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Enhancing Farm Productivity and Livelihood through Production and Distribution of Improved Seeds in the South West Region, Cameroon

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Abstract:- This study focuses on enhancing farm productivity and livelihoods in the South West Region (SWR) of Cameroon through the production and distribution of improved seeds. Access to quality seeds is crucial for improving agricultural productivity and food security. However, smallholder farmers in the region often rely on informal channels to obtain seeds, limiting their access to improved varieties. The study aims to bridge the gap between formal and informal seed systems and promote the adoption of improved seeds among farmers. Data was collected through questionnaires administered to 500 farmers across the region, complemented by institutional data sources. The results indicate that the majority of respondents were male, married, and above 40 years old. Most farmers (52.8%) had a primary level of education, with an increasing interest in farming among university graduates. The study also revealed that farming (89%) is the dominant occupation in the region.The findings highlight challenges faced by farmers in crop production, including poor farm-to-market roads, limited access to improved seeds, pests and diseases, and volatile market prices. Farmers expressed the need for support in terms of technical, material, and financial assistance to overcome these challenges. The study emphasizes the importance of improved seed availability and the adoption of improved varieties to enhance farm productivity and increase incomes for farming families. It suggests that farmers' preferences and production constraints should be considered in the development and promotion of improved seeds. Collaboration between formal institutions, farmers, and private firms is essential to develop a well-functioning seed system. Furthermore, the study identifies the government (75.54%) as the primary supporter of farmers, followed by the private sector. It recommends the construction and maintenance of farm-to-market roads, proper market structuring, and technical assistance for preserving and transforming produce to address the challenges faced by farmers. Overall, this study provides insights into the current state of seed use and challenges faced by farmers in the SWR of Cameroon. It emphasizes the importance of enhancing seed availability, promoting the adoption of improved varieties, and providing comprehensive support to improve farm productivity and livelihoods in the region.

Keywords:- *Farm productivity, livelihood, improved seeds, sustainable agriculture, crop diversification, market access*

I. INTRODUCTION

Seeds play a crucial role in crop farming as they significantly influence productivity (Asare*et al*., 2018). Access to quality seeds is essential for improving household livelihoods and food security in agrarian nations (Ghimire *et al*., 2015; McGuire and Sperling, 2016;Abebe and Alemu, 2017). Seeds carry genetic information that determines crop productivity, disease resistance, and tolerance to unfavourable environmental conditions (Bishaw, 2004; Cavatassi*et al*., 2010).

Improving smallholders' access to new crop varieties has long been recognized as a critical step in increasing agricultural productivity (Maroud*et al*., 2013). Despite the recorded productivity gains of 50% among farmers who have fully adopted hybrid cocoa as planting materials, access to these seeds remains difficult and sometimes non-existent (Kalyebara and Andima, 2006; Asare*et al*., 2018). As a result, the majority of farmers rely on informal channels, such as farmer saved seeds, seed exchanges among farmers, or local grain/seed markets, to obtain seeds (Adam and Tilahun, 2001; Phiri *et al*., 2004; Rubyogo*et al*., 2008; Ashley Asare, 2010). Informal channels have been noted to contribute approximately 90 to 100% of seed supply, depending on the crop type (Asare*et al*., 2018; Kansiime*et al*., 2021). In developing countries, most of the legume seeds used by farmers are produced in the informal sector (McGuire and Sperling, 2016).

Crop production from seeds provides the majority of human food, with wheat, rice, and maize alone accounting for 50% of human food calories (Fischer and Edmeades, 2010). To increase crop productivity, improved technologies such as highly productive seed varieties and modified farming practices are necessary. However, the use of improved varieties is the most effective means of increasing crop yield and quality (Blanca *et al*., 2017).

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Considerable resources have been devoted to the development and release of improved varieties, but their adoption has remained low (Spielman *et al*., 2010). A well-functioning seed system is crucial for enhancing improved seed supply. In this regard, a formal seed system that functions adequately complements the informal seed system (Almekinders*et al*., 2008). However, there is a coordination gap among formal institutions engaged in research and development activities, as well as between these institutions, farmers, and private firms (Spielman *et al*., 2011). This gap has led to the development of improved varieties that do not align with farmers' preferences, particularly in marginal areas, resulting in a lower rate of adoption (Blanca *et al*., 2017).

Many donor agencies have invested substantial resources in agricultural technologies in developing countries (Ghimire *et al*., 2015). However, most of these new agricultural technologies have not fully achieved the desired goals (Faltermeier and Abdulai, 2009). As a result, numerous recent studies have focused on agricultural technology adoption and its impact on smallholders' welfare in developing countries (Besley and Case, 1993; Doss and Morris, 2000; Mendola, 2007; Becerril and Abdulai, 2010). These studies have primarily examined the adoption of single agricultural technologies rather than a bundle of innovations that could enhance agricultural productivity through an integrated approach.

Farmers seek seed from off-farm sources for various reasons. Some of these reasons include; obtaining high-yielding varieties, drought tolerance, disease resistance, and preferred taste, especially for food crops (Abebe and Alemu, 2017). When farmers have access to different seed sources, there is a higher probability of adopting improved varieties (Alene*et al*., 2000).

Enhanced seed availability through formal or informal sources, or both, will improve smallholder farmers' access to seed and promote the adoption of improved varieties. Therefore, farmers' access to quality seed, as well as the introduction and adoption of improved varieties, is crucial for smallholder farmers in developing countries (McGuire and Sperling, 2016).Improved seeds can fulfil their purpose only if they are transferred to and adopted by farmers. Effective implementation of improved seed technology can lead to higher agricultural production and increased incomes for farming families, which positively impacts rural poverty. Improved crop yields also reduce the costly imports of agricultural commodities and the cost of production for basic raw materials in agro-industries. In the long run, the adoption of improved seed technology by farmers can make agro-industries more competitive in international markets.

The use of agricultural technologies such as chemical fertilizers, pesticides, and improved seeds has long been considered an effective pathway to increase agricultural productivity in Sub-Saharan Africa (Minten and Barrett, 2008; Saka and Lawai, 2009). While the combined use of these technologies is often recommended (World Bank, 2008; Hailemariam *et al*., 2013), improved seeds, in particular, play a vital role as this input alone can contribute to a 40% increase in yields (Sanou*et al*., 2017). Therefore, the use of improved seeds is essential for transforming subsistence farming, which remains prevalent in many African countries, into market-oriented agriculture (Sanou*et al*., 2017). Seed is the primary input for crop production, making seed technology the most important aspect of agricultural technology for the sustainable development of agriculture (Besley and Case, 1993; Qian and Zhao, 2017). Farmers' seed selection, maintenance, and storage are influenced by their household objectives, preferences, socioeconomic variables, opinions and attitudes, risk perception, sociocultural environment, and access to information (Hellyer *et al*., 2012).

Plant breeders, who receive rigorous instruction in the theory and practice of crop improvement, often lack knowledge of survey methods to gather structured feedback from farmers. Consequently, what conventional plant breeders consider important may not align with the preferences of the majority of farmers in an agricultural region (Blanca *et al*., 2017). Therefore, the best strategy to increase the adoption of improved seeds is to consider farmers' preferences, production constraints, and the factors that influence their farming decisions (Sibiya *et al*., 2013). Developing and promoting the adoption of yield-increasing crop varieties in a sustainable manner helps improve the livelihoods of rural farmers (Asfaw *et al*., 2012).

In a study conducted in Cameroon, which considered 259 family maize farms, the Blinder-Oaxaca decomposition technique was used to estimate the difference in productivity between adopters and non-adopters of improved seeds (Shimeles *et al*., 2018). The study concluded that adopters obtained yields 1.42 times higher than non-adopters. However, this productivity gap fell short of the expected theoretical value. To achieve the desired results, improved seed technology should be combined with other modern inputs. The ripple effect of improved seed varieties on other factors of production incurs additional costs for farmers, which should be taken into account (Shimeles *et al*., 2018).

Given the seed types available to them (Smale*et al*., 1998), farmers choose to grow the seeds that are most attractive in terms of income or other attributes of value, such as tolerance to environmental stress and early maturity, which are important to them (Edilegnaw, 2003). Farmers' seed selection, maintenance, and storage are influenced by their household objectives (Barkley and Porter, 1996; Dercon, 1996). The adoption of new technologies, such as fertilizers and improved seeds, is central to agricultural growth and poverty reduction efforts (Tura et al., 2010).

II. METHODOLOGY

The field data for this study was obtained using a questionnaire administered to a sample of farmers from at least three subdivisions in each of the six divisions of the South West Region of Cameroon. The questionnaire was designed to collect data on farmer demographics, crops cultivated, types of seeds used, methods and sources of obtaining seeds, quantity and cost of seeds, challenges faced by farmers in crop cultivation, perceptions of availability and use of improved seeds, satisfaction with the use of such

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seeds, and priority traits desired from improved seeds.A total of 500 questionnaires were administered during the study period.

To complement the questionnaire data, institutional data sources were utilized, including the Institute of Agricultural Research for Development (IRAD), the Ministry of Agricultural and Rural Development (MINADER), and Chede Cooperative. These sources provided additional information on food crop seed availability, production, pricing, and distribution in the South West Region.Additionally, a map of the South West Region (SWR) (Fig. 1) was used to provide geographical context and assist in visualizing the study area.The collected data were entered into Excel and analysed using version 23 SPSS. Statistical significance was considered at $P<0.05$.

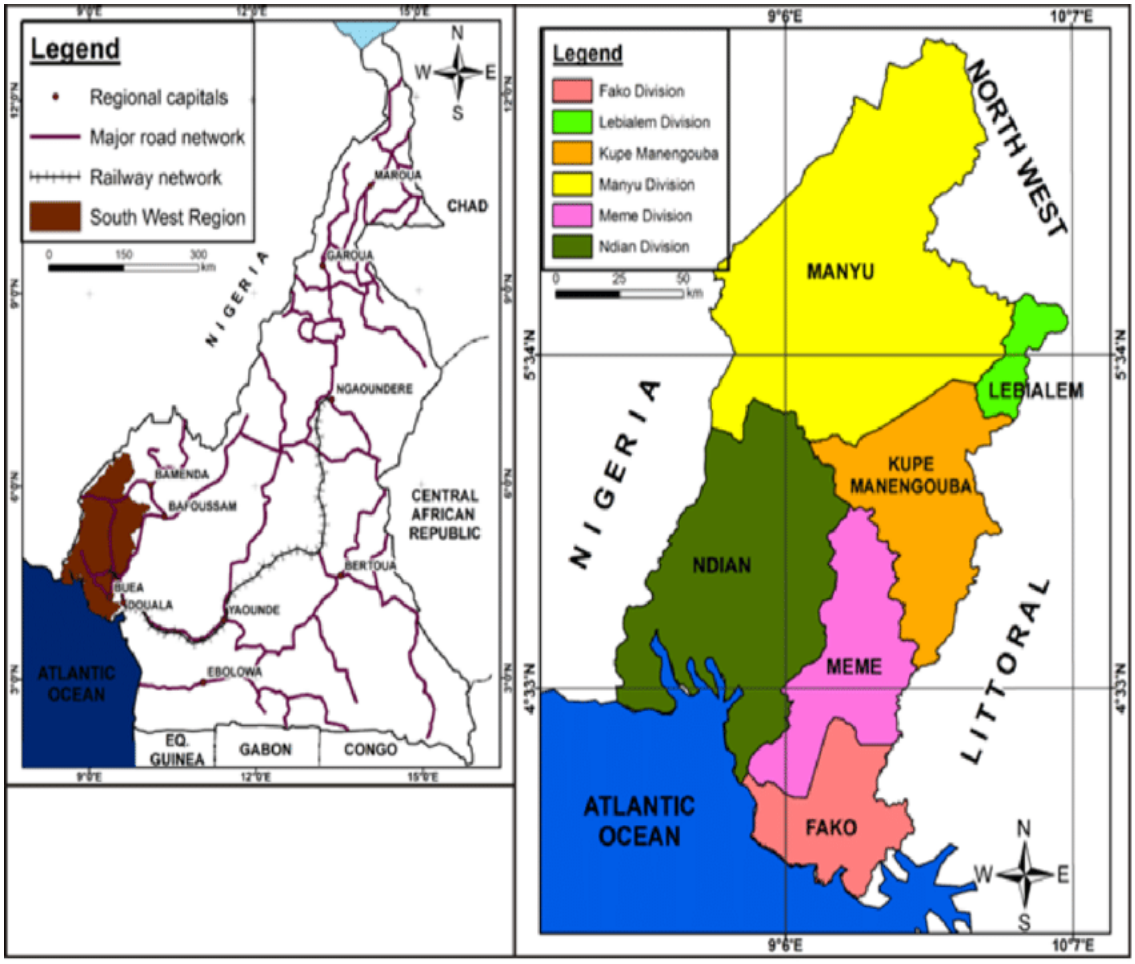

Fig. 1: Map showing the South West Region of Cameroon

III. RESULTS AND DISCUSSIONS

A. *Gender and Marital Status*

The results in Table 1 show the gender and marital status distribution of the respondents. The majority of the respondents were male (63%) compared to females (37%), except in Lebialem where the population of women (47, 56.6%) was slightly higher than that of men. Regarding marital status, most of the respondents were married (90.2%).

Table 1: Gender and marital status of respondents

Category	Type	Frequency	Percentage
Gender	Male	315	63
	Female	185	37
Marital Status	Divorced	1	0.2
	Married	451	90.2
	Single	30	6
	Widow	16	3.2
	Widower	2	0.4

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B. Age group

Figure 2 illustrates the distribution of age groups among the respondents. The majority of the farmers interviewed were above 40 years old (62.3%), followed by the age group of 30-40. This age distribution was observed consistently across all divisions within the region.

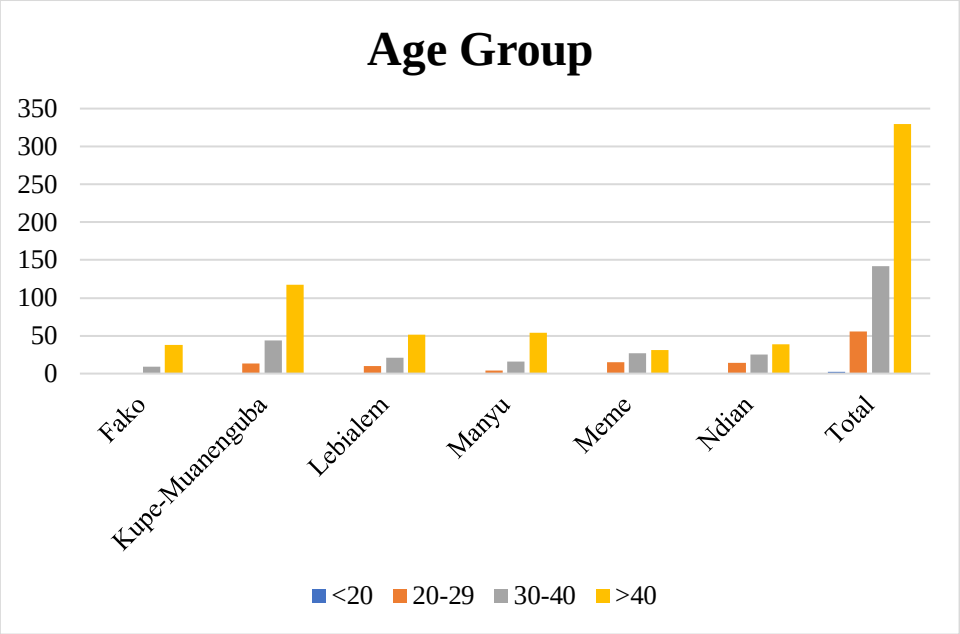

Fig. 2: Distribution of age group among respondents

C. Level of education

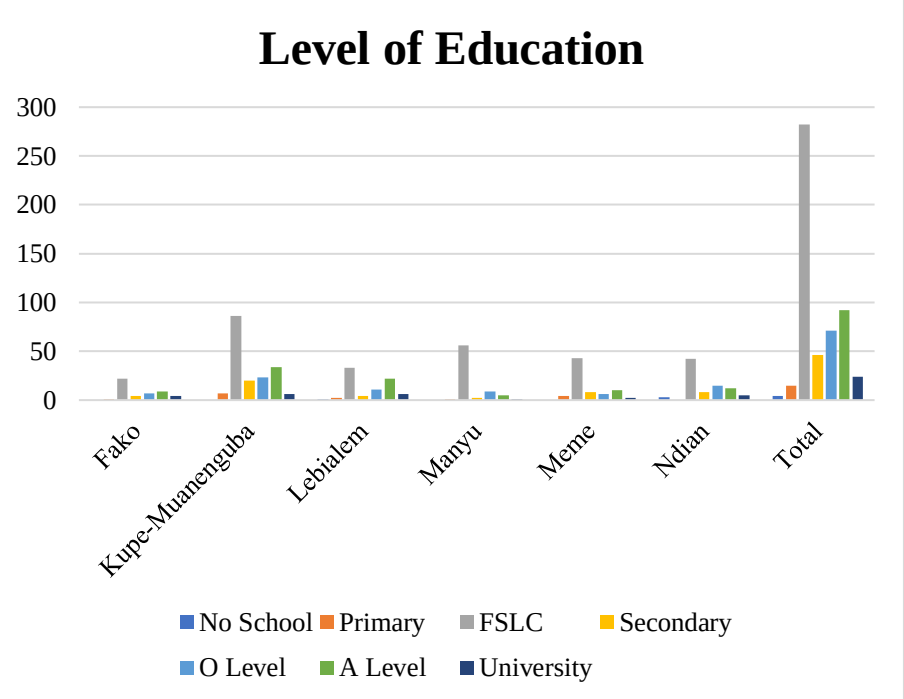

Fig. 3: Frequency of level of education

Figure 3 presents the frequency of different levels of education among the respondents. More than half of the farmers (52.8%) had not gone beyond primary level education. The next significant group was those who completed high school (16.7%) but did not pursue further education. The results also indicate an increasing interest in farming among university graduates, potentially influenced by the low employment rate in Cameroon.

D. Occupation

Table 2 provides the total count and distribution of occupations among the respondents across all the divisions in the SWR. The largest occupation group among the respondents was farmers, accounting for 89% of the total, with the highest proportion in Meme (93.4%) and the lowest in Lebialem (74.7%).Other occupations included business owners (3.6%), civil servants (1.4%), non-governmental organization workers (0.5%), petroleum company

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employees (0.4%), and unemployed individuals (1.2%).This is consistent with the agricultural nature of the region and the importance of farming for livelihoods and economic activities in the area.

Table 2: Frequency of Occupation of respondents

Profession		Division						Total
		Fako	Kupe-Muanenguba	Lebialem	Manyu	Meme	Ndian	
Business	Count	2	4	5	6	1	2	20
	% within Occupation	10.0%	20.0%	25.0%	30.0%	5.0%	10.0%	100.0%
	% within Division	4.2%	2.1%	6.0%	8.0%	1.3%	2.3%	3.6%
	% of Total	0.4%	0.7%	0.9%	1.1%	0.2%	0.4%	3.6%
Civil Servant	Count	0	2	2	1	0	3	8
	% within Occupation	0.0%	25.0%	25.0%	12.5%	0.0%	37.5%	100.0%
	% within Division	0.0%	1.1%	2.4%	1.3%	0.0%	3.5%	1.4%
	% of Total	0.0%	0.4%	0.4%	0.2%	0.0%	0.5%	1.4%
Farming	Count	44	179	62	67	71	72	495
	% within Occupation	8.9%	36.2%	12.5%	13.5%	14.3%	14.5%	100.0%
	% within Division	91.7%	95.2%	74.7%	89.3%	93.4%	83.7%	89.0%
	% of Total	7.9%	32.2%	11.2%	12.1%	12.8%	12.9%	89.0%
Clergy	Count	0	0	0	0	2	0	2
	% within Occupation	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
	% within Division	0.0%	0.0%	0.0%	0.0%	2.6%	0.0%	0.4%
	% of Total	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%
Student	Count	0	0	0	0	0	4	4
	% within Occupation	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	% within Division	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	0.7%
	% of Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.7%
Teaching	Count	0	3	10	1	1	1	16
	% within Occupation	0.0%	18.8%	62.5%	6.3%	6.3%	6.3%	100.0%
	% within Division	0.0%	1.6%	12.0%	1.3%	1.3%	1.2%	2.9%
	% of Total	0.0%	0.5%	1.8%	0.2%	0.2%	0.2%	2.9%
Technician	Count	2	0	4	0	1	4	11
	% within Occupation	18.2%	0.0%	36.4%	0.0%	9.1%	36.4%	100.0%
	% within Division	4.2%	0.0%	4.8%	0.0%	1.3%	4.7%	2.0%
	% of Total	0.4%	0.0%	0.7%	0.0%	0.2%	0.7%	2.0%
Total	Count	48	188	83	75	76	86	556
	% within Occupation	8.6%	33.8%	14.9%	13.5%	13.7%	15.5%	100.0%
	% within Division	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	8.6%	33.8%	14.9%	13.5%	13.7%	15.5%	100.0%

As mentioned earlier, the questionnaire specifically targeted active farmers. The results indicate that more than 75% of the respondents were farmers within the divisions, and 89.0% were farmers within the region. However, some active respondents did not primarily engage in farming. We interviewed teachers, businesspeople, civil servants, technicians, and four students in Ndian, as well as two clergy members in Meme.

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IV. AFFILIATION TO COOPERATIVES

A. Membership in any cooperative

Table 3: Member affiliation to cooperatives

Responses	Division						Total	Percentage
	Fako	Kupe-Muanenguba	Lebialem	Manyu	Meme	Ndian		
No	29	76	57	47	32	55	296	53.33
Yes	19	110	26	28	42	34	259	46.67
Total	**48**	**186**	**83**	**75**	**74**	**89**	**555**	**100**

Apart from farmers in Kupe-Muanenguba, where Chede has its base (59.1%), and Meme (56.8%), who belong to cooperatives, most farmers are yet to join or form groups. Overall, 53.3% of farmers in the Southwest Region are yet to affiliate themselves with a cooperative.

B. Members of Chede Cooperative

Table 4: Affiliation of respondents to Chede

Response	Division				Total	Percentage
	Kupe-Muanenguba	**Lebialem**	**Manyu**	**Meme**		
No	94	39	2	53	188	**93.53**
Yes	10	0	3	0	13	**6.47**
Total	**104**	**39**	**5**	**53**	**201**	**100**

Out of the 259 respondents who answered "yes" to being affiliated with a cooperative, 201 responses were obtained regarding their affiliation with Chede Cooperative. Ten farmers from Kupe-Muanenguba and three from Meme, totaling 13 (6.5%), answered positively to this question. It is important to note that Chede is a union comprised of primary cooperatives, not individual farmers. The survey included farmers from the following Chede-affiliated groups: BOH Agborfa, DIYFACOOP, Ikata Young Farmers' Cooperative, KMCAP Cooperative, METOKE Cooperative, MUAFCOOP Cooperative, Progressive Farmers, and Struggling Friends.

C. Other cooperatives

Table 5: Affiliation to other cooperatives

Responses	Division					Total	Percentage
	Kupe-Muanenguba	Lebialem	Manyu	Meme	Ndian		
No	31	16	0	12	0	59	23.32
Yes	93	24	6	42	29	194	76.68
Total	124	40	6	54	29	253	100.00

Farmers (194) indicated that they are affiliated to other cooperatives. The cooperatives have been listed.

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V. TYPE OF SUPPORT AND WHO PROVIDED

Support received by farmers in the past 03 years was categorized into three groups: Financial, material and technical as shown in Table 6.

Table 6: Type of support received in the past three years and how helpful it was

Category	Type	Frequency	Percentage
Type of support	Financial	16	6
	Material	98	37
	Technical	151	57
How helpful	Helpful	87	33.85
	Not helpful	8	3.11
	Somewhat helpful	8	3.11
	Very helpful	154	59.92

Financial support involves cash received by cooperatives through programs and projects. This cash assistance is usually provided to farmers by MINADER through the Seed Fund. Additionally, some politicians, such as parliamentarians, also donate cash to farming groups. Material support is provided to farmers in the form of seeds and basic equipment such as spray cans, machetes, hoes, fertilizers, and pesticides. Politicians and government programs also collaborate with research institutions to produce seeds that are distributed to farmers free of charge during the planting season. However, the distribution of free seeds is no longer popular due to misuse by individuals who are not farmers, which defeats the intended purpose of boosting production. Technical support is typically provided by organizations such as IRAD, MINADER, cooperatives like Chede, and NGOs. These entities work to enhance the capacity of farmers along the value chain and help address the challenges they face.

Support was always helpful when farmers received it on time. It was particularly not helpful when maize arrived late in the planting season and farmers could not plant in time leading to a poor yield.

Table 7 provides a list of organizations that have provided support to farmers in the past three years. The results indicate that the government, through its programs, projects, and affiliated structures, is the primary supporter of farmers (75.54%), followed by the private sector (10.09%).

Table 7: List of organisations that provided support to farmers in the last 3 years

Who Provided support		Frequency	Percentage
Cooperative	CHEDE, EKONAFCOOP, FOPCOP, NAERP, NGAFCOOP LTD, OFACA, OWEFCOOP, SOCODEVI, Ambition farmer cooperative	21	6.42
Government	ACEFA, Agric. School, Buster Institute, C2D/AFOP, CCSP, CERAC, Farmer Business School, Farmer Field School, FODECC, IRAD, MINADER, National Civic Agency for Development, National Employment Fund, Palack (2), Pamol, RUMPI, SOWEDA and Toko Rural Council	247	75.54
International Organisation	GIZ and IITA	4	1.22
NGOs	Mont Cameroon, NADEV, PALAV, PALMSEC and RUDEC	22	6.73
Private	Dikome Tea Plantation, Ebai and Sons CIG, EGI, Mbanya CIG, MbehMbong, MENNENE, NDARE, Senator Peter MAFANI MUSONGE and TELCAR	33	10.09
Total		327	100.00

VI. LEVEL OF DIFFICULTY FACED WITH CROP PRODUCTION

Farmers face difficulties throughout the entire value chain of various food crops. Theses difficulties and suggested solutions have been summarised in Table 8.

Table 8: Difficulty faced in the cultivation of some crops and suggested solutions

Crop type	Difficulty	Suggested solutions
Beans (*Phaseolus sp*)	Blight	Appropriate control measures
Bush mango (Irvingia*sp*)	Embarrassment from forestry officials	Clear documentation on exploitation of NTFPs
Bush onion (*Cyperus sp*)	Forestry law a hindrance	Officials to differentiate domesticated species
Cassava (*Manihot sp*)	Lack of improved seeds	Make available improved planting material

	Too much labour involved and it is expensive,	make available machines for peeling and uprooting, and provision of farm tools
	Difficulty to extend land	Government to allow land for increased farming
	Poor farm roads	Open and maintain farm roads
	Lack of processing equipment	Training, subsidize production and support groups to purchase
	Pest and disease	Provide clean planting material, appropriate inputs and training
	Rodents and animal damage	Appropriate control measures such as traps
	Rodents	Appropriate control measures such as traps
	Fluctuating price of inputs	Stabilize prices
	Poor farm roads	Maintain roads and open roads to new farms
	High cost of labour	Financial assistance
	Pest and disease	Training, subsidize production and support groups to purchase inputs, introduce resistant varieties
	Market not organised	Organise market
	Lack of improved seedlings	Make available seedlings in quality and quantity
	Lack of capital	Financial assistance
Cocoyam (*Xanthosoma sp*)	Poor farm to market roads	Maintain old roads and open new roads
	High cost of labour	Financial assistance
	Pests and diseases	Training on management, introduce resistant varieties and subsidize cost of inputs
	Lack of improved Planting material	Introduce improved varieties in quality and quantity
Maize (*Zea mays*)	Untimely supply of seeds	Seeds be supply in time for planting
	Lack of improved Planting material	Availability of improved seeds in quantity and quality
	Lack of inputs	Financial assistance and subsidized prices
	Pests and diseases	training on management, introduce resistant varieties and subsidize cost of inputs
	Birds and rodents	Training on management, decoy and scare crows
Oil Palm (*Elaeis sp.*)	Price fluctuation	Government to fix prices
	Poor roads and transportation difficulties	Community works to maintain roads, open new farm to market roads and Financial assistance
	Labour rare and expensive	Form union of labourers
	Expensive inputs and tools	Financial assistance
	Seedlings are expensive	Financial assistance
	Shortage of seeds	Make available seeds in quantity and quality
Pepper (*Capsicum sp.*)	Short duration for harvest	Provide improved seeds that can be harvested over an extended period
Plantain (*Musa sp,)*	Lack of improved planting material	Make available improved planting material in quantity and quality
	Poor farm to market roads	Build bridges and maintain roads
	Pests and diseases	Training, management and use of pesticides
	Falling bunches	Training, management and use of pesticides
	High cost of labour	Financial assistance
	Lack of farm tools	Financial assistance
	Lack of proper storage	Build appropriate packing houses
	Market not properly structured	Organise market

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One major challenge is the condition of farm-to-market roads, which are often impassable during the rainy season, making it impractical to access farms. To address this issue, the construction of bridges and proper maintenance of roads are necessary.

Another challenge is the lack of access to improved seeds, and when available, they are sometimes expensive. As a result, farmers often have no choice but to rely on saved seeds or obtain seeds from other farmers. However, the quality of seeds obtained from the market is often doubtful, making it difficult to guarantee the outcome.

During the production phase, there is damage caused by rodents and birds that eat seeds shortly after planting, as well as pests and diseases that reduce seed efficiency and lower yields. Farmers believe that significant support, including technical, material, and financial assistance, is needed in this area to enhance production.

Even when crops have been successfully produced, the market structure poses challenges. Market prices fluctuate drastically, often to the disadvantage of the farmers. To address this issue, proper market structuring is proposed as a solution, and support in the form of technical assistance for preservation and transformation of produce is highly sought after.

VII. USE OF IMPROVED SEEDS

Regarding the use of improved seeds, the majority of farmers (56.62%) indicate that they would use improved seeds when they have the means to acquire them. Additionally, 27.85% of farmers state that they would always use improved seeds. In most divisions, farmers consistently use improved seeds for crops such as cassava, maize, and oil palm.

What is interesting here is the fact that improved seeds are not prioritized primarily because of a lack of information (41.77%), followed by their unavailability (36.29%) when farmers require them (Fig 6). Therefore, ensuring the availability of these seeds and providing farmers with education on their usage could potentially result in a significant increase in their adoption, leading to a substantial boost in food production.

Table 9: Use of improved seeds

Question	Response	Frequency (percentage) of response per Division						
		Fako	**Kupe-Muanenguba**	**Lebialem**	**Manyu**	**Meme**	**Ndian**	**Total**
Ever heard of improved seeds?	Yes	12(10.43)	38(33.04)	7(6.09)	1(0.87)	38(33.04)	19(16.52)	115(27.71)
	No	28(9.33)	87(29.00)	76(25.33)	16(5.33)	33(11.00)	60(20.00)	300(72.29)
	Total	**40(9.64)**	**125(30.12)**	**83(20.00)**	**17(4.10)**	**71(17.11)**	**79(19.04)**	**415(100)**
Do you use improved seeds?	Yes	25(11.47)	70(32.11)	37(16.97)	3(1.38)	62(28.44)	21(9.63)	218(52.66)
	No	14(7.14)	55(28.06)	46(23.47)	14(7.14)	9(4.59)	58(29.59)	196(47.34)
	Total	**39(9.42)**	**125(30.19)**	**83(20.05)**	**17(4.11)**	**71(17.15)**	**79(19.08)**	**414(100)**
How often?	Always	7	17	14	6	4	13	61(27.85)
	When available	9	6	3	4	11	1	34(15.53)
	When means are available	10	10	35	13	39	17	124(56.62)
	Total	**26**	**33**	**52**	**23**	**54**	**31**	**219(100)**

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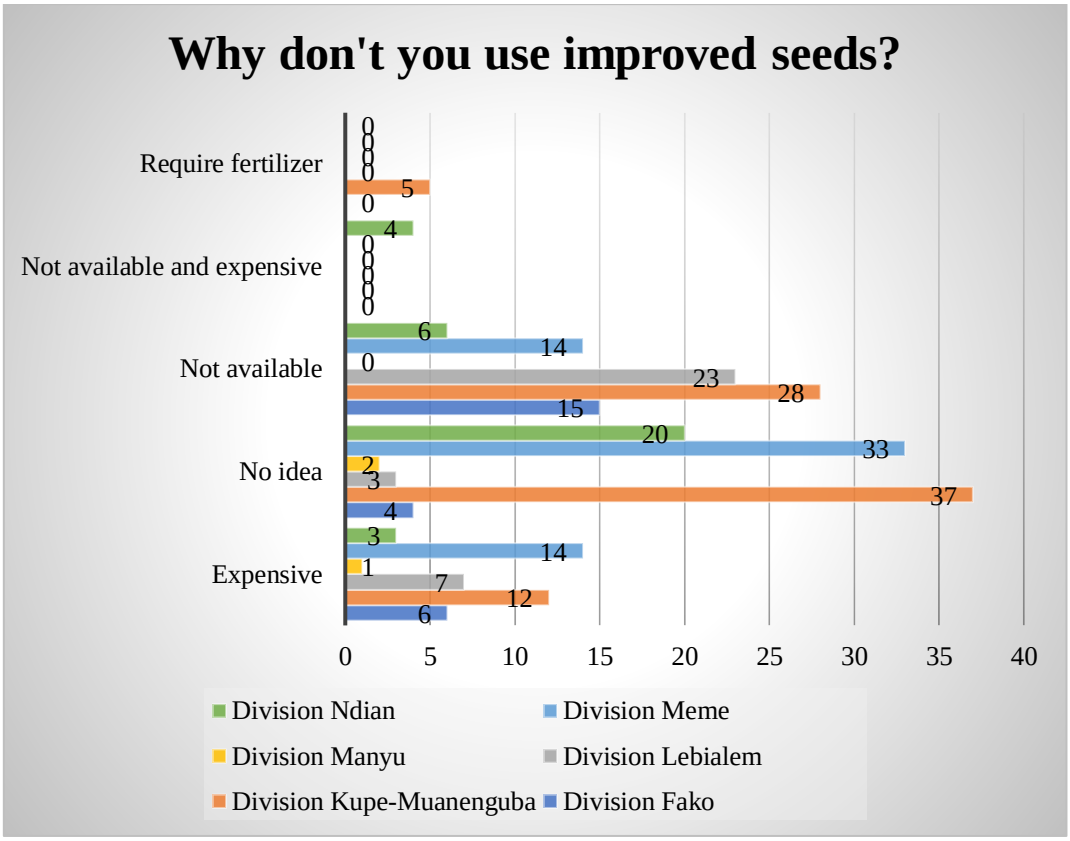

Fig. 4: Why farmers don't use improved seeds

More farmers bought improved seeds in Ndian, Manyu and Lebialem. In Fako, Kupe Muanenguba and Meme, the number of farmers who did not buy exceeded the number who bought. Overall, 61% of farmers in all the Divisions combined did not buy improved seeds. In Kupe Muanenguba more specifically 75.5% of farmers did not buy improved seeds for reasons earlier explained.

Regarding the purchase of seeds, Table 10 summarises the units and costs (FCFA) in the local markets.

Table 10: Average cost of seeds within the SW Region

Seed type	**Unit**	**Cost/unit (FCFA)**		
		Low	**High**	**Average**
Beans	Bucket (20L)	13000	14000	13500
Cabbage	grams	100	300	200
Cassava	cuttings	15	25	20
Cocoyam	Basket	1500	1500	1500
	Bag	4000	8000	6000
	Bucket (20L)	5000	5000	5000
Irish potato	Bag	40000	40000	40000
Maize	kg	300	1000	650
Oil Palm	Cheated nuts	200	300	250
	Seedling	1000	2000	1500
Orange (Citrus)	Seedling	1000	1500	1250
Pepper	Cups	100	100	100
	Pan (1L)	5000	5000	5000
Plantain	Suckers	100	300	200
	PIF (plantlets)	50	150	100
	PIF (Potted plants)	200	350	275
Rice	kg	1500	2500	2000
Tomato	Grams	50	60	55
Water melon	grams	50	90	70
Yam	Heads	100	700	400

Note: 1 Euro = 655.957 FCFA

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VIII. SOURCE OF PLANTING MATERIALS

Certified seeds were utilized for cassava, maize, and oil palm, accounting for a total of 11.43% of the seeds used in the region (Table 11).

Table 11: Type of seed systems and how seeds are obtained

Source	Frequency of mode of acquisition (%)			Total
	Bought	Obtained free	Auto produced	
Formal system	70 (70.71)	29 (29.29)	0(0.00)	99 (11.43)
Informal system	132 (17.21)	211 (27.51)	424 (55.28)	767 (88.57)
Total	202(23.33)	240(27.71)	424(48.96)	866(100)

The majority of planting materials employed in the region are sourced from the informal seed system (88.57%). Farmer-saved seeds constitute the most commonly used type (48.96%), followed by seeds obtained for free (27.71%). It is customary for farmers to receive free seeds from government officials (illustrious sons and daughters of their area and political officials) as a form of grassroots support at the beginning of the planting season. Similar trends of relying on the informal seed system, ranging from 90% to 100% depending on the crop type, have been observed in studies conducted by Asare et al. (2018) and McGuire and Sperling (2016). In this particular region of Cameroon, the majority of legume seeds used by farmers are produced within the informal sector. This is further compounded by limited access to seed vendors in the growing areas due to poor road conditions during the growing season, a situation also observed in South Sudan and Zimbabwe (McGuire and Sperling, 2016).

IX. EXPERIENCE WITH IMPROVED SEEDS FOR FARMERS WHO USE OR HAVE USED THEM

Good yield (64.38%) is the primary satisfaction derived from using improved seeds, while farmers believe that a lack of follow-up after planting negatively affects the plants. Overall, 75% of farmers who have used improved seeds have consistently experienced satisfaction. This supports the notion that to fully realize the potential of these seeds, their use should be combined with other agricultural practices, as recommended by the World Bank (2008) and Hailemariam *et a*l. (2013). The recorded negative effects primarily stem from the absence of other good agricultural practices in seed cultivation. By utilizing the seeds in conjunction with good agricultural practices, continuous satisfaction can be achieved.

Farmers predominantly opt for improved seeds when they have the means available (56.62%), with 27.85% stating they would always use improved seeds. In most divisions, farmers consistently choose improved seeds for cassava, maize, and oil palm.

Table 12: Experiences after using improved seeds

Division	What are your experiences after improved seeds as regards following characteristics? Yes (no)															Total
	Adapt to climate change	Expensive	Good growth	High nutritional value	High yield	Longer cycle	Low yield	Never planted	No follow up	No information	not available	Poor pest resistance	Poor seed quality	Resistant to pest and diseases	Taste good	
Fako	0(1)	0(2)	1(1)	0(0)	15(0)	0(0)	0(1)	0(7)	0(1)	0(1)	0(0)	0(0)	0(2)	0(0)	0(0)	16(16)
Kupe-Muanenguba	0(0)	0(0)	1(0)	0(0)	41(0)	0(0)	0(6)	0(8)	0(9)	0(0)	0(1)	0(0)	0(1)	2(0)	0(0)	44(25)
Lebialem	0(0)	0(0)	1(0)	0(0)	34(0)	0(0)	0(0)	0(0)	3(0)	0(0)	0(1)	0(0)	0(0)	0(0)	0(0)	38(1)
Manyu	0(0)	0(0)	0(0)	0(0)	13(0)	0(2)	0(7)	0(0)	0(0)	0(0)	0(0)	0(1)	0(0)	2(0)	0(0)	15(10)
Meme	0(0)	0(0)	0(0)	1(0)	7(0)	0(0)	0(0)	0(0)	0(1)	0(0)	0(0)	0(0)	0(2)	1(0)	0(0)	9(3)
Ndian	0(1)	0(2)	9(1)	0(0)	31(0)	0(2)	0(14)	0(15)	0(11)	0(1)	0(2)	0(1)	0(5)	1(0)	1(0)	42(55)
Total	0(2)	0(4)	12(2)	1(0)	141(0)	0(4)	0(28)	0(30)	3(22)	0(1)	0(4)	0(2)	0(10)	6(0)	1(0)	164(110)
Percentage	0 (1.82)	0 (3.64)	7.32 (1.82)	0.61 (0)	85.98 (0)	0 (3.64)	0 (25.45)	0 (27.27)	1.83 (20.00)	0 (0.91)	0 (3.64)	0 (1.82)	0 (9.09)	3.66 (0)	0.61 (0)	59.85 (40.15)

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X. PRIORITY LEVEL FOR DESIRED TRAITS IN IMPROVED SEEDS

As shown in Table 13, the first priority is high yield (64.23%), while the second priority is a combination of market appeal (35.29%) and pest resistance (31.52%). The third priority shows some variability, including market appeal, nutritional value, and pest resistance. The lowest desired trait is adaptation to climate change (50.49%). A similar trend was observed across all divisions within the region.

Table 13: Priority level for traits desired for improved seeds

Priority Levels	Frequency (%) for priority levels of desired traits for seed type					Total
	Adapt to Climate Change	High yield	Market Appeal	Nutrient Value	Pest Resistance	
First	12(2.51)	307(64.23)	57(11.92)	27(5.65)	75(15.69)	478
Second	31(6.08)	104(20.39)	180(35.29)	56(10.98)	139(27.25)	510
Third	47(14.24)	13(3.94)	87(26.36)	79(23.94)	104(31.52)	330
Lowest	156(50.49)	21(6.80)	44(14.24)	62(20.06)	26(8.41)	309

XI. CONCLUSION

This baseline diagnosis sheds light on the effectiveness of Cameroon's agricultural research and extension systems in supporting rural smallholder communities. The diagnosis reveals that agricultural research appears to be concentrated on a narrow range of products, particularly cassava, maize, and oil palms. However, these research products seem to reach farmers sporadically, if at all, through various ad-hoc initiatives by government agencies, international development organizations, NGOs, farmer cooperatives, or the private sector. These fragmented initiatives do not contribute to a robust and sustained government-led farmer-support program for improved seeds, which is crucial for enhancing food crop productivity and annual production volumes.

Additionally, farmers report limited or no access to seeds, whether improved or not, for three important crop clusters: fruit trees, vegetables, and non-timber forest products (NTFPs). These crops play a vital role in ensuring good nutrition and health for the population. Furthermore, farmers seem to lack awareness and education regarding the market value and income potential of these crops, and there is a lack of structured markets ready to absorb the production of these crops.

The market challenges faced by farmers cut across all crops and various points in the value chain. This poses a significant challenge to government efforts to promote smallholder agriculture as commercial enterprises or "Second Generation Agriculture." However, this diagnosis highlights the relevance and timeliness of government initiatives supported by international partners, such as PIDMA (*Projetd' Investissement et de Développement des MarchésAgricoles* or Agriculture Investment and Market Development Project) and the Agricultural Infrastructure Value Chain and Development Project (AIVDP). While limited to a few crops, these projects serve as a valuable model for other projects and programs aiming to shift smallholder agriculture from subsistence to commercial farming. Improved and certified seeds are key to modernizing and transforming rural agriculture in Cameroon.

This survey has uncovered important gaps in the food crop seed sector, particularly regarding ongoing government efforts to enhance smallholder agriculture production, incomes, and nationwide food security. The key points identified are as follows:

- Agricultural research products currently do not cover most crops essential for food security and the population's good health, with fruit and vegetable crops receiving little or no emphasis in the national research system.
- Research products should be consistently available to farmers in the right quantity and quality, delivered at the appropriate time and directly to their doorstep.
- MINADER's extension system should improve its role in educating farmers about the benefits of improved and certified seeds, as well as good planting and farm management techniques, to achieve optimal yields, which are the most important expectations of farmers from improved seeds.

Looking ahead to the research agenda, significant work remains to be done in crucial areas such as seed packaging systems and conservation methods. Although not directly addressed by the survey, these aspects are of paramount importance in the context of commercial farming, particularly for starchy and fruit crops, as well as NTFPs.'

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