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Research Application Summary

Mainstreaming seed demand forecasting in the agenda of private and public sector seed actors

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Abstract

In Mali, the total area planted annually to rice was estimated at 900,939 hectares in the cropping season 2015/2016. Five different rice production systems share this area as follows: uncontrolled flooding (31.6%), lowland rice (25.3%), irrigated rice (21.9%), controlled flooding (13.3%), and rain-fed upland rice (7.9%). The total seed requirement for these areas is not well documented and so are the total breeder seed and foundation seed needs per year. Likewise, the potential financial contribution of this seed to the country's economy is not well known. In the present research, the authors developed the concepts of "Theoretical Seed Demand" and "Practical Seed Demand" and propose a user friendly methodology for an easy estimation. "Theoretical Seed Demand" is defined as those quantities of seed used annually, originating mainly from the informal systems and, to a smaller extent, from the formal system. "Practical Seed Demand" are in turn defined as those quantities of seed originating exclusively from the formal system and that are of interest to the private sector (seed companies and / or seed cooperatives). It is expected that the developed approach would facilitate seed need forecasting, the development of seed road maps and business plans for seed entrepreneurs, the planning of seed production and commercialization in the country, and pave the way towards the emergence of a high performing and sustainable seed industry.

Key words: Mali, rice, rice production systems, seed demand, seed systems

Résumé

Au Mali, la superficie totale cultivée annuellement en riz a été estimée à 900 939 hectares pendant la campagne agricole 2015/2016. Cinq différents systèmes de production de riz se partagent ces superficies comme suit: la submersion libre (31,6%), la riziculture de bas-fonds (25,3%), la riziculture irriguée (21,9%), la submersion contrôlée (13,3%), et la riziculture pluviale (7,9%). Le besoin total annuel en semences certifiées pour ces superficies n'est pas bien documenté. Il en est de même pour les besoins annuels en semences de pré base

et de base. Par ailleurs, la contribution financière potentielle des semences à l'économie du pays est mal connue. Dans la présente recherche, les auteurs ont développé les concepts de "Demande Théorique" et "Demande Pratique» et propose une méthodologie facile pour leur estimation. La demande théorique de semence est définie comme étant les quantités de semences utilisées chaque année, provenant principalement des systèmes informels et, dans une moindre mesure, du système formel. La demande pratique de semence est à son tour définie comme étant les quantités de semences provenant exclusivement du système formel et qui sont d'intérêt pour le secteur privé (entreprises et coopératives semencières). Il est prévu que l'approche développée faciliterait la prévision des besoins en semences, le développement de feuilles de route pour la production de semences, l'élaboration de plans d'affaires pour les entrepreneurs semenciers, la planification de la production et de la commercialisation des semences dans le pays, et ouvrir ainsi la voie à l'émergence d'une industrie semencière performante et durable.

Mots clés: Mali, riz, les systèmes de production de riz, la demande de semence, les systèmes semenciers

Background

All farmers need seed annually to plant their crop areas. They usually acquire seed via two main categories of seed systems: informal or traditional systems and formal systems. Under the formal system, seed is considered as a commodity that is crucial to food and nutrition security, youth employment, poverty reduction and promotion of the national economic growth. Seed production in the formal seed system involves formally organized actors in the specialized activities of managing plant genetic resources, developing improved crop varieties, producing early generation seeds, multiplying seed, and distributing that seed to farmers within an official national or international regulatory environment. Seed most often carries the label of full certification, and activities are, to a large extent, commercialized. Advantages of the formal system are tremendous. For instance, using the formal seed systems, tomato fruit size was increased from a few grams to 1 kg per fruit (Tanksley, 2004). Likewise, rice yield was increased in China by 50% from 1975 to 1990 (The World Bank, 2008). In India, sorghum area has declined 37% but yields have increased 80% (Axtell, 2002) due to the use of quality hybrid seed of superior varieties.

By contrast, the seed sector of sub Saharan Africa is lagging well behind with only 24% of cereal areas planted to quality seed of improved varieties (The World Bank, 2008). This is due not only to the lack of breeder and foundation seed, but also due to the weakness of private sector investment in this area. Indeed, the development of a commercial seed market by the private sector depends heavily on the availability of stocks of early generation seed from the formal seed system, in sufficient quantities. Therefore, one way to ensure the take-off of the seed industry in Mali and West Africa is to increase the availability of early generation seed and enhance their accessibility to the private sector. Achieving these goals requires the knowledge of annual seed demand and seed demand forecasting. Such information would allow a good planning of seed production and marketing and therefore, the emergence of a strong and sustainable seed industry. The objectives of this study were

to analyze seed demand and propose user friendly concepts for the components of seed demand and an easy methodology for their estimation.

Literature summary

The terminology "seed requirement" was previously employed (FAO, 1994) to mean total seed needed for planting all crop areas. Total seed requirement is complex and includes two main components. Component (1) is met annually by farmers' own production or other informal seed systems and therefore often seen as of little interest to the private sector and the formal seed system. Component (2) is satisfied annually by the formal seed system and is of prime interest to the private sector. Nonetheless, Component (1) can be of paramount importance as it can be totally or partially converted into component (2) through a real commitment of the different actors involved in the seed value-chain, including policy makers and the civil society.

Despite the fact that total seed requirements are easy to determine, the estimated figures are not well documented for most of the crops grown in Mali. For the estimation of component (2), various approaches including adoption rates and planted areas were reported (Lakew and Alemu, 2012). This information is generally collected and analyzed using a "Bottom-up" approach. While such information can be utilized in the planning of seed production and marketing, other information such as sales statistics should be used with caution. Concepts to distinguish between the two components of seed demand and an easy methodology for their estimation are needed in Mali and in West Africa as a whole. Such information is also needed for other parts of Africa.

Study description

The proposed concepts, fundamentals, and purpose. The term "Total Seed Requirement" refers to the total crop area multiplied by the seeding rate. Here, the authors propose the concepts of "Theoretical Seed Demand" later referred to as "Theoretical Demand for Certified Seed" (TDCS) to speak of "Total Seed Requirement". The fundamentals behind the use of this new concept are the fact that "Total Seed Requirement" has two components. Component (1) is originating from the informal systems such as farmer-saved seed and locally acquired seed, which is of little or no interest to the formal private sector. Component (2) is defined as those quantities of seed that has gone through the process of quality control (formal system) and that is sold annually by seed companies and / or seed cooperatives, and hence is of primary interest to the private sector.

The other concept proposed by the authors is "Practical Seed Demand" which is the same as component (2). The purpose of using these two concepts is to present forward their essential features of "presence" or "lack" of interest to the private sector; highlight the fact that component (1) can be to some extent integrated into component (2); and bring to the attention of policy makers the possibility of expansion offered by the seed sector for the sake of job creation, poverty reduction, and reduction of youth unemployment, as well as improve access to quality seed by smallholder farmers. Such expansion could be achieved

through conversion of part or eventually the entirety of component (1) into component (2). The proposed concepts can be applied to all seed classes.

The proposed methodology also emphasizes the use of the term "productivity" to speak of "multiplication rate" because the latter is more mathematic related than agronomic. Further the term productivity is more meaningful as it tells the farmers the quantity of seed expected at harvest for every kilogram of seed sown.

Research application

The concepts and the methodologies developed in this research (Tables 1 and 2) for their estimation can be applied to all crops and by all seed actors from the public and private sectors. Figure 1 shows estimates of TDCS for the different rice production systems in Mali. Figure 2 shows the estimates for the PDCS for the same rice systems. Comparisons between the two estimates indicated that the potential to expand the rice sector in this country is huge ranging from 20% for irrigated rice to 75% for rain fed upland rice. The

Table 1. Methodology for assessing "Theoretical seed demand"

Required information for theoretical seed demand for all seed classes	Equations to be employed for theoretical seed demand per seed class
1. Number of hectares planted annually	**Equation 1:** Theoretical Demand for Certified Seed (R1 or R2) or **TDCS** = Number of hectares*
2. Seed quantity needed per hectare in kg ha^{-1} (seeding rate)	seeding rate (kg ha^{-1});
3. Average yield (conventional yield) in kg ha^{-1} per seed class	**Equation 2:** Productivity Estimate (kg kg^{-1}) = Conventional yield (kg ha^{-1}) ÷ Seeding rate (kg ha^{-1})
4.Quantity of seed harvested per kilogram of seed sown (productivity)	**Equation 3:** Determining Theoretical Demand for Foundation seed (TDFS) $TDFS = \frac{1}{PEFS * TDCS} = TDCS/PEFS$
5. BS: Breeder Seed	
6. FS: Foundation Seed	**Equation 4:** Determining Theoretical Demand for Breeder Seed (TDBS)
7. R1 & R2: Certified Seed	$TDBS = \frac{1}{PEBS * TDFS} = TDFS/PEBS$
8. PE: Productivity Estimate	

Table 2. Methodology for assessing "Practical Demand" for different seed classes

Required information and Acronyms	Equations to be employed for Practical Seed Demand per seed class
1. Practical Demand for Breeder Seed = PDBS	**Equation 5 :** TDCS = DCS_ISS + DCS_FSS
2. Practical Demand for Foundation Seed = PDFS	
3. Practical Demand for Certified Seed = PDCS	**Equation 6 :** DCS_FSS = TDCS – DCS_ISS
4. Seed Systems = Informal Seed System (ISS) + Formal Seed System (FSS)	
5. TDCS = Component 1 + Component 2	**Equation 7: Determining Component 1:** DCS_ISS = TDCS*RU_ISS
6. Component 1 = Demand for Certified Seed, originating from the Informal Seed System = DCS_ISS	**Equation 8: Determining Component 2:** DCS_FSS = TDCS*RU_FSS
7. RU_ISS = Rate of Use of Seeds originating from the Informal System	**Equation 9: Determining Practical Demand for Foundation Seed**
8. Component 2 = Demand for Certified Seed originating from the Formal Seed System (DCS_FSS)	PDFS = TDFS * RU_FSS
9. DCS_FSS = Component 2	**Equation 10: Determining Practical Demand for Breeder Seed**
10. RU_FSS = Rate of Use of Seeds originating from the Formal Seed System	PDBS = TDBS * RU_FSS

public sector seed actors can use these concepts and methodologies to develop seed production plans and road maps. The private sector actors can use it as well to determine their market share and develop sound business plans.

Estimates obtained through this method should be multiplied by the rate of seed replacement (0.2 on average) to determine the exact seed demand and develop more adequate production plans and road maps. In this process, accurate and up to date information on the rate of use of quality seed of improved varieties and seeding rate are needed.

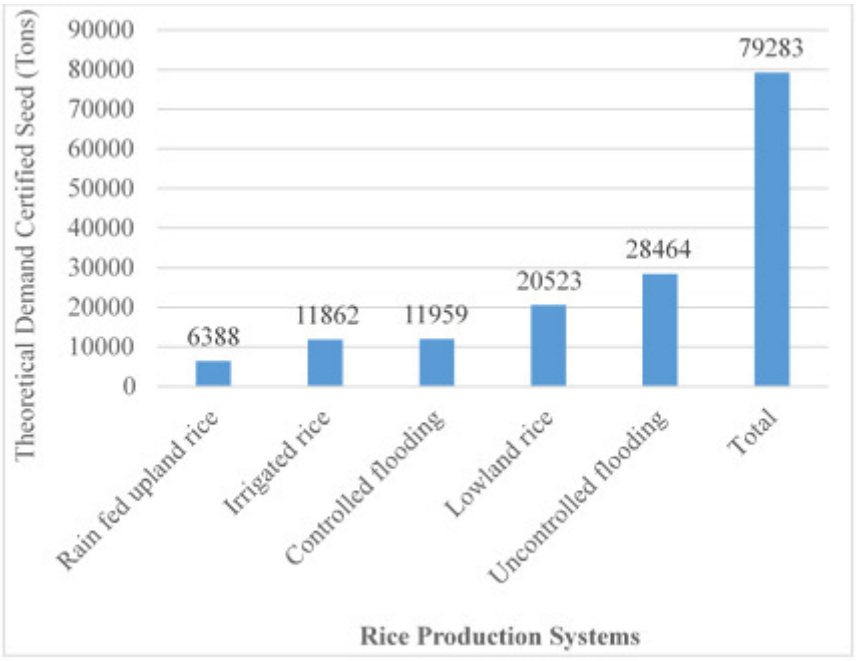

Figure 1. Theoretical Demand for Certified Seed for the different rice systems in Mali

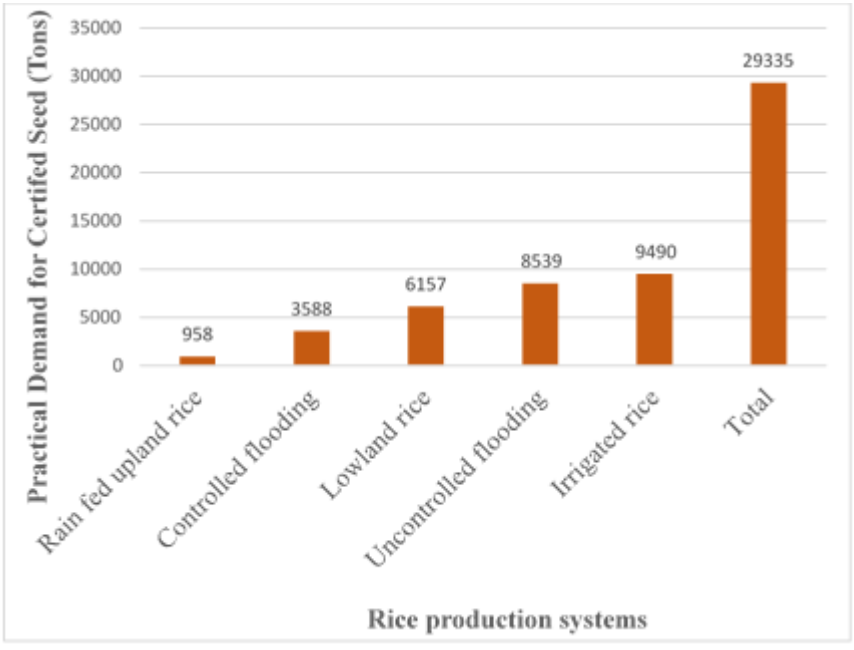

Figure 2. Practical Demand for Certified Seed for the different rice systems in Mali

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