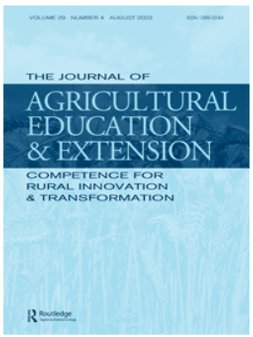

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Farmers' access, demand, and satisfaction with innovation support services and their determinants: the case of the cocoa sector in Central Cameroon

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ABSTRACT

Purpose: We assessed cocoa farmers' access to, demand for, and satisfaction with five innovation support services and the factors shaping them.

Design/methodology/approach: We used data from 10 focus groups and a survey of 421 farmers in Central Cameroon. Data were analysed using descriptive and inferential statistics, and regression models.

Findings: Results showed that farmers mostly receive training and advice whereas inputs, credit, and equipment are the most demanded services. Training and advice obtained the highest perceived quality score. Conflicts around distribution and capture by leaders were relatively frequent regarding inputs and equipment. Farmers' satisfaction with service outcomes increased with the number of services received and any services above training and advice yielded higher outcomes. Location, involvement in certification, seniority, and leadership position in farmers' organisations were significantly associated with access and demand for at least two services while satisfaction with quality was mostly influenced by prior services received and the extent to which they matched expectations.

Practical implications: Farmers' demands for services are diverse, hence the importance of providing them with either service bundles or options from which they can choose. Additional efforts are needed from service providers to create an enabling environment for the implementation of the disseminated sustainable management practices.

Theoretical implications: Farmers' satisfaction with services can be analysed from different perspectives. Both endogenous and exogenous factors determine access to, demand for, and satisfaction with services.

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Originality/value: This research is the first to assess the provision of innovation support services in the cocoa sector using an analytical framework that combines demand, access, and satisfaction with five services.

Introduction

Cocoa plays an important role in the livelihoods of west-central African countries' households. It provides employment and a significant share of the household's income. Improving cocoa farming practices has been at the centre of many interventions in the cocoa sector in the past years (Fountain and Huetz-Adams 2018). Yet, cocoa yields remain low and rural poverty high. The Cameroon government developed a strategy to increase production and sustainability in the cocoa sector. A key element to achieving its goal was the provision of innovation support services (ISS) such as extension, training, agricultural information, inputs, and equipment support, through a network of complementary public projects and programmes with private sector support (RoC 2014). There was a renewed interest of the public sector to support the cocoa sector after an initial withdrawal following the economic crises of the late 1980s to early 1990s (Achancho 2013). Yet, the private sector remains the main service provider (Lescuyer et al. 2019). In an increasingly competitive environment, companies try to secure supply and increase farmers' loyalty to their supply chain (IDH 2016) through sustainability programmes. Yet, over the past decades, the cocoa yield, production, and value in Cameroon have stagnated and the cocoa farmers' living conditions have not improved markedly (Lescuyer et al. 2019). The political crisis and instability in the South West region which was the main cocoa supplier has worsened the situation, resulting in the need to increase yields in the other regions to meet the national production goals.

Initially, agricultural extension was seen as the main innovation support service to be provided, and this was largely associated with technology transfer and training. However, over time the idea of innovation support services (and extension) has been broadened to include securing access to necessary resources such as credit, inputs, and equipment, building networks, facilitating multi-stakeholder learning, conflict management, demand articulation, interactive design, and institutional change among others (Audouin et al. 2021; Blum, Cofini, and Sulaiman 2020; Davis and Sulaiman 2014). Strengthening farmers' and other stakeholders' capacities to innovate is one of the key functions of the provision of innovation support services (Faure et al. 2019; Mathé et al. 2016; Mbo'o-Tchouawou and Colverson 2014). Nonetheless, we see that key service providers and stakeholders continue to have a narrow perspective on innovation support services, and continue to focus on technology transfer and training (Birner et al. 2009; Davis, Babu, and Ragasa 2020; Feder, Birner, and Anderson 2011). This research focuses on five innovation support services delivered in the Cameroonian cocoa sector to support farmers' adoption of sustainable practices to increase productivity and improve farmers' livelihoods.

To achieve well-balanced and pro-poor development, the services offered to farmers should be coherent with their local realities and needs, and their access inclusive (Wennink, Nederlof, and Heemskerk 2008). This is highly relevant as people are more

likely to accept and make use of services that are consistent with their local situation and culture (Brennan 2005). Moreover, farmers' satisfaction with the services received increases the likelihood of achieving agricultural development outcomes (Ragasa and Mazunda 2018). However, the effectiveness of extension systems in achieving a sustainable development agenda depends upon the quality of the provided services (Kassem et al. 2021), but also on farmers' participation in the planning, provision as well as evaluation of these services (Joshi and Narayan 2019). Services relevance is largely dependent on their ability to meet farmers' needs (Come, Neto, and Cavane 2021). To understand the lack of progress observed, especially regarding the increase in cocoa yield despite private and public investments, focusing on the provision of innovation support services in the cocoa sector, we pursue three possible lines of inquiry. First, whether the farmers effectively have access to the various services delivered by services providers. Secondly, if there is a match between the services received by farmers and those they demand. Thirdly, whether farmers are satisfied with the quality of the services they receive. Increasing farmer productivity is assumed to lead to improved livelihood and food security. However, this requires the provision of services that respond to farmers' demands. Identifying the gaps between farmers' demand and what is provided and assessing the quality of these services will provide valuable information that can be used to design policies and programmes that contribute to improving the quality of the services offered to farmers.

Conceptual and analytical framework

Client satisfaction is defined in terms of how products and services supplied meet or surpass customer expectations (Ganpat, Webster, and Narine 2014; Yaqub, Halim, and Shehzad 2019). Satisfaction with services can be seen from two different perspectives, as a 'process' or 'outcome' measure (Kassem et al. 2020; World Health Organization 2000). Satisfaction is viewed as a process measure when we are concerned with how the service is delivered (the context, processes, and perhaps the service costs) while it is considered an outcome measure when the extent to which clients view service as having helped resolve their problems is of interest (World Health Organization 2000). This paper addresses both perspectives by looking at cocoa farmers' appraisal of services quality and perceived outcomes from the services received. As beneficiaries of innovation support services, farmers can also be considered as providers' clients.

Service quality is one of satisfaction main determinants (Ghiasi et al. 2017; Kassem et al. 2021; Lotfy and Nahed 2016). Concerning extension services, Buadi, Anaman, and Kwarteng (2013) note that overall satisfaction with a service depends on high levels of desired quality of all attributes as one limiting attribute can render a service of little value. Services quality attributes include among others adequacy, relevance, availability, timeliness, affordability, equity and fairness, relation or partnerships, accessibility, diversity, and follow-up (Birner et al. 2009; Buadi, Anaman, and Kwarteng 2013; Nederlof et al. 2011; Sylla et al. 2019; Wongtschowski et al. 2016); providers' accountability and sincerity (Awatade, Ghosh, and Singandhupe 2019); the cost of services (Yifei 2017); or particularly ease of understanding, accuracy, and overall usefulness for information services (Debnath, Saravanan, and Datta 2016). Furthermore, perceived benefits (Elias et al. 2016; Joshi and Narayan 2019; Lotfy and Nahed 2016), such as services' ability to yield

outcomes in terms of agricultural productivity, food security (Ragasa and Mazunda 2018), income, employment, innovations, and value chain strengthening (Birner et al. 2009) among others determine the extent to which farmers are satisfied with them. Therefore, we measure farmers' satisfaction with services through two lenses: perceived quality and outcomes (Figure 1).

Access to and suitability of the services offered to farmers are the first determinants of its effectiveness (Lukuyu et al. 2012). In a system characterised by a plurality of innovation support services providers (Sulaiman et al. 2022), access to service implies its effective provision and receipt by farmers. Farmers' needs and demands are diverse. Leeuwis (2021) notes that demands and needs represent different levels of abstraction in the sense that a need can be translated into detailed demands. Thus, considering

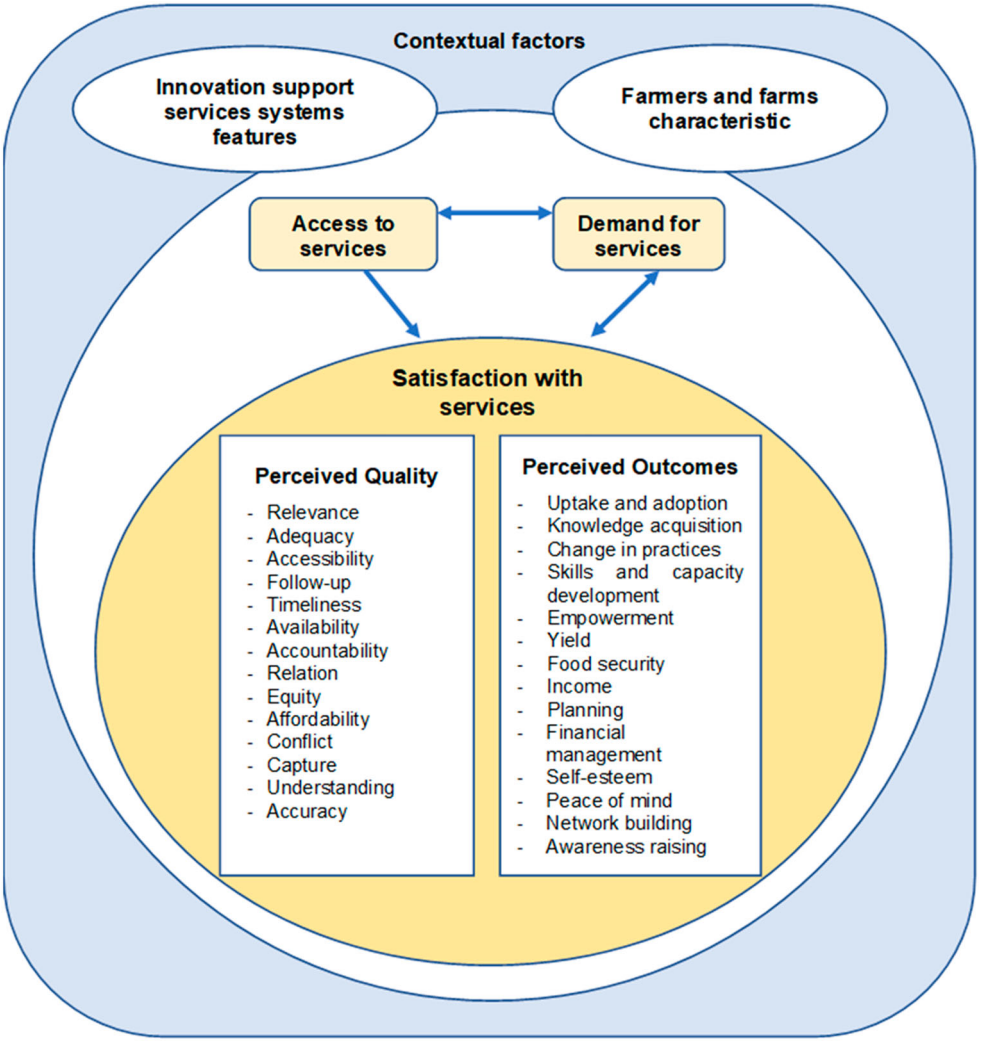

Figure 1. Analytical framework to assess farmers' access to, demand for and satisfaction with innovation support services.

that farmers express a need for support to increase cocoa productivity, in this research, we investigate services demanded for this purpose. From literature, we group the factors influencing access to, demand for, and satisfaction with services into three categories: innovation support services system features, farmers' attributes and farming systems, and contextual features (Anang and Asante 2020; Arias, Leguía, and Sy 2013; Baloch and Thapa 2014; Gido et al. 2015). Nonetheless, the degree of significance and nature of influence of these factors varies from one study to another. In addition, the extent of access to services and the match between services demanded and received are likely to influence demand and satisfaction with services (Figure 1). Focusing on the five services (credit, training, advice, inputs, and equipment) mostly reported by farmers during focus group, we aim to understand the factors influencing farmers' access to, demand for, and satisfaction with services. For this purpose, we investigate three questions:

(a) What are the services demanded and received by cocoa farmers?

(b) How do cocoa farmers evaluate the quality of the services received?

(c) What is farmers perception of the outcomes of the services currently offered to them?

Some frameworks have been developed to evaluate the performance of innovation support services, especially agricultural extension and advisory services (Birner et al. 2009; Blockeel et al. 2023; Sulaiman et al. 2022). However, they pay little attention to farmers' satisfaction with the services they receive and focus on the system level. In addition, issues related to access, demand, and satisfaction with services are often studied separately whereas these elements are likely to interact and constitute elements of a whole. Therefore, our analytical framework also aims to capture these interactions (Figure 1).

Methodology

We apply a mixed methods approach, combining grey literature review, key informant interviews (KIIs), focus group discussions (FGDs), and farmer surveys (Figure 2) to get more insight into the research problem (Strijker, Bosworth, and Bouter 2020).

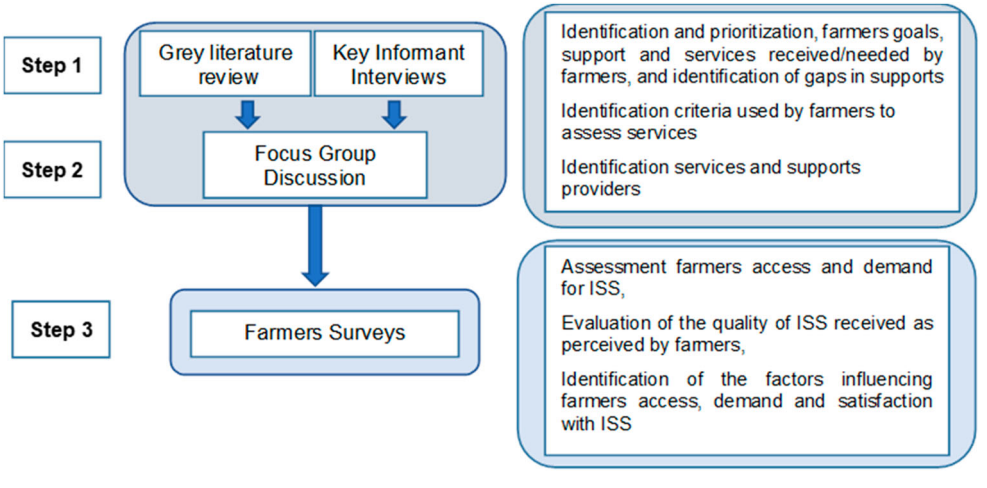

Figure 2. Steps in data collection and purpose.

Combining FGDs with farmers' survey help to unravel issues of information disclosure which can arise during FGDs (Hollander 2004), identify relevant issues to further study, and quantify and triangulate the results.

Study area

The study was conducted in the Centre region of Cameroon which supplied 43.6% of the national production during the 2020/2021 cocoa Campaign (Mbodiam 2021). Specifically, we focused on four locations purposively selected to represent the primary (Ntui, Makenene) and secondary (Ngomedzap, Ayos) cocoa production basins (Figure 3). The primary and secondary basins represent respectively areas with high and low volumes of cocoa production. In addition, farmers also reported lower average yields of 387 in Ayos and 402 kg ha^{-1} in Ngomedzap compared to 530 and 740 kg ha^{-1} in Makenene and Ntui. We assumed that farmers' access to, demand for, and satisfaction with services could vary depending on their location. The volume of cocoa beans supplied could influence the importance given to the location by services providers and hence the efforts invested in their interventions. The locations biophysical

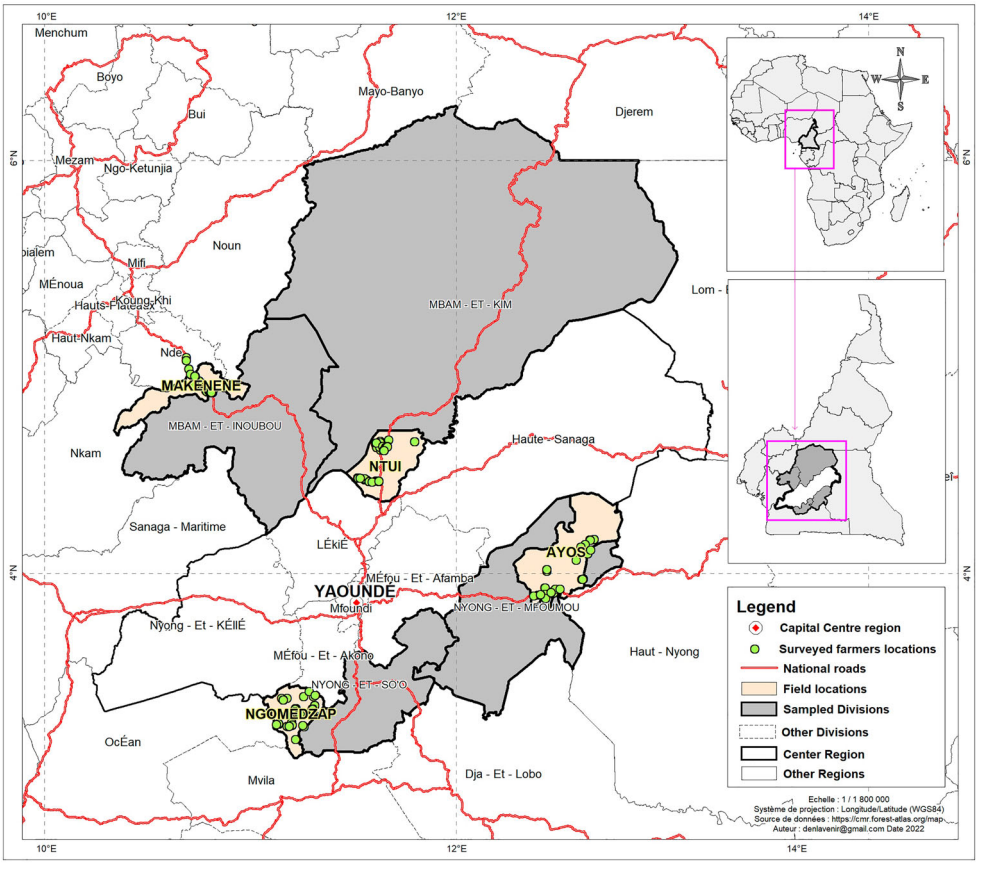

Figure 3. Location of the study area.

and infrastructural characteristics, dominant farming systems or livelihoods strategies could also influence the demands expressed by farmers.

Interviews and FGDs

We conducted KIIs to identify the different services offered to cocoa farmers. The key informants included sustainability and programme managers of three cocoa buying companies; the head of programme of a certification body, the director and president of a cocoa farmers confederation, the head of operation of an interprofessional council, and two civil servants. For triangulation purpose, KIIs were complemented by a review of flyers, reports, and other documents made available by informants or obtained through websites.

Secondly, we conducted 10 FGDs, each with 6–12 members of 10 cocoa cooperatives randomly selected from a list compiled through five organisations. We purposively selected the latter to capture the diversity of the services provided to cocoa farmers. We contacted the cooperative's leaders to explain the research objectives and asked them to invite 12 cocoa farmers members of their group, ensuring diversity in the composition (gender, age, and leadership position). A total of 103 farmers attended the 10 FGDs, including 78 males and 25 females. The FGDs served to identify the services received by farmers and their providers, farmers perceived needs, the attributes they used to assess services quality, and the perceived changes resulting from the services received. The data from the KIIs and FGDs were subject to thematic analysis in line with the research objectives. These data were used to identify and formulate contextually relevant questions for the survey questionnaire. Finally, the FGDs helped to better understand the patterns emerging from survey data analysis, put them in context, and strengthen and discuss the findings.

Farmer surveys

Sampling procedure

In Cameroon, services providers primarily intervene through farmers' organisations (FOs). Therefore, we used a multistage sampling to select 421 farmers from 22 cocoa FOs in the targeted locations (Table 1). The sample represented 28% of the total membership of the sampled FOs. To avoid including a farmer twice in the study, none of the FGDs communities and participants was involved in the survey.

In each location, we first established the list of active cocoa FOs by combining information from different service providers. Secondly, we randomly selected FOs with a minimum of 300 farmers each from which we recruited cocoa farmers. With the selected FOs leaders', we obtained the member registries which unfortunately were not always up to date. Thirdly, we performed a proportional random sampling to select the farmers to survey in each FO. We computed the total number of farmers per FOs (x_i) as in Equation (1):

$$x_i = (n_i/N_j) \times 100 \quad (1)$$

where n_i is the FO i membership, and N_j the total membership of the selected FOs in the location j. We collected data using a pretested questionnaires uploaded in the

Table 1. Distribution of survey respondents and summary of farms characteristics in field locations.

	Location	Makenene	Ntui	Ngomedzap	Ayos
Sampling	Total FOs	29	15	4	17
	Sampled FOs	9	5	2	6
	Total number farmers	318	435	373	394
	Sample farmers	107	105	101	108
Farm characteristics	Mean prod. land (ha)	4.8	4.1	3.3	3.6
	Mean total cocoa produced annually (kg)	3630.9	2191.6	1274.2	1446.9
	Mean average cocoa yield (kg ha^{-1})	530.1	740.5	401.7	386.9
	Farm age (percent)				
	0–5	1	3	4	4
	5–15	32	28	21	28
	15–25	34	48	6	16
	25–40	15	16	14	16
	>40	19	6	55	37
	Farm trees age (percent)				
	0–5	3	3	16	8
	5–15	44	39	38	45
	15–25	35	46	14	24
	25–40	10	9	11	13
	>40	8	3	22	9

mobile application KoboCollect. Four enumerators with experience in cocoa farmers survey were recruited and trained for this purpose. We gathered data on farmers' socio-economic and farm characteristics, services received and demanded, and appraisal of the services' quality and outcomes, among others. It takes about 3–5 years for a cocoa seedling to bear fruit (Ruf 2011). Thus, to be sure to capture the impact of services delivery on production, including on newly established cocoa farms, and allow farmers to compare services from different providers and assess their impact in the long-term, a time boundary of 5 years preceding data collection was set for services received.

Data analysis

Assessing farmers access and demand for services and the factors shaping them

In this study, access to service was defined its effective provision and receipt by farmers whereas demand refers to the services respondents would have liked to receive.

We computed descriptive statistics to determine the share of farmers receiving or demanding training, advice, inputs, equipment, and credit. Subsequently, we assessed the factors influencing the access to, and demand for each service; considering them to be independent. For each service, each farmer could either demand it, receive it, or not. Therefore, given the binary nature of the dependents variables, a separate binary logistic regression model (LRM) was estimated as in Equation (2) for both access and demand of each service. The log-likelihood Chi square test ($p < 0.05$) and Hosmer–Lemeshow test statistic ($p > 0.05$) were used to evaluate the goodness of fit of the logistic regression model. Finally, because farmers could receive or demand multiple services, we estimated a Generalised Poisson Regression model (GPR) to determine the factors influencing the number of services accessed and demanded (Equation (3)). The Poisson regression is appropriate for count dependent

variables. Our data violated the assumption of equidispersion and were underdispersed for both the number of services received and demanded. The computed means were higher than the variances, and the dispersion ratios (0.41 and 0.56 for the number of services accessed and received, respectively) were lower than one and significant ($p < 0.005$). Therefore, we estimated a GPR which is a better fit in such circumstances when compared to the standard Poisson regression (PRM) (Mahama et al. 2020; Okello et al. 2022).

$$\log_{it}(Y_i) \text{ or } \log_{it}(W_i) = \log\left[\frac{P}{1-P}\right] = Z$$
$$= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \mu \quad (2)$$
$$\log(D) \text{ or } \log(R) = \alpha + \beta_1 X_1 + \beta_2 X_2 + I. + \beta_n X_n + \mu \quad (3)$$

where Y_i and W_i are the dependent variables representing access (Y_i) and demand (W_i) for each service I; I referring to training, advice, input, credit, or equipment. For each service, Y_i and W_i take the value 1 if a farmer receives or demands the service, and zero otherwise. D and R are the dependent variables representing the number of services demanded (D) and received I by farmers. X_1 to X_n are the predictors related to farmers' personal and farm characteristics, relationships with providers, and location (Appendix A1).

Evaluating farmers satisfaction with the services received and influencing factors

We assessed farmers' satisfaction through the perceived quality and outcomes of the services received. We used Likert scores and formulated affirmative statements regarding the services quality attributes (Table 2) (Elias et al. 2016; Ganpat, Webster, and Narine 2014; Ghiasi et al. 2017), and the perceived outcomes from services. Farmers' responses received a score of 5, 4, 3, 2, and 1 respectively when the farmers strongly agreed, agreed, neither agreed nor disagreed, disagreed, and strongly disagreed with the statements for the service s/he received.

Table 2. Description of attributes considered for the services quality assessment.

Attributes	Description[a]
Relevance	The service received is useful, necessary and covers a topic in the interest of the farmers
Adequacy	The number and regularity at which the service is received is sufficient for farmers to change their practices
Accessibility	Everyone can have access to the service when it is available
Follow-up	Services providers make efforts to verify that the service is properly used after training is applied
Timeliness	The service is provided at the right time during the agricultural campaign
Availability	Each time the service is needed, it is provided
Accountability	The service is provided at the farmers' request and with their approval
Relation	There is good communication and relationships with the service provider
Equity	The difference in individual farmers' needs is considered during the service provision
Affordability	To receive the service is not expensive
Conflict	The service distribution/provision does not cause conflict or tension in the group
Capture	The service does not mostly benefit cooperatives leaders and the local elites
Understanding[++]	The information shared is easy to understand
Accuracy[++]	All the information shared is trustable

[a]Statements were customised for each service.
[++]Attributes only relevant for training and advice.

For each service, as in Equation (4), we estimated a quality score (S_i) representing the overall satisfaction with its quality (Ganpat, Webster, and Narine 2014).

$$S_i = \frac{\sum S_j}{S_{\max}} \times 100 \tag{4}$$

S_i is the total quality score of the service I (i = training, advice, credit, input, and equipment), and S_j is the score for each quality attribute (j = *relevance, adequacy, … accuracy*). $S_{\max}$ is the maximum obtainable score for each service received (i.e. 5 multiplied by the number of quality attributes). We used the same principles to estimate an aggregate outcomes score (O) representing the overall appraisal of the changes resulting from the services received.

The internal consistency of the various Likert items was checked using the Alpha coefficient which was comprised between 0.6 and 0.7 for all services' quality attributes, and equal to 0.9 for the services' outcomes. Referring to Ursachi, Horodnic, and Zait (2015), we assumed an acceptable level of reliabilities of the items used to measure services quality and outcomes. Thus, to identify the factors influencing farmers satisfaction with the quality of the services received (Elias et al. 2016; Ghiasi et al. 2017) and their outcomes; we used the resulting Likert scale data as continuous variables to estimate two multiple linear regressions (MLR) formulated as in Equation (5).

$$S_i \text{ or } O = \alpha + \beta_1 X_1 + \beta_2 X_2 I \ldots + \beta_n X_n + \mu \tag{5}$$

S_i is the dependent variable representing services i quality score (i = training, advice, credit, input, and equipment). O is the dependent variable representing the outcomes score from all services received by farmers. X_1 to X_n are the explanatory variables related to farmers' personal and farm characteristics, relationships with providers, location, extent of access to services, perceived benefits from the services received, experience with the services, and main providers (Appendix A1).

In addition to descriptive and regressions analysis, we performed means comparison test (t-test and ANOVA). We conducted analyses using R.4.1.0 software, and STATA. Where relevant, a p-value < 0.05 was considered statistically significant. Regarding multiple linear regression, we used the R packages 'gvlma' for the global test of linear regression model assumptions (heteroscedasticity, specification, and linearity) and no issue of heteroscedasticity was observed. We arrived at the same conclusion graphically by plotting residuals versus fitted values. The multicollinearity between the explanatory variables was checked using the variance inflationary factor (VIF), and only variables with VIF values less than 10 were retained. Thus, the final list of explanatory variables used varied from one model to another. The 'blorr' package was used to check the model fit of logistic regressions (log-likelihood, ward, and Hosmer–Lemeshow test, classification test). For all the logistic regression models, the sensitivity test showed a minimum of about 70% of observations correctly classified.

Results

Summary of respondents socio-economic and farm characteristics

In general, 81% of respondents were male, the average respondent age was 52 years, 83% were married and 94% were household heads. Respondents' households had an average size of about seven individuals. A total of 57% and 34% respectively had attended secondary and primary school. On average, they had been cultivating cocoa for about 22 years, partaken in FOs for 8 years, 30% had already occupied a leadership position in a FO, 65% claimed to be part of a certification programme and 12% had cocoa as their sole sources of financial revenues. On average farmers cultivated a total of 5.3 ha of cocoa with 3.9 ha producing beans and 1.4 non-productive. The average dry cocoa beans yield was 515 kg ha^{-1} for an annual output of 2137 kg of beans. For 59% and 19% of respondents, improved cocoa varieties represented less than 40% and more than 60% of the planted trees respectively. Almost 50% of respondents had mostly cocoa trees that were of less than 15 years old while 45% of respondents mostly cultivated farms that were first planted more than 25 years ago. In addition to cocoa plots, 83% of respondents had non-cocoa plots covering in total an average of 1.5 ha. The average time spent by respondents from their homes to the nearest input market and the cooperative office were respectively 30 and 24 min. Furthermore, we found statistically significant differences between locations regarding for instance cultivated cocoa land area, the volume of cocoa produced, yield and experience in cocoa farming. The summary statistics of the key variables used in the study are presented in Appendices 2 and 3.

Services received and demanded by farmers

The farmers survey revealed two different patterns (Figure 4). By decreasing order of importance, respondents acknowledged receiving training (68%), advice (67%), inputs on credit (30%), cash credit (22%), inputs for free (19%), and equipment for free (9%) and on credit (3%). Concerning the extent of access to services, respectively 21%, 38%,

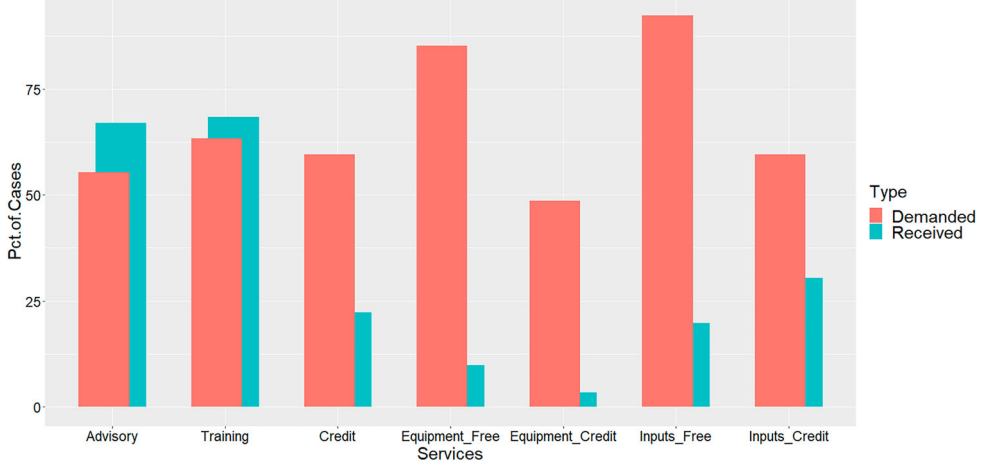

Figure 4. Respondents distribution according to the services received and demanded ($n = 421$).

23%, 10%, 2% and 1% of respondents received one, two, three, four, five, and six services (Appendix A3). Furthermore, 87% of respondents demanded at least three services (Appendix A3). Except for equipment on credit (48%), all the services were demanded by at least 55% of respondents; the proportion attaining 92% for free inputs and 85% for free equipment.

The proportion of farmers demanding training and advice was slightly less than those receiving them, yet these proportions remained above 50% for both. Contrary, for inputs, credit and equipment, the demand was significantly 2–16 times higher (Figure 4). By decreasing order of importance, the most demanded free inputs were fungicides (41%), fertilisers (27%), and insecticides (22%). The inputs demanded on credit were fungicides (35%), insecticides (27%), and fertilisers (24%). 68% of the farmers demanding credit planned to use it to hire labour. Concerning equipment, the most demanded were those for pesticide application (63% for free and 38% on credit), followed by protection equipment, farm maintenance (21% on credit), and drying equipment (17% on credit).

Farmers satisfaction with services received: appraisal of quality and outcomes

Concerning farmers overall satisfaction with the quality of the service received, we found that except for training and advice which matched or exceeded the expectation of 72% and 69% of beneficiaries, respectively; fewer were satisfied with equipment (34%), inputs (39%), and cash credit (42%) (Figure 5).

Perceived quality of services

The ANOVA-test ($p < 0.001$) showed a statistically significant difference in terms of perceived service quality (Figure 6). Advice (73%) and training (71%) scored higher than inputs (63%) and credit (63%) while equipment (58%) scored lowest. Besides, training ($p = 0.01$) and advice ($p = 0.03$) quality differed depending on the main provider. For instance, training scored higher with international partners (73%) as main provider compared to private companies (69%).

The analysis of quality attributes showed a strong contrast between training and advice, and the others services which were viewed more negatively across attributes.

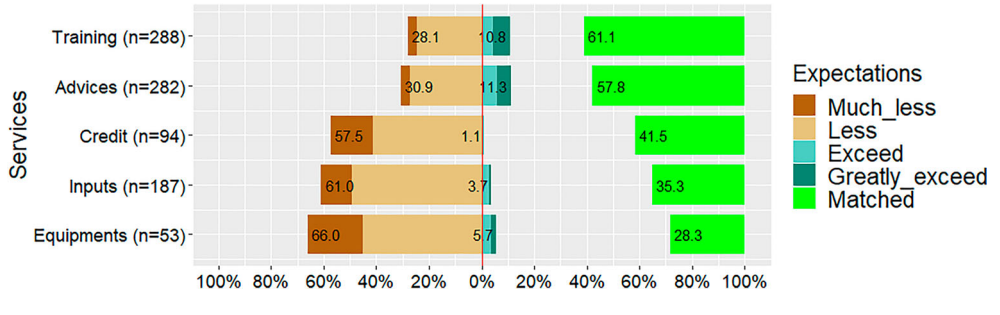

Figure 5. Respondents distribution according to their appraisal of the level of the match of the services received with their expectations.

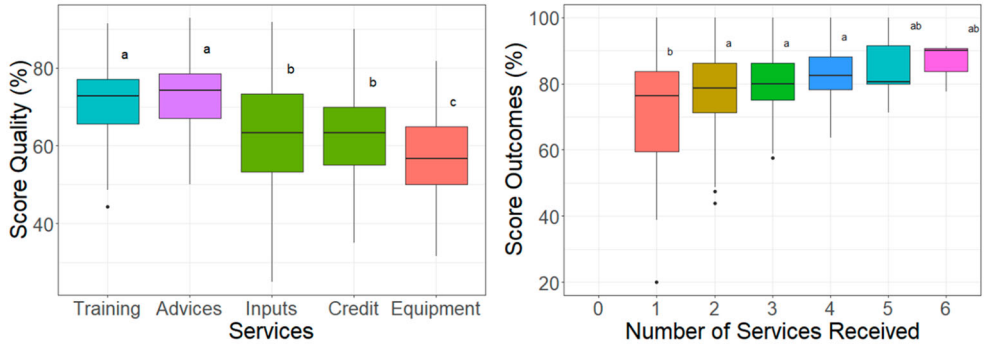

Figure 6. Aggregate score quality per services (left) and score outcomes per the number of services received (right).

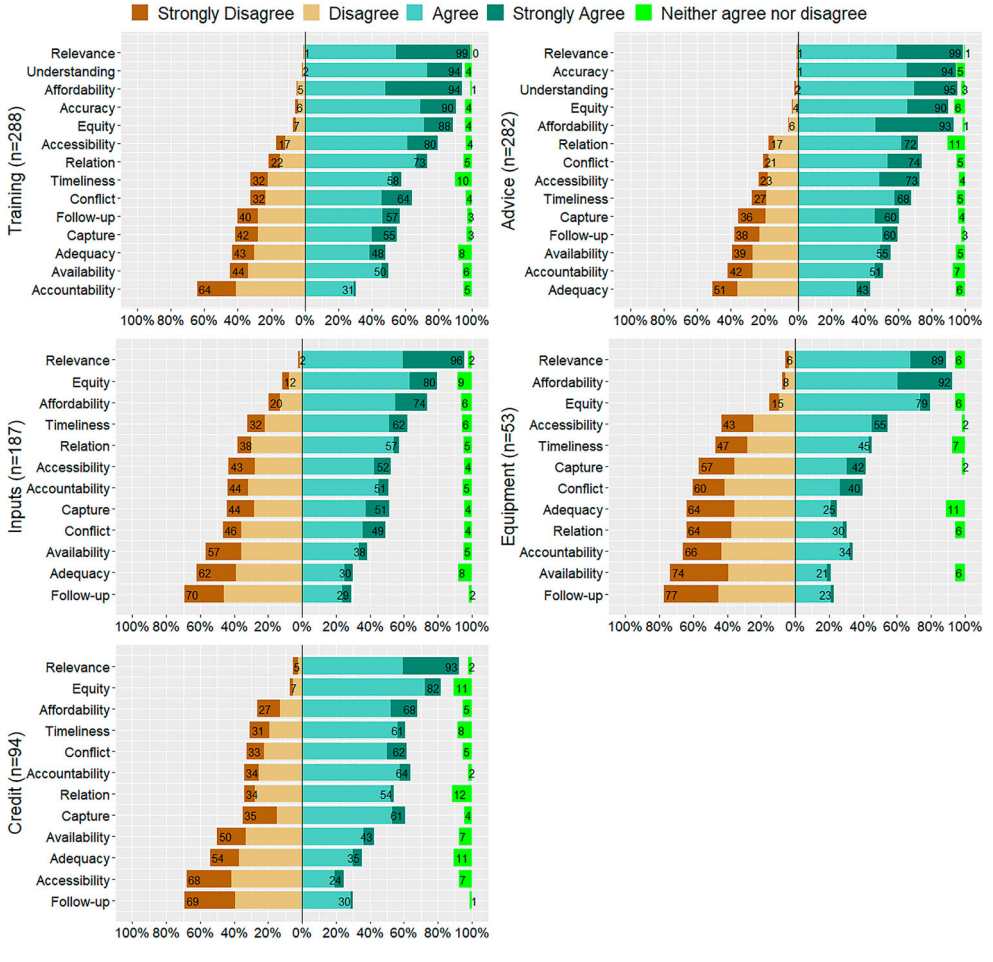

Figure 7. Distribution of farmers' responses with respect to the extent to which they agree or disagree with the quality of each service attribute.

However, we also found some similarities between services (Figure 7). Regarding similarities, for all the services, at least 88% and 68% of respondents either agree or strongly agree that the services provided were relevant and the access to them affordable, respectively. However, it was remarkable that adequacy seemed to be a less important issue for training and advice compared to other services. Besides, conflict, follow-up, accessibility, and availability were more problematic for inputs, equipment, and credit when compared with training and advice. Accountability was more an issue with training and equipment while capture was more a problem for equipment, inputs, and training. Finally, the relationship with providers was particularly an issue with equipment. Conflicts around benefits distribution, relevance and accountability can be substantiated with a FGDs participants affirmation:

> They offered us fertilisers, but we have not yet collected it because it will be of no use for us and will instead create problems in the group [… .] in the past, they gave us some pesticides that were past their expiry date, and they modified it.

The following quote by a respondent of an FGD captures frequently mentioned griefs regarding the quality of service provided: 'The supports provided are sporadic,

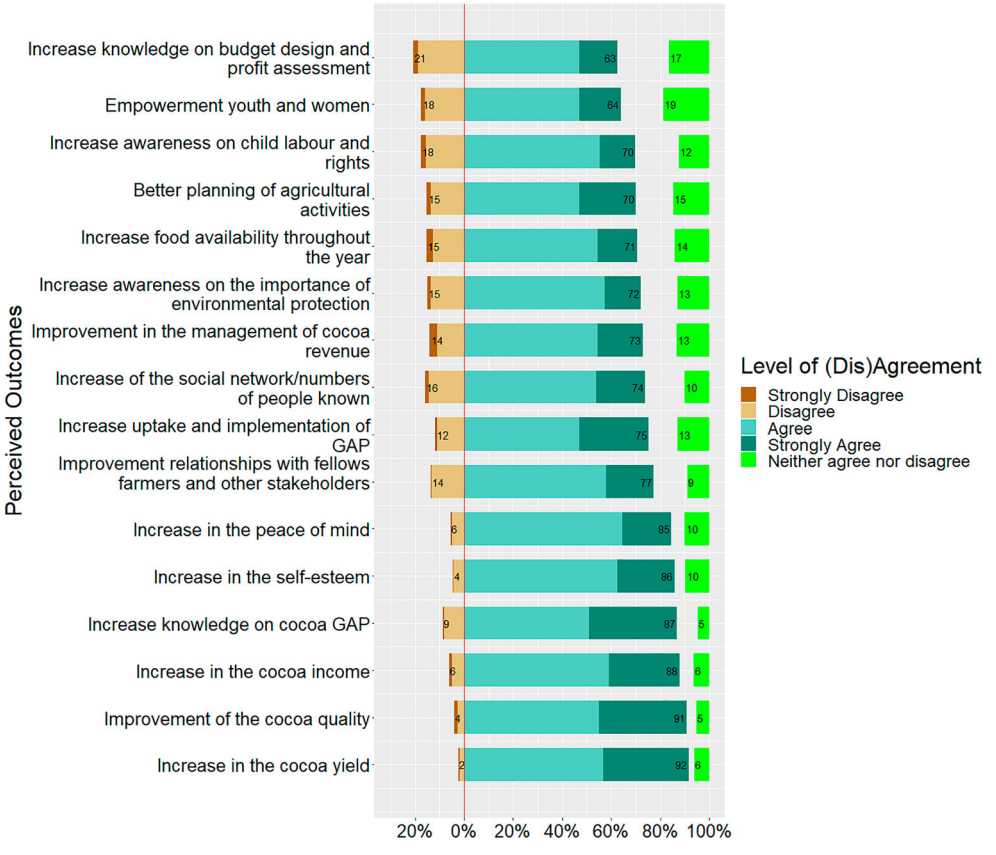

Figure 8. Distribution of farmers receiving at least one service with respect to the extent to which they agree or disagree that the services received have led to different outcomes.

insufficient, an insult to farmers and contribute to splitting and dividing groups. These supports mean nothing except for training'.

Perceived outcomes of services

Despite the concerns raised about the quality of the services received, most respondents perceived some positive returns (Figure 8). At least 60% either agreed or strongly agreed that the services received had improved their conditions in all the outcome dimensions considered (Figure 8). When asked if there was a service that contributes most to the outcomes observed, 85% of farmers receiving at least one service ($n = 263$) agreed. They ranked training first (61%) followed by advice (21%), cash credit (7%), and input on credit (7%).

The mean score of the perceived outcomes (O) of the services increased with the number of services received ($p < 0.001$). We found a significant difference between the mean outcomes score of farmers receiving two (77), three (80), or four (83) services compared to those receiving one (72) service (Figure 6). However, the average outcomes score did not significantly increase with five (84) and six (86) services. Moreover, specifically for cocoa yield, for each service taken individually, we found no significant difference between farmers receiving and not receiving them ($p > 0.005$). Nevertheless, there was a statistically significant difference in the average self-reported farmer's cocoa yields compared with the number of services received ($p < 0.005$). The average self-reported yield was higher for farmers with six services (768 kg ha^{-1}) followed by farmers with four (612 kg ha^{-1}), three (564 kg ha^{-1}), five services (545 kg ha^{-1}), and one (434 kg ha^{-1}) service.

Determinant of farmers' access to, demand for, and satisfaction with EAS

The regression analysis showed that different factors influenced access to (Table 3), demand for (Table 4), and satisfaction (Table 5) with services. Some factors were associated with more than one service. Only statistically significant variables in the estimated models are highlighted and the full regression tables are presented in Supplementary materials.

Factors influencing access to services

Location, involvement in certification, ownership of non-cocoa revenues, and the cocoa yield were statistically and significantly positively associated with access to training; and household size and certification positively associated with access to advice. The total cocoa land producing beans was positively associated with access to credit as opposed to location. Farmers in Ayos, Ngomedzap, and Ntui were less likely to access credit compared to farmers in Makenene (Table 3).

Location and seniority in FO were positively associated with access to inputs while the distance from the nearest town was negatively correlated. Living in Ayos and Ntui increased the odds of receiving inputs compared to Makenene. Access to equipment was positively associated with location, leadership position, the size of non-producing cocoa lands, and the share of improved varieties cultivated. Farmers living in Ayos

Table 3. Factors influencing farmers' access to services.

	Odds ratios (BLR)					Poisson regression	
						Total number received	
Factors	Training	Advice	Credit	Inputs	Equipment	PRM	GPR
Location [Ayos]	2.84*	1.24	0.17***	2.96**	3.30*	1.18	0.118
Location [Ngomedzap]	10.17***	1.82	0.12***	0.74	2.16	1.12	0.069
Location [Ntui]	1.84	0.75	0.17***	2.28*	5.29**	1.08	0.027
Household size	0.97	1.08**	1.00	0.98	0.92	1.00	0.001
Certification involvement [Yes]	3.90***	2.86***	1.68	0.93	1.55	1.34***	0.278***
Leaders FO [Yes]	1.91	1.32	1.27	1.35	7.05***	1.24**	0.189***
Experience FO	1.02	1.01	1.04	1.04*	1.00	1.01	0.007
Distance house-cooperative	0.99*	0.99	1.00	1.01	0.98	1.00	−0.002
Distance house-town	1.01*	1.01	1.00	0.99*	0.99	1.00	0.001
Non-cocoa revenue [Yes]	3.25**	0.46	0.92	0.95	0.52	1.00	−0.033
Non-productive cocoa area	0.98	1.10	0.99	0.92	1.20*	1.01	0.011
Productive cocoa area	1.02	1.07	1.12*	1.04	1.00	1.02	0.015*
Farm age [>40]	1.40	1.16	0.88	0.84	1.11	1.03	−0.314*
Share.improvarieties 21%–40%	0.94	0.63	1.81	0.60	3.09*	1.01	0.023
Share.improvarieties 41%–60%	0.85	0.82	1.72	0.99	2.77*	1.08	0.105
Logyield	1.77*	1.06	1.23	1.19	0.53	1.08	0.078
Observations	421	421	421	421	421	421	421
R^2 Tjur	0.337	0.135	0.191	0.126	0.230	0.327	0.115
Log-likelihood	−188	−238	−185	−261	−119	−636	−571
Dispersion							−0.53

Notes: Odds ratios that are >1 indicate that the event is more likely to occur as the predictor increases. Odds ratios that are <1 indicate that the event is less likely to occur as the predictor increases.

BLR: binary logistic regression; PRM: standard Poisson regression (presented for comparison purpose); GPR: generalised Poisson regression model.

*$p < 0.05$.

**$p < 0.01$.

***$p < 0.001$.

Table 4. Factors influencing farmers' demand for EAS.

	Odds ratios (BLR)					Incidence Rate Ratios (GPR)	
						Total number demanded	
Factors	Training	Advice	Credit	Inputs	Equipment	PRM	GPR
Location [Ntui]	0.37**	0.43*	1.37	1.85	0.48	0.88	−0.104*
Age	0.98*	0.97**	0.98*	1.00	0.99	1.00	−0.005**
Marital status [Married]	0.42*	0.49*	0.66	1.64	1.15	0.96	−0.033
Experience cocoa	1.01	1.03*	1.03*	0.99	1.02	1.00	0.005**
Certification involvement [Yes]	1.17	1.90*	0.81	2.02	1.29	1.01	0.014
Lead_FO [Yes]	1.60	1.31	1.47	1.18	1.04	1.09	0.086*
Distance cooperative	1.00	1.00	1.02**	1.00	0.99	1.00	0.001*
Productive land area	1.05	1.11*	1.00	0.98	1.01	1.01	0.004
Share.improvarieties 21%–40%	0.64	0.64	1.26	0.54	0.29**	0.90	−0.094
Number support	0.93	0.77*	1.15	0.65	0.88	0.99	−0.015
Advice received [Yes]		1.79*					
Observations	421	421	421	421	421	421	421
R^2 Tjur	0.10	0.14	0.11	0.09	0.08	0.12	0.025
Log-likelihood	−255	−258	−261	−66	−141	−828	−796
Dispersion							−0.37

Notes: Empty cells indicate that the variable was not included in the model.
Odds ratios that are >1 indicate that the event is more likely to occur as the predictor increases. Odds ratios that are <1 indicate that the event is less likely to occur as the predictor increases.
BLR: binary logistic regression; PRM: standard Poisson regression (presented for comparison purpose); GPR: generalised Poisson regression model.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

and Ntui were more likely to receive equipment compared to those in Makenene. Likewise, FO leaders were seven times more likely to receive equipment compared to simple members. Finally, the Generalised Poisson regression showed that occupying a leadership position in the FO, participating in certification, and the size of productive lands were positively correlated with the total number of services received. Having a farm aged above 40 years was negatively associated with the number of services a farmer could receive.

The FGDs also showed that service provision seems to be guided by political motives, kindship relationships, or private companies' objectives; making, local elites, their relatives, and large farmers to capture most of the support available. In this vein, a farmer during FGDs stated: 'Everything goes to them because the minister's wife is from their village'. In another group, a farmer declared 'sometimes, things arrive, or we hear that things were given, but the members of the executive committee are the only ones to know the quantity and how they manage it'. Besides, while cocoa buying companies are key players in service provision, the representative of one company stated, 'we provide support to those that we are sure will give us the production and with whom we have a long-term relationship'. A staff member from a competing company also declared that

> it is in our interest to limit our investment because there is no guarantee that production will return to us, and we have had cases where after training farmers, providing them with inputs and advice, they ended up selling the product to someone else.

Table 5. Factors influencing the overall quality and outcome score of services.

	Quality score (MLR)					
Factors	Training	Advice	Cash credit	Inputs	Equipment	Perceived outcome score (MLR)
Location [Ayos]	2.55	1.03	4.50	5.66	7.98	2.06
Location [Ngomedzap]	3.11	2.95	3.57	−2.95	4.18	0.35
Education level [Primary]	−4.92	−7.81*	7.50	12.31		5.31
Education level [Secondary]	−4.48	−6.85*	7.52	10.22		6.42
Education level [Tertiary]	−7.42	−8.95*	16.80	9.17		6.25
Experience cocoa farming	0.06	0.06	0.08	0.06	−9.59	0.15*
Leaders FO [Yes]	1.41	1.61	−0.72	−1.31	−2.41	4.53**
Experience FO	−0.13	−0.05	−0.58**	−0.15	0.06	−0.26*
Distance cooperative	−0.05*	−0.02	0.01	−0.08		0.01
Non-cocoa farm [Yes]	−0.36	0.08	2.12	−1.93	−2.40	−5.09**
Non-productive cocoa land area	−0.45	−0.07	0.05	0.13	−2.14*	−1.07**
Productive cocoa land area	0.24	−0.04	0.92**	0.27	1.02	0.22
Share.improvarieties 41%–60%	1.92	2.81*		−1.10	−0.50	−0.53
Training inclusion [Yes]	2.36*					
Training expectation [Matched]	5.49*					
Number support received	0.08	−0.36	0.38	−0.63	6.05*	
Outcome service	7.11	20.18***	0.05	15.52	−46.52	
Advice inclusion [Yes]		3.15**				
Advice feedback [Yes]		2.56*				
Advice expectation [Matched]		8.56**				
Advice expectation [Exceed]		7.80*				
Advice expectation [Greatly_exceed]		8.78*				
Credit feedback [Yes]			6.89*			
Credit expectation [Less]			10.74**			
Credit expectation [Matched]			21.87***			
Input expectation [Less]				8.93**		
Input expectation [Matched]				16.62***		
Input expectation [Exceed]				16.24*		
Input expectation [Greatly_exceed]				33.54*		
Training received [Yes]						9.13***
Advice received [Yes]						6.18***
Observations	288	282	94	187	53	401
R^2/R^2 adjusted	0.337/0.233	0.426/0.333	0.613/0.430	0.332/0.178	0.436/0.112	0.313/0.249
Log-likelihood	−970	−941	−322	−702	−190	−1523

MLR: multiple linear regressions.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

Factors influencing demand for services

The demand for training and advices was correlated with location and marital status, and negatively associated with age. Experience in cocoa farming, involvement in certification, the size of productive cocoa lands, and prior advice received were positively associated with demand for advice and negatively with the number of supports received (Table 4). The demand for credit was positively associated with experience in cocoa farming and distance to cooperatives, and negatively correlated with respondent age. Likewise, farmers cultivating 21%–40% of improved varieties were less likely to demand equipment. None of the variables of interest was significantly associated with the demand for inputs. Finally, the total number of services demanded was positively correlated with the experience in cocoa farming, distance to cooperative and leadership position in FOs, and negatively with farmer age, and location (Ntui).

Factors influencing satisfaction with services

The multiple linear regression showed that the quality score of training was negatively correlated with distance from cooperative and positively with inclusion in training design and the extent of match with expectation (Table 5). Advice score was negatively associated with education level and positively with farm composition, perceived outcomes, inclusion, feedback, and expectations. Cash credit score was negatively correlated with experience in FOs and positively with size of productive cocoa land and farm composition, feedback, and expectations. The score of inputs was positively related to expectations. Equipment score was positively related to the number of supports received and negatively associated with the size of non-productive cocoa land. Finally, the outcome score from the services received was positively correlated with experience in cocoa farming, leadership position, access to training and advice, and negatively associated with seniority in FOs, ownership of non-cocoa farms, and the size of non-productive cocoa farms.

Discussion

Matching services to contextual farmers challenges

Regarding services provided to increase productivity, the findings show some mismatch in what farmers received and what they demand. Farmers demand mostly support in terms of credit, inputs, and equipment, and to a lesser extent ask knowledge through training and advice. In Ghana, Anang and Asante (2020) also found credit to be less accessible than other services. While the provision of training and advice is often done *en masse*; credit, inputs, and equipment require more tailoring to the recipients' conditions and are more selective, *de facto* excluding some farmers. This was confirmed during FGDs, where participants underscored a lack of transparency in the distribution of inputs, credit, and equipment within cooperatives when these were available, but also highlighted the fact that the quantities put at their disposal were not enough for everyone to benefit. Ruf et al. (2019) in Ivory Coast also highlighted FOs limitations in providing services to their members. Finally, the high cost for providing these services might explain their lower perceived quality, especially in a context where farmers do not contribute much to the service costs.

The findings underscored the role of contextual factors on demand for services as the demands expressed by farmers resonate with barriers to good agricultural practices (GAP) adoption. Two-thirds of credit seekers plan to use it to hire labour while inputs and equipment demands are oriented towards effective pest and disease, and soil fertility management. First, our findings confirm Suh and Molua (2022) claim that farmers do not earn sufficient income to hire labour and lack the financial resources which are necessary to purchase inputs and equipment. They also underscore the importance of pests and diseases such as mirid and black pod which can cause cocoa yield losses of up to 100% with poor management (Mahob et al. 2021; Nembot et al. 2018). Thus, offering services that simultaneously address these challenges is key to increasing productivity.

The importance of providing a combination of services to farmers

The findings revealed that receiving more than one service significantly increased the perceived outcomes. However, the mean outcome score of farmers receiving five or six services did not significantly differ from that of those receiving two, three, or four services. This suggests that at a certain point, providing more services to a farmer is not effective. Therefore, it is essential to either supply options or a bundle of services to farmers to improve outcomes and satisfaction. Discussing potential strategies to stimulate technological change and address the variety of constraints and risks faced by farmers, Ronner et al. (2021) and Descheemaeker et al. (2019) propose to provide farmers with a basket of options from which they could select the ones responding the best to their needs and adapted to their conditions. However, both scholars stress the importance of feedback and co-learning between relevant stakeholders in building the basket of options. Furthermore, Abetu (2022) found that offering bundles of complementary services to farmers resulted in several benefits such as increased adoption of innovations and enhanced yields.

While attempts to increase farmers knowledge and access to information can be praised, our findings highlight farmers dissatisfaction with access to inputs and finance including through credit (Fountain and Huetz-Adams 2018; Kenfack Essougong et al. 2020; Langyintuo 2020; van Vliet et al. 2021). These resources are necessary to implement sustainable cocoa management practices advocated during training and advice. This might be one explanation of why, despite decades of public and private investments, yields remain low, and most farmers remain unable to earn a living income (Fountain and Huetz-Adams 2018; van Vliet et al. 2021). Furthermore, on average farmers receive training and advice from more than one provider on 8–10 topics, respectively. One could argue that the diversity of service providers and the topics covered offer farmers some flexibility in the choice of what they can apply given their conditions (Norton and Alwang 2020), hence the higher satisfaction with these services.

Understanding factors influencing access to, demand for, and satisfaction with services

We found that location influenced the total number of services demanded, access to services, and the degree of access was influenced by leadership positions in FOs. The

locations where farmers live define the challenges they face but also the opportunities available to them. Farmers in Ayos and Ngomedzap were more likely to receive training. The two locations have the lowest average reported yields (387 and 402 kg ha^{-1}, respectively) compared to 530 and 740 kg ha^{-1} in Makenene and Ntui. This might justify the additional efforts to ensure they have access to knowledge relevant to boost their production. Further, farmers in Makenene were more likely to receive credit than the rest. They are mostly migrants from the Cameroon highlands ('grassfields') where rotating saving and credit associations are rooted in culture (Tchuindjo 1999). Thus, they are more inclined to form such associations through which they can access credit. Besides, Makenene is located along a main road and some of the FOs in the locality are affiliated with a credit union which offers credit to their members at a preferential rate. An association between location and access to credit in Tanzania (Mwonge and Naho 2021) and with access to extension service in Uganda (Okello et al. 2023) has been reported previously. Certification was positively correlated with access to training, advice, and the total number of services received. Certification means that farmers must meet certain standards which comes with a cost, but also provides benefits such as competitive access to some services (Ingram et al. 2018; Lescuyer and Bassanaga 2021). Occupying a leadership position in FOs increased the likelihood to receive equipment, and the total number of services received and demanded. Group leaders are at the front of the exchanges with service providers and the first informed when something is available and oversee redistribution within FOs. When transparency is not a rule, capture and favouritism easily occur, especially for scarce and costly services such as equipment and inputs. For instance, in Ivory Coast, Ruf et al. (2019) found that certification benefits accruing to cooperatives did not benefit all the members. Moreover, it is plausible that, together with experienced cocoa farmers, groups leaders request for more services due to the witnessed benefits accruing from previous services.

Similarly to Mwonge and Naho (2021) findings, farm size was positively associated with access to credit. The likelihood of receiving credit increased with the total area of land producing cocoa. Farmers with large surface areas are more likely to produce a higher volume of cocoa which is sometimes used as collateral to access credit under informal channels. This confirms that access to credit depends on the creditworthiness of the borrower which can be measured as the value of assets legally owned by the farmer (Asante-Addo et al. 2017; Chandio et al. 2021). Farmers with improved varieties and younger farms were more likely to receive equipment support. This might be related to the Cameroonian government's strategy to revamp the cocoa sector which promotes gradual farm regeneration with improved varieties (RoC 2014). It might be in the same vein that farmers with older farms (>40 years) received less services than farmers with young farms. Farmers earning non-cocoa revenue were more likely to access training. One could argue that they are more likely to cover the certification cost, and thus eligible for its benefits (Ingram et al. 2018; Lescuyer and Bassanaga 2021). This could also mean that they seek training to increase the cocoa share in their total revenue. Nevertheless, unlike previous scholars (Ali and Awade 2019; Balgah, Shillie, and Njonyi 2022; Mwonge and Naho 2021), we found that respondent age, gender, education level, household size, and experiences did not significantly influence access to credit.

Demand for advice increases with involvement in certification and size of productive cocoa land. One could assume that the more farmers produce, the more they need

knowledge and assistance to manage and follow their farms. This assistance is also necessary to ensure they meet certification standards and benefit from premiums. The likelihood of requesting advices reduced with the number of services, suggesting that they are primarily sought to overcome challenges resulting from limited access to other services. A higher age was negatively associated with training, advice, and credit demand. In contrast to our findings, investigating demand for private-fee extension services, Foti et al. (2007) reported a significant influence of farm size and location on demand for extension services.

Besides, like Chandio et al. (2021), we found that experienced farmers are more likely to demand credit. If we consider experience to be associated with age, this finding is ambiguous in the sense that, taking credit is a risk. Thus, it contradicts the view that older farmers are risk-averse. Nonetheless, compared to previous scholars, we found neither effect of the farm size and education level on demand for credit (Chandio et al. 2021; Djoumessi et al. 2018) nor of economic returns (yield) on farmers satisfaction (Anang 2016). Furthermore, married farmers were respectively 58% and 51% less likely to demand training or advice compared to non-married. When this is difficult to explain, it may be linked to time availability or reduce need for information as a result of mutual exchange in the couple or larger network.

Inclusion and feedback were positively correlated to satisfaction with advice and training, and advice and credit, respectively. This suggests that increased farmers' participation in the design, implementation, and monitoring of the interventions aiming at supporting them is likely to improve the overall quality of these interventions and their outcomes (Joshi and Narayan 2019). Education enhances farmers awareness of alternatives and the rewards expected from the implemented activities (Elias et al. 2016). Education was found to be negatively associated with advice satisfaction. This is contrary to Ganpat, Webster, and Narine (2014) who claim that the higher the farmers' education level, the greater their likelihood of satisfaction with extension services. In general, the findings showed that different factors, either related to context, innovation support services system features or farm and farmers' characteristics influenced farmers' satisfaction with outcomes and different services. Thus, this suggests that what holds true in one place at a particular time, might not be true in a different place at the same time or in the same place at a different time. It also stresses the need to account for local realities, the diversity of farming systems and farmers' personal attributes if farmers' needs are to be met and high levels of satisfaction achieved.

Conclusion and implications

This study assessed cocoa farmers' access to, demand for and satisfaction with five innovation support services and the factors shaping them. The findings indicate a partial mismatch (or tensions) between services demanded and those delivered. Training and advice services were the most accessed, highly rated in terms of quality yet least demanded services when compared to credit, input and equipment. These demands reflected the challenges faced by farmers. The perceived outcomes from services increased with the number of services accessed. Location, involvement in certification and FO leadership were the main factors influencing farmers' access to services and demand whereas feedback, inclusion, and the extent of match with expectation were the key factors influencing

satisfaction. The findings highlight the limitations of services providers in addressing the challenges encountered by farmers holistically. They suggest that combining services lead to higher perceived outcomes and stress the importance of providing farmers with options from which they can choose. Without a transformation in the cocoa landscape, it will be utopic to expect service providers to meet the demands of the many thousands of smallholders who depend on cocoa for their subsistence. This is especially true, given the prevailing environment which is characterised by limited public investment and market liberalisation. There is a need to rethink the current business model and move from a supply-driven model, where providers finance services and decide what they offer to farmers, to a demand-driven model where farmers contribute to the definition of priorities and can hold providers accountable for what they deliver. In the meantime, the focus in the cocoa sector must shift from human capital building to one that simultaneously seeks the construction of an enabling environment where public services are available, farmers have access to both knowledge and the resources required for their application, and easily develop strategies to earn a living income. Moreover, there is a need for new policies that support and encourage the provision of services bundles to farmers and facilitate integration in services delivery through a high degree of coordination, communication, and collaboration between service providers to ensure that the diverse demand expressed by farmers are addressed. The analytical framework proposed in this study highlights the relationship between demand, access, and satisfaction with service and the diversity of factors shaping them. However, there is a need to investigate from a supplier's perspective the rationale behind the services provided to farmers, including the priorities they set and the challenges they experience in delivering services to farmers. Whether the correlations observed imply causality remains unclear. It would be interesting to assess the impact of the services received by cocoa farmers on their performance, for instance, in terms of adoption of good agricultural practices, yield or net returns using a different method for comparison.

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Appendices

Appendix A1. Description of the variables to be used in the different regression models.

Dependants variables	Description	Measure
Yi	Access to services i	0 = No; 1 = Yes
Wi	Demand for services i	0 = No; 1 = Yes
Si	Score quality service i	Index (max = 100)
D	Number of service demanded	Count
R	Number of service received	Count
O		Index (max = 100)

(*Continued*)

Continued.

Dependants variables		Description	Measure
		Score outcomes all services received	
Explanatory variables			
Location	Location	Farmers location	1. Makenene; 2. Ayos; 3. Ngomedzap; 4. Ntui
	Dist coop	Time from homestead to cooperative office	Minutes
	Dist town	Time from homestead to nearest town	Minutes
	Dist market	Time from home to nearest market	Minutes
Farm characteristics	Prod.land	Total area of cocoa lands already producing beans	Hectares
	Nonprod.land	Total area cocoa lands not producing beans yet	Hectares
	Age.farms	The age of cocoa farms (in years)	1. Very young (<5); 2. Young (5–15); 3. Mature (15–25); 4. Old (25–40); 5. Very old (>40)
	Farm composition (share.improvarieties)	Share of improved cocoa varieties in the farms	1. 0%–20%; 2. 21%–40%; 3. 41%–60%; 4. 61%–80%; 5. 81%–100%
	Yield	Cocoa farms yield (total production/total productive lands)	kg ha^{-1}
	Own.ncfarm	Ownership of non-cocoa farm	0 = No; 1 = Yes
Personal characteristics	Age	Farmer age	Years
	Gender	Farmer gender	0 = Female; 1 = Male
	Own.ncrevenu	Ownership of non-cocoa revenue	0 = No; 1 = Yes
	Educ_level	Highest level of formal education	1. None; 2. Primary; 3. Secondary; 4. Tertiary
	Head.hh	Farmer is a household head	0 = No; 1 = Yes
	Household size (hh_size)	Number of people living in the household	Count
	Experience	Number of years of respondents experience in cocoa farming	Years
	Cert.cocoa	Farmer selling certified cocoa during the last 5 years	0 = No; 1 = Yes
	Seniority in FOs (Exp-FO)	Number of years in the producer organisation	Years
	Leadership in FO (lead_FO)	Respondents member of the executive management of the group	0 = No; 1 = Yes
Features extension system	Feedback	Respondents consulted by provider about the services offered	1 = Yes, 0 = No
	Inclusion	Respondents involved in the planning of services provision	1 = Yes, 0 = No
	Year service	Last time the service was received	Years
	Providers	Number of service providers	Count
Access to services	Outcome	Overall appraisal of the benefits from services received during the last 5 years	Index (max = 100)
	Expectation	Farmers appraisal of the extent of match between service and expectation	1. Much less; 2. Less; 3. Match; 4. Exceed; 5. Greatly exceed
	Number support	Number of services received by the farmers during the last 5 years	Count

Appendix A2. Summary of mean of numerical variables used in regression per location.

Variable	Full sample	Makenene	Ntui	Ngomedzap	Ayos	*F*-statistic*
Cocoalands (ha)	5.3	5.3	6.3	5.1	4.6	4.1***
Prod.land (ha)	3.9	4.1	4.8	3.6	3.3	4.9***
Nonprod.land (ha)	1.4	1.2	1.6	1.5	1.3	0.9
Size. non-cocoa farm (ha)	1.5	1.4	1.2	1.5	1.9	3.7**
Total cocoa produced annually (kg)	2137	2191.6	3630.9	1446.9	1274.2	27.8***
Yield (kg ha^{-1})	515	530.1	740.5	401.7	386.9	47.8***
Age (years)	52	52.3	50.9	53.6	52.4	0.8
Hh_size	7.2	7.2	7.5	6.6	7.4	1.1
Exp_cocoa (years)	22	24.4	21.9	20.2	20.7	2.5*
Exp_FO (years)	7.7	10.3	7.9	5.1	7.4	13.4***
Year_village	29	32	25.4	26.7	31.3	3.5**
Dist.coop (min)	24	11.5	19.3	37.6	26.9	11.8***
Dist.mark (min)	30	13.4	31.6	30	45.2	15.2***
Dist.town (min)	45	16.6	64.5	42.7	57	28.8***

*Statistical significance markers: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Appendix A3. Summary of categorical descriptive variables.

Variable	Full sample	Makenene	Ntui	Ngomedzap	Ayos	Chi square (χ^2)*
Age.farms						96.5***
0–5	3	1	3	4	4	
5–15	27	32	28	21	28	
15–25	26	34	48	6	16	
25–40	15	15	16	14	16	
>40	29%	19%	6%	55%	37%	
Age.farmtrees						56.5***
0–5	7	3	3	16	8	
5–15	42	44	39	38	45	
15–25	30	35	46	14	24	
25–40	11	10	9	11	13	
>40	10	8	3	22	9	
Share.improvarieties						23.5**
<20%	43	49	42	51	33	
21%–40%	16	15	19	16	14	
41%–60%	22	23	18	18	27	
61%–80%	13	8	11	12	22	
80%–100%	6	6	11	4	4	
Own.ncfarm						24.3***
No	17	33	14	12	10	
Yes	83	67	86	88	90	
Cert.cocoa						12.4***
No	35	38	21	43	37	
Yes	65	62	79	57	63	
Own.ncrevenu						9.8**
No	12	20	13	8	7	
Yes	88	80	87	92	93	
Gender						4.2
Female	19	25	18	16	16	
Male	81	75	82	84	84	
Marital_status						1.9
Not married	17	20	19	15	14	
Married	83	80	81	85	86	
Educ_level						33.5***
None	2	6	3	1	0	
Primary	34	41	41	18	37	
Secondary	57	52	50	69	57	

(*Continued*)

Continued.

Variable	Full sample	Makenene	Ntui	Ngomedzap	Ayos	Chi square (χ^2)*
Tertiary	6	1	7	12	6	
Head.hh						1.1
No	6	8	7	5	5	
Yes	94	93	93	95	95	
Lead_FO						14.3***
No	70	70	65	84	62	
Yes	30	30	35	16	38	
Number support received						38.2***
0	5	7	5	2	5	
1	22	25	12	31	19	
2	38	39	36	44	32	
3	23	12	32	16	31	
4	10	14	10	8	8	
5	2	2	3	0	3	
6	1	0	1	0	2	
Number support demanded						45.6***
1	2	3	3	3	1	
2	11	1	17	17	14	
3	14	15	15	15	7	
4	19	21	12	12	19	
5	20	24	11	11	25	
6	14	18	14	14	14	
7	19	19	29	29	20	

Figure in percentages except for the Chi square.
*Statistical significance markers: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.