Supporting Agricultural Extension: Could farmers contribute?

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Abstract

Is extension an effective tool for increasing social welfare? The objective of this study is to evaluate the feasibility of farmer financial participation in extension as an alternative to increase its efficiency. While extension costs have been high, the impact at farmers' welfare has not yielded the expected results. Rice production in Nigeria and Benin is used as a study case. Rice is an important food crop and cash crops and both countries have conditions to produce it locally. Two concepts are used to evaluate private participation: farmers' capability to pay (CTP) and requirement to pay (RTP) for extension. Farmers' capability to pay is evaluated from the expected increase benefit due to extension work. Requirement to pay is deducted from extension costs. Results show that rice farmers could initially contribute with 25% of the extension costs in Nigeria and 10% in Benin. While financial participation from farmers is a possibility, the role of the government is still needed to guarantee social welfare.

JEL Subject Codes: Q16, O3

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1. Introduction

Is extension an effective tool for increasing social welfare? Agricultural extension has been questioned due to its low effectiveness in improving farmers' welfare (Carney 1998; Rivera and Zijp 2002; Chapman and Tripp 2003) in spite of the existence of extensive literature reporting high returns to agricultural extension investment (Birkhaeuser et al. 1991; Evenson 2001). The objective of this research is to evaluate the feasibility of farmer financial participation in extension as an alternative to increase efficiency. The objective of this study is to develop parameters for evaluating private participation in extension.

In recent years, financial diversification in agricultural extension has received more attention. Rivera and Zijp (2002) described experiences on contracting for agricultural extension in countries as contrasting as Bangladesh, Chile, Estonia, Germany, Mali, Uganda, USA, and others. Katz (2002a), introduced the term financial participation to refer to any type of stakeholders payment for the extension services and presented 40 case studies around the world. Davidson and Ahmad (2003) have used the case of Pakistan to discuss privatization and the crisis of agricultural extension in this country. Experiences in various locations around the world (Schwartz 1994; Carney 1998; Chapman and Tripp 2003) are demonstrating that inefficiencies in resource allocation are unavoidable if a service such as extension is provided free of charge to stakeholders who might be able and/or willing to contribute to obtain appropriate service.

Rice production in Nigeria and Benin is used as a case study to evaluate the feasibility of introducing financial participation in the extension system. Rice is a main staple and cash crop in both countries (Ahoyo Adjovi 1996; Akpokoje et al. 2003) however the public delivery of rice technologies has been inefficient, accentuated by elevated costs (Akpokoje et al. 2003). Countries with similar technology delivery problems have handed out extension services to private providers or have diversified funding (Carney 1998; Berdegué and Marchant 2002; Katz 2002b; Rivera and

Zijp 2002; Chapman and Tripp 2003; Davidson and Ahmad 2003). The conclusion in those countries has been the same. Although economic and social reasons justify public financing of agricultural extension services, not all services need to be publicly provided (Sulaiman and Sadamate 2000).

We introduce two concepts to evaluate financial participation in agricultural extension: capability to pay (CTP) and requirement to pay (RTP). Capability to pay is evaluated from the expected increase benefit due to extension work. Requirement to pay is deducted from extension costs. Willingness to pay for extension is a concept that has more often been used to evaluate private provision of extension and is not part of this study.

This study is based on a project initiated in 1999 by the West African Rice Development Association (now Africa Rice Center, WARDA) and supported by the German Ministry of Economic Cooperation (GTZ/BEAF). The main goals of the project were to develop participatory tools that would enhance stakeholder participation in the rice technology development process and to explore alternative ways to increase the efficiency of agricultural extension.

2. Site Description and Characterization

The villages covered in this study are located in Kogi, Ogun, and Ebonyi states in Nigeria and in the department of Collines in Benin. Each key site has unique ecological, social and economic characteristics.

a. Rice Farmers

Farmers were identified in a two-step process. First, rice-growing villages were located with the help of agricultural extension officials. Next, farmers were called to community planning meetings and invited to participate in the project. A total of 272 farmers enrolled in the project activities, 176 from Nigeria (57 in Kogi, 49 in Ogun and 70 in Ebonyi), and 96 from Benin (46 in Dassa and 50 in Glazoue). The primary data in this study came from three different sources. The first source was a household survey conducted during 2002 – 2003, addressed to each participatory farmer. The

survey covered general household characteristics, rice production, and market information. The second source of information was on-farm trial experience. Each of the 272 farmers agreed to implement an on-farm trial during two cropping seasons to test an improved rice variety and compare it to the locally used variety. The last source of information comes from semi-structured interviews with rice producers, extension agents and agriculture authorities. Statistical data on rice prices and agricultural extension expenditure were collected from official institutions in Nigeria and Benin. Finally, financial information about the WARDA project was used to complement estimations.

b. Rice Production

The Institute National de Recherche Agronomique du Bénin (INRAB) and the Nigerian Cereal Research Institute (NCRI) have been working with the Africa Rice Center (WARDA) in collaborative projects for increasing the productivity of rice. The national agricultural research system is not effective in adapting the technologies to local conditions and in producing enough seed to satisfy the demand. In the case of rice seed, the availability of improved commercial seed is very limited although there is demand for them. The public sector is not able to adapt the improved lines and reproduced them at commercial levels.

c. Agricultural Extension

Agricultural extension in West African countries is being carried out since the mid 1980's. It was designed and supported by the World Bank (Shaib et al. 1998) and is based on the Training and Visit (T&V) system. T&V is a transfer of technology model, an expensive top down approach that works under the assumption that farmers lack adequate knowledge that restrains productions increase. T & V concentrates on the transfer of scientific agricultural knowledge and technology from research institutions to farmers. Even though there have been efforts to replace the system, this scheme still persists in the extension strategy of the Agricultural Development Program (ADP) in charge of the extension services in Nigeria (Idowu 1988). Similar development of extension

services happened in Benin, where CARDER (Centre d'Accion Regional pour le Developpement Rural) is the institution in charge of agricultural extension (von der Lühe 1991). The main criticism to this extension approach is the most crucial one: the system is not cost effective or financially sustainable.

3. Capability to Pay for Extension Services

The concept of "capability to pay" (CTP) is introduced to evaluate how the extension service could increase farmer's welfare. The benefit from the extension activity has to be perceived by the farmers in a direct way, not only to increase the incentives to pay for extension, but also to make farmers able to pay for the service. In this study CTP for extension is derived from the expected increase in rice gross margins (GM) due to extension work. There are two main assumptions behind the GM estimation: a) improved rice varieties have higher yield performance in the field compared to local varieties; b) the rate of input use remains constant; c) adoption is monotonic. Total revenues are estimated from the total production at the farm gate price. Total variable costs include the costs of seed, fertilizer and total labor cost. Opportunity cost of the inputs was estimated at 10% of the variable costs. GM results (Table 1) show that rice production is a profitable activity in all the sites but small production areas are the main constraint to larger benefits specifically in Benin. The highest net returns were recorded in Dassa (3.34) and Glazoue (2.59) mainly due to a large average yield, however the average rice areas in both Benin sites are relatively small.

New technology (improved rice seed) delivered by the extension system could impact GM in two main ways, increasing productivity and thus total revenues or decreasing input use or total costs. In this study we are dealing with the first case. Although farmers' preferences can be different from scientific breeding priorities, high yield is an expected attribute in any improved variety. On the other hand, yield improvement alone it is not sufficient to affect farmers' decision to adopt a variety (Dalton 2004). Table 2 presents GMs estimations at two different scenarios with yield increase of 10 and 20% due to the adoption of the technology. Assuming than the production

costs are unaffected by the use of the improved technology, the scenario cases show that a 20% increase in yield would imply at least a GM increase of 32% (Kogi, Glazoue). In monetary terms this can be translated to about US$ 44 increase (Dassa).

For farmers in Nigeria a 10% yield increase due to extension would be at least US$ 22/household (Kogi), while in Benin, this value would be at least US$ 23/household (see Glazoue Table 3). A certain percentage of the GM increase can be used to pay for the extension services. Farmers' CTP fixed at 10% of GM increase could be a conservative amount to pay for such extension services. Notice that the extension agent would need to diversify activities or have additional sources of income. Extension exclusively for one crop does not seem sensible, especially for a food crop like rice.

In Nigeria, at 10% yield increases the CTP values are at least equal or higher than US$ 0.83 (Ogun state). These values doubled under the 20% yield increase scenario. In Benin, the CTP values were considerably lower due to the smaller rice area, US$ 0.25 in Dassa and US$ 0.17 in Glazoue with a 10% yield increase. The ability to pay is constrained by the rice cropping area and thus by the low profit obtained from rice production. While GMs are at the same level in Benin as in Nigeria, the benefit cost ratios are higher in Benin. Rice cropping in Benin is then a possible source of income. Moreover farmers interviewed in this country sell at least 50% (Glazoue) of their harvest, evidencing an important link to the market through this crop.

4. Requirement to Pay for Extension Services

An extension system based on private contributions requires a minimum participation in order to keep operating. In this concept not only farmers' interest are involved but also extension agents' and the government's, and the interest of any other stakeholder willing to participate and benefit from the system. Dinar and Keynan (2001) evaluated economic performance of paid extension in Nicaragua. These authors have compared the performance of paid and public extension services at four levels: farmers, extension agent, government and the society. In the study the farmers were

considered net benefit maximizers, the extension agent or agency profit maximizers or cost minimizers, the government was seeking costs-effectiveness, while the society was expected at least to do the same or more with fewer resources. In a reduced model the main utilities involved are the farmers', the extension agents' and government utilities. Welfare of these actors is often in conflict, making social welfare a difficult goal to attain.

Rice farmers were involved in an on-farm trial activity where they have the chance to compare the performance of their local rice with the performance of an improved variety. Furthermore, farmers were advised and monitored by a WARDA extension agent. The salary of the extension agent was paid by WARDA and it was equivalent to US$100, which is above the salary offer by the local extension system. Each extension agent was in charge of an average of 25 to 30 farmers. The seed and fertilizer was provided as well by WARDA. The size of the experimental plot was 20 x 50 m where half of the area was dedicated to the improved variety and the other half to the local one. The visits to the plot were periodical and the extension agents had to report specific rice performance information to WARDA. The main variables to determine different contribution levels of the government (public sector) and the farmer (private sector) were extension agent salary and the number of farmers assisted. Extension cost per farmer can be: decreasing or constant, depending on the change of extension agent salary with respect to the change of the number of farmers assisted.

a. Constant Extension Costs

In the first case scenario the initial monthly salary of the extension agent was fixed to US$ 100, while the number of farmers assisted and the level of contribution assumed different values (Table 4). The ratio of the salary of the extension agent to the number of farmers assisted is the cost of extension per farmer, or the RTP per farmer. This cost of extension is covered partly by the farmer and partly by the government. The farmer's contribution varies from 10% of the total extension cost per farmer to 100%. The government level of contribution takes the complementary values, from 90% coverage to 0% coverage. Note that individual farmer contributions decrease and

government cost effectiveness improves with the number of farmers assisted. On the other hand, the number of farmers reached by the extension agent does not affect his salary; however, the efficiency could be harmed if the same agent covers too many farmers. At the same time the only incentive for the extension agent is a better than average salary.

Under this financing model the CTP of US$ 0.83/month/farmer (assuming a 10% yield increase due to the extension work) makes farmers' contribution feasible. At a 10% level of farmers' contribution the RTP values are all below the CTP for Nigerian farmers who could contribute up to 25% of the extension costs. In Benin the CTP constraining values are much lower than in Nigeria, allowing farmers with a 20% yield increase to contribute only to 10% of the total costs.

b. Decreasing Extension Costs

The contribution estimations that result from this scenario are alike to the previous case; however in terms of welfare this is a more favorable situation for all the stakeholders. On one hand since the extension costs decrease with the number of farmers assisted, the cost effectiveness of the government increase. On the other hand, the extension agent incentives are higher because his salary increases with the number of farmers assisted (Table 5).

As in the previous case, Nigerian farmers' CTP is comparable to the farmers' RTP when farmers are paying at least 25% of the total extension costs. In Benin only a yield increase of 20% could improve the CTP of the rice farmer (US$ 0.24) enough to be able to contribute but bearing no more than 10% of the costs, at least at an initial stage. In this situation extension agents are encouraged to have a better performance and cover more farmers. The government is cost effective and farmers' contribution decrease with more farmers participating. However, too many farmers assisted by only one extension agent would have a negative impact on the system. While this can be seen as a perfect scenario there is a need to balance extension costs and coverage. If there is no limit on the number of farmers covered by the extension agent, farmers' welfare and

extension agents' efficiency could decrease. Also note that total extension cost actually increases for the government.

5. Private Participation Feasibility

In theory, to keep the incentives for a paid extension system farmer's ability to pay should be at least equal or higher than the requirement: CTP > RTP. In practice, paid agricultural extension is not an idea that can be easily sold to risk avers farmers in West Africa. Independently of the crop the idea of paying for a service, so far publicly rendered, needs time to be accepted. The probabilities that small farmers in the study area could finance 100% of the costs without a form of government support are small. Even in a country like Chile and after more than 2 decades of privatized extension, the government still allocates public resources to pay 85 to 90% of the total extension costs (Berdegué and Marchant 2002).

RTP values estimated for Benin and Nigeria are well below similar estimations done for other conditions (Perraton et al. 1983 in Malawi; Dinar 1996 in Israel; Currle et al. 2002 in Thuringia; Schmidt 2005 in Romania). In Nigeria, data from 1997 indicate that under the T&V system only 6.5% of the families in Kogi; 4.4% in Ogun and 1.3% in Ebonyi had direct access to extension (Federal Agricultural Development Program 1999). While the cost of covering these households ranged from US$ 8.86 in Kogi to US$ 11.70 in Ebonyi and US$ 33.30 in Ogun. It is difficult to make a direct comparison among these values, since they have been estimated based on other conditions and with other assumptions. These are real extension costs that are not limited to a commodity; however the estimations do help to envisage how expensive the extension service could be and how much government support it still needs to keep operating.

Agricultural extension has to offer real technological advantages to have this level of contributions. Increasing the low rice yields in study areas might not seem an onerous task but it should not be taken for granted either. There are serious constrains to rice production independently of rice quality and yield, like bird attacks in Ogun, or high labor demand in Benin,

that have induced the move from this crop to less labor demanding ones. Rice is just the example crop used in this study. Paid extension service could not be sustainable based on only this crop.

As Dinar (1996) argues, the production of certain crops could not pay for the service. Certain agricultural growers, predominantly small holders, would not be able to afford the service which is also the case for the small rice farmers in the study areas, mainly in Benin. Note that the average rice area per household is below a hectare in Dassa and Glazoue. Commercialized extension would probably need to be more diversified and provide different packages of services to different client groups. Estimated contributions of 25% of the extension costs in Nigeria and 10% in Benin are still acceptable, at least for initial stages.

6. Role of the Government

As Hite states (1993), it is not possible to make any definite statement about the efficiency implications of any specific privatization without knowing all the costs, including those implicit in the political trades. Nevertheless agricultural policy environment is changing to adapt to global political and economical trends. Under this changing environment, there are several driving forces pushing for privatization. In fact, evidence of high social and private return to R&D support the view that society is investing too little in agricultural R&D (Alston et al. 1999). Then it is the governments' responsibility to create conditions for private participation and avoid market failures.

Private extension does not necessarily reduce the public role, but allows a better priority setting. Training of extension agents could be a public task under the conditions in both Benin and Nigeria. Professional competence of extension agents is a must for any extension system improvement. The vast majority of extension workers begin their careers in the field with a weak knowledge of agricultural science and limited skills in extension communication (SAA 2005). Despite their first-hand experience with farmers and farming they are usually underpaid. Another important government task would be to deal with finding an answer to the question of what are the prospects for developing institutions that favor small resource-poor farmers. If private extension

actually happens in either of these two countries small farmers would probably be affected or neglected by these services.

The nature of agricultural extension required to overcome the rice market problems is neither completely public nor completely private. Local conditions like long distances, low education of farmers and the presence of different ethnic groups create excludability and thus conditions for private participation. The complexity of rice production, small rice areas. and the low demand for local rice hamper the incentives for private investment. Extension in the case of rice must then be a public task, but financial participation from farmers is still a possibility.

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Table 1 Rice gross margins (US$/Ha)

Component	Units	Kogi	Ogun	Ebonyi	Dassa	Glazoue
Total Revenue (TR)	US$ / Ha	**220.00**	**300.16**	**244.45**	**406.93**	**232.754**
- Survey based yield	kg / Ha	1.280.00	1130.00	1490.00	2352.00	1345.40
- Retail price	US$ / kg	0.17	0.27	0.16	0.17	0.17
Total Variable Cost (TVC)	US$ / Ha	**86.18**	**152.69**	**141.25**	**121.96**	**89.95**
- Seed	US$ / Ha	12.75	22.56	19.69	16.76	14.55
- Fertilizer	US$ / Ha	0.00	0.00	17.58	0.00	0.00
- Hired Labor	US$ / Ha	69.98	124.02	98.34	98.47	70.44
- Interest working capital (10%)	US$ / Ha	3.45	6.11	5.65	6.72	4.96
Gross Margin (TR – TVC)	US$ / Ha	**133.82**	**147.47**	**103.20**	**284.97**	**142.81**
Total Production Cost / kg	US$ / kg	**0.07**	**0.14**	**0.09**	**0.05**	**0.07**
Benefit- Cost Ratio		**2.55**	**1.97**	**1.73**	**3.34**	**2.59**

Table 2 Rice gross margins at different yields increases

State	Gross Margin (US$/Ha)	10% yield increase			20% yield increase		
		Total (US$/Ha)	GM Increase (US$/Ha)	GM Increase (%)	Total (US$/Ha)	GM Increase (US$/Ha)	GM Increase (%)
Kogi	133.82	155.82	22.00	16.44	177.82	44.00	32.88
Ogun	147.47	177.49	30.02	20.35	207.50	60.03	40.71
Ebonyi	91.56	114.84	23.28	25.43	138.12	46.56	50.85
Dassa	284.97	325.67	40.69	14.28	366.36	81.39	28.56
Glazoue	142.81	166.08	23.28	16.30	189.36	46.55	32.60

Table 3 CTP estimations at different level of yield increase

State	Rice Area/ Household (Ha)	Rice Period (months)	10% yield increase			20% yield increase		
			GM Increase (US$/Ha)	Benefit/ Month (US$) *	CTP **	GM Increase (US$/Ha)	Benefit/ Month (US$)	CTP **
Kogi	2.26	5	22.00	9.94	0.99	44.00	19.89	1.99
Ogun	1.39	5	30.02	8.34	0.83	60.03	16.69	1.67
Ebonyi	2.87	5	23.28	13.36	1.34	46.56	26.73	2.67
Dassa	0.31	5	40.69	2.52	0.25	81.39	5.04	0.50
Glazoue	0.36	5	23.28	1.68	0.17	46.55	3.35	0.33

* Benefit/month is related to the average rice area in each site
** CTP is 10% benefit/month

Table 4 Scenario 1 – RTP per farmer with constant extension costs

Ext. Salary /month (US$)	No. Farmers Assisted	RTP (US$)							
		Farmer 10%	Gov 90%	Farmer 25%	Gov 75%	Farmer 50%	Gov 50%	Farmer 100%	Gov 0%
100	25	0.40	3.60	1.00	3.00	2.00	2.00	4.00	0.00
100	30	0.33	3.00	0.83	2.50	1.67	1.67	3.33	0.00
100	35	0.29	2.57	0.71	2.14	1.43	1.43	2.86	0.00
100	40	0.25	2.25	0.63	1.88	1.25	1.25	2.50	0.00

Table 5 Scenario 2 – RTP per farmer with decreasing extension costs

Ext. Salary /month (US$)	No. Farmers Assisted	RTP (US$)							
		Farmer 10%	Gov 90%	Farmer 25%	Gov 75%	Farmer 50%	Gov 50%	Farmer 100%	Gov 0%
100	25	0.40	3.60	1.00	3.00	2.00	2.00	4.00	0.00
115	30	0.38	3.45	0.96	2.88	1.92	1.92	3.83	0.00
130	35	0.37	3.34	0.93	2.79	1.86	1.86	3.71	0.00
145	40	0.36	3.26	0.91	2.72	1.81	1.81	3.63	0.00