irrigated scheme. The Government is in charge of extending and maintaining the primary roads, irrigation and drainage canals, and the outlet infrastructure and equipment. The secondary roads, irrigation and drainage canals are maintained by ODRS while producers assure the maintenance of the tertiary ones and the gullies in their compartments. Besides, producers pay water usage fees to ODRS, and ODRS among other activities assures the assistance, training, input access facilitation and advisory service to producers for their production activities on and beyond the irrigated scheme. ODRS also elaborates the production calendar, controls and supervises its implementation.

2.2.2. Baguinéda

As similar to ODRS, the management of the Baguinéda irrigated scheme is also jointly assured by the *Office du Périmètre Irrigué de Baguinéda* (OPIB), the Government and the producers. They are also bound by the "Contrat-

Plan" (renewed every three years) which stipulates that the Government is in charge of extending and maintaining the primary roads, irrigation and drainage canals. The secondary roads, irrigation and drainage canals are maintained by OPIB while producers assure the maintenance of the tertiary ones. Similarly, producers pay water usage fees to OPIB, and OPIB assures the assistance, training, input access facilitation and advisory to producers for their production activities on and beyond the irrigated scheme, elaborates the production calendar, controls and supervises its implementation.

In both locations farmers are associated to the management through joint committees "*les comités paritaires*" in charge of land and maintenance funds management. These committees, presided by ODRS and OPIB are composed of sixteen members, eight representatives of producers and eight representatives of ODRS for Sélingué and OPIB for Baguinéda. The committees should be renewed every three years. These committees deliver on plots attribution, reattribution and retrieval. They also deliver on the use of funds intended for the reparation and maintenance of relevant infrastructures. These funds are constituted of water usage fees paid by all producers. The committees are also responsible for coaching farmers to proceed to the maintenance of tertiary canals and decide of sanctions in case of no execution.

In addition to the "Contrat-Plan" and the joint committees, it is instituted that all farmers sign and respect operating conditions documents "Cahier des charges" with ODRS/OPIB. These documents legally bind ODRS/OPIB and farmers. They engage through this document to pay water usage fees, permanently cultivate their fields, clean and maintain the tertiary canals. The document also highlight that the plots should not be borrowed, rented, sold or inherited.

2.3. Presentation and description of the irrigated schemes

2.3.1. Sélingué

Structure and protection infrastructure of the scheme

The irrigated scheme is divided into fourteen sectors, numbered from 11 to 24. Each sector can be considered as an autonomous scheme, water-supplied by a secondary canal through a secondary inlet (on the main canal), and drained by a secondary culvert which drains into the main culvert of the scheme. Each sector is divided into elementary compartments with an average gross surface area of 6 ha and an average net surface area of 5.11 ha, after deduction of the areas occupied by the roads, irrigation and drainage canals. With its 872 ha of net area dedicated to rice, there are 170 compartments. The compartments are grouped in fours (4) to form a sub-sector, water-supplied by a tertiary canal through a tertiary inlet (on the secondary canal which borders the sector to the south), and drained by a tertiary culvert which drains into the secondary culvert bordering the northern sector.

The scheme is protected in the south by the platform of the hydroelectric dam and on the west, between the scheme and the Sankarani river bed, by an elevated dike of 13,545 m long with a width of 4.50 m. This is necessary because of the risk of the plain being submerged by flooding from the river. At the downstream end of the scheme (lowest point), where the main culvert C1 which collects excess water from the scheme opens out, the dyke is equipped with a structure for draining water into the river. This structure consists of a quadruple gravel drainage pit, equipped with non-return drainage valves, and a drainage pumping station. This pumping station is equipped with three electric generators, whose role is to ensure the drainage of the scheme when the water level of the river, in flood, is higher

than that of the plain and when, consequently, drainage by gravity has become impossible. In the east of the scheme, parallel to the main irrigation canal P1, a channel was created to drain run-off water from outside plateau till the river.

Irrigation network

The scheme is equipped with one water intake (with a capacity of 3 cubic meter per second). This intake provides water to the main irrigation canal sectioned in two, therefore considered as two irrigation canals, P1 and P2. The total length of the two main irrigation canals is 10.7 km, 6,522 m for P1 and 4,201 m for P2. To the main irrigation canals are connected thirteen secondary irrigation canals, it could be counted fourteen if we consider the fact that P2 plays the role of secondary irrigation canal by directly receiving tertiary irrigation canals on its section crossing longitudinally the scheme. The total length of the thirteen secondary irrigation canals is 11.8 km. Each secondary irrigation channel irrigates through the tertiary irrigation canals a separate and independent sector. In other words, a sector is the sum of the compartments irrigated by the same secondary irrigation canal. To the secondary irrigation canals and P2 for its concerned section, are connected 50 tertiary irrigation canals with a total length of 27.99 km. Each tertiary irrigation canal irrigates a set of four compartments, called a sub-sector. The total length of three levels of irrigation canals is 50.5 km. The tertiary irrigation canals provide water to gullies in each compartment, and plots are irrigated from the gullies. The net area per rice production compartment being 5.11 ha, we can deduct that there are 611 m of irrigation gully per compartment, and similar for drainage. The system of irrigation on the scheme is gravitational.

Drainage network

There are drainage gullies in the comportments that drain water into the tertiary culverts, which drain into the secondary culvert to finally end in the main culvert, before returning into the river. Similar to irrigation gullies, there are on average 611 m of drainage gullies per compartment. Like tertiary irrigation canals, there are 50 tertiary culverts, with a total length of 23 865 m. There are fourteen secondary culverts, numbered from C11 to C24, with a total length of 14 100 m. The main culvert is 10 285 m long. The total length of the drainage culverts (tertiary, secondary and main) is 48.25 km.

Roads network

The scheme is equipped with some primary, secondary and tertiary roads. The primary or main roads, along the main irrigation and drainage canals, have a width of 6 meters and a total length of 22 050 m. The secondary roads, along the secondary irrigation canal, have a width of 4.5 m and a total length of 13 700 m. The tertiary roads, or compartments interconnecting roads, have a width of 3 m and a total length of 26 750 m. In sum, the total length of all the roads is 62.5 km.

Each sector is crossed along its longitudinal axis by an interconnecting route that provides access to each compartment at all times of the year.

2.3.2. Baguinéda

Structure and protection infrastructure of the Scheme

While the Sélingué irrigated scheme is subdivided following the irrigation canals, the Baguinéda irrigated scheme is subdivided according to villages and groups of villages. However, to make the parallel with Selingué, we decided to

refer to the irrigation network for better and easy understanding. There are four sectors which are Sector I (Kobala-Coura), Sector II (Baguinéda-Camp), Sector III (Sébéla) and Sector IV (Tanima). Each sector is divided into sub-sectors following the secondary canals and into blocks following the tertiary canals. Sector I has seventeen subsectors, twelve, six and seventeen sub-sectors for Sector II, III and IV respectively. The average block size is 6.76 ha. With regards to the protection of the scheme, there are 25 km of protective dyke.

Irrigation network

The irrigated scheme is water-supplied by the Niger river from the dam called "*Barrage des aigrettes*" and at its end, the drainage water also returns to the same river. The water intake has a maximum capacity of 12.5 cubic meter per second. This dam "*Barrage des aigrettes*" also supplies water to the Sotuba hydro-electric power central. The system of irrigation on the scheme is gravitational.

In each sector, the secondary canals are connected to the primary one. There are fifty-two secondary irrigation canals. These fifty-two secondary canals are split into seventeen secondary canals for sector I, twelve for sector II, six for sector III and seventeen for sector IV. The secondary canals supply water to the tertiary ones which in turn irrigate the fields through the gutters. The main irrigation canal has a total length of 37 km, going from Bamako to the exit into the Niger river, and the fifty-two secondary irrigation canals and the four hundred and forty-two tertiary irrigation canals measure 56 km and 144 km, respectively (Héritier, 2017). There are 2 331 gutters in total and seven regulators, regulating water at some sections on the main irrigation canals.

Drainage network

Similar to the irrigation network, there are primary, secondary and tertiary drainage culverts, in addition to drainage gullies at blocks' level. The drainage gullies in the blocks drain water into the tertiary culverts, which drain into the secondary culvert to finally end in the main culvert, before returning into the river. The main drainage culverts measure 35 km, and the secondary and tertiary culverts measure 59 and 174 km, respectively.

Roads network

To ensure good traffic flow throughout the scheme, a network of carriageways has been built along all the irrigation canals (from the main canal to the tertiary ones), secondary and tertiary culverts. In total, there are 47 km of main roads, 56 and 144 km of secondary of tertiary roads.

2.4. Data collection and analysis

Purposive sampling technique (Ilker et al., 2016) was used in this study to select hundred and twenty-one farmers in different villages of the two locations (sixty-one in Baguinéda and sixty in Sélingué) for individual interviews. The interviews were conducted through a questionnaire including questions on physical and institutional constraints preventing farmers to adopt SRI. In addition, two focus group discussions with farmers in each location (male and female groups of ten people each) and key informant interviews with management staffs and extension officers were also conducted (including six people in Sélingué and five people in Baguinéda). The collected data were analysed through content and thematic analyses methods. EXCEL and SPSS software were used for frequencies and patterns.

3. Results and Discussion

3.1. Management of the schemes

If the architecture and logic of the management of the schemes, as mentioned above, is sound, focus group discussions with both sides revealed complicated functioning. In fact, results indicates that different parties hardly execute their responsibilities. In Sélingué, the primary irrigation and drainage canals (government's responsibility) are not cemented (for most part of it) and that leads to water loss through percolation and infiltration and therefore limits the irrigation capabilities. The electric pumps at the outlet of the irrigated scheme have not been operational since around 2007, according to farmers and confirmed by staff members. This renders the scheme vulnerable to floods through return of water from the main bed of the river. Such floods occur in case of heavy rain or release of water by the Sélingué hydroelectric power dam in order to protect their own infrastructure from too high-water levels. In addition, in both locations, farmers reported that the maintenance of the secondary irrigation and drainage canals (ODRS/OPIB responsibility) are not properly done. Visiting the two schemes, holes and breaks could easily be observed on parts of these canals. Though the situation seems worser in Sélingué than in Baguinéda.

Elsewhere, the management staffs of both locations reported that farmers do not respect their engagements as per the operating conditions document "*Cahier des charges*". In fact, despite sensitisation, not all farmers clean or repair the tertiary canals. They proceed to rental, borrowing and merchandising of plots. The inheritance is also systematic. During discussions with farmers, these information were not refuted. However, some famers in Sélingué indicated that though cleaning of the tertiary canals falls onto them, it is very difficult for them to proceed to it because of their depth and the presence of snakes. They added that if one is bitten by a snake, one will have to spend a lot of money to get cure, lose that campaign or eventually one's life. Moreover, in Sélingué, it was common to see farmer-installed pipes cutting through the irrigation or drainage canals, or circulation roads, destined to either irrigate or drain water from the plots, against the set rules. This situation was not observed in Baguinéda. However, a few farmers in Baguinéda indicated they use their motored pumps to irrigate their plots in case of dry spell and lack of irrigation water. The difference could be due to the fact that rice production is done in Baguinéda exclusively during the rainy season.

Furthermore, the operationalisation of the joint committees seems challenging. In fact, it was reported that meetings are not held as frequently as they should be and the renewal of the committee members as for the representatives of the farmers seems problematic. In Sélingué for example, a committee established in 2009 and that was supposed to be renewed in 2012, was actually renewed in 2016. This clearly reveals disagreement among farmers and the inability of ODRS to assist on that. Such cases were not reported in Baguinéda.

These results shows that none of the parties in both schemes respect fully their engagement. The non-respect of the management rules by both parties in these two schemes appeared as hinderance to SRI adoption since they affect water control, irrigation, drainage and floods occurrence on the schemes.

3.2. Partnership, advisory service and awareness delivery

In their intervention areas as per their assigned objectives, OPIB/ODRS are in charge of providing advisory service to farmers. They promote validated good agricultural practices, manage government fertiliser subsidy program, create and facilitate partnership between farmers and other assisting organisations like NGO/Projects, universities and research institutions. In addition, they facilitate farmers' access to credit for inputs and equipment through

partnership with financing institutions. This, altogether, is supposed to increase farmers knowledge and facilitate their access to equipment for better incomes and improved livelihoods.

However, on the delivery of these services, there was a lot of mutual accusations. From the discussions with farmers, they complained that the fertiliser subsidy program is not satisfactory. They reported delay in the provision, selectiveness and discrimination. They stated that big producers and farmers in good terms with agents are prioritised over neutral and small land owners. Moreover, they mentioned that the same discrimination and selectiveness continues when it comes to designating participants for new training programs or in case of assistance from a new project for example. They also indicated that it is a small group of farmers benefiting everything while all the rest is left behind. On the other side, agents from both locations indicated their limited number and logistic means to properly engage with all farmers directly. They therefore pass through farmer organisation leaders to reach the others and also use radio communication means. Or, difficult functioning of farmers' organisations, affinity problems and non-involvement of all farmers in the organisations seems not an adequate environment for this option to work properly.

The need for a proper delivery of the advisory service is clearly reported to be important in contributing in the adoption of SRI principles. In fact, access to advisory service has been identified as contributing factor in the adoption of four out of the six SRI principles in our study. In addition, engagement with NGO/Projects which itself is related to the advisory service has been identified as contributing factor in the adoption of two out of the six SRI principles. Therefore, the non-effectiveness of these services and collaborations in the study areas hinders SRI adoption. In line with our findings, Sattler and Nagel (2010) confirm that the components of the diffusion environment are part of the adoption determinants. In addition, Moore et al. (2024) indicated that participation to trainings (which is mostly coordinated though partnership and extension service) is part of the significant predictors of SRI adoption. Kabir et al. (2024) indicated that some of the major constraints to SRI adoption include inadequate training and limited market access-which could also be facilitated by management institutions (extension service). Moreover, Mkubya et al. (2023) showed that access to extension service has positive impact on SRI adoption, and Mhango (2024) confirmed that the knowledge of farmers has significant influence on adoption of SRI.

3.3. Physical conditions of the schemes

As indicated earlier, with the irrigation and drainage equipment and installations working properly no flooding should occur in the two schemes. However, fifty percent of SRI nonadopters from our sample from Sélingué mentioned water level control as a problem dissuading them from practicing SRI. The same issue was mentioned by 8.57 percent of those from Baguinéda. This indicate that there are more drainage related issues in Sélingué than in Baguinéda. However, with regards to irrigation, Sélingué is more water supplied than Baguinéda due to the fact that *Sankarani* is a tributary of the Niger River, which at the same time exposes Sélingué to the occurrence of more floods than Baguinéda. This relative easiness of irrigation explain why rice is produced in Sélingué during the two seasons and only during the rainy season in Baguinéda.

In both locations, field visits and discussions with both management staff and farmers revealed that most farmers have increased their plot size by encroaching on roads, irrigation and drainage canals margins. This has created situations where water infiltrates easily from one plot to another and therefore hindering the application of some SRI

principles like Early Age Transplanting (EAT), Alternate Wetting and Drying (AWD), Organic Fertiliser Application (OFA) and weeding to some extent. This situation coupled with the non-synchronous activities in the schemes renders water management challenging in the two locations. Moreover, it is shared by both sides (farmers and OPIB/ODRS) that some sectors in both schemes are not well planned (elevated than the others), which renders their irrigation more difficult despite the water level. These infrastructural problems which further complicate the SRI adoption falls on the responsibility of the government and ODRS/OPIB.

4. Conclusion

This study analysed the importance of management institutions and physical conditions in the adoption of SRI in Baguinéda and Sélingué irrigated schemes, Mali. Results revealed that in both locations, there are operational problems within farmers' organizations as well as management offices. None of the parties, including government, plays fully its roles as indicated in the governing documents of the schemes. This situation emphases the difficult physical conditions reported by respondents in the two irrigated schemes. Therefore, as indicated in several studies, the combination of these factors negatively affects SRI adoption. These results point out that SRI adoption is a complex process that goes beyond farmers willingness to adopt different principles. It requires interventions on training and sensitization of farmers but primarily the creation of adequate institutional and operational physical conditions enabling SRI adoption.

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6. References

1. Africare Mali. (2008). The System of Rice Intensification (SRI) First Experiences from Timbuktu – Mali; Farmer-led SRI test in Goundam – 2007/2008. Africare Mali, Bamako, Mali. http://sri.ciifad.cornell.edu/countries/mali/MaliAfricare200708.pdf
2. Héritier Rutabara (2017), La perception de l'entretien du réseau de drainage et sa solution selon les agriculteurs-Étude de cas de Baguinéda Amont (OPIB / Mali), Master thesis, 2iE, Ouagadougou.
3. Ilker, E., Sulaiman, A. M., Rukayya S. A. (2016). Comparison of Convenience Sampling and Purposive Sampling. American Journal of Theoretical and Applied Statistics. 5, (1), 2016, pp. 1-4. https://doi.org/10.11648/j.ajtas.20160501.11
4. Kabir, A. M., Murtala, N., Garba, M., & Abu, I. A. (2024). Determinants of Adoption of System of Rice Intensification (SRI) Practices Among Male Rice Farmers in Kano State, Nigeria. Nigerian Journal of Agriculture and Agricultural Technology, 4(4B), 270–281. https://njaat.com.ng/index.php/njaat/article/view/921
5. Katambara, Z., Kahimba, F., Mahoo, H., Mbungu, W., Mhenga, F., Reuben, P., Maugo, M. and Nyarubamba, A. (2013). Adopting the system of rice intensification (SRI) in Tanzania: A review. Agricultural Sciences, 4, 369-375. https://doi.org/10.4236/as.2013.48053
6. Maya Moore, Kimmerling Razafindrina, V. Ernesto Méndez & Meredith T. Niles (2024) An analysis of the adoption of the "system of rice intensification" (SRI): why a homegrown technique has yet to take seed among rice farmers in Madagascar, Cogent Food &Agriculture, 10:1, 2319932, DOI: https://doi.org/10.1080/23311932.2024.2319932
7. Mhango Solomon S. (2024). Factors Influencing Adoption of System of Rice Intensification among Smallholder Farmers in Mvomero District, Tanzania. International Journal of Multidisciplinary Research and Analysis. ISSN(print): 2643-9840, ISSN(online): 2643-9875, DOI : https://doi.org/10.47191/ijmra/v7-i02-33

8. Mkubya R.W., Damas P. and Mahoo H.F. (2023). Socio-Economic Factors Influencing the Adoption of SRI among Smallholder Rice Irrigation Farmers in Morogoro Region, Tanzania. Tanzania Journal of Agricultural Sciences (2023) Vol. 22 No. 1, 169-183
9. Noltze, M., Schwarze, S. and Qaim, M. (2013) Impacts of natural resource management technologies on agricultural yield and household income: The system of rice intensification in Timor Leste. Ecological Economics, 85, 59-68.
10. Sattler, C., and U.J. Nagel. (2010). Factors affecting farmers' acceptance of conservation measures – A case study from north-eastern Germany. Land Use Policy 27: 70–77.
11. Styger E. (2011). Introducing the System of Rice Intensification (SRI) to irrigated systems in Gao, Mopti, Timbuktu and to rainfed systems in Sikasso, 2009/2010. Consultancy report for Abt Associates, Bamako, Mali

Uphoff, N. (2016). The System of Rice Intensification (SRI)-Responses to frequently asked question. SRI-Rice, B75 Mann Library, Cornell University, Ithaca, New York 14853, USA. 226p. ISBN: 13: 978-1515022053. https://sri.cals.cornell.edu/aboutsri/SRI_FAQs_Uphoff_2016.pdf

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