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RESEARCH ARTICLE

DIAGNOSIS OF RICE SEED SECTOR IN CÔTE D'IVOIRE: ASSETS, WEAKNESSES AND STRATEGY FOR A SUSTAINABLE MULTIPLICATION, AND DISSEMINATION OF QUALITY SEEDS

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Abstract

In Côte d'Ivoire, less than 10% of rice-growing areas are covered by improved varieties seeds of good quality. A diagnosis of the seed sector was carried out to highlight its main constraints and propose a strategy for the sustainable production and dissemination of seeds. The schedule of fixtures indicates that the seed issue is taken into account by policies, strategies and regulations specific to the seed sector and the agricultural sector as a whole. Unfortunately, in its implementation, these seed policies and strategies do not take up their proper place to ensure increased agricultural productivity. Seed production is based on formal and informal seed systems. In the formal system the supply of quality seeds is negligible. The main constraints of this system cover all links in the value chain. To improve farmers' access to seeds of good quality, a strategy that is fully aligned with regional strategies, and especially the revised national rice development strategy, which takes into account the period from 2020 to 2030, has been proposed. The goal of this strategy is to increase the rate of the use of seed of improved varieties seeds up to 70% by 2030. This strategy promotes the professionalisation and empowerment of private sector. Its implementation should involve all stakeholders in the country's seed value chain.

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Introduction:-

Rice (*Oryza sp.*) is the staple food of the Ivorian population. It is the main cereal consumed by all social classes in the country, with a ratio of 70kg/year/capita. The rice-growing area in 2019 was estimated at 823,411 ha (Gecit, 2019) for a milled rice production of 1,304,468 tonnes and a consumption requirement of 1,830,385 tonnes (MINADER, 2019). To reduce the gap between supply and demand, the government imports € 450 million worth of rice each year (Ciyow, 2019). The country is the fifth-largest importer of rice in the world and the second-largest in the continent after Nigeria. To achieve rice self-sufficiency, the Ivorian government adopted a national rice strategy in 2012 (ONDR, 2012), which was subsequently reviewed in 2020 (COMMODAFRICA, 2020). One of the options of this strategy is to improve access to quality seed of varieties adapted to climate change with good grain quality. Indeed, the seed is the primary production factor for farmers. It contributes to at least 40% of crop yields in West and Central Africa (Djamen, 2016). Unfortunately, only a few rice farmers in Côte d'Ivoire have access to good quality seed. Only 10% of the rice area is covered with the improved varieties seeds of good quality (Guei, 2009).

To identify the constraints of the rice seed sector, several surveys at the national and regional levels (Djamen, 2016) were conducted. Indeed, a diagnostic study of the seed sector was carried out in 2016 as part of the technical support project for the implementation programmes of the main orientations of the agricultural policy of the West African Economic and Monetary Union (WAEMU) to revitalise the rice sector in West Africa (ODVL, 2016).

The present synthesis paper proposes through a review of these different studies, to describe the country's seed sector, identify its main constraints and propose a strategy able to supply sustainably and efficiently seeds of elite varieties to rice farmers.

Methodology:-

The methodology adopted for the diagnosis was based on documentation and consultation with stakeholders. The documentation consisted of exploiting the studies carried out on the rice seed sector in Côte d'Ivoire. This documentary research was carried out to understand the functioning of the sector and the actions undertaken by the administrative authorities to improve it and to identify these main constraints. Regarding consultation, a workshop with all stakeholders of the sector (Research Centers, seed companies, service in charge of seed regulation and certification and technical partners) was organised in Jacqueville from February 9 to 14, 2020, to update data and validate a strategic approach proposed by the Rice Sector Development Agency (ADERIZ) for the establishment of an efficient and sustainable seed system.

Results:-**National seed sector review**

The review of the national rice seed sector has focused on the current situation in terms of policies, legislation/regulations and private and public initiatives in the seed sector. It also highlighted the main actors involved in the production, the supply chain, planning and the quantity of seed available on the market.

Policy and regulatory aspects of the seed sector

The rice seed strategy is based on various plans and programmes developed within the framework of agricultural development policies. First, there was the Agricultural Development Plan from 1992 to 2015, adopted in 1993, which recommends, concerns rice, the search for food security and self-sufficiency through the national coverage of rice needs and the competitiveness of the national sectors (MINADER, 1993). Then, there was the Poverty Reduction Strategy Document, adopted in January 2009, which identifies rice as a pillar of food security and self-sufficiency and which opts to promote food crop production by ensuring financing conditions and improving marketing channels (FMI, 2009). There is also the National Agricultural Investment Programme (PNIA) from 2010 to 2015 and from 2018 to 2025, which reflect the country's vision, ambitions and priorities in the agricultural sector (AISA, 2010; MINADER, 2017). The most recent is the National Rice Development Strategy, which was adopted in 2012 (ONDR, 2012) and revised for the period 2020-2030. This strategy is based on the implementation of integrated rice projects that take into account irrigated rice cultivation, the development and rational use of plots, the production of high-yielding varieties and the total mechanisation of the rice value chain (COMMODAFRICA, 2020).

Regarding legislation, there are international, regional and national texts set up to organise the national seed sector. There are the following:

Regulation n°03/2009/CM/UEMOA, on the harmonisation of regulations on quality control, certification and marketing of seeds and seedlings in the West African Economic and Monetary Union (WAEMU), and subsequent application texts (WAEMU, 2009);

Regulation C/REG.4/05/2008 on the harmonisation of the regulations on quality control, certification and marketing of seeds and seedlings in the ECOWAS region and subsequent implementing legislation (**ECOWAS, 2008**);

Decree n°2013-678 of October 2, 2013, establishing the national register of plant species and varieties cultivated in Côte d'Ivoire and decree n°2013-679 of October 2, 2013, establishing, attributing and organising the national committee on seeds and seedlings (CONASEM), which is responsible for giving advice and recommendations on seed policy and its implementation to the Ministry of Agriculture.

Ministerial orders have also been made to regulate the seed sector. There are the following:

Order No. 44/MINAGRA of April 21, 2000, appointing the members of the technical committee for the official register of plant species and varieties;

Inter-ministerial Order n°239/MINAGRI/MESRS/MC of August 9, 2012, which modifies Inter-ministerial Order n°11 of February 15, 1999, on the establishment of the technical committee on the official catalogue of plant species and varieties;

Inter-ministerial Order No. 122 of August 18, 1998, creating the official register of rice species and varieties;

Order n°015 of April 28, 2010, concerning the admission to the control, delivery, suspension and withdrawal of the professional card of actors of the seed sector in Côte d'Ivoire;

Order n°017 of April 28, 2010, on the approval of technical regulations for the production, control and certification of plant seeds produced in Côte d'Ivoire;

Order n°018 of April 28, 2010, fixing a fee for the approval and registration of a variety in the official catalogue of species and varieties cultivated in Côte d'Ivoire;

Order n°019 of April 28, 2010, relating to the control of seeds and seedlings, the delivery, suspension and withdrawal of the professional card of actors of the seed sector in Côte d'Ivoire;

Order n°020 of April 28, 2010, fixing the cost of the Certification fees for seeds and seedlings produced in Côte d'Ivoire;

In addition to the legislation, several initiatives of the state, its technical partners and sleeping partners have been launched for the rice seed sector, particularly in the domains of seed production, extension and support to access to seeds for farmers.

Main stakeholders in the sector and seed supply chain

Seed production is organised around the production of breeder and foundation seed on the one hand and the multiplication of foundation seed into the certified seed (R1, R2) on the other (**Figure 1**). The main actors in the seed sector are research, producers, suppliers, users (rice farmers) and the authorities responsible for control and regulation.

Research

At the research level, the National Centre for Agronomic Research (CNRA) is responsible for the management of genetic resources, variety creation and the production of breeder and foundation seeds. However, as regards foundation seeds, CNRA has the possibility of extending this activity to the private sector, which will work under its control with precise guidelines. Africa Rice Center (AfricaRice) supports CNRA in variety development and seed production. CNRA supplies foundation seed to private producers to produce certified seed.

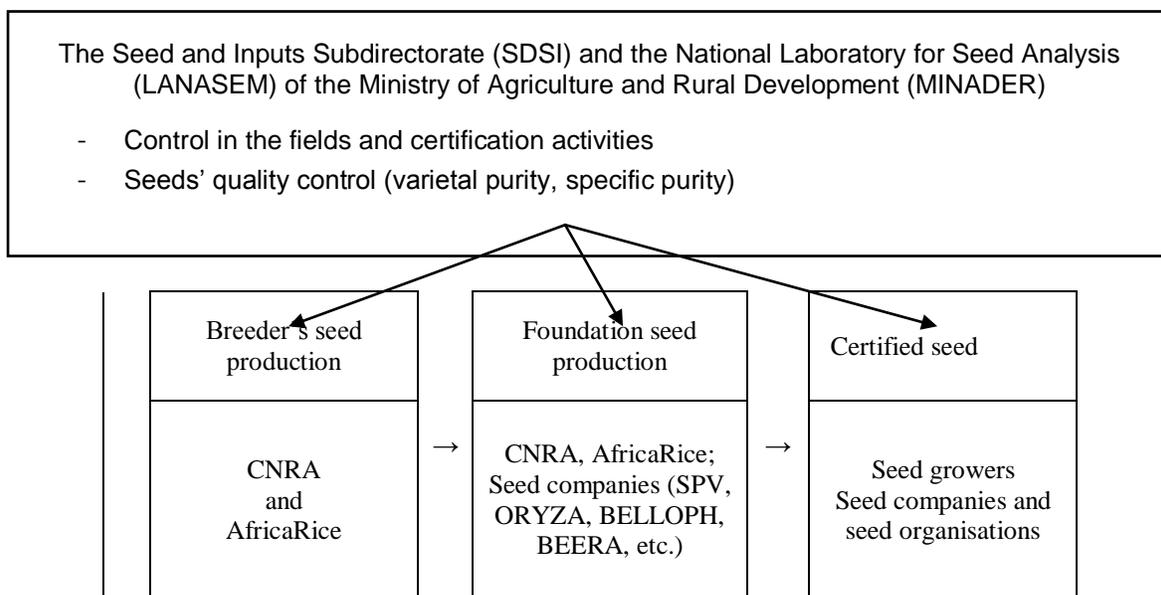


Figure 1:- Rice seed production organisation in Côte d'Ivoire.

Producers

The production of certified seeds is the responsibility of seed companies (ORIZA, SPV, BILLOPH, BEERA, GRACI, etc.) and/or state institutions such as the Rice Sector Development Agency (ADERIZ). ADERIZ's certified seed production activities include the supply of inputs to seed growers, technical assistance in the monitoring of plots, as well as the repurchase of production. The National Agency for Support for Rural Development (ANADER) also provides technical support to the seed growers.

The processing and storage of certified seeds are done at the conditioning centres of Yamoussoukro and Bongouanou. At the national level, there are six mobile conditioning units of which two are working.

Distributors

The distribution is mainly done by ADERIZ. However, farmers' organisations, NGOs and/or agricultural development projects, seed companies and other private structures (input shops) also participate in distributing seeds.

Users

The majority of users are smallholder farmers with few links to markets. Apart from those involved in cash crop production, they have little access to inputs.

Control and regulatory departments

Seed production is under the control of the Department of Seeds and Inputs (SDSI) of the Ministry of Agriculture and Rural Development (MINADER). It carries out seed control and certification activities and ensures compliance with seed legislation and regulations on seed production, marketing, import and export.

Seed Testing Laboratory (LANASEM) is responsible for seed quality control (varietal purity, specific purity) to deliver an analysis bulletin for certification purposes.

The SDSI has inspectors or seed supervisors in the field, located in the Regional Directorates of Agriculture (DRA) to monitor seed growers.

Seed supply and demand

In terms of rice seed supply, data collected from ADERIZ from 2012 to 2017 shows that the quantities of certified seed (R1) produced for irrigated and rainfed-lowland rice varied between 135 and 2,130 tonnes (**Table 1**). The quantities of upland rice seed varied between 10 and 167 tonnes during the same period. Demand cover rate averaged 1% for upland rice and 15% for irrigated and rainfed-lowland rice.

Table 1:- Certified seed supply and demand cover rates from 2012 to 2017.

	Ecology	Year					
		2012	2013	2014	2015	2016	2017
Quantity of certified seed produced and released (tonnes)	Irrigated and rainfed-lowland	2,130	632	494.15	418	134.76	348.12
	Upland	10	167	0	87	41.91	25.82
Area cultivated (ha)	Irrigated and rainfed-lowland	53,250	15,800	12,353.75	10,450	5,390.4	8,703
	Upland	250	3,340	0	2,175	1,636.4	645.5
	Total area cultivated	53,500	19,240	12,353.75	12,625	7,026.8	9,348.5
Cover rate of demand (%)	Irrigated and rainfed-lowland	51	18	7	5	3	5
	Upland	0	6	0	0.3	0.2	0.1

Seed system typology

Seed production in Côte d'Ivoire is characterised by the coexistence of two systems, namely the formal and the informal system.

Formal system

The formal system is based on the classical components of plant breeding, production and dissemination of planting material, and legislation integrating quality control and seed certification (WARDA, 2009; Beye et al., 2009). In this system, the seed is produced through a scheme with two steps. The first phase of multiplication, which concerns the production of breeder seed, is essentially the responsibility of research. The second phase, which is based on the production of foundation and certified seed, is the responsibility of the seed growers and companies. Varieties must be registered in the national or regional catalogue before the seed is commercialised. Quality control and seed certification are mandatory. The formal system currently provides less than 10% of seeds in Côte d'Ivoire.

Informal system

In this system, the farmers select the best plants in their fields to produce seeds. It is characterised by the dissemination of seeds through exchanges, mainly by swap at the village level or by a gift from their relations. It is also characterised by the non-existence of quality control and seed certification system. Varietal purity is low. The informal system supplies almost all (about 90%) of the rice seed in Côte d'Ivoire.

Main constraints of the seed sector

The main constraints of the seed sector identified, can be classified into three groups: (i) legislation/policy and planning constraints, (ii) constraints related to the production, quality control and management of seed producers and (iii) constraints related to supply and commercialisation.

Legislative, policy and planning constraints

In Côte d'Ivoire, there is a regulation of the seed sector. However, it remains poorly known and implemented. Indeed, the decree relating to the establishment and functioning of the National Seed Committee (CONASEM) in charge of the implementation of the seed regulation was signed on October 2, 2013. Unfortunately, this institutional department is not yet functional. The Technical Committee for Catalogue Registration (CTIC) of species and varieties cultivated in Côte d'Ivoire lacks funding to ensure the updating and dissemination of the official catalogue of species and varieties. The decree on the establishment and functioning of the Support Fund for the Seed Sector (FAS) has not yet been signed. An insufficient synergy and coordination have been observed between the actors of the seed chain. Policies to encourage private sector involvement in the seed chain are insufficient. The human and financial resources allocated to state structures (CNRA, LANASEM, SDSI, etc.) to ensure seed production and certification are insufficient. Actions to promote and encourage producers to use certified seed are practically absent.

At the planning level, the constraints are at two levels. There is unsuitability between supply and demand for certified seed. Information systems such as the cyber seed network of the Regional Seed Observatory for sub-

Saharan Africa (<http://www.ci-semence.org/>) and the seed information system initiated under the aegis of the FAO are poorly known and are difficult to release due to lack of resources.

Constraints related to production, quality control and management of seed producers

Production

At the level of the CNRA, the main constraint identified is the lack of financial and human resources (technicians and research assistants) and infrastructures (irrigated areas, conditioning centre). This situation leads to a low production capacity of breeder and foundation seeds, in sufficient quantity to meet national needs.

Regarding seed companies and seed growers, there is a low capacity to produce certified seeds (R1 and R2) due to the manual cultivation and harvesting conditions and to their low capacity to mobilise funds for the recruitment of occasional labour during harvesting and post-harvest activities. Thus, the products stored at the harvesting sites are subjected to bad weather for several days before being removed. The quality of the seed is strongly damaged by the lack of drying facilities. Storage conditions are also precarious. Seeds are rarely treated with products, resulting in early deterioration due to combined insects and fungi damage. In addition, the prevalence of the informal system over the formal system contributes to a further deterioration in the quality of the seeds available on the market. Finally, the lack of confidence between producers and their input suppliers due to non-compliance with contracts make access to credit very difficult for producers.

Quality control and management of seed producers

Due to the lack of material, financial and human resources, the seed inspectors of the SDSI of MINADER are unable to carry out all the control operations leading to the certification of seeds. The human resources (inspectors and controllers) of the decentralised administrations are insufficient. There are insufficient laboratories for seed quality analysis. There are only in Korhogo, Bouaké and Yamoussoukro. Moreover, these laboratories suffer from a lack of resources (financial and material) to fully ensure the quality control of seed samples.

At the management level, extension systems are inefficient. The National Agency for Support for Rural Development (ANADER) and other NGOs involved in the training on seed production do this activity only in the implementation of projects.

Supply and commercialisation

The most important structure in seed distribution is ADERIZ, whose conditioning and storage centre is located in Yamoussoukro. Unfortunately, the lack of financial resources and facilities makes it difficult for this organisation to set up a distribution network throughout the national territory. The purchase of seed is therefore very expensive due to transportation and additional costs. Moreover, farmers always complain about the poor quality of seeds sold and sometimes regret stock shortages. This situation has the consequence of the systematic use by rice farmers either of the seeds kept each year from their harvest or poor quality seeds available on the local market.

Seed sector improvement strategy

The strategy for improving the seed sector is based on the national seed sector development programme designed by ADERIZ (ONDR, 2012). This programme is fully linked to regional strategies and especially to the national rice development strategy which takes into account the period 2020 to 2030 (COMMODAFRICA, 2020). The overview of this programme is to build a professional and efficient rice seed sector to support the achievement of rice self-sufficiency. Its overall goal is to contribute to the sustainable meeting of the needs for quality seeds through:

1. The strengthening of the institutional and operational capacities of the seed sector actors (to organize and professionalise the rice seed sector);
2. The perpetuation and securing of breeder, foundation and certified seeds productions;
3. The quality control and certification of produced and commercialised seeds;
4. The creation of an incentive setting for private sector involvement in the seed sector;
5. Promote the use of quality seeds to rice farmers.

The outcome of this strategy is to increase the use of quality seed up to 70% in 2030, including 30% of certified seed and 40% of the seed of good quality obtained through the Community-Based Seed System (CBSS), an intermediate system between the formal and informal systems. To achieve this, all actors involved in the promotion of rice seed should be combined through a common strategy. This strategy should stimulate the professionalisation and empowerment of private sector actors, especially in terms of the sustainability of production, conditioning, packaging, storage and marketing activities for quality seeds, particularly certified seeds.

State intervention will be restricted to its sovereign task (control, monitoring, collection, certification, improvement of the business environment, etc.) and the establishment of a more responsible and efficient seed administration.

Institute for implementing the strategy

The actors who will take an active part in the implementation of this strategy are the state of Côte d'Ivoire, the research institutes, ADERIZ, seed companies, extension teams, professional organisations of the seed sector and the sleeping partners.

The State, through the decentralised services of the Ministry of Agriculture, will exercise its leadership by making the Directorate of Food crop and food security (DPVSA) responsible for coordinating interventions. The SDSI through seed inspectors in the regional directorates will ensure quality control of seeds in the field and the laboratory, the certification and the capacity building of actors.

The research institutions which are CNRA and AfricaRice will ensure the production of breeder and foundation seeds and the capacity building of the actors.

ADERIZ and the seed companies will provide a part of the foundation and certified seed and ensure the capacity building of the actors.

The extension teams (ANADER and NGOs) will ensure awareness, information and training.

Professional organisations of the seed sector (ANASEM-CI, APROSEC, seed producers' groups, professional organisations of traders, traders and input distributors) and other private operators will contribute to the implementation of the seed legislation, production of quality seeds of improved varieties, participation in the financing of some projects, participation in training and support/advice of different actors, participation in the concertation with different actors, participation in the functioning of seed distribution networks and participation in the monitoring/assessment of the strategy.

The rice inter-profession will ensure the establishment of partnership agreements on the management of seed marketing and outlets, promoting of seeds, determining a modulated price scale for each class of seed, adapting supply to demand, traceability of the seed, sharing of strategic information on seed, representation of the interests of the sector and participation in monitoring/evaluation of the strategy.

The technical and financial partners will participate in the dialogue on the seed policy with the Government, in consultation with the various actors, in support of the development of the operational programs, in the provision of technical assistance competent for the strengthening of the institutional and operational capacities of the technical structures responsible for implementation. They will also participate in mobilising the resources needed for the elaboration, implementation and monitoring/evaluation of operational programs and the monitoring/evaluation of the process.

Strategic principles and approaches

The strategy for the development of the seed sector must take into account the sovereign role of the State. Indeed, for reliable management of the sector, it is essential to establish an institutional framework capable of mobilising and channelling resources towards achieving the objectives set and ensuring effective implementation of the strategy, through autonomy in financial management. The State's intervention will be limited to its regular role (monitoring, certification, improvement of the business environment, etc.). The aim is to create institutional conditions and an environment conducive to the activities of the administration of the seed sector. Furthermore, because of the disengagement of the State in commercial activities, support for the installation of the private sector for the production and marketing of seeds must be provided.

In irrigated areas, the seed production will be entirely done by the private sector and ADERIZ. In other ecologies, the State, with the support of its development partners, will provide leadership and organisation for the emergence of a private sector in seed production. This will result in a gradual shift from the informal sector to the formal sector. In addition, in the short term, the State will have to continue its policy of purchasing seeds to guarantee opportunities for seed producers' initiatives. Successful implementation of the strategy requires regular monitoring and periodic

evaluations to make the necessary adjustments. To this end, an internal and external monitoring/evaluation mechanism must be put in place. The Ministry of Agriculture (MINADER) will be able to carry out this activity.

At the legislative level, the implementation of the law will regulate seed activities and ensure good quality seed to meet the objectives of increasing agricultural productivity. This action will help to raise awareness of regulation through the wide dissemination of texts and, above all, to ensure that it is respected by all stakeholders. It is also important for seed sector actors to be informed of existing regional and subregional legislation.

For the sustainability of seed production, policies must support the establishment of a competitive and dynamic private sector. Seed marketing prices are a key element for the functioning of the seed sector as they are a key factor for the profitability of the business and the access of the seed by farmers. From this point of view, a framework for consultation on seed prices will have to be established. Through this mechanism, economic studies will be carried out to guide the price policy of stakeholders in the seed sector.

The State will have to establish, with the support of development partners, a seed support fund and study the sustainable modalities of financing the seed fund. A reflection of this is underway within ADERIZ.

In the field of production, the public sector must not in any way become a competitor of the private sector. The public sector will have to produce only the categories of seed that fall within its mandate (pre-base and base) and the seeds that are requested, which are not produced by the private sector. As the private sector develops its capacity to produce and distribute quality seed, the public sector will have to withdraw and gradually concede its place to the private initiative in this area. The private sector will therefore be the main actor in the production, distribution and marketing of certified seed. To foster this transition, the government will need to implement specific support measures for private sector development. These include tax measures, facilitating access to credit, technical and investment support. The Government will also have to support the organisation of seed professionals and encourage their participation in the management of the sector. To ensure that seeds are available as close as possible to farmers, the Government will need to promote the establishment of a private seed distribution network through specific support measures. The quality control and certification of seeds of improved varieties should be based on the work of seed inspectors (field control) and laboratory specialists who are responsible for public structures. To put the rice seed sector competitively, a perfect mastery of quality control and seed certification will be required. Market conquest depends on it. To achieve this, it is necessary to strengthen the technical capacity of the personnel responsible for the inspection, control and certification of seed; widely disseminate the seed certification guide (Fondio *et al.*, 2016); increase the number of specialists in all areas of the seed control and certification process; to provide the SDSI responsible for the inspection, control and certification of seed with resources for carrying out its mission; encourage private sector intervention in the inspection, control and certification of seed based on a delegation of power through the establishment of a specification.

The supply of quality seed must be ensured by private operators who source from recognised seed producers. The revitalisation of this link will involve improving the distribution and post-certification quality control components. To do this, it is necessary to set up a good distribution network and to make it known. In addition, it is important to disengage production areas and to strengthen quality control of stocks. In this regard, the State in its regalian mission will have to support the establishment of mobile conditioning centres (to improve the quality of seed) and cocoons (for seed conservation).

In terms of marketing, the government will have to ensure compliance with legal and regulatory measures relating to seed marketing. The government will have to implement measures to promote the seed sector. This involves assisting in the organisation of marketing campaigns and the establishment of appropriate methods of promotion, as well as the extension of good agricultural practices and training of farmers.

Conclusion:-

The use of quality seed remains one of the important levers to boost the development of the agricultural sector. Given the importance of the seed sector in the agricultural development process, the Government of Côte d'Ivoire, through the ADERIZ, has fully committed itself to develop a strategy for the development of the rice seed sector. The issue of the rice seed sector is as follows: (i) low availability of seed, (ii) poor quality of seed, (iii) high price of seed, (iv) the lack of a well-functioning and structured network in terms of marketing and distribution of rice seed, (v) the difficulty for actors to have access to credit or a fund for the development of the seed sector, (vi) the poor

functioning of the institutional framework, (vii) the lack of material to reduce the difficult working conditions and increase the efficiency of activities. Because of this situation, the Ivorian State must take measures to:

1. Establish a real seed industry in Côte d'Ivoire;
2. To ensure continuously, the production of breeder and foundation seed;
3. To ensure a better supply of foundation seed to multipliers and seed companies and certified seed to rice farmers in sufficient quantity and quality;
4. Ensure quality control and certification of all classes of seed produced and marketed;
5. Create favourable conditions for a strong private sector for the development of a successful seed sector;
6. Promote the use of quality seed among rice farmers;
7. Create conditions for the professionalisation of the actors in the seed sector.

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