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Review

Diversity in success: Interaction between external interventions and local actions in three rice farming areas in Benin

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ABSTRACT

Since the rice crisis of 2007, the government of Benin has initiated many programmes for rice intensification. Comparison of three rice production areas shows that local rice production has indeed been increased by the facilities provided by the government programmes. Although broadly the same facilities (market outlet, credit, input, etc.) were provided to rice farmers in the three study areas, which are located close to one another, there are not only similar, but also some different outcomes with regard to farmers' practices. There were also some unexpected changes, like the shift from limited collective canal cleaning to individual canal cleaning in Koussin-Lélé and the use of pumps in upland areas in Bamè. The study explores the interplay between these external interventions of government programmes and local actions of farmers to explain the outcomes. Using an actor-oriented perspective, the study concludes that farmers' agency played a critical role in the success of interventions; the changes occurred because of local actions of the farmers and intermediaries interacting with the external interventions at diverse junctures. Differences in strategies for resolving livelihood problems, in production options and biophysical conditions influence farmers' local actions and contribute to the explanation of the diversity of outcomes. The main lesson drawn from this research is that evaluation studies should not consider external interventions as the only or primary source of change. The dynamic interplay between local agency, intermediation and external interventions makes room for change.

Contents

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1. Introduction

Developing irrigation facilities for agricultural purposes has always been an issue of interest for public actors (IFAD, 2008; Sharma, 2004). Soon after independence in the 1960s, the Benin government created nearly 2,236 ha of command areas, used mainly for rice production with the assistance of Chinese projects (Sodjinou et al., 2008). The termination of this project in 1979 and the gradual structural reforms of the economy led to the collapse of these irrigation schemes, and rice production declined. Numerous interventions through successive generations of projects were undertaken to increase local rice production (e.g. *Société d'Aménagement de la Vallée de l'Ouémé* (SADEVO), *Société Nationale d'Irrigation et d'Aménagement Hydro-agricole* (SONIAH). However, studies suggested that these projects had limited success (Abiassi and Eclou, 2006; Adegbola and Singbo, 2005) because they had underestimated the complexity of the social context (Vincent and Roth, 2013).

Since 2007, a new generation of programmes has been crafted that provide institutional conditions for farmers to improve rice production. The government has provided subsidies on seeds and fertiliser, as well as credit and a market facility for local rice intensification. The government's investment is supposed to lead to new models of rice production and trade (MAEP, 2010). Between 2007 and 2012, rice production increased from 47,000 to 96,000 t in Benin (Index-Mundi, 2012). The intervention programmes have been successful in providing access to formal credit and the market to most rice farmers. The same facilities were provided to rice farmers in three study areas located close to one another with similar, but also different, outcomes regarding farmers' social practices.

Numerous studies have portrayed interventionists in 'heroic' terms, as authors of positive changes in local areas (Hawkins et al., 2001; Khavul et al., 2013; Rollnick et al., 1992); less attention has been given to the initiatives that local actors take to create space for change (Janssen and van Ittersum, 2007; Morgan, 2001; Paul, 1987). Local actors have often been regarded as passive adopters of externally devised interventions (Kristjansona et al., 2002; Long, 2001). Such analysis does not capture the complexity of change processes (Chizema and Buck, 2006; Walters et al., 1999). Therefore, this research studies the interplay between external interventions and local actions of farmers. The following research questions are addressed: (1) what are the changes in the social practices of actors in the rice value chains in the three areas? (2) How did the external interventions interact with the actions of farmers in the three areas? (3) To the extent that the outcomes are different, why did similar interventions lead to the diverse changes in social practices? And (4) how did the interplay between the interventions and local agency make room for change?

We start with the description of the actor-oriented theoretical perspective used to analyse the findings. Then we turn to the design of the research, based on chronological causal reasoning constructed around the timelines of the key events drawn from interviews and observations. The changes in social practices are presented in two sections. The first section presents the changes in social practices in comparison with the baseline situation (Section 4). The second section describes the key events chronologically (Section 5). For each event, the immediate outcomes of the interplay between the external interventions of the government programmes and farmers' local actions are highlighted. After analysis of the main factors influencing the diversity of the outcomes, the implications for evaluating external interventions are reflected on in the Section 6.

2. Theoretical framework

The intervention programmes are specifically designed to intensify rice production (higher yields and more production cycles). The interventions' effect on farmers' social practices was investigated in relation to rice production and the wider impacts on farmers' livelihoods in terms of rice yield, rice production and income. In this study, we consider social practices as the daily activities of people in their social, cultural, economic and political contexts (Shay, 2008).

We assume that the external interventions do not directly affect the social practices, but that social change results from the interplay between interventions (state-directed as well as NGOs' interventions) and farmers' local actions. According to this assumption, the change process is recursively shaped by two processes: (1) the on-going practices of people who try to accommodate themselves to everyday contingencies and (2) external institutional forces (Cunha and Cunha, 2003).

The intervention programmes fit well with the theoretical assumption in some recent studies that argue that institutions at a higher than local level are needed to provide smallholders the necessary conditions to create local opportunities and improve their livelihoods (Hounkonnou et al., 2012; Pal et al., 2002; Roling et al., 2012).

Notwithstanding the valuable contributions of the actor-oriented approach to policy studies, it does not pay much attention to institutional contexts and their effect on actors' agency (Giddens and Audet, 2005). In this study, we regard the interventions constituted by government programmes as new institutional contexts for local situations. We analyse whether the interventions provide enabling or hindering conditions for the changes observed in the research areas.

Long (2001, 17) explains that the way people make use of the external interventions rests fundamentally on how each agent 'translates' the interventions in accordance with his/her own interest. When people make use of externally recommended options, they try to create space for their own interests and make a choice among options that best fit with their own needs (van der Ploeg and Long, 1994; Verbole, 2000). The interplay between external interventions and local dynamics can be described in terms of what Long (2001, 15) defined as an 'interface', i.e. the point where different life-worlds and social fields intersect. The interface is also assimilated to arena, a social space of interaction and encounter (de Sardan, 1995, 185; Hasselskog, 2009, 10). In this study, we consider the arena of interest to be the local rice production system where the encounter between farmers and government interventions gives rise to a new set of interactions. As diverse goals and rationales are brought into contact in the arena, a clash of expectations is likely. That is, we take it as inherent in the idea of an arena that there will be competing interests and rationales, and hence also tension and conflict (Long, 2001, 59). Rarely does a development project, policy or process create only winners (Kanbur, 2003). With interventions, there are winners and losers, and thus interventions are accompanied by conflicts.

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3. Research design

Central to this research are three rice production areas (Koussin-Lélé, Bamè and Zonmon) located in the inland valleys in the Agonlin Plateau region of Benin (Fig. 1). In these areas, a few hundred farmers produce rice alone or in combination with vegetables and maize, using a gravity irrigation system in the lowlands and a pumping system in the uplands. The three areas are different in terms of the importance of rice income for farmers' livelihoods, the farmers' experience in rice production and their water management practices. These differences promised a fruitful comparison across the areas.

The investigation started concurrently with the intervention of the rice intensification programme (*Programme d'Urgence d'Appui à la Sécurité Alimentaire*: PUASA) in the areas, around 2009, and ended in November 2012 when the final fieldwork was finished. This period was chosen because PUASA was the first major programme after the rice crisis. Like succeeding additional programmes, it aimed to intensify local rice production (Soulé and Blein, 2008).

To explore the changes in social practices, the first author (PhD student at the time of the study) conducted 58 interviews with farmers in the three areas (33 from Koussin-Lélé, 15 from Bamè and 10 from Zonmon) between August and November 2012 to discuss the changes they observed in the area, related both to the rice production (e.g. production practices, yields, rice-production income, etc.) and the institutional context and how they explained the changes that occurred. With a snowball sampling procedure, the interviewees were selected by asking initial farmers to identify other potential interviewees (Biernacki and Waldorf, 1981). Recruitment of additional interviewees ceased when potential information collected became redundant. On average, each interview lasted 45 minutes to an hour. Each was digitally recorded, the recordings were translated from the local dialect (*Fongbé*) into English and transcribed.

Building on the outcomes of the individual interviews, nine focus group discussions (FGDs) (five at Koussin-Lélé, two at Bamè and two at Zonmon) (Kitzinger, 1994) were organised. During the

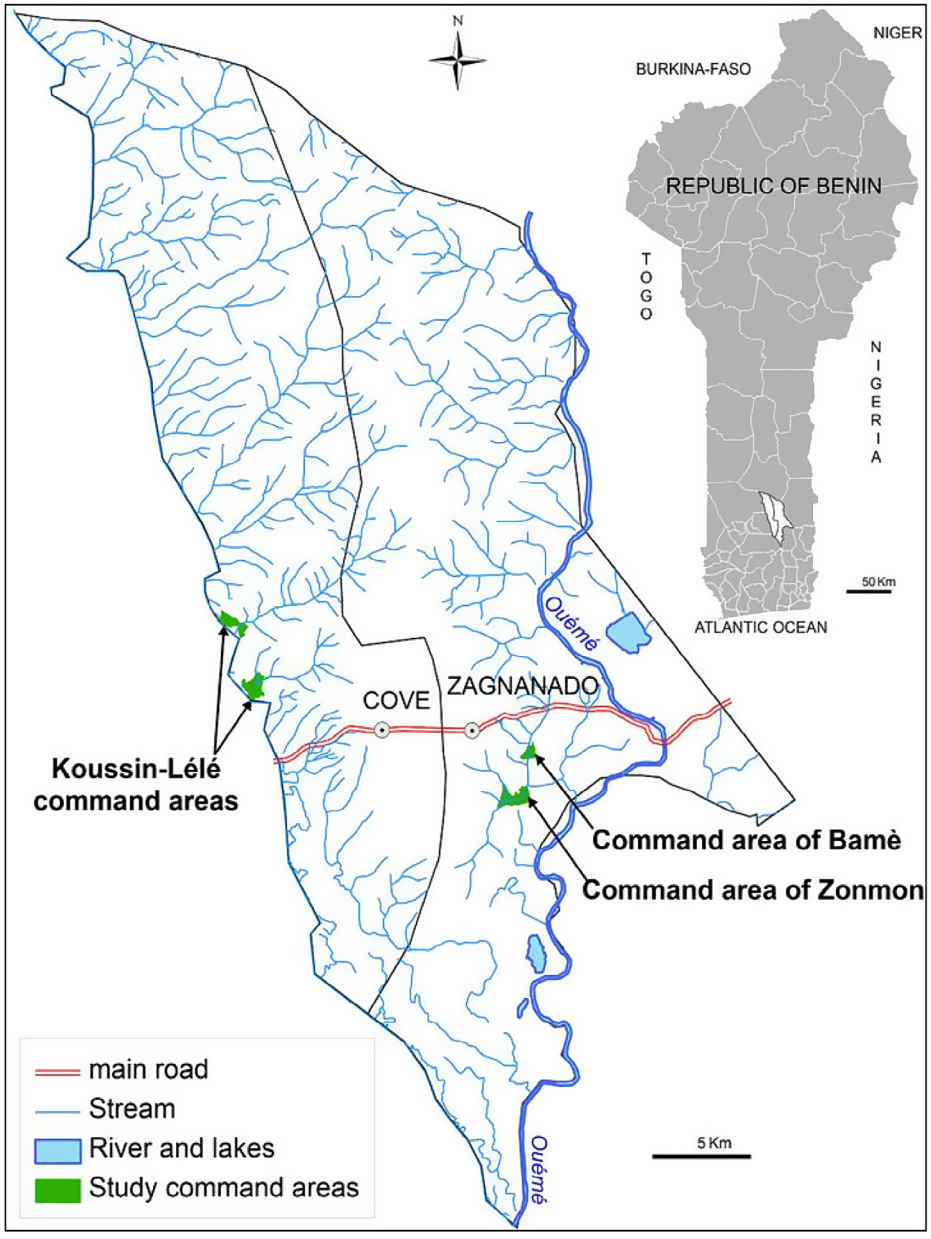

Fig. 1. Map of Covè and Zangnanando districts showing the irrigation command areas.

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discussions farmers were invited to reflect on the changes that they framed as relevant. The number of participants in each focus group ranged from six to eight as usually recommended (Asbury, 1995). Each focus group meeting lasted approximately an hour to an hour and a half. The focus group discussions were also recorded and transcribed. The transcribed interviews were analysed with the following focus: (i) the changes in practices in the farmers' perspective and (ii) the events to which the interviewees contributed these changes.

To validate the perceptions of change espoused in the interviews, farmers' practices were observed. For instance, direct observations were made in the fields about when and how farmers performed the canal cleaning. The information collected during the interviews and the observations were compared with the data collected for the diagnostic study (Totin et al., 2012) to define the main changes.

The influence of the government programmes on yield and farmers' rice-production income, was assessed by administering an additional questionnaire survey to 50 rice farmers (26, 12 and 12 in Koussin-Lélé, Bamè and Zonmon, respectively) based on a stratified random sample (see description in Table 1). The farmers were selected from the different groups producing in each area, on the basis of land size diversity, credit condition and whether rice is the main or a secondary income source. These selection criteria aimed to produce a good representative sample of the different categories of farmers. The survey focused on the total annual rice production, the production costs, the selling price, the average amount sold, in order to assess the rice income.

For the 50 farmers, the average yield and amount sold were estimated by building on their responses and their own written reports. The production cost (C_p) for each farmer during the first growing season was calculated by including the direct input costs for seed, fertiliser, herbicides and labour. For the calculation, the authors assumed that labour is hired for all activities. Thus, only hired labour from outside the family was considered. When a farmer received credit from both local traders and the government programme (*Projet de Développement Agricole des Communes*: PDAC), the cost of the credit (C_c) per kilogramme was assessed by dividing the total interest paid for each type of credit by the farmer's total production. For instance, if a farmer received (1) a loan of 15,000 F cfa from a trader and paid back 25,000 F cfa at harvest time, and (2) 10,000 F cfa from the PDAC programme and reimbursed 10,300 F cfa with a total production of 600 kg, the cost of the credit per kilogramme of paddy is: $C_c = (25{,}000 - 15{,}000/600) + (10{,}300 - 10{,}000/600) \approx 17$ F cfa per kg. Then, the total cost $C = C_p + C_c$.

Finally, to investigate the interaction of the programme interventions with the farmers' local actions, farmers were invited to reflect during the FGDs on whose actions influenced each of the changes that they framed as relevant and what other (unexpected) events they saw as facilitating the changes. Additionally to the farmers' FGDs, 20 individual interviews were conducted with programme staff and the extension officers operating in the research areas. The interview questions focused on the main causes of changes. The authors explored the extent to which the interventionists related the changes to the interventions in the area, the unexpected events or farmers' actions. The transcribed interviews provided information for detailed qualitative analysis of both similarities and differences between interventionists and farmers' perspectives. The transcripts were analysed with a specific focus on the order of events and in what way one event triggered a next one. Guided by an actor-oriented perspective (Long, 2001) and building on the interviews with the stakeholders in the three areas, timelines of the critical events were then drawn in each area. Thus, the timelines capture chronologically the interplay between the external interventions of the programmes, farmers' local activities and our research activities.

4. Interventions and outcomes

In this section, we first present the major intervention programmes and then the changes that occurred in the three areas in the context of those interventions. The changes described relate to revenues from rice production and practices of rice production, selling, financing and water management.

Table 1
Description of the rice farmers' population and the sample interviewed ($N = 50$)

Selection criteria	Koussin-Lélé		Bamè		Zonmon	
	Total	Sample ($N = 26$)	Total	Sample ($N = 12$)	Total	Sample ($N = 12$)
Land size[a]	70 of rice farmers used in average more than 0.5 ha for rice cultivation, while about 130 of them used less than 0.5 ha	10 farmers using more than 0.5 ha for rice cultivation and 16 farmers using less than 0.5 ha	11 farmers using more than 0.5 ha and 9 farmers using less than 0.5 ha	7 farmers using more than 0.5 ha and 5 farmers using less than 0.5 ha	8 farmers using more than 0.5 ha and 40 farmers using less than 0.5 ha	2 farmers using more than 0.5 ha and 10 farmers using less than 0.5 ha
Credit conditions	120 of rice farmers received bank credit only for rice cultivation; 56 of the farmers used loans from local traders only; 50 farmers used both the bank credit and loans from traders and 24 farmers did not ask for any kind of credit.	15 rice farmers with bank credit only; 5 farmers using only loans from local traders; 4 farmers using both the bank credit and loans and 2 without any type of credit	15 of rice farmers received bank credit only for rice cultivation; 2 of the farmers used loans from local traders only; 16 farmers used both the bank credit and loans from traders and 3 farmers did not ask for any kind of credit.	4 rice farmers with bank credit only; 2 farmers using only loans from local traders; 5 farmers using both the bank credit and loans and 1 without any type of credit	25 of rice farmers received bank credit only for rice cultivation; 19 of the farmers used loans from local traders only; 17 farmers used both the bank credit and loans from traders and 4 farmers did not ask for any kind of credit.	6 rice farmers with bank credit only; 3 farmers using only loans from local traders; 2 farmers using both the bank credit and loans and 1 without any type of credit
Rice production	180 farmers produced rice as the main income source while 20 of them produced it as a secondary income source	20 farmers with rice as a main income source and 6 producing rice as a secondary source	14 farmers produced rice as the main income source while 6 of them produced it as a secondary income source	8 farmers with rice as a main income source and 4 producing rice as a secondary source	15 farmers produced rice as the main income source while 33 of them produced it as a secondary income source	3 farmers with rice as a main income source and 9 producing rice as a secondary source

[a] The average land size is 0.5 ha.

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Table 2
Intensification of rice production.

	Koussin-Lélé		Bamè		Zonmon	
	2009	2012	2009	2012	2009	2012
Total rice cultivated land (ha)	200	350	15	17	10	27
Number of rice farmers	200	200	19	20	21	48
Yields first cycle (t/ha)	3.2	3.9	2.0	2.5	3.5	3.9
Yields second cycle (t/ha)	2.2	2.5	2	1.8	0	2.3
Yields third cycle (t/ha)	2.0	2.3	0	1.8	0	0
Average of production cycles per year*	2.4	2.8	2	3	1	2
Total annual production (t)	1480	1871	60	103.7	35	167.4

* Not all farmers produced during the three cycles.

4.1. National intervention programmes

The government of Benin initiated a variety of short-and long-term measures, such as provision of subsidies and the establishment of diverse programmes aimed at providing access for farmers to agricultural inputs (MAEP, 2010). Some long-term programmes aimed at strengthening rice self-sufficiency. The first large national programme was PUASA. The programme offered subsidies for seeds and fertilisers, as well as credit to farmers. In Koussin-Lélé, Bamè and Zonmon, the programme supported the rehabilitation of the irrigation schemes and provided agricultural equipment to rice farmers.

In October 2010, PDAVV (*Programme de Diversification Agricole par la Valorisation des Vallées*) was initiated to (1) facilitate access to appropriate funding services for micro and small enterprises operating in the local rice chain, (2) increase the chances of sustaining farmers' gains within the rice chain and (3) to facilitate the sustainable integration of micro and small enterprises in the rice market (CARD (Coalition for African Rice Development), n.d.). In Bamè and Zonmon respectively nine and four farmers were funded in the framework of the programme to increase their rice production.

To ensure food security for low income households, the government charged SONAPRA, the national company for crop promotion, to buy and mill the farmers' paddy. Between 2010 and 2011, SONAPRA contracted with the private entrepreneurs specialised in processing to mill the paddy. Since 2011, the government has promoted two large-capacity milling industries under SONAPRA's auspices. With this new infrastructure, SONAPRA increased the amount of rice bought from the farmers. SONAPRA provides fertilisers to farmers, the cost of which is deducted before farmers are paid for their paddy. In addition, it offers a better price than the local traders in order to secure the crop for the large-capacity mills.

In August 2012, PDAC began to facilitate access to agricultural financing for all entrepreneurs operating in rural areas. It was established that each rice farmer could receive €245 per ha of rice cultivated, including a €90 fertiliser subsidy. One of the prerequisite conditions for accessing the PDAC credit was that the extension agents had to validate the land size that each farmer cultivated and approve the credit request before the applicant could receive the credit. The programme partnered with SONAPRA to enable deduction of the loan from the price paid for the farmers' harvest, at an interest rate of 9% per year. One hundred and fifty-seven rice farmers participated in the programme in Koussin-Lélé, 20 in Bamè and 48 in Zonmon.

4.2. Rice intensification and revenues

In combination, the intervention programmes addressed major barriers in the local rice chain. They provided access to formal credit and a market outlet for most rice farmers that facilitated the intensification of local rice production. Table 2 shows the intensification of rice production in the three areas. Total rice production had increased in all three areas. Table 2 shows that this increase relates to the expansion of the rice-growing land and the number of rice farmers, the increase in production seasons or the increased rice yield.

Additionally, the total average amount of rice sold by farmers increased, as presented in Table 3. Given that the rice production cycle covers 4 months and the official minimum wage in 2012 was 31,625 F cfa per month, the average returns presented in Table 3 show that, in Koussin-Lélé, the most successful rice production area, the average return in 2012 was about 160% of the minimum wage level, during the first growing season. In Bamè, the farmers' return was about 63% of the minimum wage, and 45% in Zonmon. During the second and third seasons, the return per farmer was lower because the yields and the average amount sold decreased.

4.3. Changes in social practices

The rice intensification results from an expansion of land and the number of farmers, but also to the changed practices. In the three areas, the main changes in social practices documented in the study related to (1) rice production, (2) rice selling, (3) agricultural financing and (4) water management, as presented in Table 4.

4.3.1. Rice production

In 2010 in Koussin-Lélé, almost 56% of farmers grew rice in three seasons, 32% grew rice in two seasons and the rest produced only in one season. After the interventions, four in five farmers cultivated during the three seasons and the rest produced in two seasons. They produced within the command area during the first and second seasons, and hired land around the command area to produce during the third season.

In Bamè, the farmers also increased the average number of production cycles, from two to three. They all produced rice in the potential three cycles per year. Among the 20 farmers that had previously produced rice in the lowlands only, in 2012, eight still produced only in the lowlands and five in the lowlands during the two dry seasons and in the upland area during the wet season. The seven other farmers produced three seasons in the uplands.

In Zonmon, in 2010 the farmers had all produced only during the first growing season. Since March 2012, farmers have started

Table 3
Average revenue per farmer (in F cfa) (paddy) for one production cycle per hectare (2009, 2011 and 2012 data) ($N = 50$).

	Koussin-Lélé		Bamè		Zonmon	
	2009	2012	2009	2012	2009	2012
Production cost (per kg)	109	105	113	121	118	134
Selling price (per kg)	123	160	121	160	123	160
Margin (per kg)	14	55	8	39	5	26
Average amount sold per farmer (kg)	3500	3700	1900	2040	2000	2200
Average return per farmer (cycle/4 months)	49,000	203,500	14,630	79,560	9,800	57,200
Average return per farmer per month*	12,250	50,875	3,658	19,895	2,450	14,300

* We assume that labour is hired for all activities; the exchange rate during the study was fixed at 655 F cfa for 1€.

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Table 4
Overview of changed practices.

Areas	Situation in 2009 (baseline)	Situation in 2012
Koussin-Lélé	• Rice production: ○ Almost half of the farmers grew rice in 3 seasons per year ○ Random transplantation of rice seedlings (not in line) • Rice selling: ○ All farmers sold their harvest to local traders and local consumers (respectively, about 85% and 15%) • Agricultural financing: ○ About 55% of farmers had loans from local traders and a minority of farmers had access to credit from the rural banks • Water management: ○ Collective primary canal cleaning ○ Use of gravity irrigation only	• Rice production: ○ Almost 4 in 5 farmers grew rice in 3 seasons per year ○ Transplantation in line • Rice selling: ○ All farmers sold part of their harvest to SONAPRA ○ About 18–20% of farmers sold part of the milled rice to local traders • Agricultural financing: ○ About 4 in 5 farmers had credit from the rural banks (through PDAC) and some farmers (about 28%) still received credit from local traders for their other food crops • Water management: ○ Individual canal cleaning ○ Use of individual pumps in addition to gravity irrigation (43 farmers)
Bamè	• Rice production: ○ All 20 farmers grew rice in the lowlands ○ Almost half of the farmers grew rice in 3 seasons per year ○ Random transplantation of rice seedlings (not in line) • Rice selling: ○ Farmers sold the milled rice to local traders • Agricultural financing: ○ Almost half of the farmers received credits from local traders and almost 50% had bank credits • Water management: ○ Use of gravity irrigation ○ Use of pumping in the uplands by 9 farmers	• Rice production: ○ Of the 20 rice farmers, 8 grew in the lowlands, 7 grew rice in the uplands, 5 grew rice in uplands and lowlands ○ All the farmers produced rice in 3 seasons ○ Transplantation in line • Rice selling: ○ All farmers sold their paddy harvest to SONAPRA ○ About 10% of farmers sold part of their harvest to local traders • Agricultural financing: ○ All rice farmers obtained bank credit and 12% of farmers still received credit from traders. • Water management: ○ Use of individual pumps in the uplands by 12 farmers and the gravity irrigation in lowlands ○ Mulch application in uplands (33% of farmers)
Zonmon	• Rice production: ○ All 20 farmers grew rice in 1 season per year ○ Random transplantation of rice seedlings (not in line) • Rice selling: ○ Farmers sold the milled rice to local traders and consumers (respectively, about 60% and 40%) • Agricultural financing: ○ Except for 1 of them, all the farmers asked for credit from local traders • Water management: ○ A few farmers contributed to collective canal cleaning (about 6–8 of the 20 rice farmers) ○ Use of gravity and pump irrigation	• Rice production: ○ 28 farmers turned from vegetables to rice ○ 29 of the 48 famers produced twice per year ○ Random transplantation of rice seedlings • Rice selling: ○ Farmers sold 80% of their paddy harvest to SONAPRA and kept the rest for their own consumption • Agricultural financing: ○ All the rice farmers received bank credit, but 1 in 3 farmers still also received credit from local traders • Water management: ○ More farmers (48) were involved in canal cleaning ○ All farmers worked together, but each of them cleaned a specific segment of the canal

Source: Based on interviews and observation.

producing during both the first and the second seasons each year. In addition, many farmers changed from growing vegetables and maize only to a combination of vegetables/rice and maize/rice.

In 2010, in all three areas, farmers transplanted the rice seedlings unevenly, using their feet as a guide. Since March 2012, the rice farmers have modified the transplanting practice and two in five transplant in lines using a string or a rope. One in five often transplants the seedlings uniformly, at an equal distance, but not in lines. The rest still plant randomly. This change in transplanting practice, presumably has contributed to the yield increase in the three areas.

4.3.2. Rice selling

In all three areas, the farmers customarily sold the rice, all locally milled, to local traders and directly to consumers. Farmers who received loans from local traders were committed to paying back the loan in kind from their rice harvest. With facilities provided through formal credit and the market outlet, farmers sold the harvested paddy directly to SONAPRA. This formally organised paddy outlet represented 90% of the market for the farmers. The farmers in all three areas who received credit from traders to produce maize and other food crops (2 in 10) paid back with milled rice.

4.3.3. Agricultural financing

In the three areas, in 2010, the majority of farmers turned to local lenders for individual loans to buy seeds and fertiliser, although they were charged with high interest rates (up to 150%). In Koussin-Lélé and Bamè, 40% of rice farmers also obtained credit from the rural banks. These credits were cheaper, but restricted, because banks provided credit for established groups, in a solidarity system and only for rice production. Hence, about 80% of farmers who could not receive bank credit, or not enough to cover their needs, turned to local lenders for individual loans.

The PDAC programme facilitated access to formal credit for all rice farmers, under the conditions discussed in Section 4.1. However, because the credit was given only for rice production, 28% of farmers in Koussin-Lélé, 12% in Bamè and almost 30% in Zonmon still engaged in a relationship with local traders for growing other crops.

4.3.4. Water management

In Koussin-Lélé, in the dry season from January to March, water becomes scarce. To cope with the water shortage, farmers agreed to work together to clean all the canals. In 2010, the regular farmers (80% of association members) indeed cleaned the canals twice a year according to the rules. However, they deliberately took more time

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than the prescribed 1 day, to act out their frustration with leaders. They cleaned less well than they were supposed to do. The privileged farmers (group leaders, traditional chiefs and landowners) predominantly escaped from this duty as the following quote shows:

> *I always participate in the canal cleaning because I think that we should all contribute to improve the irrigation water delivery. I feel disappointed that our leaders, who should lead by example, do not worry about this task. It is frustrating!* (A farmer from Koussin-Lélé, Benin, field interview, November 2011).

After the government programme interventions, in Koussin-Lélé, the farmers still cleaned their canals twice a year, but no longer collectively. Instead, each farmer was responsible for cleaning the segment of canal around his (her) plots. Farmers who were not available during the set period were allowed to pay a labourer to clean his (her) segment. Also, 43 farmers whose plots were located at the tail-end of the irrigation scheme had started using individual pumps to supplement the gravity irrigation.

In Bamè, during the dry season, the water discharge decreases in the lowlands, due in part to the weeds growing in the canals. Some of the farmers coped with the water shortage during the dry season by delaying their rice cultivation, so that not all of them needed water at the same time. Since the end of 2010, when the Africa Rice Centre started to conduct agronomic experiments in the command area, the farmers have managed to off-load the canal maintenance onto Africa Rice Centre.

With the credit and market outlet facilities provided by the intervention programmes, 12 farmers moved to the uplands where they used individually owned pumps as the irrigation system. About four farmers also used mulch in their plots in the uplands to manage the soil moisture in order to reduce irrigation frequency, and thus the related production costs.

In Zonmon, among the 20 farmers who produced in 2010, only about six to eight contributed to cleaning the canals. During the dry season, when the water level decreased, the farmers rented motor pumps to get water from the main canals. Some farmers, who were unable to afford the pumping irrigation costs, chose to start earlier, following the retreat of the water level after the flooding in order to harvest before the dry season. Since summer 2011, the number of rice farmers involved in rice production has gradually increased, from 20 to 48 farmers. All 48 farmers worked together, in September 2012, to clean the main canal.

The external interventions facilitated changes in the social practices relating to rice production (more cycles per year) and financing and rice selling in a formalised market system (Table 4) in all three areas. Beyond these similarities, there are some obvious differences between the three areas. The most obvious ones are the change from limited collective canal cleaning to individual canal cleaning in Koussin-Lélé, the use of pumps in upland areas in Bamè and farmers who changed from growing vegetables or maize alone to growing rice in combination in Zonmon. In the following section, we explore how the interaction between the external interventions and local actions led to different outcomes from a process perspective.

5. Understanding the evolution of changed practices

In order to trace how the most striking change in practice in each area came about, this section describes the key events chronologically and, for each event, focuses on whether and how it contributed to increasing the room for change. Thus, the interaction between the external interventions, farmers' local actions and the research activities are investigated.

5.1. From collective to individual canal cleaning rules in Koussin-Lélé

The events identified as key, leading to a change in the canal cleaning rules in Koussin-Lélé, are described in Fig. 2. There are three groups of farmers (G1, G2 and G3) along the main canal: G1 members located close to the watergate at the head of the scheme; G2, 500m from the watergate; and G3 at the tail-end (approximately 900 m from the gate).

Water shortage resulting from broken watergates and silted canals created frequent conflicts among these groups of farmers, often between January and March–April. In March 2009, during the dry season a conflict emerged between two farmers from G2 and G3. At that time, water delivery decreased. A G3 farmer closed the intakes in the neighbouring plots in G2 to increase the water flow so that it could reach his plots in G3. The G2 farmer protested against these water cuts, because he was also expecting the water to weed his plots. A physical fight arose between the two farmers over the water distribution. It spilled over into a huge conflict between the two farmers' families. In response, farmers' leaders, traditional chiefs, extension officers and the elected municipal leaders organised a meeting with representatives of the rice farmers to discuss the problem and resolve the conflict.

The farmers reported that, although the conflict was not good in itself, at least it helped to attract the attention of the extension staff and the elected leaders. Moreover, the conflict created space to open a discussion about the water problem among all farmers, including those who had no problems with water supply (e.g. G1 members). The farmers' leaders agreed to impose additional

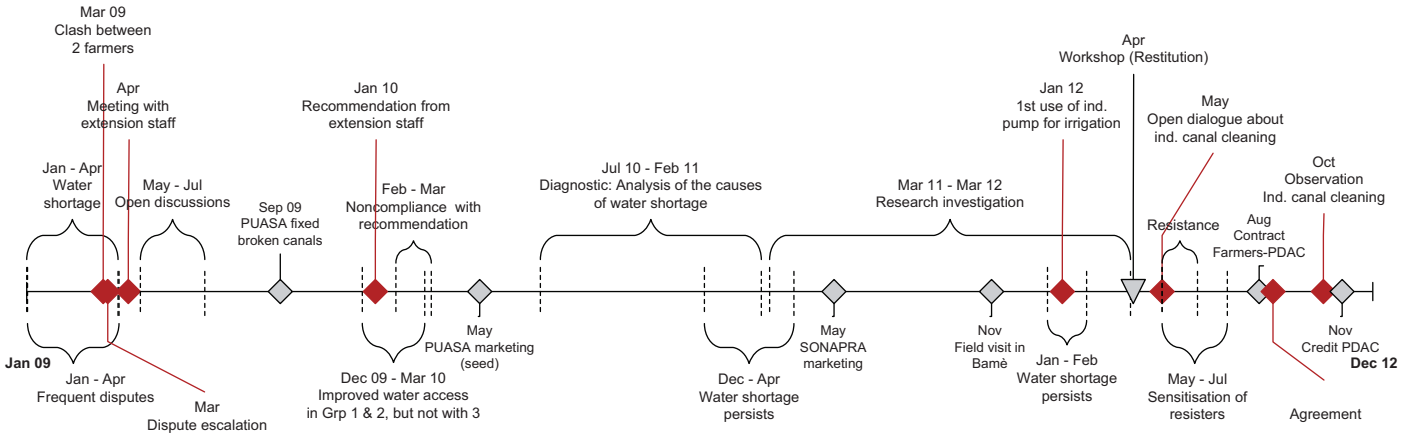

Fig. 2. Timeline of critical events in the change process in Koussin-Lélé.

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penalties on members who obstructed the water course illicitly or did not follow the water turn as planned. The G3 members thought that this penalty system was not the solution to their water problem. A huge amount of water was being lost because most of the watergates were broken, and therefore they were of the view that irrigation infrastructure rehabilitation was the solution.

In September 2009, the extension officers and the municipal mayor solicited PUASA's help to renovate the irrigation infrastructure. The programme staff agreed to fix the broken canals if farmers would ensure regular maintenance. Two months after the rehabilitation, a portion (almost 50 m) of the lined canals collapsed in the tail-end section. Therefore, the farmers located in this part complained that their access to irrigation water had become more difficult.

In January 2010, a similar conflict arose, so the extension officer organised another meeting with the farmers' leaders. At this meeting, it was decided that the farmers should repair the broken segment. Moreover, all farmers in the command area had to follow the established plan for water allocation and participate in canal cleaning. According to farmers, canal cleaning was a wasted effort because of the lack of a reliable market for the resulting production. In effect, this meeting did not produce any change in the field: G3 farmers continued with illegal water cutting practices, none of them followed the water turns plan and the canals were not cleaned either.

Since May 2010, the PUASA programme has bought farmers' harvest at a good price. Farmers explained that previously they were not motivated to clean the canal because of the absence of a guaranteed market. However, although now a market outlet existed, farmers' contribution to the maintenance of the infrastructure did not improve. At the same time, both the G1 and the G2 members were receiving enough water to cover their needs since the rehabilitation of the canals. According to them, the canal cleaning would not add any value to the amount of water they were already receiving. Therefore, the canal cleaning was no longer a real challenge. Then, four of the G3 farmers bought individual pumps to irrigate their plots during the critical period. They also rented the pumps to other rice farmers. In total, 43 of the 200 farmers used the pumps to irrigate their plots from January to April 2012. These pumps provided the farmers at the tail-end section with more water for their plots. However, G2 farmers reported that for them the use of the pumps had negative effects:

> *Since they started using the pumps, we have now less water for irrigation. I spent four to six hours getting water into all my plots. Before they started using the pump, I could finish in three hours. Pump use is not a good solution to improve water delivery. If the canals are well cleaned and the broken gates fixed, we will all have enough water without using the pump.* (G2 farmer Koussin-Lélé, Benin, field interview, September 2012).

In April 2012, the researcher organised a workshop aimed at stimulating reflection among the participants about the lack of effectiveness of the rules for the collective maintenance of the canals. The extension officers supported this aim. Most participants stated in the interviews that the workshop helped them to 'break the former established rules'.

At the workshop, the G2 members who experienced water shortage because of water pump use in G3 suggested changing the rules so that each farmer must clean the segment of canal around his own plots. However, at first not all farmers were convinced of the desirability of having this rule, as the following statement shows:

> *The individual cleaning facilitated individualisation, instead of promoting cooperation. When we are in a group, we should do things together. Group members need to have a unified heart to support and guide one another.* (Farmers' leader, field interview, November 2012).

This disagreement was finally resolved with the start of the PDAC programme, which provided a formal credit facility for all farmers producing rice, thereby solving the last major barrier to rice production in the area. Because of the market outlet, credit and input (seed and fertiliser) facilities, they were able to make a better profit from rice production, and they then finally reached agreement on individual canal cleaning. The extension officers sensitised them to adopt better water management practices and to avoid conflict in order to make better use of the existing opportunities (market, credit, inputs). In October 2012, we observed that the farmers indeed cleaned individually.

5.2. Starting to use the uplands for rice production in Bamè

The major change observed in Bamè relates to the use of the uplands for rice production instead of growing rice in the lowlands only, and mulch application in these uplands by a small number of farmers. Figure 3 shows the sequence of events that accounted for this change.

The support of the PUASA programme in terms of maintenance of the irrigation infrastructure and equipment (cultivator and a small mill) to farmers on a credit basis stimulated 11 farmers to produce rice for the first time in 2008. They worked together and cultivated 2 ha of land. The PUASA programme bought all the harvest. The 11 farmers were supposed to share the revenues evenly. However, farmers reported that, after the harvest was sold, the regular farmers received €65 each, whereas the elites (leaders, landowners, etc.) pocketed €160. Frustrated, the regular farmers expressed their desire to produce individually, so that they could sell their harvest on an individual basis. The leaders did not agree and insinuated that the extension officers would not allow it.

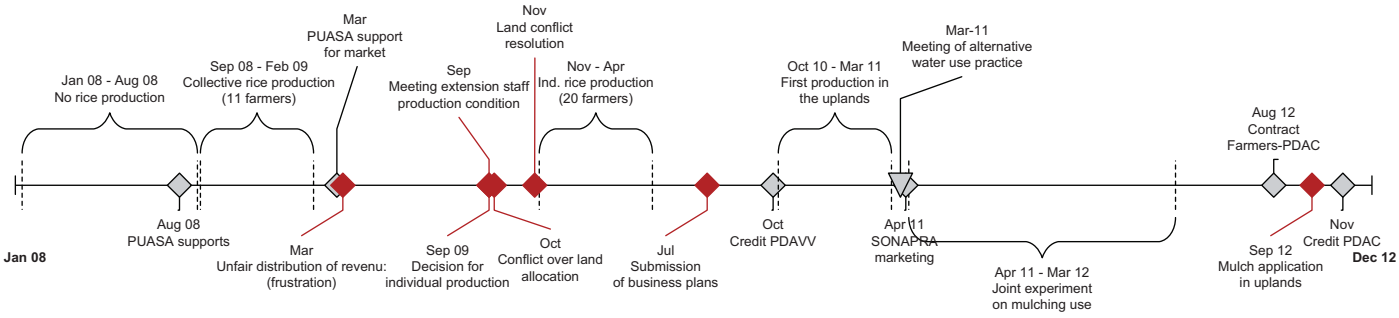

Fig. 3. Timeline of critical events in the change process in Bamè.

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To evaluate the effectiveness of the PUASA programme during the first season, the extension staff organised a meeting with rice farmers to discuss the constraints they faced. The regular farmers regarded the meeting as a good occasion to inform the extension staff about their problems and their desire to produce individually. The farmers' leaders tried to explain why not all farmers had received the same amount of money. When the arguments did not convince the extension staff, the leaders agreed with the option to produce and sell the rice individually.

With this decision, a huge conflict emerged among the farmers about how to allocate the land in the command area for individual rice production. From informal discussions with the farmers, it appeared that the leaders chose to keep the well-irrigated and fertile lands for themselves and distributed the poor lands to other farmers. Three-quarters of farmers interviewed said that the leaders claimed to be large producers and that they should get 10 plots, whereas only three or four were given to the regular farmers.

Some of the farmers reported the unfairness of the land allocation to the extension officers and asked their advice to resolve it. Together with the village elders, the extension officers sought a consensus. They suggested that the farmers' leaders should get eight plots and the regular farmers an average of five. This did not resolve the frustration among the regular farmers, who stated this decision was taken because of the close relationship between their leaders and the traditional chiefs.

> *They allocated the poorest part of the command area to me. Look at my soil, it is only sand, no clay in it! The leaders had the best lands. They did it purposely to compensate for the fact they did not succeed in acquiring the land size they expected.* (Farmer from Bamè, field interview, October 2012).

In November 2009, motivated by the incentive price that the PUASA offered, nine new members joined the rice farmers, and all 20 farmers produced individually in the command area. Because of the latent conflict over land allocation and the difficult access to bank credit, the extension officers suggested that all rice farmers should apply for the new public entrepreneurial fund (PDAVV programme). Only nine farmers were selected for the credit. Among other things, they were expected to buy a pump in order to have a full control of irrigation water and to increase their rice production. Since it was not possible to enlarge the rice area in the lowlands, the programme stimulated the nine farmers to move to the uplands where they had access to 50 ha of virgin land.

The guaranteed market outlet that SONAPRA offered from April 2011 onwards had an additional effect on the development of rice production in the uplands. It motivated three additional farmers who had not received credit from PDAVV to start producing rice there. The migration of farmers to the uplands helped to reduce the tension about land allocation in the lowlands.

The pumps, however, entailed considerable extra fixed costs and increased the cost of rice production in the uplands. Therefore, the farmers anticipated that the costs could be reduced if the soil moisture was controlled better. The farmers' analysis inspired the researcher to organise a meeting (in March 2011) together with the rice farmers from the three areas under study and an extension agent. The aim was to reflect collectively on practical techniques that could help to increase the efficiency of water use in the rice plots. In conclusion, 10 farmers decided to start an experiment with the use of rice straw mulching. The outcome of this meeting was that they implemented the experiment together with the extension officer and the researcher in a communal field (Totin et al., 2013).

The findings of the joint experiment stimulated four participating farmers to apply mulch in their own plots in the following growing season.

5.3. *From growing vegetables and maize only to growing rice in Zonmon*

In Zonmon, the major distinguishing change relates to the shift from growing vegetable and maize only to a combination with rice production. The critical events that facilitated this change are described in Fig. 4.

Rice production resumed in Zonmon in 2009 with the PUASA programme, which provided support for irrigation infrastructure rehabilitation and seed. These interventions motivated 20 farmers to start rice production. During this first growing season (2009), there was no formal credit available for farmers. Therefore, most of them turned to local lenders. Because of farmers' complaints about the high interest rate charged by these lenders, the extension officers recommended that they should apply to the PDAVV programme for credit. All 20 farmers applied, but only four of them were funded for the pilot phase.

In 2011, the four farmers who received the PDAVV credit enlarged their plots from 0.5 to 1.5 ha. SONAPRA bought all 15 t of paddy harvest in bulk and paid the farmers spot cash. With this market outlet and because they expected to receive the credit the next time, 10 of the rice farmers decided to produce during two growing seasons per year.

The second cropping season in 2011 coincided with the period when the other farmers grew maize and vegetables. A conflict arose when a group of maize farmers diverted the irrigation water flow at the head of the scheme. This unauthorised cut caused a severe scarcity of water at the tail section where rice was grown. With the mediation of the community development committee, solutions were explored. The committee suggested that maize farmers would leave 2 m of farmland around the main canal and not till near the canal. In compensation, rice farmers would pay the equivalent of €150, corresponding to the damage they caused in the maize plots.

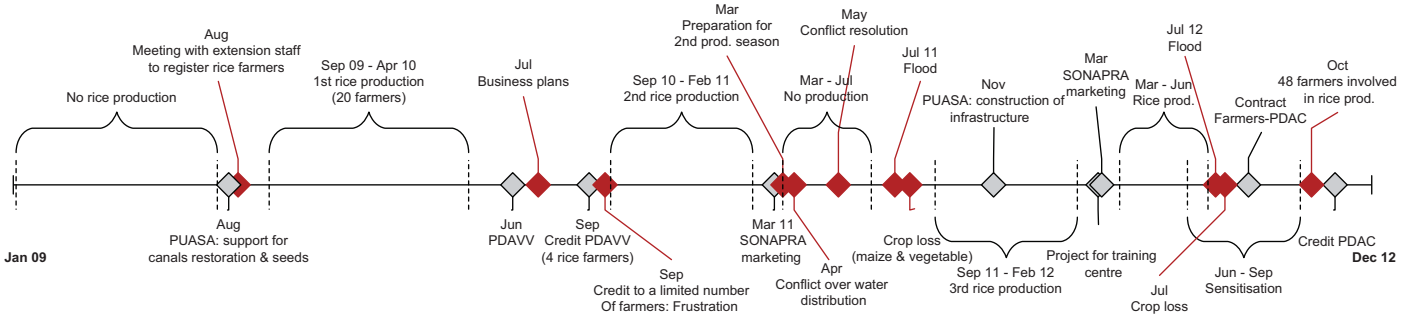

Fig. 4. Timeline of critical events in the change process in Zonmon.

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During this second season however, 80% of the farmers were unable to produce rice because of the delay in finding a solution to the conflict, and they feared that, if they sowed at this time, there could be a risk of flooding at harvest time. They then decided not to pay any compensation as suggested.

In July 2011, a flood occurred in the command area, whereas floods used to take place between August and September, when there were no crops in the lowlands. It caused an estimated 80–90% crop loss. Maize and vegetable plots were the most affected, and these crops were the main income source for almost 85% of the community. Because of the flood, five maize and vegetable producers chose to produce rice instead, because it would tolerate the floods better, in the following rice growing season (September 2011–February 2012). As three of the five new rice farmers were involved in the water conflict, this shift contributed to pacifying the conflict.

To facilitate post-harvest activities and rice harvest conservation, the PUASA programme constructed a rice drying area and a warehouse for the farmers. In February 2012, the president of Benin chaired its launch and the inception of an agricultural programme in the village aimed at young entrepreneur training. The municipal council used the construction of the infrastructure and the president's visit as arguments to sensitise more farmers to produce rice.

In March 2012, SONAPRA bought all the paddy harvest in bulk, directly in the village for the second time. The guaranteed rice market stimulated most of the farmers to produce rice in the potential three cycles per year. In April 2012, we observed 29 farmers, including the 20 farmers who started in 2009, the five maize producers who cultivated rice after the flood and four other new maize producers. The nine farmers combined both maize and rice production in the lowlands. During this growing period, there was no conflict over water distribution.

> *We are all interested in rice production because of the market outlet facility that SONAPRA offers. During the previous seasons, the local traders bought our harvest at a low price, and we could not complain, because there was no other option for us.* (Farmer from Zonmon, field interview, November, 2012).

In July 2012, flooding again occurred earlier than expected, damaging farmers' crops. Therefore, producing only maize or vegetables was no longer a secure option for the farmers. The floods again motivated the farmers to combine rice and other food crops instead of relying on maize and vegetables only. Then, when formal credit was made available to all the rice farmers with the PDAC programme in addition to SONAPRA's market outlet, 19 farmers started rice production. In September 2012, there were 48 farmers producing rice in the area.

> *I lost all my harvest in two consecutive years. I found that it may be more secure for me to combine rice and the other food crop. I do not produce because people from the municipality asked me to do so!* (A new rice farmer from Zonmon, field interview, November, 2012).

6. Analysis and discussion

6.1. Interplay between interventions and local agency

In the rice value chain, we observed changes in practices of rice production, selling, financing and water management across the three areas studied. Beyond these direct outcomes, there were also some indirect effects. In the context of the three areas, we saw that farmers drew on the external interventions to create new opportunities. For instance, in Bamè, farmers used the framework of the PDAVV programme to move to the uplands, hence resolving the land conflict that existed in the lowlands. The existence of a formal market outlet and credit motivated farmers in Koussin-Lélé themselves to set new regulations for effective participation in canal cleaning.

We also saw an interaction between interventions and the physical context. At Zonmon, the increase in the number of farmers engaged in rice production was linked not only to the new rice market outlet and credit facility, but also to the floods occurring early and unexpectedly. In Bamè, the existence of available upland area was another important additional condition for the positive outcome of the interventions. As shown in the timelines, the extension agents played broader intermediation roles than in classic extension by informing farmers about the existing programme and hence facilitating the interaction between rice farmers and programme staffs (Klerkx et al., 2010).

Moreover, the analysis of the chronological events shows that conflicts between farmers had different outcomes. Farmers' strategies, the role of conflicts and physical conditions are further discussed in the next section in which we draw some lessons by comparing the three cases.

6.2. Factors shaping diversity of outcomes

This section explores the main factors influencing the diverse patterns of responses to the external interventions in the three areas.

6.2.1. Subsistence strategies influencing diverse responses

Rice does not have the same importance in all three areas. In Koussin-Lélé and Bamè, rice is the main source of income, whereas in Zonmon farmers have many other income-generating activities. This difference influenced farmers' choices. According to Feeny (1983), smallholder farmers are subsistence-oriented, prioritising safety and reliability over profit. They then organise their resources by adapting external interventions to fit their subsistence strategy (Hasselskog, 2009). In Koussin-Lélé and Bamè, farmers used the opportunities offered by the external interventions to overcome the canal cleaning and land allocation constraints.

In the case of Zonmon where rice production was not a crucial source of household revenue, the external interventions did not have, at first, any indirect effects, beyond the expected programme outcomes. However, when subsistence strategies were hindered by the floods for 2 years consecutively, the farmers adapted their production practice to this changing context and turned to rice production in addition to vegetables and maize. Richards (1989) shows how small farmers adjusted their farming practices repeatedly to adapt to changing agricultural conditions. The farmers' need to guarantee their subsistence shapes the way they interact with external interventions.

6.2.2. Conflicts as catalyst for change

In all three areas, there were conflicts among the farmers relating to collective resources. This observation urges further exploration of the role of conflicts in the interaction between interventions and local actions.

There were long-lasting social tensions among the elites and the regular farmers. Although the regular farmers can be seen as less powerful actors in Koussin-Lélé for instance, they initiated the rule change relating to canal cleaning. In the three areas, the conflicts played different roles: in Koussin-Lélé, the water conflict emerged before the external intervention. In this area, the intervention was used to resolve the existing tension. In Bamè and Zonmon, conflicts emerged in response to the interventions, creating new inequalities between the farmers. The way the conflicts were managed in the three areas contributed to the different outcomes of the interventions. In Koussin-Lélé, when the conflict over water distribution arose, the extension agents organised a range of

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meetings with the farmers to discuss the problem and managed to re-arrange the rules to individual canal cleaning. Moreover, they solicited the intervention of PUASA to renovate the irrigation infrastructure in order to reduce the water that was being lost because of the broken watergates. In Bamè, farmers did not reach such a consensus on the conflict about land allocation, probably because of the hierarchical relationships and the importance of traditional norms of the community. Furthermore, the fact that in Bamè all the farmers are from the same village did not give much room to change the rules and solve the land allocation problems in the lowlands. Instead of changing the local rules for land allocation, the extension staff and the elders of the village guided farmers to look for and find the alternative of the uplands for rice production. They also helped farmers to come with the option to produce and sell their harvest on an individual basis to avoid frustration related to the unfair distribution of revenue in the collective production system. In Zonmon, the community development committee mediated and assisted farmers to identify suitable solutions for the conflict over the irrigation water sharing.

Although the term conflict is often associated with negative encounters (Labianca et al., 1998), in the three areas the conflict played an important role in changing farmers' practices. Power differences and conflicts did not hinder farmers' ability to cope with the challenges they faced in these changes. Instead, they created new opportunities for the farmers. When the farmers engaged in a conflict, this fostered awareness about the existence of a problem among those who did not suffer from it. A second positive effect of the conflicts was that outsiders (extension agents, community development committee and elders) helped the farmers to look for alternative solutions for the existing problems (Cosier and Dalton, 1990). The active mediation of the extension agents, community development committee and elders was conducive for the changes and helped farmers to seek consensus instead of being stuck in an impasse as a result of the tensions and conflicts over the access to the resources. These outsiders hence contributed to make the tensions constructive for the changes that occurred. This finding confirms the important role of brokers, who engage in facilitating the interrelations among stakeholders, in a change process as explained by Klerkx and Leeuwis (2009).

6.2.3. *Alternative production options and natural circumstances as elements of difference*

The study has shown that farmers in the three areas do not have the same rice production options and are not dealing with the same biophysical context. The availability of land, apart from the lowlands, and the occurrence of floods differed in the three areas.

In Koussin-Lélé, farmers produced in the lowland area during the first and the second seasons. They hired the land surrounding the irrigated area, to produce during the third season because they were not able to produce in the lowlands during the flood period. In the dry season, from December to March, the velocity of water flow decreases, irrigating only 63% of all the plots sufficiently (Totin et al., 2012). These characteristics contrast with Bamè where farmers had the options alternative of producing either in the lowlands or the uplands. In Zonmon, the farmers produced rice only in the lowlands because they had no upland alternative and hence could not produce when the command area was inundated, mainly from July to September.

Hence, the biophysical conditions, including floods and the availability of land in the upland part of the valley in addition to the lowlands, and the importance of rice for farmers' livelihoods both help to explain the different outcomes of the governmental programmes in addition to the different ways in which tensions between the farmers were managed.

6.3. *Implications for evaluating external interventions*

The analysis elucidates that external interventions are in a constant process of interaction with local actions (Bierschenk, 1988). The change is not only the outcomes of the interventions, but rather a process that involves many actors who continuously reshape and transform the interventions to fit their goals and interests (Mongbo, 1995; Verbole, 2000). Therefore, the investigation of intervention outcomes needs to focus not only on programme goals and planned activities, but also on social relations, actions and interactions (Bagozzi and Dholakia, 2002). Marsh (1978) presents goal-oriented evaluation as an objective and reliable approach for assessing changes. A weakness of this approach for evaluating external interventions is that it may underestimate the potential of local actions that also facilitate the expected changes (Binnendijk, 2000; Thurston and Potvin, 2003).

This study confirms that changes should not be seen from a single perspective. Taking into account local actors' and interventionists' perspectives provided insight into the combined effect of several intervention programmes, local actions, tensions and intermediaries' roles. Many authors advocate the use of participatory evaluation approaches, such as responsive evaluation (Kouévi et al., 2013; Visse et al., 2012) or most significant change (Dart and Davies, 2003), because they promote collective agenda setting and shared expectations (Holte-McKenzie et al., 2006; Parkinson, 2009; Quintanilla and Packard, 2002; Scarinci et al., 2009). During the investigation, the interventionists often explained the changed local practices as a direct outcome of their activities without acknowledging the role of the farmers. Although the farmers themselves mentioned actions they had undertaken over time, they did not attribute the changes to their own actions. They tended to attribute the successful changes to project staff. In view of this latter observation, we doubt whether involving people in the evaluation as advocated in participatory approaches is a sufficient condition for a deep understanding of the changes. Clearly, even participatory evaluation approaches involving farmers in the evaluation via interviews, focus group discussions, workshops and the like are bound to disregard the contribution of local actors to successful interventions if the local actors do not acknowledge the importance of their own actions. To avoid this failure, it is important for evaluators to focus on changes in social practices rather than production figures and carefully pay attention to the chain of events, while zooming in on the interaction between external interventions, intermediaries and local actors.

7. Conclusions

The new generation of rice intensification policy in Benin has provided external institutional conditions for farmers to change their practices for rice production, selling, financing and water management and ultimately contributed to an increase in their incomes. The government programmes mitigated the main institutional barriers that hindered the rice farmers in the three research areas and allowed them to deal with the problems of ineffective water management, inequitable land allocation and discriminatory participation in canal cleaning.

The study shows that the generic interventions provided not only institutional conditions for rice intensification, but also room to change local rules that had hindered effective water management. The research highlights that changes should not be considered as the outcome of external interventions only. In practice, the dynamic interplays between local agency, intermediation and interventions from outside make room for change. In light of this, the study concludes that evaluations would benefit from analysing the chain of events meticulously with a timeline, and triangulating interviews and informal conversations with field observations. This is

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a good way to explain different outcomes of generic policy and sheds light on interactions with farmers' actions and local conditions.

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