



Support to the competitiveness of the rice sector in the Caribbean

Technical Assistance for the
EU/CARIFORUM project 9 ACP-RPR 006 – REG/7461/000

RICE SEED PRODUCTION, PROCESSING AND MARKETING

PART 1

APPROACH TO ESTABLISH A SEED GROWERS ASSOCIATION

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1. INTRODUCTION

Adequate seed production requires know how and facilities such as land, processing equipment and testing apparatus. Cooperation between stakeholders in the seed production chain is also highly required. Practical rules and regulation are other elements of seed production as well as research and breeding. An effective extension is indispensable in properly planning and implementing seed programs.

A proper implementation of a reliable seed program means delivering adequate quantities of seed at the right place, the right time and at an affordable price. To optimally manage this seed production chain it is highly important that every link is properly in place and functioning adequately. One such a link in the production chain of the seed program is the seed farmers, who are responsible for timely producing good quality seed.

To assure both an efficient input (policy making) and output (production) from the seed farmers it is an obligation to organize. An effective seed farmer's organization will be able to better negotiate and represent themselves in the seed production activities and will benefit every stakeholder in the rice sector.

This report highlights the status of the current seed program in general and proposes the approach to be followed to set up a seed grower's association.

2. THE CURRENT SEED PROGRAM

2.1. Breeding

For the last 12 years ADRON is responsible for the rice research and breeding activities in Suriname. After some six to seven years of breeding work the first four selected lines were released. ADRON-111 is one of the lines which is still widely used especially among small farmers. On the large scale farms it is used on a smaller area (table 1). Two other lines released recently are used on a smaller scale. It can be noted that ADRON-125 released three seasons ago has a 10% higher cargo outturn while ADRON-117 has a good yield and milling outturn, but a disadvantage is the thin grains. The yield potential of the lines is between 6 to 7 tons per hectare.

The lines -2 and -6 were probably introduced by LON some years ago and are not included in the current formal seed program.

Table 1: Rice varieties planted in main season 2005

Variety/Line	Large scale farms (%)	Area/Variety	Small scale (%)	Area/variety	Total area
ADRON-102	0.0	0	3.1	344	344
ADRON-111	25.8	2416	55.6	6171	8587
ADRON-117	4.1	384	2.3	255	639
ADRON-125	5.1	478	9.4	1043	1521
Eloni	0.0	0	3.1	344	344
Groveni	25.4	2378	6.3	699	3077
Ferrini	14.8	1386	3.1	344	1730
Others/mix	0.0	0	14.0	1554	1554
-2	23.4	2191	3.1	344	2535
-6	1.4	131	0.0	0	131
Total	100.0	9363	100.0	11099	20462

Source: ADRON

Currently breeder seed, Foundation seed and Registered seed of the three ADRON lines is produced. The production of certified seed is done by the seed farmers.

2.2. Production

Since the last eight years ADRON produces registered seed for seed farmers. The area sown and the consequently the volumes produced are far not sufficient for the total demand. In the current seed supply system a formal seed production chain is absent, while the informal supply system is inadequate in terms of quantity and quality. Both the formal and informal systems need improvement.

Table 2: Foundation seed production by ADRON

Year Var./line	2004		2005	
	Ha	Kg	Ha	Kg
ADRON-101				
ADRON-102				
ADRON-105				
ADRON-106				
ADRON-111	0.6	3,649	0.8	3,780
ADRON-117	0.4	2,183	0.4	2,076
ADRON-125	0.6	3,066	0.8	3,216
Eloni				
Groveni				
Ferrini				
TOTAL	1.6	8,898	2	9,072

Source: ADRON

Table 3: Registered seed production by ADRON

Year Var./line	2004		2005	
	Ha	Kg	Ha	Kg
ADRON-101				
ADRON-102				
ADRON-105				
ADRON-106				
ADRON-111	7	43,475	11	57,965
ADRON-117	0.8	5,276		
ADRON-125	3.7	20,740	4.2	26,175
Eloni				
Groveni				
Ferrini				
TOTAL	11.5	69,491	15.2	84,140

Source: ADRON

Both large scale and small scale farmers are part of the local supply system. The large scale farmers are more aiming at self sufficiency while the small scale farmers besides covering their own use neighboring farmers are supplied.

Table 4: Certified seed production by seed farmers

Year Var./line	2004		2005	
	Ha	Kg	Ha	Kg
ADRON-101				
ADRON-102				
ADRON-105				
ADRON-106				
ADRON-111	262	1,430,520	420	2,145,360
ADRON-117	10	5,870		
ADRON-125			85	443,275
Eloni				
Groveni				
Ferrini				
TOTAL	272	1,436,390	505	2,588,635

Source: ADRON

Seed farmers receive on irregular basis guidance from ADRON. A more thorough training can better improve the seed production activities and consequently the seed quality.

2.3. Processing

Small scale Seed farmers do not process their product. They sell the seed un-dried and un-cleaned. Over-ripening of the crop is allowed to reduce moisture content resulting in less drying hours. Sun drying is mainly applied by the small farmers. Very few farmers do cleaning by winnowing or by soaking for pre germination. The need for a professional equipped processing facility is high. This facility has to process the seed properly, i.e. cleaning, drying, storage and packaging on a professional basis so that the quality of the seed produced by the seed farmers can be maintained. It is suggested that the best location of this unit will be at the previous POR and ADRON complex.

2.4. Marketing

The 'seed' is marketed wet on the basis of 79 kg per bag at a farm gate price of 110% to 125% of the commercial price. If seed is harvested over ripe (15 – 16%) it is sold on the basis of 75 kg per bag. It is suggested that the marketing can be done by both the institution in charge of the processing unit or by the seed farmers.

2.5. Quality control

The formal quality control among seed farmers is very poor resulting in the absence of a reference to improve. The seed unit of the Ministry of Agriculture conducted a quality test on Foundation and Registered seed the last three seasons. In the past these seeds were controlled on an irregular basis.

3. THE PROPOSED SEED PROGRAM

Planning and implementing a seed program are cooperative integral activities of every stakeholder in the rice sector. The structure of the development of a seed program is illustrated in the figure below.

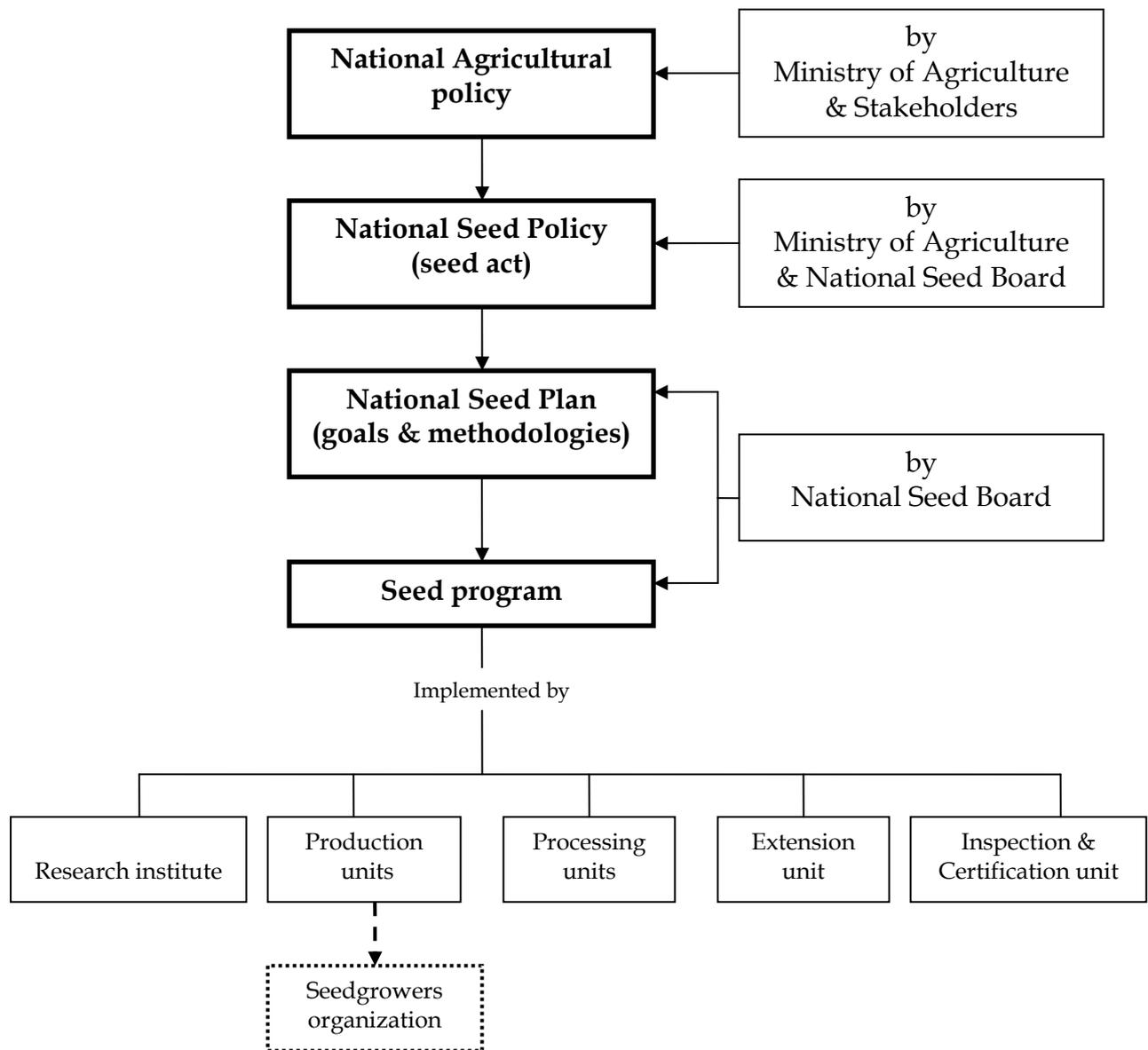


Figure 1: Seed program development & implementation
 (Modified from FAO/Suriname, 1994)

On the basis of the situation of the current seed program improvements that are required become clear. One of the weaknesses of the current seed supply system is the absence of a seed farmers association. In order to improve the seed supply it is a very great urgency to set up such an organization.

4. THE ORGANIZATION

4.1. Contribution

The seed grower's association is one of the links in the chain of the seed program which has a great impact in the smoothly implementation of the program. It is meant to properly organize the production unit to be able to achieve the main purpose of such a seed program; delivering adequate quantities of seed at the right place, the right time and at an affordable price. The association will increase the output efficiency of the production link by contributing in the development and implementation of the seed programs. A set of activities will be carried out to be able to contribute properly.

Representation and participation

In the planning phase of the seed program input from the production part is very important and crucial. Feed back of the planned program to the farmers is also of very great importance. Obviously, with at least 70 small farmers and 5 large scale farmers representatives will be required to obtain efficiency in the planning process. Beside representation in the planning process the production units will have to represent and participate in seminars, field days, group discussions, workshops, etc.

Negotiation

As an agricultural production partner an adequate and sufficient negotiation capacity is required. Negotiations for especially credit on the input side and price of the seed on the output side will be required. As a result formal and informal agreements will be closed with other stakeholders in the developing seed enterprise.

Development of the seed program

To participate in the planning phase of the seed development program it will be necessary to elaborate issues important for the planning process. The association is the best, of course after feed back from its members, entity to do so.

Production

Beside of the inspection and certification unit it is a task of the association to continuously give feedback to its members in order to be able to guarantee production according to rules, regulations and standards. The proper implementation of the seed program will be guaranteed.

Extension/training

By closely being in touch with its members the association can assist the extension unit in determining the extension and training needs. This will guarantee up to date training and thus again a proper implementation of the seed program.

Marketing/promotion

Good marketing is inherent in the activities of every link in the seed program. It will result in a better implementation, while the awareness among farmers to make use of good seed will increase. The entire rice industry will benefit from this action and its results. In case the seed farmers will directly sell their seed to the farmers the organization will have to plan and implement a promotion program possibly in cooperation with the extension unit. It has to be noted that a proper flow of the product (seed) will result in a good implementation of the seed program which will benefit every stakeholder in the industry.

International and national relations/partnerships

The seed industry will like any other industry have to expand its network beyond the borders of Suriname to share and benefit from the industry in other countries. Exchange of technology, expertise, know-how, technicians will upgrade the efficiency of the program implementation.

4.2. Approach

Before the establishment of the seed grower association some crucial preparatory meetings and discussions are required (table 5). The responsible body to initiate and implement the establishment seems very likely to be the National Seed Board (figure 1).

In its activities the board will get logistical support from ADRON and the MoA.

Table 5: Time table to found the association

Action	M1	M2	M3	M4	M5	M6
Initial meeting National Seed Board (NSB) with relevant actors.	█					
In-depth survey about the association planned and executed.	█					
First meeting with seed farmers for feed back & explanations about the seed act (regulations and opportunities).		█				
Team with independent members installed.		█				
Election prepared by team as instructed by NSB.		█				
If necessary extra meeting will be held.		█				
Second meeting planned and board elected.			█			
Draft by-laws presented by associations board and discussed among members.			█			
Draft by-laws adjusted according to feed back from the meeting and submitted for approval by the President.				█		
By-laws approved.				█		
Association running.				█	█	█

M = month

5. BY-LAWS OUTLINE

Like any other registered organization it is an obligation to have a by-law approved by the president of the Republic of Suriname. The articles must be transparent and supportive in achieving the organizations objectives and not contradicting any existing rule and regulation in Suriname. A draft outline of the by-laws with the articles to be taken into consideration and elaborated is presented below.

Table 6: brief description of the articles to be explored in the by-laws

Article	Description
<i>Type of organization</i>	Association
<i>Duration of the association</i>	Undetermined/unlimited
<i>Objectives of the association</i>	Make use of all legal possibilities to optimize the seed production environment
<i>Defining memberships</i>	Types of members if different and with or without vote
<i>Procedures to obtain memberships and to resign</i>	Approval by board or general meeting
<i>Fee to be paid by members</i>	On the basis of ratio to be defined
<i>The union's sub elements and their tasks and competencies</i>	General meeting, executive board and possible commissions
<i>Financing channels</i>	Description of the possible earnings
<i>The board's tasks and competencies</i>	Secure description of the boards composition, tasks and competencies
<i>General meetings of the association</i>	Procedures and reasons to call the meeting
<i>Procedures for elections</i>	Procedures for elections concerning persons and issues
<i>Procedures to adjust articles</i>	Description of the requirements
<i>Procedures to dissolve the association</i>	Conditions, situations and procedures to dissolve
<i>Procedures of settlement after dissolving the association</i>	Procedures to liquidize the properties of the association

These general articles are indispensable in running the association properly, smoothly and objectively to achieve its main goals.

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Anon, 2005. Zaadwet. No. 51. Republiek Suriname.

Chopra and Reusché. 1991. Seed enterprise development and management. Bangkok, Thailand.

FAO/Suriname. 1994. First National Forum on Seed Policy and Plan. Paramaribo, Suriname.

Delhove, 1991. Seed programs and projects in ACP-countries. CTA, Wageningen, Netherlands.

Annex 1 Terms of Reference

BACKGROUND INFORMATION

Beneficiary country

Suriname

Contracting Authority

The Caribbean Forum of ACP States (CARIFORUM)

Relevant country background

Suriname is located in the northern part of South America and has an area of 163,820 km². The population in 2005 was estimated at 485,000 of which most live in the coastal zone including about 200,000 in the capital of Paramaribo. The main constraints to Suriname's economic growth and development are institutional and policy-related. The agricultural sector contributes an average of 9% to Gross Domestic Product (GDP), employs about 15% of the labour force and is a major contributor to Suriname's food supply. Agriculture also accounted for about 15% of total exports in 2000.

Current state of affairs in the relevant sector

The use of quality seed is the foundation of all crop production to produce quality crops. The post harvest processing of crops relies on obtaining quality raw materials. This is not happening in Suriname due to the producers' insufficient access to good quality seed among other things. The Stichting ter bevordering van de Machinale Landbouw in Suriname (SML) en de Stichting Experimentele Landbouwbedrijven (SEL) have been producing rice seed in the past. Due to the problems these two companies have been facing, the production of seed has been declining for some time and ceased entirely a few years ago. For almost eight years now, the Anne van Dijk Rijstonderzoekscentrum Nickerie (ADRON) has been producing basic seed and foundation seed that is being sold to small seed farmers. Part is also being distributed to large farmers. The Seed Act has already been passed by the National Assembly and will become operational shortly. This has implications for the seed industry, which has the duty to become more professional. The industry should organize itself and should take measures to provide a product of high quality.

CONTRACT OBJECTIVES & EXPECTED RESULTS

Overall objectives

The overall objectives of the project of which this contract will be a part are as follows:

- The development of the competitiveness of the Caribbean ACP Rice Industry, and thereby contributing to the region's social and economic development and preventing the socio-economic deterioration which might occur as a result of the ongoing process of trade liberalisation;
- To enhance the competitive position of producers, processors, millers and others actors in the industry, by improving productivity, management, research, training and marketing.

Specific objectives

The objectives of this contract are as follows:

- Organize seed producers into an effective association

- Improvement of the quality of rice seed through training
- Proposals for processing and distribution of seed in order to guarantee a high quality product

Results to be achieved by the Consultant

- Report on the activities that will contribute to the establishment of a seed growers' association including a draft of the bylaws.
- Details of training course(s) or changes in competencies required, including general description of subjects to be included, training method, required training material (training manual).
- A business plan proposal for a seed processing and distribution facility.

ASSUMPTIONS & RISKS

Assumptions underlying the project intervention

- World prices for rice do not decline further in next years.
- Agriculture trade negotiations at WTO offer larger opportunities to developing countries.
- US does not use aggressively PL 480 as food aid.

Risks

- World prices for rice decline.
- Prices for input e.g. fuel and fertiliser keep rising, which could lead to decline in paddy production.

SCOPE OF THE WORK

General

Project description

The project consists of three parts. Firstly, putting the first step towards establishing a seed producers association. Secondly, investigate the need for training and make recommendations (training manuals etc). Finally, drafting a business plan proposal for setting up a seed processing and distribution facility.

Geographical area to be covered

The activities shall be conducted in the Nickerie district since more than 80% of the total rice producing area is located in this district.

Target groups

The groups of this study will be seed producers being small and large.

Specific activities

Note that some activities may be conducted concurrently and that these listing are a guide and can be modified during the inception phase which is during the first week of engagement.

Activity 1

Conduct a survey among farmers and seed producers to investigate among other things their perception, expectation and needs with respect to the seed supply system.

Activity 2

Consult other stakeholders (millers, ministry of agriculture etc) to get their view on the seed supply system.

Activity 3

Conduct a stakeholder's workshop where the establishment of a seed producers association will be discussed. Also it is a good opportunity to implement an upstream downstream planning approach.

Activity 4

Draft the bylaws for the seed producers association.

Activity 5

Propose and describe training courses for different levels of the seed system (production, processing, distribution, etc.)

Activity 6

Prepare a business plan proposal for a seed processing and distribution facility.

Activity 7

Prepare reports and draft training manuals.

Project management

Responsible body

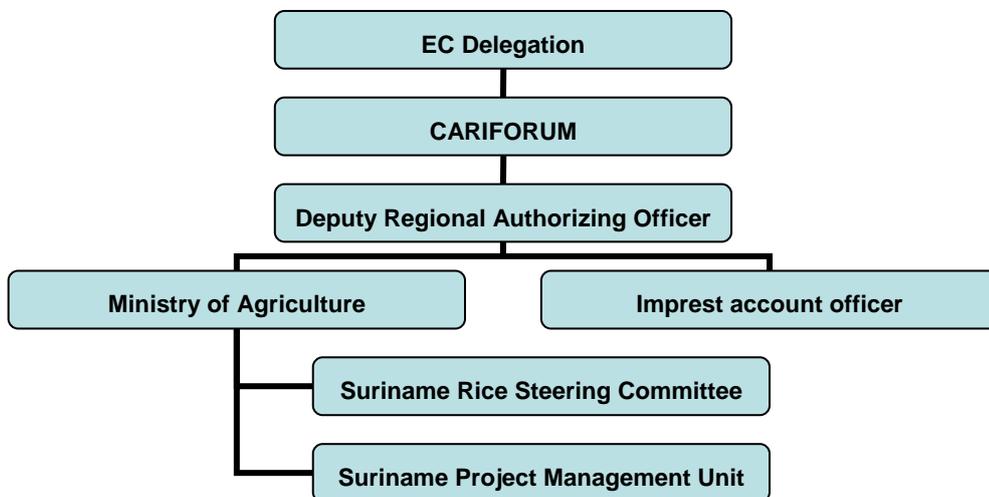
The Suriname Programme Management Unit (SPMU) will be responsible for supervising the consultant.

Management structure

The following is a flow of information in the system in which the consultant will report directly to the SPMU.

Facilities to be provided by the Contracting Authority and/or other parties

The Contracting Authority shall bear the costs of workshops and/or training courses.



LOGISTICS AND TIMING

Location

The study shall primarily be conducted in the Nickerie District.

Commencement date & Period of execution

The intended commencement date is 01 October 2005 and the period of execution of the contract will be completed within 3 months from the date of signature.

REQUIREMENTS

Personnel

Key experts

All experts who have a crucial role in implementing the contract are referred to as key experts. The profiles of the key experts for this contract are as follows:

Expert 1 and team leader must possess specialised knowledge in processing and expert 2 must possess detailed knowledge and experience in organizational strengthening.

Key expert 1: Team Leader

Qualifications and skills

- At least a M.Sc.-degree in post harvest technology
- Fluent in Dutch

General professional experience

Experience in post harvest activities (cleaning, drying etc.)

Specific professional experience

Experience in Seed processing and conditioning

Key expert 2: Organization expert

Qualifications and skills

- At least a M.Sc. -degree in social sciences
- Fluent in Dutch

General professional experience

Experience in working with organizations

Specific professional experience

Experience with working in the rice sector

Other experts

CVs for experts other than the key experts are not examined prior to the signature of the contract. They should not have been included in tenders.

The Consultant shall select and hire other experts as required according to the profiles identified in the Organisation & Methodology. These profiles must indicate whether they are to be regarded as long-term/short-term, international/local and senior/junior so that it is clear which fee rate in the budget breakdown will apply to each profile. For the purposes of this contract, international experts are considered to be those whose permanent residence is outside the beneficiary country while local experts are considered to be those whose permanent residence is in the beneficiary country.

The Consultant should pay attention to the need to ensure the active participation of local professional skills where available, and a suitable mix of international and local staff in the project teams. All experts must be independent and free from conflicts of interest in the responsibilities accorded to them.

The selection procedures used by the Consultant to select these other experts shall be transparent, and shall be based on pre-defined criteria, including professional qualifications, language skills and work experience. The findings of the selection panel shall be recorded. The selection of experts shall be subject to approval by the Contracting Authority.

Note that civil servants and other staff of the public administration of the beneficiary country cannot be recruited as experts.

Support staff & backstopping

The costs of support staff must be included in the fee rates of the experts.

Office accommodation

Office accommodation of a reasonable standard and of approximately 10 square metres for each expert working on the contract is to be provided by the SPMU.

Facilities to be provided by the Consultant

The Consultant shall ensure that experts are adequately supported and equipped. In particular it shall ensure that there is sufficient administrative, secretarial and interpreting provision to enable experts to concentrate on their primary responsibilities. It must also transfer funds as necessary to support its activities under the contract and to ensure that its employees are paid regularly and in a timely fashion. The consultant shall provide his own computer.

If the Consultant is a consortium, the arrangements should allow for the maximum flexibility in project implementation. Arrangements offering each consortium partner a fixed percentage of the work to be undertaken under the contract should be avoided.

MONITORING AND EVALUATION

Definition of indicators

1. The consultant within the week shall submit an inception report indicating in detail how he intend to fulfil this consultancy. Approval of the inception report is not required for further work to be completed. The inception report is simply an understanding on the process of implementation of the work that will be agreed upon by both parties.
2. Just in time reports on activities will be helpful to prevent rejection of the final report. The final report will become due no later than 3 months after the start of the consultancy. Four singed copies and a copy in CD or memory stick (to be provided by the SPMU) must be submitted. The SPMU will have 1 week after submission to review, accept or reject before making the final payment.

Special conditions

The consultancy is a complete task and does not in any way suggest any future engagements, written or implied.

This contract is a lump sum price contract.

RICE SEED PRODUCTION, PROCESSING AND MARKETING

Part 2

TRAINING SEED FARMERS; A PROPOSAL

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1. INTRODUCTION

This manual is an elaboration of the training chapter included in the business plan to setup a seed processing facility.

As it can be clearly observed and also reported by farmers there is an acute deficit in good quality seed in the rice sector. This deficit results in a lower profitability due to lower yield and lower quality. With the use of good quality seed a higher yield of up to at least 5% per hectare can be obtained.

Currently ADRON is producing breeder, foundation and registered seed. The amount is far not enough to supply the total demand. The registered seed is sold to seed farmers for further multiplication on an area of about 275 hectares yearly.

The total demand is estimated on about 3,200 tons per year on a basis of 45,000 hectares area sown, a purchase pattern of 50% and a density of 140 kg/ha. An area of at least 800 hectares of certified seed production is required considering a dry cleaned production of 4 tons/ha. It is expected that the purchase pattern will gradually increase because of the implementation of the seed act.

This point is where seed farmer's role in the seed production becomes evident. Due to lack of sufficient formal seed production and a seed processing unit, seed farmers will play an important role in producing sufficient seed for a high productivity and quality.

To truly play this role the seed quality aspect requires great attention. In order to meet the standards as stated in the seed act seed farmers surely need a thorough training. This training will cover all relevant aspect of seed production and processing. In the following chapters the different aspect will be explored.

2. SEED SUPPLY SYSTEM; AN APPRAISAL

2.1. ADRON

ADRON is part of the formal seed supply system. This system is incomplete due to the absence of a seed production unit. An appraisal reveals the following facts.

Strengths

The research center has in the nearly 12 years of its existence some strong point regarding seed production:

1. Available know how.
2. Trained man power.
3. Drying and cleaning facilities.
4. Excellent fields conditions.
5. Approval of the seed act.

Weakness

However there are also several weaknesses:

1. Lack of qualified personnel.

2. Limited area for registered and certified seed production
3. Limited processing facilities.
4. Poor seed production organization.

Opportunities

Given the production circumstances, international support and policy intentions there are some opportunities:

1. EU support regarding seed production and processing facility.
2. Willingness among farmers to produce seed.
3. Awareness to make use of good quality seed.
4. Expand seed production team by internal training

Threats

Different requirements need to be in place to be sure that the seed production & marketing is not jeopardized. Not being alert can cause some threats:

1. Poor marketing due to poor implementation of the seed act.
2. Decreased willingness to use good quality seed due to poor export and consequently delayed payment to farmers by millers.
3. Poor profitability due to increased fuel and urea price can hinder the use of good quality seed.

On the side of the formal seed supply system there are enough possibilities to enhance the system. However, an integral approach is indispensable to guarantee a sustainable improvement of the system.

2.2. Seed farmers

The seed farmers have during the last 8 years proved their very important role and contribution in de seed production process. However they also are confronted with different aspects.

Strengths

As the farmers have a long experience (± 25 years on average), thus history of rice production, they have witnessing the ups and downs in the formal seed production during the last decades and relied on their own informal system. Strengths among farmers regarding seed production can be summarized as follows:

1. Fields for seed production available.
2. To a certain extent know how available.
3. Existing informal seed marketing network.

Weakness

The weaknesses among farmers are:

1. Field maintenance not properly known.
2. No processing facilities available.
3. Absence of an organization.
4. Paddy is not purchased on the basis of quality.

Opportunities

The sector and international attention provides some opportunities:

1. EU support in producing, processing and organizing.

2. Awareness among farmers to use good quality seed.
3. Willingness to produce seed.
4. Trainers available.

Threats

The seed business has also some threats under the current situation:

1. Poor marketing due to improper implementation of seed act.
2. Decreased willingness to use good quality seed due to poor export and consequently delayed payment to farmers by millers.
3. Increased input price.

2.3. Improvements/actions required

The analysis of the seed supply system reveals the issues that need attention in order to improve the production, processing and marketing of seed. A brief consideration of the issues is given below.

Area

The volume of both the foundation and the registered seed has to increase in order to be able to supply the total demand. This means an increase in the area. Given the estimated need of 1,600 tons of certified seed per season an area of 400 hectares is needed. This will require an amount of 60 tons of registered seed, an area thus of 15 hectares. To supply this area, about 2.1 tons of foundation seed is required, roughly an area of 0.5 hectare. The area for registered and certified seed is insufficient.

Training

One of the weak points is the limited knowledge about seed production and processing among farmers. At the same time there are opportunities which make it possible to enhance this knowledge.

Facilities

Seed drying packaging and storage require special equipment and machineries, which is limited available. ADRON has some equipment and machinery to process seed, but are not sufficient for the proposed volume. Expansion of facilities is required and essential in guaranteeing good quality seed.

Promotion

There is to some extent willingness among farmers to produce seed. Also to a certain extent there is awareness among the farmers to make use of good quality seed. It is clear that the willingness to produce as well as to use high quality seed must be increased. Promotion through demonstration and mass communication is required. Moreover the millers will play a role in the awareness of the farmers to use high quality seed by purchasing paddy based on quality. In this regard it is suggested that millers must be forced by law to pay more for good quality paddy they buy.

Implementation seed act

The seed act is the main fundament on which the enhancement of the seed supply system in Suriname relies. Regulation, rules, requirements and other stipulations that make the business feasible, sustainable, attractive and

transparent will motivate stakeholders to invest. This act is already approved, however the stakeholders should be informed about the rules etc.

3. THE TRAINING; general considerations & organization

3.1. Objectives

Overall objective

Strengthen the competitiveness of rice production through increased yield and higher quality and decreased cost per ton paddy.

Specific objectives

- Understanding the rice sector on both national and international level.
- Explore the interaction between on the one hand yield and quality and on the other hand seed quality.
- A better understanding of the production and processing techniques and marketing strategy.
- Clarify the rules, regulations and other stipulation with regard to seed production, processing, marketing and use.

3.2. Approach and material

Participatory strategies will be applied to conduct the training. One of the widely used approaches is the Farmer Field School (FFS) method. This approach is highly effective since subjects are discussed, implemented, measured and evaluated in the field. Unlike the top down approaches, the FFS provokes and compels participation. The output is therefore a result of teamwork and easily disseminated to participants.

The approach requires like any other strategy, proper planning and implementation. It also requires some basic input to guarantee success. Transport, stationery, field accessories, promotion material and audio visual equipment are the main basic input necessary to implement FFS.

Table 1: Material and equipment required

#	Material/equipment	Amount/sets	Remark
1	Transport (4WD vehicle)	1	
2	Computer with internet connection	1	
3	Color Printer	1	
4	Digital photo camera	1	
5	Digital video camera	1	
6	Stationery (all in)	4	
7	Field accessories	4	
8	Promotion materials	4	
9	General	--	

The proposed materials and equipment are meant to support a smooth implementation of the training and guarantee also support afterward through video and manuals.

3.3. Organization

The field schools will last for one season. It is proposed to initiate the school on a location that has no affinity with any participant. By doing so feelings of favor and preference for a single participant will be eliminated and the total participation will be adequate.

Uncertainty, discontent and distrust are some of the aspects among farmers that need proper attention in planning and organizing the training. Especially failure of similar institutions in the past is still easily recalled by farmers today.

3.4. Evaluation

Evaluation of the training will allow us to adjust the content for future trainings and thus improve the efficiency and output. Both the seed farmers and the product (seed) need to be evaluated. This evaluation will reveal shortcomings in the chain of seed production. The evaluation is a task of the seed unit and the field inspectors.

4. THE TRAINING ISSUES

4.1. Rice production; a national and international view

Rationale

To induce changes (innovation) a thorough understanding of the sector is absolutely required.

Objectives

- Explore the position of the Suriname rice sector in national and international context.
- Relate the first objective to actions required for a higher competitiveness. The seed production, processing and marketing in relation with the competitiveness must be made clear.

Content

- History of rice and seed production; the organization and structure of rice and seed production especially after the introduction of the High Yielding Varieties.
- Rice production area, volume, yield, system; the dynamics in the issues mentioned and its importance in forecasting the seed demand.
- Rice marketing & quality standards; current and possible markets and the corresponding requirements.
- Seed program and improved rice production; the need of a new seed program and its contribution to the improvement of rice production.

4.2. Seed programs

Rationale

Knowledge about possible seed programs in the past and in other countries can trigger and guide the setup of the new seed program and allow analyzing if it is affordable.

Objectives

- Clarify the organizational structure of seed programs.
- Clarify the technical aspects of seed programs.

Content

- Breeding program; the basis of a seed program as supplier of new genetic material or breeder seed.
- Seed production, processing, storage and marketing; steps of the seed program essential in delivering and maintaining quality.
- Compare good seed versus farmers seed and determine the impact of good seed; the impact of good seed on the profitability of rice farming.
- Determine if investments in seed production are affordable; the return of investments on field level.

4.3. Seed act

Rationale

An understanding of the regulation, rules, requirements and other stipulations results in smooth and better implementation.

Objectives

- Teach the rules regarding seed production, processing and marketing.
- Explore the technical requirements of seed production, processing and marketing.

Content

- Discuss the seed act and its consequences for seed production, processing and marketing; rules, regulations and requirements regarding varieties, seed producers, seed processing and marketing.
- Discuss the impact of the seed act on the seed supply system and seed program; rules and regulation regarding the marketing strategy.
- Discuss the impact of the seed act on rice production; estimate the impact of the seed act on the use of good seed and the impact of the use of good seed on the production.

4.4. Rice morphology

Rationale

Knowledge about the morphology of the rice plant gives a better understanding of its requirements to grow properly in order to achieve high yield, pure seed, good quality, etc.

Objectives

- Explore the morphological characteristics of the seed, plant and inflorescence.
- Relate the morphology with the requirements of a seed program.

Content

- Describe the morphological characteristics of germinating seed and seedlings; describe germination and seedling according to the SES.
- Determine the morphology of rice tillers, roots, culm and leaves; according to SES.

- Describe the morphology of the inflorescence; according to SES.
- Morphology as basis of a high quality output; the relation between plant type and output.

4.5. Seed production agronomy

Rationale

For an excellent output the seed production process must be well managed. An understanding of its agronomy is indispensable.

Objectives

- Explain and discuss the difference between crop and seed production.
- Explain the seed crop establishment, cultivation and protection.

Content

- Land preparation; its effect on crop establishment, growth and ripening.
- Crop growth and management; factors affecting the growth and thus consequently the required management for a quality output.
- Crop protection; traditional versus alternative (integrated) approaches.
- Harvesting; the effect of moisture content and other factors on the quality.

4.6. Field inspection and rouging

Rationale

Purity is eminent in seed production. Proper inspection and rouging are the main tools to maintain purity and viability.

Objectives

- Explain the techniques necessary to guarantee pure and quality seed production.
- Explain the features (criteria) for proper plant selection.

Content

- Determine morphological and agronomical characteristics of the varieties; positive and negative selection on the basis of agronomical and morphological characteristics to guarantee purity.
- Timing and frequency of field inspection and rouging; best timing and frequency of selection in order to be able to select on the basis of characteristics.

4.7. Seed processing, packaging and storage

Rationale

After having taken the rules and conditions of seed production into consideration and produced pure and viable seed, it is very important to process and handle

seed with great professionalism in order to maintain the quality obtained from the efforts made in the field.

Objectives

- Improve understanding in the techniques, efforts and conditions required to dry, clean and store seed.
- Maintain seed quality by proper handling.

Content

- Drying, cleaning, packaging and storage of seed; determine the effect of improper processing after harvest on germination and vigor.
- Description of seed quality; quality aspects of seeds and how to determine.
- Factors affecting the seed quality; how to improve and maintain the quality after harvest.

4.8. Seed quality standards, classification and testing

Rationale

To produce according to a quality standard at least requires understanding of the standard and the measures to determine the products standard.

Objective

- Increase the understanding in the seed quality standards.
- Techniques to determine the seed quality known.

Content

- Seed classification and its matching standards; seed classification and the corresponding standards worldwide. How to achieve the requirements.
- Testing seed quality; how to sample and test.

4.9. Seed market demand and marketing

Rationale

As producer of especially seed, a proper understanding of the market and the demand is required to make good planning, which increases the certainty and thus consequently the commitment to produce good quality seed.

Objectives

- Able to understand and make market demand analysis
- Derive seed production requirements

Content

- Demand calculation; assessment on the basis of area, purchase pattern and seed density.
- Purchase pattern; how to determine the purchase pattern.
- Marketing; marketing rules and regulations according to the seed act and conducting surveys.

4.10. Bookkeeping and rice production economics

Rationale

Essential supporting financial data is very important to make decisions. On the basis of these supporting data the profitability is determined. This indicates the feasibility. Also changes to improve the efficiency in the production process can be made.

Objectives

- Improved data recording
- Cost-benefit calculation

Content

- Data recording format sheets; why, which and how data should be recorded.
- Data analysis and interpretation; what are the uses of information revealed from the analysis.

5. MONITORING AND EVALUATION

An adequate time scheduled monitoring on the basis of criteria defined by the consultants will be required to properly guide the training and obtain a high output. These monitoring activities will be carried out by the seed farmers association in close cooperation with the trainers (consultants) and trainees.

At the end of the training a total evaluation of the course will be made by the trainers together with the trainees and the farmers association. Reports will be made available to the Suriname Project Management Unit.

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Annex 1: Logical Framework

	INTERVENTION LOGIC	OBJECTIVELY VERIFIABLE INDICATORS	SOURCES OF VERIFICATION	ASSUMPTIONS
Overall objective	Strengthen the competitiveness of rice production through increased yield and higher quality and decreased cost per ton paddy.	<ul style="list-style-type: none"> • Increased production • Increased yield • Increased quality • Increased export 	<ul style="list-style-type: none"> • Statistical data MoA • Asycuda • Research reports 	<ul style="list-style-type: none"> • World market price at least stable • Fair trade
Specific Objectives	<ul style="list-style-type: none"> • Understanding the rice sector on both national and international level. • Explore the interaction between on the one hand yield and quality and on the other hand seed quality. • A better understanding of the production and processing techniques and marketing strategy. • Clarify the rules, regulations and other stipulation with regard to seed production, processing, marketing and use. 	<ul style="list-style-type: none"> • Training manual produced • Seed farmers training conducted 	<ul style="list-style-type: none"> • Evaluation reports • Training certificates delivered 	<ul style="list-style-type: none"> • Willingness among farmers to participate • Training facilities available
Expected Results	<ul style="list-style-type: none"> • Seed farmers trained • Increased area of seed production • Seed quality enhanced 	<ul style="list-style-type: none"> • Seed crop improved in the field • Laboratory test 	<ul style="list-style-type: none"> • Field inspection report • Seed unit report 	<ul style="list-style-type: none"> • Sufficient registered seed available • Seed production facilities available

RICE SEED PRODUCTION, PROCESSING AND MARKETING

PART 3

PLAN TO SETUP A SEED PROCESSING FACILITY

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Summary

The rice sector is a very important sector for the economy of Suriname. The total area planted is on average 45,000 hectares, while around the 40,000 to 50,000 tons are exported annually. Besides the export earnings it supplies the local demand of 25,000 to 30,000 tons per year and the sector also cover a significant percentage of the employment. It has also some other spin-off impact.

The Suriname Rice Sector however has a low competitiveness as a result of different adverse conditions. Its improvement requires an integral approach where the different issues will get attention and improved. One of the constraints is the very low availability of good quality seed, which has a negative impact on the production as well as quality and the cost per hectare.

In order to enhance the seed availability the *production area* must be increased. ADRON will be responsible to supply with *registered seed*. A *seed processing unit* is also indispensable to maintain the quality of the produced seed. Seed farmers also require *training* to be able to produce according to norms presented by the seed inspection and certification agencies. *Quality control* by this unit must be carried out continuously.

The processing unit planned to setup will have a capacity to dry and clean at least 1,600 tons certified seed per season. This amount of seed will be produced on about 400 hectares on the basis of 4 tons per hectare dried clean seed. This amount of seed will cover around the 12,000 hectares.

The total cost of the processing unit is estimated to be about € 475,000 with a life time of 15 years. The discount rate is 12%. Given the cost and return per year the payback period is between 9 to 10 years. The Internal Rate of Return (IRR) is 16.47% and the benefit cost ratio is 1.13. With a 10% increase in investment cost the IRR is 12.73% and the payback period between 10 to 11 years. On the basis of an extra yield of 5% the total sector will earn more than ½ million US dollars extra per season. The project has very little additional environmental impact.

Vision statement

General Key problem

Low competitiveness of the rice sector of Suriname due to low productivity, low processing outturn, inadequate marketing facilities and among others adverse production conditions like poor extension, use of low quality seed, poor access to credit, lack of managerial skills and market intelligence.

Specific issue in study

Quality seed availability is extremely low due to both poor willingness among private companies and poor facilitation by the government for the production of Registered seed for further multiplication as well as the production of Certified seed. In addition a proper formal seed supply system is absent.

Approach

Proper access to quality seed is one of the most important basic need/requirement in enhancing rice production and quality of the production system in Suriname. Quality

seed has the possibility to increase the yield as well the quality of the paddy. Improved access can be obtained by *increasing production* of Registered seed and consequently of Certified seed multiplication with a proper *processing* unit available. These intentions require a proper *training* of seed farmers and other actors in the production and processing and convincing farmers to use good quality seed. To increase the production the number of small seed farmers will be doubled to about 70. The total area covered will be 200 hectares. The large scale farmers will produce on 300 hectares Certified seed. With these 500 hectares of seed production 12.500 ha paddy production area will be covered. Gradually the area for the seed production will be increased to at least 800 hectares. It is clear that use of high quality seed by farmers can contribute in improving of the rice industry in Suriname.

Abbreviations

ADRON	Anne van Dijk Rijstonderzoekscentrum Nickerie
BC	Benefit/Cost ratio
CARICOM	Caribbean Common Market
CON	Cultuur Onderneming Nickerie
EU	European Union
IRR	Internal Rate of Return
GDP	Gross Domestic Product
PBP	Prins Bernhard Polder
POR	Praktijk Onderzoek Rijst
MoA	Ministry of Agriculture
NPV	Net Present Value
SML	Stichting ter bevordering van de Machinale Landbouw
SNRI	Stichting Nationaal Rijstonderzoeks Instituut
SRD	Surinaamse Dollar
WTO	World Trade Organization

1. Introduction

Rice production is for Suriname in several ways of great importance. Food security, employment and the macro economic contribution are some of the aspects of importance. Of course the sector has its spin-off activities.

The last 3 to 4 decades the rice sector makes use of modern cultivation systems with two crops per year. Research at the SML played a very important role in the mechanization process. More than the half of the production is exported with peak production years reaching 100.000 tons export. However, the rice sector is for some period of time adversely affected by different poor conditions regarding production, processing and marketing.

Poor dry and wet infrastructure, inadequate title on land, poor access to credit, old machineries, low availability of Urea and low availability of good quality seed are the main constraints on the production level. Improper extension and inadequate managerial skills of farmers also have a negative impact.

The managerial skills of the processing unit are low and machineries are old and poorly maintained. These are the main constraints at the processing level.

Poor market information, inadequate market research and low product quality are the main bottlenecks at marketing level.

To enhance the situation of the sector four main issues need attention:

1. Increase yield
2. Improve quality
3. Reduce cost of farming
4. Adequate marketing

To achieve the four abovementioned state of the issues, beside other actions the use of good quality seed is essential. In other words the use of good quality seed is indispensable in the enhancement of the Surinamese rice sector.

As indicated before the seed production, processing and marketing is currently very poor. In fact since the two Government owned seed farms (SML and PBP) terminated their seed producing activities, the availability of high quality seed decreased. Besides the lack of adequate knowledge big scale farmers are not so willing to invest in the seed production branch. The last 8 years the Research centre ADRON has been producing basic, foundation and registered seed and guiding private farmers in producing high quality seed.

As it can be perceived and observed there is an urgent need to enhance the rice seed industry in Suriname. This plan explores the actions that are fundamental in improving the seed supply system and also includes a budget required to implement these actions.

2. Seed production and processing; a general overview

2.1. *Breeding as basis of seed production*

Once a variety is developed and released there has to be a continuous supply of Breeder seed to the seed multiplication system. The breeder is generally responsible for the production of Breeder seed. This activity involves a severe selection in the different breeding steps. Selection is among others carried out to improve and maintain the genetic quality of a variety. If a variety is not maintained properly it may lose its characteristics for which it was bred. The repeated saving and use of seed of a variety by farmers can change the genetic composition of the variety. These changes in the varieties are results of segregation, mutation, cross pollination or mechanical admixture. The abovementioned degeneration can be tackled in two ways (Almekinders and Louwaars, 1999):

1. improving degenerated varieties
2. maintain the genetic composition appropriately

Crop improvement can be partly obtained by introducing new varieties or selection within the existing variety and making use of good seed of these varieties.

Variety maintenance includes the maintenance of diversity and uniformity.

The abovementioned steps and procedures provide us with quality seed; the most crucial input in agriculture.

2.2. *Seed supply systems*

Once Breeder seed is made available by the breeder the production of Foundation seed and Certified seed can start. The supply of seed can be divided in two systems:

- The local seed supply system, also known as farmers' seed system or informal seed system.
- The formal seed supply system

These two systems are a result of diverging developments in agriculture (Almekinders and Louwaars, 1999).

In the local seed system selection, seed production and seed exchange are integrated into crop production. The activities in this system take place outside the formal regulations of seed production by registered institutions.

With the introduction of mechanization, fertilization and the use of chemicals the agriculture rapidly changed in the developed countries. As a result the formal seed supply system took birth. Breeding, seed production and other technologies are moved to specialized institutes and organizations.

2.3. *Seed quality*

Seed quality is the main aspect need to be taken into consideration in setting up and implementing a seed program. Another aspect is the availability.

Quality aspects that need attention are (Almekinders and Louwaars, 1999):

1. Physiological
2. Sanitary
3. Analytical
4. Genetic

The physiological seed quality refers to the ability of a seed to germinate at the desired time and to assure an adequate vigor of the seedling (Louwaars and Marrewijk). It includes germination capacity, viability, characteristics related to dormancy and vigor. Biotic factors, moisture, temperature and the storage duration are the four major factors that affect the physiological quality. It can be measured by germination tests and other viability and vigor tests.

Sanitary seed quality refers to the presence or absence of diseases in or on the seed. These diseases can be caused by fungi, viruses and bacteria. Standards for sanitary seed quality are difficult to define since the rejection or acceptance of a seed lot depends on the type of pathogen.

Analytical seed quality refers to the percentage of undamaged seed in a seed lot. A seed lot can be divided into good seed (insect damaged seeds included), inert matter and foreign seed.

Genetic seed quality includes genetic variation within a seed lot. This quality varies depending on the agro ecological region and climatic condition. Depending on the end-use the criteria to define the genetic seed quality of a particular seed can differ.

2.4. Seed production

Seed production requires a business approach and should start with an assessment of the demand. In general the conditions and practices that lead to good yields also lead to good seed and a good seed yield. The main differences between grain production and seed production concern the higher quality requirements of the latter. A major principle of seed production is that in order to produce good seed a very good mother crop is needed (Almekinders and Louwaars, 1999). The crop must be well managed for a good healthy seed production. A poorly managed seed crop may give reduced yield and lower quality resulting in a poor crop establishment in the following years. An extra care for seed crops is therefore very wise.

To maintain a high level of seed quality, measures must be taken to guarantee the abovementioned four types of seed quality requirements.

2.5. Seed harvesting, processing and storage

Harvesting should be done on the basis of a well scheduled scheme to maintain the good quality. It will reduce losses due to shattering or insect pests. Contamination during bagging must be eliminated by using clean bags while proper labeling can avoid mistakes.

Seed should be processed (cleaning, aerated storage, drying) quickly to guarantee longer storage period.

High moisture content increases the life processes in the seed and therefore result in the loss of viability. Harrington's rule: one percent reduction of seed moisture content doubles the safe storage period. The moisture content as well the storage temperature plays an important role in maintaining the seed quality. That is why aerated or air cooled storage is very important.

Seed cleaning is on the one hand done in order to sort out non demand grains according to the shape, size, width, length, texture, etc and on the other hand to remove non-crop seed.

High temperature and moisture are enemies in storage. These factors affect the seed quality. Moisture is also produced by respiration and therefore adequate aeration is required.

2.6. Seed marketing

The market consists of four basic elements: the producer, the product, the customer and the competitor. Marketing consists of a marketing strategy, market research, market communication, pricing, logistics, distribution and selling. It is the basis of any commercial activity and should get significant attention.

3. History of rice production and seed supply system

A brief description of the developments in rice production and the seed supply system is pointed out in the paragraphs below.

3.1. Rice production

Rice has been grown in Suriname for several centuries, but initially, until 1873, there was just upland rice, grown upcountry. To this day the maroons in upper Suriname grow a large variety of upland rices in a shifting cultivation scheme under upland conditions. The precise source of these rices remains subject to speculation. Starting in 1873, the immigrants from the Indian subcontinent and Indonesia brought Asian rice varieties and the use of commercial wetland paddies to Suriname.

Five overlapping periods in Suriname's rice history can be distinguished: (i) until 1900, when rice was mostly grown as an upland crop, (ii) 1900-1949, when research at the Agricultural Experiment Station started, and rice began to receive attention as an economically important crop, (iii) 1949-1975, when the research became dominated by work in Nickerie, usually involving SML as sponsor or facilitator, with strong support through Wageningen Agricultural University in the Netherlands, (iv) the period 1975-1993, when SML no longer could count on funds from abroad, its research declined at the same time that a drain of brains occurred away from the rice research establishment, and when preparations took place for the establishment of a nationally oriented rice research effort, and (v) the period 1993-2005 when the plans for SNRI and ADRON saw their implementation.

Rice has always been a very important crop in the history and economy of Suriname. From the 16th century until the abolition of slavery in 1863, it was cultivated and used as a food crop, mainly by the slaves. The cultivation was primitive, mostly as part of a shifting cultivation system.

After the arrival of the contract laborers the wet cultivation method was introduced. Before this period rice was planted as an upland crop. From the beginning of the 20th century rice has gradually developed into a product of economic importance (van Amson, 1987; 19). With the arrival of a new group of contract laborers in 1894, this time from Indonesia the expansion of the rice growing area get another push.

Early in the beginning of the 20th century the crisis in the cacao cultivation made experiments with new crops necessary.

Therefore, at the end of 1903, the Agricultural Experiment Station (AES) was founded in Paramaribo. This station set up experiments with rice at different locations.

From 1901 till 1913 there was an extension of the area planted with rice, reaching about 680 hectares in 1910. The First World War has a very strong positive impact on the rice production in Suriname. In 1920 the area had increased to 4,000 hectares. In the beginning the contribution of the Nickerie district in the production was low. Gradually this has changed and this district became the leading rice production area. In 1930 the total area has increased to 10,000 hectares. Up till then the rice production was entirely done by manual labor. In the beginning of the thirties the use of the ox plow was introduced. The Agricultural Experiment Station supported this. With this innovation the manual labor decreased from 150-160 man-day per hectare to about 78. In the fifties about more than 50% of the area was cultivated by machines resulting in a manual labor of 55 man-day per hectare. In this period mechanization was the main objective. Till 1940 the total area remains constant with an increase of 7,000 hectares till 1950.

After the Second World War the interest in rice cultivation increased with as result the establishment of an experimental farm "Prins Bernhard Polder" (PBP) in 1949. Not long after this the Foundation for the development of Mechanized Agriculture in Suriname (SML) started a rice project in Wageningen in the Nickerie district.

Gradually the use of machinery increased especially in the Nickerie district. However transplanting and harvesting were done manually. In 1963 the first sowing experiment with airplane was carried out. In the mean time breeding work resulted in varieties with a short growth duration and stiff straw. All combined efforts finally resulted in the sixties in a completely mechanized operation with two rice crops a year.

Between 1950 and 1960 the total harvested area doubled from about 17,800 to 31,330 hectare per year (Amson, 1987). Nickerie contributed to most of the rice produced. In the late sixties the area in Nickerie increased to about 22,785 hectares. This figure transformed in 59,000 hectares in 1981. The bottlenecks in the rice sector came during the oil crisis and the strong competition from the US on the European market. To cope with the bottlenecks a National Rice Research Institute was proposed as well as sufficient attention for seed production.

3.2. Rice research

Research has played an very important role in the development of the rice industry in Suriname. Selection and breeding of varieties suitable for mechanized production was advised and promoted by Dr. H.N. van Dijk and the Agricultural Experiment Station. The use of tractors, plows, combines and other equipment increased after the Second World War and nowadays rice production is highly mechanized.

Research was primarily done at SML in Wageningen for large-scale farmers.

This research had a great positive impact on the mechanization and the use of improved technologies in the rice production. Extension to small farmers was in charge of this large farms and the Ministry of Agriculture.

To conduct applied research for small farmers, in 1975, the "Praktijk Onderzoek Rijst" (POR) was established. Unfortunately the POR terminated its research activities in 1984 because of lack of qualified personnel.

Till then extension was well organized and had a positive impact on the rice production. The total area increased to about 55,000. From the early eighties the rice research was conducted on a very low level, mainly because the lack of qualified researchers. The need for a national rice research institute was stressed and in 1987 the foundation for rice research in Suriname (SNRI) was established. In 1994 this institute could begin its work through its work arm, ADRON. There has been a lack of applied research for nearly 10 to 15 years.

Developing of new varieties, production of basic seed and applied research is carried out by ADRON to cope with practical problems in the field. Five research programs have been established:

1. Breeding
2. Crop management (soil tillage, fertilizer, weed, IPM and water)
3. Post Harvest
4. Seed production
5. Communication

Among others the release of three new lines, minimum soil tillage, I&D maintenance technique and the production of seed for seed farmers are some achievements of the research center. Hereby the communication to and from farmers, the analyses of data are also of importance for the activities at this research centre.

3.3. Seed supply system

The structure

The recognition of the use of good seed exists from the early period when rice was planted under upland conditions by the maroons. The Agricultural Experimental Station and the Extension Service played an important role in the further development and organization of the seed production. However before the 50's seed production was not very well organized. But with the increase of rice area the need to organize was high. The Agricultural Experimental Station in Paramaribo started with a 12 ha seed production farm which was in 1957 named Oryza. The seed produced on this field was sold through the Agricultural Extension Service to small farmers. The Agricultural Station produced breeder seed, while the Extension Service multiplied the foundation seed.

The area at Oryza increased and the SML also started producing seed in Wageningen. The Prins Bernhard Polder supplied the basic material to the Wageningen seed plant. Both Oryza and SML made use of contract growers in order to meet the demand (Van Amson, 1987). To eliminate the shortage private companies such as Van Dijk, Baitali N.V., CON N.V. were also involved in the seed production. Historically there is a cooperation between professional seed production units and seed growers, thus a cooperation between formal and informal seed supply systems. Till the nineties seed was produced by SML, while the informal system also exists.

Seed purchase pattern

Farmers buy seed based on quality, price and availability (Rees et al, 1994). Many farmers had the preference to produce their own seed. The lack of a proper drying facility hindered such intention. Most of the farmers are willing to purchase seed if the price is not too high. However the phenomenon that farmers allocate a piece of their land to multiply seed by their own also exists and makes an estimation of the demand uncertain. A survey in 1993 showed the purchase pattern; on 62% of the small scale area own or neighbor's seed was used (Rees et al, 1994). This figure increased to 76% in 1998 (Wildschut, 1998) and 90% in 2004 (ADRON survey, 2004). The more the seed production and processing facilities like Prins Bernhard Polder and SML decreased their seed production activities the more farmers rely on their own and neighboring seed. In the pattern illustrated by Wildschut there is one possibly positive tendency; very few farmers purchase their seed at mills.

Meanwhile the SML and PBP are not producing seed any more and farmers rely on the seed produced by ADRON and some seed farmers. However the quantity is not sufficient for all farmers resulting in inadequate seed use by many farmers with high red rice infestation as one of the consequences.

4. Situation analysis

4.1. Rice sector

Suriname has a land area of 163,820 square kilometers and a population of 500,000, mostly concentrated in the cultivated narrow coastal strip, with 50% of the population concentrated in the capital Paramaribo.

The agricultural sector contributes an average of 9% to Gross Domestic Product (GDP), employs about 15% of the labor force and is a major contributor to Suriname's food supply. Agriculture also accounted for about 15% of total exports in 2000. One and half million hectares (Ha) are estimated to be available for agriculture, of which about 114,000 Ha are on the coastal plain.

Over the last decade, agriculture suffered particularly from unfavorable macro-economic conditions (overvalued exchange rate, rapid inflation, an emerging parallel market, etc). This was particularly evident in the rice sector, which is the most important agricultural crop in Suriname.

4.2. Rice production

4.2.1. Area

The total area sown per year shows a fluctuation with a decreasing tendency (table 1). The year 2002 was the lowest level during the last ten years. The cropping intensity decreased from around the 1.1 in 1996 to approximately 0.8 in the last five years.

Table 1: Planted area (ha) from 1996 to 2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Area (ha)	61,775	53,495	50,135	48,460	41,995	50,780	41,473	50,146	47,850	43,800

Source: Ministry of Agriculture & ADRON

The Nickerie district has the largest share in the above mentioned planted area. The contribution of the other two districts, Coronie and Saramacca, is up to 5000 hectares per year. Nickerie contributes on average 42,000 hectares per year. The contribution of small scale farming to the overall planted area is getting more important. In 2004 in Nickerie small scale area planted was larger than the large scale farming, 24,000 hectares and 21,750 hectares respectively. Farmers are strongly convinced that the area planted will increase rapidly if the infrastructure, input cost and farm gate price will get to optimal conditions.

4.2.2. Production

Table 2 summarizes production levels obtained during 1996-2005. Two estimates of the amounts produced are recorded; first wet paddy (21% moisture) and second dry paddy (14% moisture). The paddy production trend followed the planted area tendency as illustrated in table 1 earlier.

Table 2: Paddy Production (tons) from 1996 to 2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Paddy (wet)	249,075	232,085	205,215	196,400	178,273	208,404	171,138	224,759	202,395	192,966
Paddy (dry)	228,651	213,054	188,387	180,295	163,655	187,564	154,024	202,283	182,156	173,669

Source: Ministry of Agriculture & ADRON

According to farmers the production level can be increased by enhancing the three main bottlenecks as mentioned earlier.

4.2.3. Yields

There was a slight increase in 2003. An explanation brings us to the extreme sunshine during the spring crop growth and harvest.

Table 3: Yield (tons/ha) from 1996 to 2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Average dry	3.70	3.98	3.76	3.72	3.90	3.77	3.76	4.11	3.88	4.05

Source: Ministry of Agriculture & ADRON

One of the main objectives in the rice sector is the increase of production per hectare. To increase the yield, besides the bottlenecks mentioned by farmers some other measures has to be taken. This includes proper training of farmers in a spectrum of subjects with regards to paddy production.

4.2.4. Rice production system

The production system includes small scale and large scale farms as well as private and parastatal companies. Smallholder production is gradually being marginalized and is increasingly becoming a part-time activity. At the other extreme are large commercial rice farms, private and parastatal, operating fully mechanized paddy production systems. Many of the larger enterprises are run by extended families, at times with linkages abroad (taking care of the final processing and sale on the external markets). There is a tendency amongst existing large-scale rice producers to vertically integrate paddy production, drying, milling and exporting (Agrotec, 2002).

The rice production is irrigated and highly mechanized. Soil tillage is done by tractors. The fields are generally twice dry tilled and on average three times wet. Urea application is done twice or three times while an increasingly part are fertilizing with TSP. Pesticides application is on average three times. The harvest is done by combines. Rice is produced twice a year, although just nearly 50% of the available area is used.

4.3. Marketing

4.3.1. Marketing of paddy

Due to the lack of drying and storing facilities, especially among small farmers, wet paddy is after harvest immediately transported to the mills. Generally there is no price arrangement between the farmer and miller. This causes uncertainty among farmers on

the price they will receive. Usually there is a one price policy applied. This fact together with delayed payment and lack of working capital discourages the use of "certified" seed by rice farmers (Agrotec, 2002). Paddy price is fluctuating and currently ranging from SRD 25 to SRD 27 (US\$ 9 to 9.8)/ bag of 79 Kg. The total paddy production does not meet the available processing capacity. After having being dried, the paddy is milled according to needs and packed for the local market and export.

Domestic rice marketing constraints comprise the depression of the paddy farmgate price caused by low international prices and inefficient paddy buyers and the raised cost of production due to increased urea price. Possible opportunities to overcome these specific constraints are to either improve the paddy-buying organizations or to raise the supply for urea.

The main external marketing constraints include high dependency on external and preferential markets, restricted ability by Suriname's operators to operate and compete on the larger Caribbean market and lack of a brand image for rice originating from Suriname. For example, there are opportunities such as the capacity to gain niche markets in sophisticated countries such as Europe, Caribbean, Central America, Brazil and the rest of South America (Agrotech, 2002).

4.3.2. Local market

On the domestic market, millers usually sell their product to wholesalers and, to a lesser extent, to retailers (supermarket chains) by using retail packages. However millers are integrating their activities in the marketing chain and are currently also active in the wholesale branch.

In Suriname, long grain white rice is mostly demanded by domestic consumers. Three grades of white rice are sold on the domestic market: the "Super", sold at a premium; the "Semi-super" and the "Consumption". These two latter grades are mostly sold by retailers within town's markets and small shops, with the premium grade primarily marketed through supermarkets, where the most affluent share of the domestic consumer's population does its shopping. Increasingly the "Super" grade is also exported into the Caribbean region (Agrotech, 2002).

The average amount of white rice remained in the country available for domestic consumption and stock during the last 10 years has been around the 55,000 tons (ASYCUDA).

The consumption is estimated at 25,000 to 30,000 tons, which is about 55 kg/person/year. This indicates a stock of around the 25,000 tons per year.

4.3.3. Export markets and their standards

The export markets

Suriname has a long export history, which started in 1928 (van Amson, 1987). Currently Suriname is exporting about 40% of its national rice production, however its 55.000 hectares account for only 0.04% of the total rice area in the world. This indicates a very low influence of Suriname on the international market. This means that Suriname has to adjust it self to the developments in the market. The CARICOM and Brazil are the potential export markets beside the EU (table 4).

Table 4: Total export (tons) by destination from 2000 to 2004

Destination	2000	2001	2002	2003	2004
EU	45,181	45,419	61,391	30,018	22,366
CARICOM	1,771	6,294	8,114	8,944	20,876
Brazil	--	--	--	1,745	7,920
Others	319	1,432	2,307	1,239	665
Total	47,271	53,145	71,812	41,949	51,830

Source: Asycuda

The EU market

Because of regulations and decisions taken by the World Trade Organization (WTO) the preferential export channels to the EU are now under restrictions. This means that Suriname has to compete with leading exporters as India, Thailand, Vietnam, and the United States. Since the beginning of 1999 the international prices are decreasing. To compete with the large producers and with the declining world market prices, Suriname's rice sector needs an efficient production with low production cost, high production, and good quality. Also added value like parboiling is an option (Berkhuizen, 1998). The good cooking quality was one of the strong points of Surinamese rice in the past. Currently the quality is low and given the international price, rice production is rarely profitable for the majority of the Surinamese farmers. With its current level of quality Suriname is barely able to compete with other countries.

Table 5: Requirements for Cargo EU market

(All values are maximum except where otherwise indicated)

Factors	A (%)	B (%)
Moisture Content	13.5	13.5
Damaged kernels(singly or Combined)	0.3	0.3
Red kernels	2.0	2.0
Yellow kernels	0.05	0.05
Amber kernels	--	--
Green kernels	2.5	3.0
Paddy	0.5	0.6
Milling Yield	72	70
(Head Rice)(Min)		
Total Milled Yield(Min)	--	--
Broken kernels	4.0	6.0
Chalky kernels	2.5	3.0
Total Foreign Matter	0.1	0.1

CARICOM

This market is besides the EU the most important market for Suriname. The total need is about one million tons per year of which mainly Parboiled rice. Suriname however is mainly exporting white rice to the CARICOM. The standards for these markets are somewhat different (tables 6 and 7).

Table 6: Requirements for Cargo

(All values are maximum except where otherwise indicated)

Factors	Extra A Premium (%)	A (%)	B (%)	C (%)
Moisture Content	14.0	14.0	14.0	14.0
Damaged kernels(singly or Combined)	1.0	2.5	3.0	4.0
Red kernels	1.0	2.5	3.5	5.5
Yellow kernels	0.1	0.2	0.6	1.5
Amber kernels	0.5	0.8	1.0	2.0
Green kernels	2.0	3.0	4.0	6.0
Paddy	0.5	1.0	1.5	2.0
Milling Yield (Head Rice)(Min)	72.0	71.0	70.0	65.0
Total Milled Yield(Min)	88.0	86.0	82.0	80.0
Broken kernels	6.0	8.0	12.0	15.0
Chalky kernels	2.0	3.0	4.0	6.0
Total Foreign Matter	0.5	1.0	1.0	1.0
Organic	0.5	1.0	1.0	1.0
Inorganic	0.0	0.0	0.0	0.0

Table 7: Requirements for Milled rice

(All values are maximum except where otherwise indicated)

Factors	Extra A Premium (%)	A (%)	B (%)	C (%)
Moisture Content	14.0	14.0	14.0	14.0
Damaged kernels(singly or Combined)	0.5	1.0	2.0	3.0
Red striated kernels	0.1	0.5	1.0	2.5
Yellow kernels	0.1	0.2	0.6	1.5
Amber kernels	0.5	0.8	1.0	2.0
Chalky kernels	2.0	4.0	6.0	8.0
Total broken kernels	4.0	7.0	15.0	25.0
-Chips	0	1.0	2.0	3.0
Paddy	0	0.1	0.5	0.5
Total Foreign Matter	0.1	0.2	0.5	0.5
Organic	0.1	0.2	0.5	0.5
Inorganic	0	0	0	0

Americas and Africa

Latin and Central America give the opportunity for export. Proper marketing and market study are required. At this moment an agreement with the government of Brazil allows to export about 10,000 tons of white rice to the Brazilian market.

Very little quantities of 500 to 1,000 tons per year are exported to countries as Mozambique and South Africa.

4.4. Seed demand

The seed demand depends largely on the area that will be sown and the willingness and persuasion among farmers to use good quality seed. The total yearly seed demand can be calculated on the basis of the total rice area planted annually and the seed

purchase pattern. In 1993 on 62% of the 14,000 hectares, own or neighbor's seed was used by small farmers. This figure for the large scale farmers was 26%. The total demand on 40,000 hectares was 3,400 tons per year (Rees et al, 1994). In 2004 on 90% of the small scale farming area own or neighbors seed was used (ADRON survey). This clearly indicates the decrease in the availability of certified seed after Prins Bernhard Polder en SML terminated their seed production activities.

The total demand per year can be calculated on the basis of the area sown (45,000 hectares), seed purchase pattern (estimate: 50%) and a rate of 140 kg/hectare:

Estimated demand = (45,000 x 0.5) x 140 = 3,150,000 kg; approximately 3,200 tons per year.

It is assumed that as a result of the implementation of the seed act the seed purchase pattern of 50% will increase to 90% in 4 years time, an on average increase of 10% per year demanding about 5,500 tons.

4.5. Seed production and processing

Currently ADRON is the only institution that produces *breeder seed*, *foundation seed* and *registered seed*. Both large scale and small scale seed farmers are responsible to produce '*certified*' seed. The total production area available at ADRON is around 7 hectares. It must be mentioned that not all of the seed farmers have been produced seed according the quality standard. This is the reason that they must be well trained to produce good quality seed. In the context of this seed program more farmers will be approached to participate.

Table 8: Seed quality standards by classification

Factor	Foundation	Registered	Certified
Purity (minimum %)	99	98	98
Foreign Matter (maximum %)	1	2	2
Weed (maximum %)	0	0.5	0.5
Red Rice (grains/ 500 gram seed)	0	1	2
Germination (maximum %)	90	90	90
Moisture (maximum %)	13.5	13.5	13.5

Source: ADRON

4.5.1. Supply system

In the current seed supply system both the formal and the local systems are weak. Lack of qualified land is one of the major constraints in adequately produce registered seed. The absence of the formal system and the absence of a grading system for purchasing paddy are some other important constraints in the seed supply system. The local system (seed farmers) produces not formally *certified seed*. A total of 9 tons Foundation seed on 2 hectares and 60 to 80 tons Registered seed on 11 to 15 hectares are produced annually. These output results in a certified seed production of about 2,500 tons on 500 hectares. The Foundation and Registered seed are dried, cleaned, packed and then sold to the seed farmers. The seed farmers do not dry the seed and sell it as wet product and not cleaned for the extra price of up to 25% above the normal farm gate paddy price per bag of 79 kg.

4.5.2. ADRON

Since the last eight year ADRON produces registered seed for seed farmers. These seed farmers produce certified seed under supervision of ADRON and distribute it in the neighborhood. The area sown and the consequently the volumes produced are far not sufficient for the total demand.

Table 9: Foundation seed production

Year Var./line	2000		2001		2002		2003		2004		2005	
	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg
ADRON-101	0.8	4,418										
ADRON-102	0.8	4,154	0.8	4,910	0.1	610	0.8	5,345				
ADRON-105	0.8	3,469										
ADRON-106	0.8	3,284										
ADRON-111			0.03	314	0.2	1,570	0.8	4,944	0.6	3,649	0.8	3,780
ADRON-117									0.4	2,183	0.4	2,076
ADRON-125									0.6	3,066	0.8	3,216
Eloni	0.2	1,242	1.6	4,910								
Groveni	0.3	1,715	0.05	290								
Ferrini			0.2	1,085								
TOTAL	3.7	18,282	2.68	11,509	0.3	2,180	1.6	10,289	1.6	8,898	2	9,072

Source: ADRON

Table 10: Registered seed production

Year Var./line	2000		2001		2002		2003		2004		2005	
	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg
ADRON-101	0.8	4,635										
ADRON-102	0.8	4,524			1.7	10,536	0.8	5,166				
ADRON-105												
ADRON-106												
ADRON-111			3.6	22,350	8	50,707	7	43,543	7	43,475	11	57,965
ADRON-117									0.8	5,276		
ADRON-125									3.7	20,740	4.2	26,175
Eloni	0.8	4,237										
Groveni	0.8	4,167	0.2	1,080	0.6	3,233	0.6	3,269				
Ferrini	0.8	4,036	0.2	913	0.5	2,886	0.6	3,356				
TOTAAL	4	21,599	4	24,343	10.8	67362	9	55,334	11.5	69,491	15.2	84,140

Source: ADRON

4.5.3. Seed farmers

Both large scale and small scale farmers are part of the local supply system. The large scale farmers are more aiming at self sufficiency while the small scale farmers besides covering their own use neighboring farmers are supplied.

Table 11: Certified seed production by seed farmers

Year	2000		2001		2002		2003		2004		2005	
Var./line	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg	Ha	Kg
ADRON-101	16	77,616										
ADRON-102	23	134,450	2	13,700	35	233,322	42	271,236				
ADRON-105												
ADRON-106												
ADRON-111			105	709,275	180	1,212,929	201	1,307,907	262	1,430,520	420	2,145,360
ADRON-117									10	5,870		
ADRON-125											85	443,275
Eloni	21	105,006										
Groveni	5.5	25,223	5.5	24,332	9	43,568	13	62,920				
Ferrini	4.5	18,764	4.5	19,553	8.5	44,042	14	62,790				
TOTAL	70	361,059	117	766,860	232.5	1,533,861	270	1,704,853	272	1,436,390	505	2,588,635

Source: ADRON

Seed farmers receive on irregular basis guidance from ADRON. A more thorough training can better improve the seed production activities and consequently the seed quality.

4.6. Survey results

The purpose of the survey was to explore the perception of farmers, millers, farmers organization, Ministry of Agriculture and the research station, regarding seed production, processing and marketing. The current seed farmers were also included in the study.

General

The farmer's community has a relatively good education level. This enforces the opportunity to enhance the sector through training and education. Farmers are widely content with the available lines; on around 75% of the small scale farm area these lines are cultivated. The larger scale farms have these lines on about 35% of the area. Machinery, especially tractor, is owned by three third of the farmers. The machine park however is very old resulting in high maintenance and inefficient use. In farmers view input, infrastructure and farm gate price are the three main problems in descending order. Seed is only mentioned by 15% of the farmers as a problem, while every farmer perceives a very poor availability of good quality seed. This indicates that the impact of good quality seed on the survival of the sector is underestimated. The need thus of an awareness campaign to convince farmers in using good quality seed is highly required.

Production

The low availability is a result of the disappearance of the seed production companies in the past such as PBP and SML. The area planted by both ADRON and the current seed farmers is insufficient.

Regulation and rules are necessary to structure the seed production to obtain good quality and adequate quantity.

Processing

Small scale Seed farmers do not process their product. They sell the seed un-dried and un-cleaned. Over-ripening of the crop is allowed to reduce moisture content resulting in less drying hours. Sun drying is mainly applied by the small farmers. Very few farmers do cleaning by winnowing or by soaking for pre germination. The need for a professional equipped processing facility is high. This facility has to process the seed properly, i.e. cleaning, drying, storage and packaging on a professional basis so that the quality of the seed produced by the seed farmers can be maintained. It is suggested that the best location of this unit will be at the previous POR and ADRON complex.

Marketing

The 'seed' is marketed wet on the basis of 79 kg per bag at a farm gate price of 110% to 125% of the commercial price. If seed is harvested over ripe (15 – 16%) it is sold on the basis of 75 kg per bag. It is suggested that the marketing can be done by both the institution in charge of the processing unit or by the seed farmers.

Organization

The seed production is to a certain extent organized as an ADRON network. The processing and marketing are totally unstructured and managed by individual farmers. In order to organize the production a seed growers association is proposed or required. The opinions about the organization of the processing facility are wide; as a profit organization, as a non profit organization, etc. The marketing can be done both by the individual seed farmer or the processing unit.

4.7. Improvements required

ADRON is part of the formal seed supply system. This system is incomplete due to the absence of a seed production unit. An appraisal reveals the following facts.

Strengths

The research center has in the nearly 12 years of its existence some strong point regarding seed production:

1. Available know how.
2. Trained man power.
3. Drying and cleaning facilities.
4. Excellent fields conditions.
5. Approval of the seed act.

Weakness

However there are also several weaknesses:

1. Lack of qualified personnel.
2. Limited area for registered and certified seed production
3. Limited processing facilities.
4. Poor seed production organization.

Opportunities

Given the production circumstances, international support and policy intentions there are some opportunities:

1. EU support regarding seed production and processing facility.
2. Willingness among farmers to produce seed.
3. Awareness to make use of good quality seed.
4. Expand seed production team by internal training

Threats

Different requirements need to be in place to be sure that the seed production & marketing is not jeopardized. Not being alert can cause some threats:

1. Poor marketing due to poor implementation of the seed act.
2. Decreased willingness to use good quality seed due to poor export and consequently delayed payment to farmers by millers.
3. Poor profitability due to increased fuel and urea price can hinder the use of good quality seed.

On the side of the formal seed supply system there are enough possibilities to enhance the system. However, an integral approach is indispensable to guarantee a sustainable improvement of the system.

Seed farmers

The seed farmers have during the last 8 years proved their very important role and contribution in de seed production process. However they also are confronted with different aspects.

Strengths

As the farmers have a long experience (± 25 years on average), thus history of rice production, they have witnessing the ups and downs in the formal seed production during the last decades and relied on their own informal system. Strengths among farmers regarding seed production can be summarized as follows:

1. Fields for seed production available.
2. To a certain extent know how available.
3. Existing informal seed marketing network.

Weakness

The weaknesses among farmers are:

1. Field maintenance not properly known.
2. No processing facilities available.
3. Absence of an organization

Opportunities

The sector and international attention provides some opportunities:

1. EU support in producing, processing and organizing.
2. Awareness among farmers to use good quality seed.
3. Willingness to produce seed.
4. Trainers available.

Threats

The seed business has also some threats under the current situation:

1. Poor marketing due to improper implementation of seed act.
2. Decreased willingness to use good quality seed due to poor export and consequently delayed payment to farmers by millers.
3. Increased input price.

Improvements/actions required

The analysis of the seed supply system reveals the issues that need attention in order to improve the production, processing and marketing of seed. A brief consideration of the issues is given below.

Area

The volume of both the foundation and the registered seed has to increase in order to be able to supply the total demand. This means an increase in the area. Given the estimated need of 1,600 tons of certified seed per season an area of 400 hectares is needed. This will require an amount of 60 tons of registered seed, an area thus of 15 hectares. To supply this area, about 2.1 tons of foundation seed is required, roughly an area of 0.5 hectare. The area for registered and certified seed is insufficient.

Training

One of the weak points is the limited knowledge about seed production and processing among farmers. At the same time there are opportunities which make it possible to enhance this knowledge.

Facilities

Seed drying packaging and storage require special equipment and machineries, which is limited available. ADRON has some equipment and machinery to process seed, but are not sufficient for the proposed volume. Expansion of facilities is required and essential is guaranteeing good quality seed.

Promotion

There is to some extent willingness among farmers to produce seed. Also to a certain extent there is awareness among the farmers to make use of good quality seed. It is clear that the willingness to produce as well as to use high quality seed must be increased. Promotion through demonstration and mass communication is required. Moreover the millers will play a role in the awareness of the farmers to use high quality seed by purchasing paddy based on quality. In this regard it is suggested that millers must be forced by law to pay more for good quality paddy they buy.

Implementation seed act

The seed act is the main fundament on which the enhancement of the seed supply system in Suriname relies. Regulation, rules, requirements and other stipulations that make the business feasible, sustainable, attractive and transparent will motivate stakeholders to invest. This act is already approved, however the stakeholders should be informed about the rules etc.

5. The Seed program

5.1. Existing facility's fate

In the early beginning (1920's) seed production was done by the Experimental Station and distributed through the Extension Service. In 1943 about 3,000 bags of SKK were distributed. SML started seed production in 1952 on a limited scale and reached about 320 hectares in 1956. In 1955/56 the station started trials and selection on a nearby location which was later named Oryza and expanded to about 100 hectares. Foundation seed from at the LON was multiplied at SML and further multiplied at the PBP farms. This structure and volume were not able to supply the increasing demand. Historically the three parastatal institutions (Oryza, SML and PBP) have been playing an important role in rice seed production in Suriname. Currently none of these institutions

are producing seed. The physical condition of the once well maintained seed production and processing facilities are depreciated and neglected.

5.1.1. Oryza

Oryza is established in 1957 for variety trial and selection purposes by the Experimental station (Van Amson, 1987). It was proposed by the experimental Station to increase the 4 hectares to about 100 hectares in order to be able to supply the whole seed production in the mid region. Currently the 120 hectares (Chedammi, 2003) is not utilized and thus no seeds are produced, while the machineries are old and the seed market vanished because very few farmers in the mid region are active. Some of the remaining farmers are purchasing seed at ADRON.

5.1.2. SML

This parastatal rice farm started its activities in 1949 and has a seed production unit of 200 hectares and a seed processing plant. Currently both seed production and commercial paddy production is absent and the farm is undergoing a privatization process. This future is very unpredictable and unreliable since the developments are not clear. Reinvestment in the existing seed production and processing unit will increase the risks and uncertainty and is obviously not wise.

5.1.3. Prins Bernhard Polder

The Prins Bernhard Polder was established as a pilot project for mechanical agriculture in 1948 (Ten Have, 1967). First an area of 240 hectares was and later extended to 500 hectares. In 1955 the Prins Bernhard Polder was incorporated in the Foundation for Experimental Farms (SEL). The last ten years the processing unit is out of function while the land it leased by a miller.

5.2. Elements of the seed program

A seed program as part of the national seed plan is a chain (figure 1) of activities which guarantee the objective of delivering adequate quantities of good quality seed on the desired place and time and an affordable price. It consists of breeding, multiplication, production, harvest, processing and marketing. Quality control (inspection, testing and certification) is an inherent part of every link in the chain.

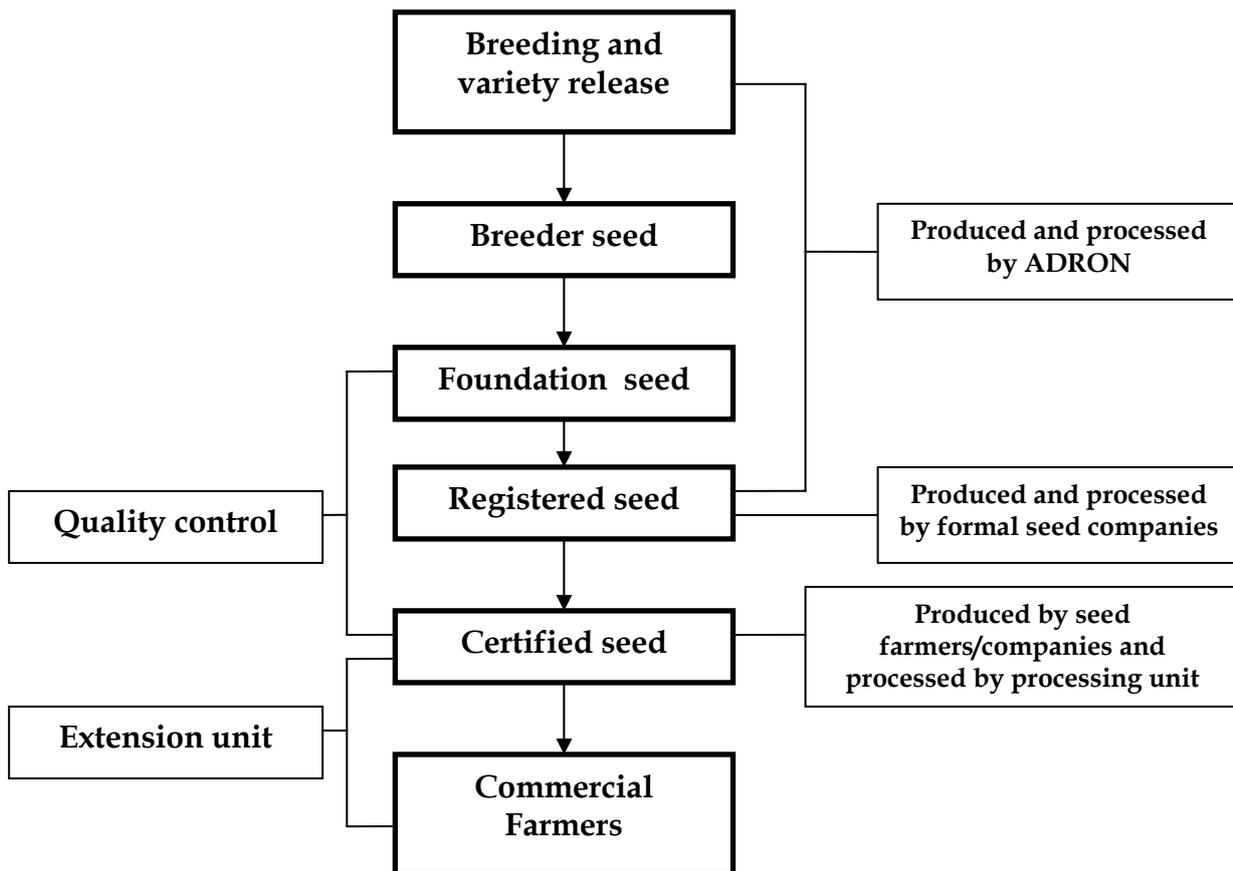


Figure 1: the seed program

5.2.1. Breeding

The breeding department of the research institute will be responsible to supply the production units with Foundation or Registered seed. Currently it can be foreseen that seed of three lines will be produced; ADRON-111, ADRON-117 and ADRON-125. Depending on the feedback from the field the amounts of seed produced will be determined. Given the current situation seed of ADRON-111 will be produced in highest volume followed by ADRON-125 and ADRON-117 respectively. To supply the need of registered seed ADRON will increase the production area to 30 hectares.

5.2.2. New production units

In order to overcome the barriers and delay in reinvesting in the seed production sites of existing units, especially SML and PBP, it is suggested by the stakeholders that the informal system could be better expanded and improved through recruiting more seed farmers or expansion of the area planted by the current seed farmers. This process however, is already initiated and effect can be seen at the end of 2006. In the initial phase it is suggested that per season on about 500 hectares 2000 tons certified seed must be produced. Gradually this must be expanded to 800 hectares which will cover the need given the 45,000 hectares sown per year and the seed purchase pattern of 50%. Both small scale and large scale seed farmers must be recruited on the basis of criteria required to produce good quality seed. The production area can be expanded

within two seasons while effect can be seen over a period of three seasons. The existing ADRON farmer's network must be utilized.

5.2.3. New processing unit

To properly process and handle the seed produced it is important to setup a well defined and equipped processing unit (annex 4). The processing unit basically requires a dryer, cleaner, packaging machine and storage space. Supportive equipment and apparatus are also required. It is mentioned that the location must be easily accessible in term of distance for farmers of the western polders as well as the farmers of the eastern polders. The previous POR and ADRON location is suggested. The stakeholders also suggest that the management must be structured as a profit organization. It is estimated that this facility needs an investment of around € 475,000 (annex 4) with a drying capacity of 4 tons per hour. The cleaning capacity will be 8 tons per hour. It will be exploited by well trained personnel and it is suggested that the first two years the unit will be managed by the seed experts of ADRON. It must be stressed that the facility will be managed according to a business approach which means profit will be made in order to guarantee the continuity. However the price of quality seed must not exceed 180% of the price of commercial paddy.

5.2.4. Marketing

Proper promotion and regular market study are required to guarantee good performance of the seed supply chain. Together with other stakeholders information must be disseminated. The price of seed can be expected to be around 180 to 190% of the commercial paddy price.

In our case it is not expected that there will be a high competition on the supply side. It is quite the contrary to convince farmers to use high quality seed despite the high cost of it. We think that the price of the seed will play a major role whether they will use good quality seed or not. Currently farmers are willing to pay SRD 0.60 per kg for cleaned, dried seed of high quality. For comparison: the price of wet, un-cleaned paddy for processing is around SRD 0.36 per kg farm-gate. The price of certified seed is around SRD 0.60; 67% higher but acceptable.

5.2.5. Training seed farmers

The operators of the unit will be trained by the company delivering the machinery. This is included in the price.

The seed farmers on the other hand require also a thorough training to adequately perform as a seed farmer. For the production of good quality seed know how and skills in a diverse set of issues must be learned (see training manual).

5.2.6. Quality control

The quality control of breeder seed is the full responsibility of the breeder. Quality control by the inspection and certification unit starts from the production of Foundation seed. Field inspections and post-harvest quality control will be applied to control and certify seed. This will be carried out by field inspectors and the certification unit under supervision of the National Seed Board.

6. Financial/Economical/Environmental analysis

The viability of proposed investments is analyzed on the basis of common key indicators as Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost (B/C) ratio, Sensitivity Analysis and Payback period.

Risks and Assumptions

The assumptions for the financial, economic and environmental analysis are:

A. International level

1. World market price stable or increasing.
2. Fair trade on the world market.

B. National level

3. Seed act implemented.
4. Research continued.
5. Input price acceptable.
6. Paddy price based on quality.
7. At least 3200 tons seed required; 45,000 hectares with purchase pattern of 50% and 140 kg/ha.
8. Macro economic stability

C. Facility level

9. Life time Processing Facility 15 years.
10. Discount rate 12%.
11. Seed marketed by processing unit and by seed farmers

Financial analysis

Based on the investment and running cost and the above mentioned assumptions the key indicators have been calculated (table 11). In annex an explanation of the figures in table 11 is given.

The viability of an investment depends on the profitability, feasibility and the worthwhileness. It is important to test the performance of a business in these areas. The profitability is important to survive in the medium to long term. Income must exceed expenditure. In the short term cash flow (feasibility) is more important than profitability and worthwhileness. However, in order to survive and grow there must be an acceptable return on the capital invested.

Table 12: The key indicators calculated on the basis of 3200 tons per year

Year	Cost (€)	Receipts (€)	Net Benefit (€)	Net benefit at 10% cost increase	Net benefit decrease by 10%
0	475,000	0	-475,000	-522,500	-475,000
1	59,904	148,640	88,736	81,792	73,872
2	59,904	148,640	88,736	81,792	73,872
3	59,904	148,640	88,736	81,792	73,872
4	59,904	148,640	88,736	81,792	73,872
5	59,904	148,640	88,736	81,792	73,872
6	59,904	148,640	88,736	81,792	73,872
7	59,904	148,640	88,736	81,792	73,872
8	59,904	148,640	88,736	81,792	73,872
9	59,904	148,640	88,736	81,792	73,872
10	59,904	148,640	88,736	81,792	73,872
11	59,904	148,640	88,736	81,792	73,872
12	59,904	148,640	88,736	81,792	73,872
13	59,904	148,640	88,736	81,792	73,872
14	59,904	148,640	88,736	81,792	73,872
15	59,904	148,640	88,736	81,792	73,872
NPV			101,033	17,528	13,068
IRR/			16.47	12.73	12.60
Sensitivity (B/C) ratio			1.13	1.02	1.02
Payback period (years)			9 - 10	10 - 11	13 - 14

Economic analysis

The use of good quality seed results in different advantages such as:

- Higher yield ($\pm 5\%$).
- Better quality.
- Lower cost due to lower seed rates and lower pest damages.

A calculation of the direct impact per year on the basis of higher yield can be made taking into consideration area sown, average yield per hectare (4.5t wet paddy/ha) and the seed purchase pattern. The following figure appears:

Impact= $(45,000 \times 0.5) \times (0.05 \times 4,5) = 5,060$ tons of extra paddy. On the basis of US\$115,- per ton farm gate, the total extra earnings per year will be US\$582,000. An extra earning thus of US\$25,- per hectare.

Other direct and indirect impact also exists. Employment is one of the other direct effects of the project. The implementation of the project will have an intangible educational impact.

Environmental analysis

Although on an relatively low rate, the processing unit will make use of diesel fuel for its dryer, resulting in the emission of greenhouse gases.

About 0.5 to 1 ton of inert material will be produced after the cleaning process of 3200 tons per year.

On the other side a reduction of at least 50% in the use of pesticides will be obtained among the seed farmers as a result of the training.

It is also assumed that the use of good quality seed on the estimated 22,500 hectares per year sown with the certified seed will result in fewer pests which will consequently reduce the pesticide use. An increased seed purchase pattern from the starting 50% till up to 90% will increase the area sown and thus have a higher positive impact by reduction of pesticides use.

Conclusion

The project is profitable, feasible and worthwhile and with respect to the environment very acceptable.

7. Monitoring and Evaluation

Monitoring and evaluation are important aspects in achieving the projects output and objectives. These aspects are incorporated in all stages of the plan and are continuously carried out.

An ongoing day-to-day assessment of the activities must be carried out on the basis of indicators determined and the results must be reported by the designated manager which is assigned by the board of the processing unit. This will allow to assess physical and financial progress of the project as reported by the contractor. Data will be made available by the contractor if necessary.

An external supervision must be assigned to monitor the implementation of the plan by the contractor. This might be a consultancy bureau.

The delivering company of the seed processing machineries will also report on their activities as agreed (installing and training), while the manager together with the trainees will report their findings on the performance of the company.

At the end of the project a total evaluation will be carried out and reports will be produced by the manager together with the board. Reports will be made available to the Suriname Project Management Unit.

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Berkhuizen

Annex 1: LOGFRAME

	Intervention logic	Verifiable indicators	Source of verification	Assumptions
Overall objective	Enhanced competitiveness of paddy producers and millers	Rice yield increased to 4.5 t/ha paddy Rice quality increased	ADRON and MoA statistics Quality certificate of MoA for export cargo	World prices do not further decrease Fair trade possible
Specific objective	1. Explore the best setup of a seed producers association 2. Improvement of the seed quality 3. Proposal for the setup of a seed processing facility	Recommendation regarding steps to be followed and bylaw made Recommendation regarding a training is made Proposal regarding location, design, technical and economical aspects done	Report Report Report	Farmers still motivated to participate Farmers recognize the need for training Farmers recognize the importance of using good quality seed Seed act triggers the use of good quality seed
Expected results	1. Activities to set up a seed farmers association elaborated 2. Training approach justified and subject description available 3. Detailed seed processing facility plan available	Bylaw produced and organizational structure elaborated Curriculum compiled Feasibility study conducted	Report Training manual Business plan	Farmers are willing to organize and EU Project continues

Annex 2: Survey form

QUESTIONNAIRE FOR THE SEED STUDY SURVEY

Part 1: quantitative

Farmer's personal notes

Name	
Address	
Age	
Education	
Other occupation	

Farmer's capacity

Total area	
Area hired	
Varieties (last two seasons)	
Seed source (last two seasons)	
Average Yield (last two seasons)	
Years of experience	
Trainings attended	

Farmer's machineries and equipment

Tractor	
Combine	
Harrow	
Plough	
Water pump	
Sprayers	

For all the equipments; is it hired or owned and if owned what is the current condition of the equipment?

For seed farmers only

Which seed class do you produce?

Do you know the seed standards and do you determine it?

What type of guidance do you receive and is it of any importance?

Do you apply any extra management activities for seed production?

Do you apply any processing activities (drying, cleaning, etc.?)

What is your marketing strategy?

Do you need any kind of training in producing seed?

Do you think that seed farmers should organize and why?

Would you like to participate in such an organization?

Part 2: qualitative (Farmer's perception)

What are the three main problems in the rice sector and why?

What is the performance of the current varieties available?

Please describe the current seed availability and seed price?
 Please describe the current seed quality? If necessary, how can we improve it?
 Is seed processed in a proper way by your supplier? Where do we need improvement?
 Can a seed farmers association help in enhancing the seed situation?
 What organizational structure of this association will be the most effective?
 What is the best location and management structure of a processing facility?
 Describe the best marketing strategy of seed?

Part 3: economical

Cost (SRD) per activity per hectare

Straw burning	
Dry Soil tillage	
Irrigation	
Wet soil tillage	
I&D maintenance	
Seed and seed treatment	
Molluscicide, Insecticide and labor	
Transport seed to field	
Sowing	
Insecticides and labor	
Herbicides and labor	
Fertilizers and labor	
Irrigation	
Insecticide and labor	
Herbicides and labor	
Fertilizer and labor	
Irrigation	
Insecticides and labor	
Herbicides and labor	
Fertilizer and labor	
Ditch cleaning	
Harvest	
Yield (tons/ha)	

Annex 3: INVESTMENT SEED PROCESSING UNIT

A DRYER, INCLUDING BUILDING.			
1	Dryer	80,000	80,000
2	Building 20*12	40,000	53,000
3	Transformer		15,000
4	Elevators and conveyors		24,000
5	Pre-Cleaner		16,000
6	Weigh bridge		15,000
5	Contigencies		20,000
	Sub total		223,000
B STORAGE, PACKAGING INCL BUILDING			
1	Building 15*40, all in		99,000
2	Cleaner		20,000
3	Packaging machine		8,000
5	Fork Lift Truck		26,000
4	Contigencies		18,000
	Sub total		171,000
C CIVIL WORKS			
1	Removing scraps and suchlike		1,700
2	Entrée		1,000
3	Sandfill		32,000
4	Roads		6,500
5	Fench		8,000
6	Contigencies		4,800
	Sub total		54,000
D	LABORATORY APPARATUS		15,000
E	OFFICE SUPPLIES		7,000
F	MISCELLANEOUS ITEMS		5,000
	TOTAL INVESTMENT		475,000

Remarks: All estimates are including engineering and supervision
The dryer has a capacity of around 4 ton per hour, 60 ton per 24 hours
So the dryer can process in one (1) season at least 1,600 ton.

Annex 4: Cost calculation

Investment € 475,000

FIXED COST		
Depreciation		
Depreciation period	15	year
Remaining value	10%	
D-method	fixed percentage	
Depreciation value	28,500	per year
Interest		
Fixed rate	12%	per year
Interest value	31,350	per year
Maintenance		
Average cost	2%	per year
Maintenance cost	9,500	per year

TOTAL FIXED COST 69,350 PER YEAR

RUNNING COST		
Fuel cost	15 l/mt @ SRD 0.65	2.88 per mt wet paddy
Electricity power	estimated	2.00 per mt wet paddy
Labor		7.72 per mt wet paddy
Packaging		2.50 per mt wet paddy
Miscellaneous		0.75 per mt wet paddy
ADRON management fee		0.25 per mt wet paddy

TOTAL RUNNING COST 16.10 per mt wet paddy
TOTAL RUNNING COST 18.72 PER MT DRIED PADDY

VOLUME OF PROCESSED PADDY PER YEAR IS ESTIMATED AT 3200 MT

THE TOTAL COST OF DRYING PADDY AT DIFFERENT VOLUMES.

Volume dried paddy per year	2800	3200
Fixed cost	24.77	21.67
Running cost	18.72	18.72
Total cost per ton dried paddy	43.49	40.39
Profit 15%	6.52	6.06
Cost plus profit per mton dried paddy	€ 50.01	€ 46.45
Drying fee per kg in SRD	0.169	0.157
Cost of the wet paddy per bag of 79 kg	SRD	32.00
Cost per ton wet paddy	SRD	405.06
Equivalent per ton dried paddy	SRD	471.00
Cost of the paddy in SRD per kg	SRD	0.47

THE PRICE OF DRIED PADDY FOR THE FARMERS WILL BE SRD 63 - 64 ct per kg.

THE CURRENT PRICE IS NOW SRD 65 ct per kg.

THE PRICE OF WET SEED PADDY IS CALCULATED SRD 4,- HIGHER THAN NORMAL PADDY.