

The National Agricultural Innovation Strategy of the Republic of Suriname

Ministry of Agriculture, Animal Husbandry and Fisheries

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Acronyms and abbreviations

ADEKUS	‘Anton de Kom’ University of Suriname
ADRON	‘Anne van Dijk’ Rice Research Organization
AgGDP	Agricultural Gross Domestic Product
ARSD	Agricultural Research Sub-Directorate
CELOS	Center for Agricultural Research Suriname
FTW	Faculty of Technical Sciences
IDB	Inter-American Development Bank
LVV	Ministry of Agriculture, Animal Husbandry and Fisheries
SNRI	Foundation National Rice Research Institute

Executive summary

Suriname has great agricultural potential, but has not been able to exploit it to its full potential. Despite some export successes (fisheries, rice and bananas), decreasing competitiveness has turned Suriname into a net importer of agricultural and food products. In order to reverse this situation, innovation (i.e., the generation, adaptation and exploitation of new knowledge and technology) will be essential.

This agricultural innovation strategy describes:

1. The key innovation challenges and opportunities in the three sub-sectors (agriculture, livestock and fisheries) as identified by the White Papers and other policy documents. They scope the content of the current agricultural innovation agenda;
2. With the exception of rice, the production volumes of most agricultural commodities in Suriname are too small to warrant the generation of own technology. Hence, the proposed innovation strategy is to focus mainly on the import of agricultural technologies and their validation, adaptation, and transfer to farmers; and
3. A set of key reforms needed in the agricultural innovation system in order to substantially improve the implementation of the agricultural innovation agenda. The proposed reforms not only address bottlenecks in staffing and infrastructure (the innovation ambitions very much exceed the present capacity on the ground), but also better coordination and collaboration within the system between different research actors, between research and extension, and between the public and the private sector. Another key reform is the integration of 'innovation-oriented research' and 'extension' activities into joint agricultural innovation projects, which should foster better collaboration and a stronger orientation on concrete innovation results.

1. Introduction

Agriculture remains an important economic activity in Suriname, providing employment and income to some 17% of the economically active population. Nevertheless, the sector has gradually fallen behind in competitiveness over the years, which has resulted in a widening deficit on the country's agricultural and food trade balance. This is disappointing, also given the fact that Suriname has great agricultural potential in terms of agro-ecological conditions and land that could be brought (back) into production. The intention of the government is to reverse this situation – raise the competitiveness of the agricultural sector and turn the agricultural and food trade deficit into a surplus. In the words of the President of the country: “Suriname should become the food basket of the Caribbean”.

Innovation is the key towards raising competitiveness. Hence this strategy sets out what the government aims to do to accelerate agricultural innovation. At the end of the day, however, it is the private sector that will have to adopt new production technologies and processes, raise its competitiveness, and develop new markets. Close collaboration between the public and private sector is essential for agricultural innovation to take off. The times that state-owned companies led the development of the agricultural sector in our country are long behind us.

After decades of relative decline in agricultural research and extension capacity, this strategy sets out to reverse this trend by: (i) investing in human resources and infrastructure; (ii) adopting a more results-oriented culture in the form of innovation projects; (iii) increasing stakeholder participation in innovation processes; (iv) reorganizing the Extension Service; and (v) introducing an Agricultural Innovation Board as a platform for agricultural innovation actors and stakeholders to meet, discuss innovation options, and coordinate their activities.

2. Strategic Guiding Principles

The **vision** of this strategy is that Suriname will have established itself as the food basket of the Caribbean by 2025.

The **mission** of the strategy is to promote and facilitate innovation among farmers in order to enhance their competitiveness in local as well as overseas markets.

Guiding **core values** of the agricultural innovation strategy are:

1. An integrated and holistic ‘agricultural innovation system’ approach → linkages important
2. Focus on results → clear measurable targets
3. Import of knowledge and technology is key to Suriname’s agricultural innovation strategy
4. Responsiveness to stakeholder (farmers, processors, exporters, consumers) needs
5. Stimulation of entrepreneurship and learning among farmers and fishermen
6. Dynamic, learning organization → experiment with different approaches

3. Situational Analysis

3.1 Key actors and problems

The agricultural research and extension system of Suriname comprises the following key actors:¹

- (1) Agricultural Research Sub-Directorate (ARSD) of the Ministry of Agriculture, Animal Husbandry and Fisheries (LVV). ARSD, which focuses on crops only, comprises a large number of divisions, including several divisions that deal with inspection and control functions. Crop research focuses primarily on fruits, vegetables and flowers/ornamentals. A new cluster laboratory is currently under construction, encompassing laboratory facilities for soil, crop protection, seed quality control, post-harvest, weed management and processing. In addition, ARSD has four agricultural experimental gardens in various parts of the country. Total staff: 136 (of which 16 researchers);
- (2) Agricultural Sub-Directorate, LVV. Responsible for crop extension. Most of the extension staff is spread over the country in regional and resort offices. Educational profile of extension staff very weak and the dominant extension approach is that of 'farm visits'. A reorganization of the Extension Service has been pending for quite some time. Total extension staff: 152;
- (3) Livestock Sub-Directorate, LVV. Research and extension activities integrated into a single unit. Six technical focal points operate as subject matter specialists – they conduct some research, but focus more on technology transfer. In addition there are 15 livestock extension officers based in the different resorts. Total research and extension staff: 21;
- (4) Fisheries Sub-Directorate, LVV. The Fisheries Sub-Directorate does have a Statistics and Research Division, but currently this division mainly deals with compiling statistics. There is no extension division, but sometimes ad hoc training events are being organized. In addition, there is a commitment to establish two aquaculture research and training centers – one for brackish water and one for fresh water. Total aquaculture research and extension staff: two aquaculture specialists;²
- (5) 'Anne van Dijk' Rice Research Organization (ADRON) operating under the National Rice Research Institute Foundation (SNRI). ADRON is responsible for rice research, including rice breeding. It currently is also involved in rice seed production, but this activity will be transferred to a separate entity under SNRI in the coming year. This should allow ADRON to focus more strongly on its research task. ADRON also operates a technology transfer program. Total staff: 61 (of which 4 researchers);
- (6) Center for Agricultural Research in Suriname (CELOS), 'Anton de Kom' University of Suriname. Conducts crop and forestry research. The informal division of labor between ARSD and CELOS is that crop research by CELOS focuses on crop production in the interior areas, while ARSD focuses on crop production in the coastal zone. In the case of CELOS the emphasis in its research approach is more on integrated agricultural production systems rather than on mono-cropping. Nevertheless, it has pioneered in recent years a cassava research program. Forestry research includes an important agro-forestry component. CELOS owns quite a bit of laboratory and experiment station facilities that require updating. These facilities are also used by students and staff from the university. Total staff: 127 (of which 14 researchers); and

¹ For a more detailed review see the diagnostic paper that was prepared in preparation of this strategy.

² The Fisheries Department has 1-2 aquaculture specialists in house at the moment, but they are not doing any research.

- (7) Faculty of Technical Sciences, 'Anton de Kom' University of Suriname (FTW-ADEKUS). Some research by faculty staff as well as by students. In particular MSc theses by students of the recently established Master of Science Program on Sustainable Management of Natural Resources (SMNR) can be of interest to the agricultural sector. The total amount of budget and staff time dedicated to agricultural research is significant, but difficult to quantify.

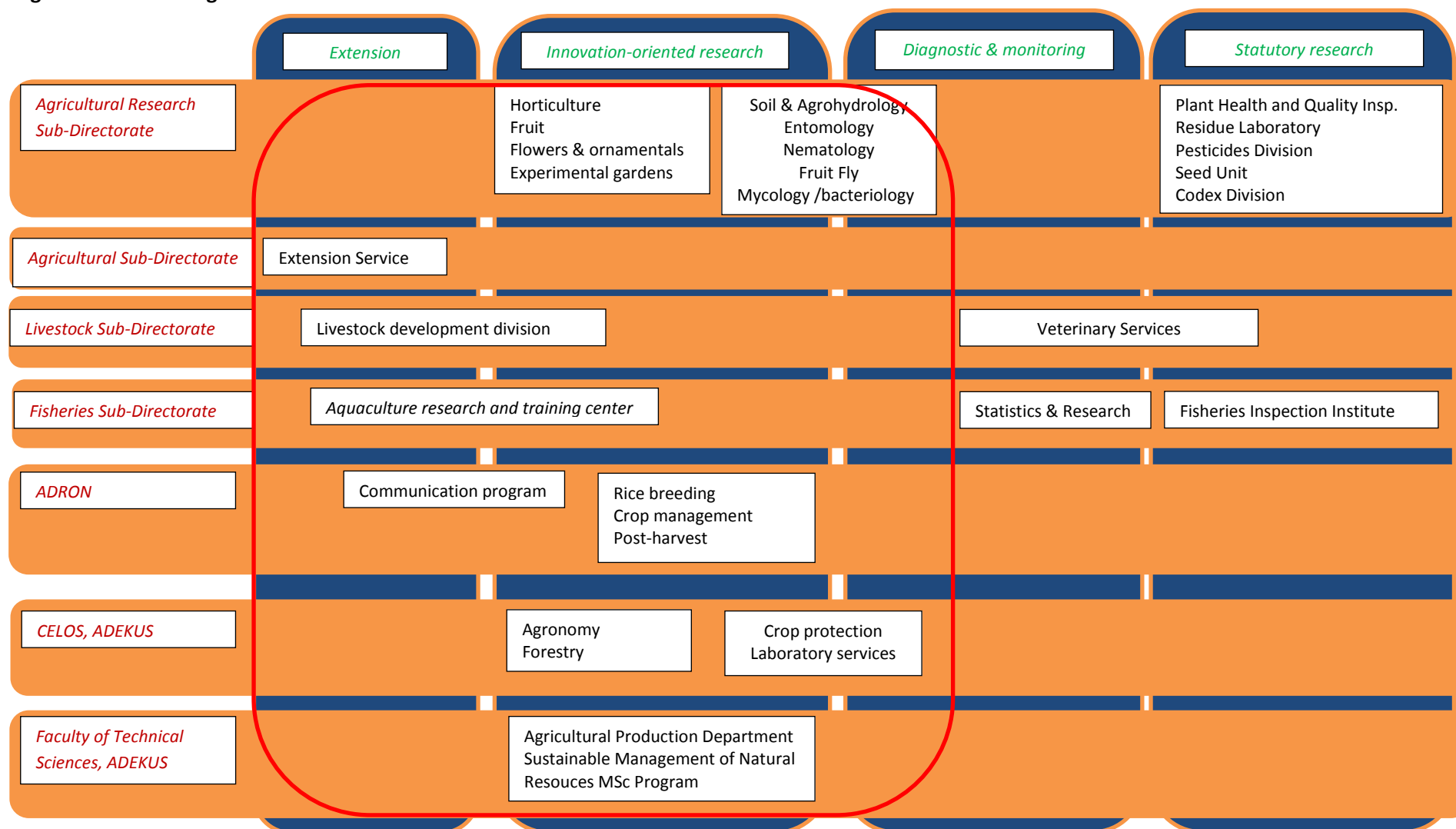
The research and extension activities of the different actors can be clustered in the following functional categories: (i) extension; (ii) innovation-oriented research; (iii) diagnostic & monitoring; and (iv) statutory research (i.e., scientific analysis that the government is obliged to perform as part of its control functions). This classification of the different entities is depicted in Figure 1. The focus of this strategy is primarily on the 'extension' and 'innovation-oriented research' functions (the activities within the red box). Research in support of control functions will be dealt with under other strategies such as the Agricultural Health and Food Safety Strategy, etc. Nevertheless, these strategies overlap as they use the same laboratory facilities and sometimes also the same staff. The 'diagnostic and monitoring' function is relatively small and is in the case of crops included in the innovation strategy, but in the case livestock (i.e., veterinary services) it is left outside the present strategy.

Table 1 provides an overview of the total recurrent and development budget for agricultural research and extension in Suriname in 2013. The development budget stands out as being rather ambitious. However, the historical record is that actual development expenditures tend to be a lot lower than the budgeted expenditures (i.e., on average 40-60% less), while in the case of recurrent expenditures the difference between budgeted and actual expenditures tends to be minimal. What usually happens is that the implementation of 'development' activities is being delayed in time. They subsequently reappear in the next year development budget.

Table 1: 2013 Budget for Agricultural Research and Extension in Suriname

	Crops	Livestock	Fisheries	Forestry	Total
<i>Recurrent budget</i>	<i>(SRD million)</i>				
ADRON (estimate)	3.500				3.500
LVV-Agricultural Research Sub-Directorate	5.933				5.933
LVV-Agricultural Sub-Directorate	4.489				4.489
LVV-Livestock Sub-Directorate		0.976			0.976
LVV-Fisheries Sub-Directorate			0.000		0.000
CELOS-ADEKUS (estimate)	4.000			4.000	8.000
FTW-ADEKUS	NA	NA	NA	NA	NA
Subtotal	17.923	0.976	0.000	4.000	22.898
<i>Development budget</i>					
ADRON					0.000
LVV-Agricultural Research Sub-Directorate	20.179				20.179
LVV-Agricultural Sub-Directorate	1.614				1.614
LVV-unspecified research and extension	17.436				17.436
LVV-Livestock Sub-Directorate		5.000			5.000
LVV-Fisheries Sub-Directorate			15.708		15.708
CELOS-ADEKUS					0.000
FTW-ADEKUS	NA	NA	NA	NA	NA
Subtotal	39.229	5.000	15.708	0.000	59.937

Figure 1: Overview agricultural research and extension in Suriname



Most of the development budget for 2013 is going into building new infrastructure (joint laboratory, cluster laboratory, border control facilities, and aquaculture research and training center) and into the rehabilitation and redeployment of old infrastructure (state farm and agricultural experimental gardens). Only small amounts of the development budget (except for the recurrent budget of ADRON, which is part of LVV's development budget) are actually going into research and extension activities.

In 2011, Suriname spent 1.1% of its AgGDP on agricultural research. This agricultural research intensity ratio (which only captured the recurrent expenditures) is substantially above the 0.6% average reported for middle-income countries³ and within the range of 1-1.5% recommended by the GCARD Roadmap.⁴ This relatively high score of Suriname is typical for a small country. A Caribbean study, for example, reported an average agricultural research intensity of 2.6% for small Caribbean countries (population 5.0 million <) in 1996 – ranging from 0.0% (some tiny islands) to 8.3% (Trinidad and Tobago).⁵ The problem with small countries is that they lack economies of scale. To maintain the same level of research services as large countries, they have to invest relatively more. In that light, it is recommended that Suriname aims at an agricultural research investment level of 1.5-2.0% of AgGDP. This is still substantially lower than what rich countries invest in public agricultural research – about 3% of AgGDP on average⁴.

Suriname's agricultural extension intensity yielded a 0.5% of AgGDP in 2011. In the case of public agricultural extension there is considerable less international quantitative data and analysis available that allows benchmarking the investment level by Suriname. A target of 1% of AgGDP for agricultural extension has been the norm for long. Modern communication media can help to bring extension costs down (and in particular so in countries with large populations), but this depends on the presence of rural infrastructure such as access to electricity. In poorer countries (but probably also in the interior areas of Suriname), literacy rates determine whether brochures and posters are effective extension tools. The general rule of thumb is that the poorer the country, the more it will cost to get an extension message across. It is recommended that Suriname aims at an investment level of at least 1% of AgGDP in agricultural extension.

In addition to less than optimal investment in agricultural innovation activities, the Diagnostic Review that was prepared in preparation of this strategy⁶ identified the following key weaknesses:

1. A lack of coordination and collaboration within the innovation systems between: (i) the different research agencies; (ii) between research and extension; and (iii) between government and the private sector (i.e. farmers, processors, traders, etc.);
2. A very weak focus on measurable results and hence a lack of accountability and transparency;

³ Beintema, N., G-J. Stads, K. Fuglie and P. Heisey. 2012. *ASTI Global Assessment of Agricultural R&D Spending: Developing Countries Accelerate Investment*. Washington, DC: IFPRI.

⁴ Global Forum for Agricultural Research (GFAR). 2011. *GCARD Roadmap: Transforming Agricultural Research for Development Systems for Global Impact*. Rome: GFAR Secretariat.

⁵ Roseboom, J., M. Cremers, and B. Lauckner. 2001. *Agricultural R&D in the Caribbean: An Institutional and Statistical Profile*. ISNAR Research Report No. 19. The Hague: ISNAR.

⁶ Roseboom, J. 2013. *Diagnosis of Agricultural Research in Suriname*. Paramaribo: IADB.

3. A major discrepancy between the innovation policy goals and ambitions as formulated in the White Papers and the capacity on the ground (both in terms of staffing and infrastructure) to implement them; and
4. The need for an in-depth review of the Extension Service that should result in a much needed reorganization of the Extension Service.

The results of a SWOT analysis of both research and extension in consultation with the principal actors are presented in tables 2 and 3. An overarching issue is the weak coordination and collaboration between research (ARSD, but also ADRON, CELOS and ADEKUS), extension and market development. Moreover, LVV lacks dedicated specialists regarding market development.

Table 2: SWOT Analysis Agricultural Research

<u>Strengths</u> # Rich history of agricultural research # Rice breeding program	<u>Weaknesses</u> # Two parallel structures, but both have been in decline for a long time # Large parts of the research infrastructure of ARSD and CELOS run down and out of date # Lack of funding for operational research costs at CELOS and ADEKUS # Weak coordination and collaboration # Currently, research activities at LVV do not occur in the form of projects and programs that formulate research activities with clear goals and targets # Poor recording and sharing of research results # Capacity spread very thinly / lack of critical mass # No capacity in farm economics # Educational profile of research staff low – hardly any MSc's left at ARSD # Weak research-extension linkages
<u>Opportunities</u> # Present government committed to further develop agriculture # Significant investments on their way towards upgrading the research infrastructure at LVV (i.e., cluster lab, experimental gardens) # Increased collaboration with foreign agricultural research organizations (Brazil, Cuba, Netherlands, Belgium, etc.) and regional research networks	<u>Threats</u> # Low interest in agricultural sciences as a career opportunity # Government salaries too low to attract qualified academic staff and keep them # A new government may be less interested to support the further development of agriculture

Table 3: SWOT Analysis Agricultural Extension LVV

<u>Strengths</u> # Presence of extension staff throughout the major production areas # Some experience with alternative extension approaches such farmer field schools and with GAP and IPM # Agri-business training provided by LVV in collaboration with the Chamber of Commerce	<u>Weaknesses</u> # Outdated, rather paternalistic approach (75% of the extension time is spent on farm visits) # No strategy, no concrete objectives, and no performance indicators # Educational profile of a large part of the extension staff (far) too low # Very limited or no backstopping by subject matter specialists # LVV extension officers used for other tasks such as data collection, supervising infrastructure maintenance, licenses, etc. # Extension focuses mainly on the agronomic side of agriculture, but not the economic one # Limited knowledge about the economics of farming (some extension officer have followed the agri-business course, but there is no dedicated subject matter specialist in the system) # Very limited knowledge about markets and market development # Percentage female extension officers very low (5%<)
<u>Opportunities</u> # Major effort to upgrade extension staff on its way # Increased use of other models of delivering advisory services such as modern media, farmer field schools, etc. # Transforming existing LVV infrastructure into training/demonstration/information centers # Contracting out of extension services # Present government committed to develop agriculture # FAO assistance in reform process (?)	<u>Threats</u> # Appointment of staff not on merit, but on political affiliation # Little interest in agriculture as a career among NATIN students # A new government may be less interested to support the development of agriculture

3.2 Ongoing policies and initiatives

The Agricultural Sector Plan 2005-2010⁷ argued that there is substantial fragmentation and duplication in agricultural research in Suriname, which is causing inefficiencies. Better collaboration and coordination between the different research actors is needed as well as a greater stakeholder participation in defining the research agenda. The Plan recommended giving agricultural research a financial impulse and improving collaboration and coordination between the different research actors. In order to achieve the latter, the Plan proposed the establishment of a National Agricultural Research Board. This Board was established in 2008, but met only twice in 2009/2010 and has been discontinued since then. Regarding agricultural extension, the Plan identified the following problems with agricultural extension: (a) weak links with agricultural research, which results in a low level of innovation; (b) low level of education and motivation of extension staff; and (c) limited budgets.

The current strategy of LVV has been laid down in a Policy Note 2010-2015⁸ and in a series of white papers (some nine in total) published in 2011. Policy statements regarding agricultural research and extension are quite scattered across these white papers and they very much vary in terms of the

⁷ Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2004. *Agrarisch Sector Plan 2005-2010*. Paramaribo: LVV.

⁸ Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2010. *Beleidsnota LVV 2010-2015: De Beleidsstrategie voor de Agrarische Sector*. Paramaribo: LVV.

amount of details provided. Moreover, there has been very little progress in the implementation of the (innovation) activities proposed by the white papers to date. In part this is due to lack of operational funding, but more importantly due to lack of capacity.

LVV's development budgets for 2012 and 2013 have been making a serious attempt to resolve some of the infrastructural constraints in the agricultural innovation system by rehabilitating some of the old research and extension infrastructure of LVV or setting up new ones:

- The four experimental gardens operating under ARSD are in the process of being rehabilitated and their demonstration capacity strengthened;
- The old State Farm is being transformed into a livestock training and demonstration facility, which will be run as state-owned foundation;
- The Fisheries Sub-Directorate is planning to set up one or two research and demonstration units for small-scale aquaculture production; and
- Some 14 greenhouses have been purchased and put up as demonstration facilities in different locations.

Also a start has been made with the training of extension officers, but there has been no systematic analysis of staff needs in research and extension that reflects the ambitions as spelled out in the white papers.

4. Strategy & Objectives

4.1 Innovation approach

The traditional approach to agricultural research and extension is to treat them as separate functions, each with its own organization and strategy. It has been known for long that this segregation often leads to weak linkages between research and extension, which limits their ultimate impact. Moreover, the very linear conceptualization of the innovation process tends to reduce innovation to technological innovation based on scientific experimentation only, while ignoring the hands-on learning by economic actors – that is learning by doing, using and interacting.

Innovation policies⁹ typically tend to mobilize a far broader set of instruments than just investment in public R&D and technology transfer schemes (such as tax deduction facilities or subsidies for private R&D, intellectual property rights, business incubators, risk capital for start-ups, promotion of specialization and clusters, and regulatory frameworks) and combine them in such a way that they create synergy benefits. It is important for more sector-specific innovation policies, such as an *agricultural* innovation policy, to coordinate their actions with the national innovation policy¹⁰ and concentrate on the instruments that are sector-specific.

⁹ Innovation policies first emerged in the developed countries in the 1990s, but were quickly adopted by developing countries as well.

¹⁰ Suriname does not have an integrated national innovation policy yet. The responsibility for the development of such a policy has been delegated to the Competitiveness Unit that has been setup within the Office of the Vice President (with support of IDB) in 2012.

By adopting an agricultural innovation system¹¹ perspective, this strategy aims at a more integrative and holistic approach towards agricultural innovation and places stronger emphasis on concrete *economic results*. This also brings organizational issues in value chains and markets into the domain of agricultural innovation. Raising production leads to nothing if the surplus cannot be sold in the market at an attractive price.

The difficulty of any holistic system approach is where to draw the border -- what can be considered the core of the agricultural innovation policy and what should be considered as enabling, external factors. Agricultural research and extension clearly belong to the core of the agricultural innovation policy, but other topics (e.g., agricultural education, rural infrastructure, regulatory frameworks) may not because they fall under other policy domains. In such instances it is important for the agricultural innovation policy to seek coordination with these other policy domains.

The constraints of being small

Suriname is a small producer. Production volumes of most agricultural commodities are too small to warrant the development of original new technology – in most instances the costs will exceed the benefits. Hence, the agricultural innovation strategy of Suriname has to focus primarily on the screening of imported technologies for their suitability under local production circumstances, adapt where necessary and possible, and popularize the most promising. The only exception is the rice breeding program. But even in this case, collaboration with other partners (in particular Guyana) will be needed.

By acknowledging the importance of technology importation, maintaining good international contacts and linkages with potential sources of technologies (such as research organizations in neighboring countries (in particular EMBRAPA), regional research networks (Procitropicos), and CGIAR centers) becomes paramount.

4.2 Innovation challenges and priorities

A series of White Papers, which were published by LVV in 2011, analyze the various challenges in the agricultural sector and describe how LVV intends to address them. Many of the challenges raised have an innovation component. This section summarizes the innovation priorities as identified by these documents, which reflect LVV's standing policy.

A definition of innovation and innovation systems

Innovation is the process by which individuals or organizations master and implement the design and production of goods and services that are new to them, irrespective of whether they are new to their competitors, their country, or the world.

Innovation is neither science nor technology but the generation and application of knowledge of all types (including scientific knowledge, but not limited to it) to achieve desired social and economic outcomes. Often innovation combines technical, organizational and other sorts of changes.

An innovation system is a network of organizations, enterprises and individuals focused on bringing new products, new processes and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance.

¹¹ For a state-of-the-art compilation of agricultural innovation system thinking see the 'Agricultural Innovation Systems: An Investment Sourcebook' published by the World Bank in 2012. It can be accessed on-line on the World Bank homepage.

4.2.1 Crops

The principal crops that currently are supported by research and extension activities are: rice (ADRON), cassava (CELOS), and vegetables, fruits and flowers & ornamental plants (ARSD). Moreover, some research on coconut palm has been revived recently (ARSD and CELOS). FTW-ADEKUS does not focus its research on specific crops, but has adopted an integrated agricultural production system approach. This approach is also the dominant perspective adopted by CELOS (see Table 4).

Linkages between research and extension are in particular weak in the case when ADRON, CELOS or FTW-ADEKUS are responsible for the research, while LVV should provide the extension. By aiming at joint innovation projects, collaboration between these different actors should be strengthened and streamlined.

Three functions that are closely related to agricultural innovation and that cut across all four actors include: (i) **diagnostic services**; (ii) **the maintenance of different seed and plant collections**; and (iii) **reproduction of seed and planting materials**. Coordination between the different actors is needed in order to streamline the performance of these functions and avoid duplication.

Rice

Rice is by far the biggest crop grown in Suriname (some 27,000 ha per season) and will remain the backbone of Suriname's agriculture in the foreseeable future. The steady decline of the rice production area that started in the 1980s has been stopped and since 2007 the rice production area has been growing again due to major investments in the rehabilitation of irrigation systems and favorable world market prices. The aim of the government is to substantially increase the rice production area in the coming years through rehabilitation and expansion of irrigation schemes. In addition, by supporting ADRON, the government aims to increase the efficiency (i.e., higher yields and lower costs) and quality of rice production and processing and hence increase the overall competitiveness of the rice sector. ADRON comprises the following five programs:

1. The *plant breeding program* aims to develop higher yielding varieties with good cooking and taste qualities as well as with a specific timing of flowering;
2. The *crop management program* conducts research that focuses on soil fertility, integrated pest management, zero-tillage and the control of weeds (in particular red rice). It also aims to target some of its research capacity on upland rice production in the interior areas, where yields are very much lower than in the irrigated areas.
3. The *post-harvest processing program* conducts research that focuses on a more optimal use of waste generated during the processing of rice and on the taste and cooking qualities of new rice varieties;
4. The *technology transfer program* will continue its use of mass media (radio, television and internet) and information brochures in order to reach farmers. ADRON will also continue its farmer field schools. However, ADRON does not have the staff (or the ambition) to provide on-farm extension services. This is a responsibility that lies with the Extension Service of LVV. Closer collaboration between ADRON and the Extension Service is needed in order to make sure that rice farmers receive the best extension services possible; and
5. The *rice seed production program*, which is responsible for most of the rice seed production within Suriname, will be transferred to a separate agency under SNRI in 2014 in order to let ADRON concentrate on its research and technology transfer mandate.

Table 4: Innovation Priorities for Crops

	LVV (research and extension)	ADRON	CELOS-ADEKUS	FTW-ADEKUS
Crops	Vegetables (prioritized crops: okra, eggplant, and bitter gourd) Fruits (prioritized crops: west indies cherries,, passion fruit, pineapple) Flowers & ornamental plants Palm trees (coconut and acai)	Rice (irrigated as well as some research on upland rice in the interior areas)	Cassava Communal agriculture	Not-specific
Research activities	Crop management (open air and <i>in greenhouses</i>) Crop disease control methods <i>Post-harvest processing</i> <i>Marketing and market development</i> <i>Organic production</i>	Crop management Rice breeding Post-harvest processing	Crop and cultivation system management Screening of cassava varieties <i>Identification of processing qualities of cassava varieties</i> <i>Mechanization</i> <i>Post-harvest processing</i> Agro-forestry	Sustainable agriculture (integrated agricultural production systems) Post-harvest processing
Extension activities	Farm visits Demonstrations Information materials Specific training courses Farmer field schools Good agricultural practices <i>Modern media</i> <i>Agri-business development</i>	Technology transfer program using modern media Farmer field schools	Information materials (brochures, manuals, etc.) Training	Information materials (brochures, manuals, etc.) Training
Diagnostic services	Crop diseases, soil analysis	Crop diseases, soil analysis	Crop diseases, soil analysis	Crop diseases, soil analysis
Maintenance of plant and tree collections	Citrus (wide range of species), banana, kumquat, cacao, coffee, cashew, mango, mangosteen, bay, soursop, carambola, bilimbi, akee, avocado, west indies cherry, palm trees (various species, including coconut), black pepper, etc.	Rice variety collection	Cassava	Agro-biodiversity
Reproduction of seed or planting material	Nurseries	Rice seed production	In-vitro propagation of planting material	--

Note: Themes in italics have been identified as priorities, but lack capacity to be implemented.

Cassava

Traditionally, cassava has been part of the mixed cropping systems that can be found in the interior areas. Production is mainly for own consumption and processing of cassava is done at household level.

When, in the early 2000s, the government looked for new opportunities to develop agricultural markets, cassava came up as a crop with considerable potential in terms of: (a) primary production; (b) value addition at the processing stage; and (c) import substitution as well as export. As part of an initiative to develop a cassava value chain that was launched in the mid-2000s, CELOS was asked to conduct research on the genetic and mechanized crop management aspects of cassava production. Over the past eight years, CELOS has collected more than 100 different cassava varieties – both imported from Columbia as well as collected locally. Each variety has been described and its specific characteristics documented. It is from this pool of genetic material that farmers can choose the variety that fits their specific production circumstances best. In addition, CELOS has developed a cassava rapid multiplication protocol. The actual take-off of the cassava value chain is currently underway – a processing plant is in place, some 800 farmers have been trained in cassava production by LVV, the first contracts between the processing plant and farmers have been signed, and cassava production has started.

Important areas of research that CELOS will undertake in the coming years regarding cassava include: (i) disease control in cassava production; (ii) improved cassava production techniques; (iii) mechanization of cassava production; and (iv) characterization of cassava varieties in terms of their processing qualities with emphasis on the utilization of cassava roots and foliage flour as poultry feed components. Because it is an emerging crop, the Extension Service will continue to pay specific attention to cassava production.

Vegetables, fruits, and flowers & ornamental plants

Suriname produces a wide range of vegetables, fruits, flowers and ornamentals plants, but most of them in relatively small volumes (i.e., less than 100ha under production). Only bananas, oranges, plantains and grapefruit stand out as the ‘bigger’ fruit crops (with production areas of respectively 2081 ha, 1414 ha, 440 ha, and 233 ha in 2010 -- FAOSTAT).

In the case of banana production, the responsibility for innovation is left to SBBS (a state-owned company) which dominates this industry.

The strategy for the other crops is to select a limited number of species in each category on which to focus the research and extension effort for a period of 3 years (2013-2015). After this period a new selection will be made in close consultation with the different sub-sectors. The idea is to rotate the limited capacity to conduct research and provide extension rather than spending resources too thinly and haphazardly.

In the case of vegetables, the following crops have been prioritized in consultation with vegetable exporters and based on market analysis in 2012: (i) okra, (ii) eggplant, and (iii) bitter melon. This strategy endorses this selection for the current period.

In the case of fruits, the following crops have been prioritized: (i) West Indies cherry; (ii) passion fruit (important potential as fruit juice); and (iii) pineapple (growing demands in export markets).

In the case of flowers and ornamental plants no specific species have been selected yet.

The primary focus of research for these crops will be on optimal crop management practices (with specific attention to greenhouse production and organic production) and plant disease control (with specific attention to integrated pest management). In addition, research should be started up for these crops on post-harvest handling and processing and on marketing and market development. This will require mobilizing or creating new research capacity.

Integrated production systems

Both CELOS and FTW-ADEKUS have adopted an integrated production system approach, whereby research focuses on the whole production system rather than specific crops in isolation. This approach is in particular relevant in the mixed production systems that exist in the interior areas.

LVV's White Paper on the Interior Areas identified the following innovation topics that would require input from research (in particular CELOS and FTW-ADEKUS) and extension:

1. Demonstration pilots to show the impact of adopting nitrogen-fixing trees and fallow periods on mixed production systems;
2. Demonstration pilots of intensified production systems;
3. Demonstration pilots of Taungya production systems, whereby, after clearing the forest, tree species are planted between the food crops in order to generate harvestable timber;
4. The establishment of small nurseries in order to supply indigenous farmers with planting material; and
5. The development of locally processed products that can generate additional income.

Other innovation priorities

Good Agricultural Practices (GAP) address the environmental, economic and social sustainability of on-farm processes in order to guarantee a product that meets national or international (Global GAP) safety and quality standards. Increasingly farmers are required to proof that they adhere to such standards by (overseas) processing industries, retailers, supermarkets, and consumers. This requires that farmers learn about these standards and how to comply.

The Extension Service will continue the GAP program that was launched several years ago. Continued awareness campaigns and training will be needed in the coming years, but should be more explicitly linked to concrete results – i.e., that a significant percentage of farmers are actually GAP certified.

In addition to GAP certification, there are various other **crop production standards** that farmers may have to adopt in order to access specific (export) markets. Together with the agricultural sector, LVV will identify what type of specific product and production standards may be needed to secure local and overseas markets and identify the most cost-effective way of doing this. This can be either by adopting an international public or private standard or by developing a national standard. In the latter instance, there is a role for the Suriname Bureau of Standards (SBS) to develop such a standard in collaboration with LVV and organize its certification and control.

In the case of **organic production**, a CARICOM standard for organically produced foods is currently under discussion (see website SSB). When approved, the government intends to adopt this standard as the national standard for Suriname and to organize its certification and control. ARSD will develop, in addition to conventional crop management guidelines, a set crop management guidelines that comply with organic production standards. The Extension Service will be responsible for organizing awareness and training in 'organic production' standards and procedures.

Poor business management at farm level (e.g., no book keeping) is a major weakness in the agricultural sector. This problem is currently being addressed by a series of training courses in **agri-business management** organized by the Extension Service in collaboration with the Suriname Chamber of Commerce. LVV will continue this activity in the coming years and improve its own knowledge base in this area – i.e., by training more extension officers in agri-business management and by creating one or more subject-matter specialist positions on this particular topic.

Market and value chain development is key to the development of all agricultural sub-sectors, but in particular those that aim to export. Instruments that LVV will use in order to promote market and value chain development include: (i) Feasibility studies into new market opportunities; (ii) Promotion of collaboration between value chain actors and stakeholders in innovation platforms (such as in the horticulture sector); and (iii) Provide assistance with resolving bottlenecks within value chains such as lack of adequate packaging and cold-storage facilities for fruits and vegetables or weak export promotion and marketing.

4.2.2 Livestock

Demand for livestock products exceeds supply in most livestock product categories, resulting in a relatively large dependence on imports (in particular chicken parts, milk powder and processed livestock products). Import levies are generally low, which means that there is relatively little protection from international competition. With a few exceptions, livestock production (and in particular by small producers) operates at a rather low level of technological development. Hence the strategy of the Livestock Sub-Directorate is to focus mainly on the promotion of existing (often imported) technologies and good agricultural practices. The White Paper on Livestock¹² prioritizes the following innovation interventions:

1. Transformation of the State Farm into a **livestock training and demonstration facility**. This idea was already launched under the Agricultural Sector Plan (ASP), but its implementation has been delayed due shortage of funds and capacity. It is now expected that the State Farm will be operational as a training and demonstration facility by 2015. Its focus will initially be on dairy production only, but could eventually be expanded to cover also production in small ruminants, cattle, and pigs;
2. **Grassland improvement** through extension, training and research. The quality of grassland is generally poor, which affects in particular production levels of dairy and meat cattle;
3. **Genetic improvement** of livestock through the promotion of better animal breeding and reproduction practices. When necessary, life animals (in particular cattle and small ruminants) will be imported by LVV in order to improve the genetic pool of livestock. At the

¹² Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2011. *Beleidswijtboek Veeteelt*. Paramaribo: LVV.

same time, the Livestock Sub-Directorate will continue to promote artificial insemination by providing such services;

4. Introduction of **Good Agricultural Practices (GAP)** among livestock farmers. Several GAP training events have already been organized for dairy and poultry farmers in 2012 and will be continued in the coming years. In particular the lack of hygiene in dairy production is a major challenge that needs to be tackled by the industry. New legislation regarding sanitary issues in the livestock sector is in the making, which will require farmers to be updated on the standards set by such legislation; and
5. Promotion of **small ruminant production**. This project has just entered its second phase. The key activities of this project are: (a) the provision of improved, imported livestock to farmers; (b) training of farmers in small ruminant production; and (c) the establishment of a network of small ruminant demonstration farms.

In addition, the White Book proposes the following set of studies to be outsourced by the Livestock Sub-Directorate to CELOS, FTW-ADEKUS, consultants or foreign research organizations and which address specific challenges or opportunities, including:

1. A feasibility study on **large-scale, export-oriented livestock production**;
2. A feasibility study on **livestock production in disbanded mining areas**;
3. A feasibility study on the development of **processed livestock products**. A large part of the livestock import comes in the form of processed meat products. Local production of such products could help to reduce the import bill and create local value addition;
4. Research into the development of **animal feed products on the basis of local feed components**. This study will have to be done in close collaboration with the three animal feed companies; and
5. Research into the development of **large-scale, mechanized production of local animal feed components**. Together with the study on the development of animal feed products on the basis of local inputs, this study aims at reducing the animal feed import bill.

4.2.3 Fisheries

The Fisheries Sub-Directorate has identified the following innovation priorities for the fisheries sector:

1. **Fish stock research**. In order to facilitate the implementation of government fisheries policies (e.g., the Fisheries Management Plan in order to secure the long-term sustainability of the fisheries sector), an in-depth understanding is needed of fisheries stocks and their development in the territorial sea areas of Suriname as well as the wider region. The latest regional stock assessment study took place in 1988 and needs an update urgently. This is an effort that cannot be accomplished by Suriname alone and hence the government will seek collaboration with the other countries in the region and CARICOM to pull off regional studies on this topic and mobilize international funding and expertise for such studies. At the same time, in-house data collection on fisheries and their analysis will be strengthened.
2. **Aquaculture**. Overfishing has become a major threat to the sustainability of the fisheries sector worldwide and puts very much a constraint on its further expansion. In order to supply the growing demand for fish (due to a growing world population and better incomes), aquaculture will have to play an important role. It is for that reason that the government

seeks to promote the development of aquaculture and in particular that of small and medium-sized aquaculture businesses. Two aquaculture research and training centers will be set up by the Fisheries Sub-Directorate -- one for brackishwater aquaculture in Commewijne and one for freshwater aquaculture in Coronie. Their mandate will be to test and adapt imported aquaculture technology to local circumstances, demonstrate aquaculture techniques, develop disease control expertise, provide training, information and advice, and function as a hatchery for specific species. Aquaculture-related innovation priorities that most likely will have to be outsourced or conducted in collaboration with third parties include: (i) The reduction of feed costs in aquaculture through local sourcing of feed stuff; (ii) Aquaculture marketing research; and (iii) A survey regarding the pollution of rivers in Suriname, the impact of such pollution on fisheries/aquaculture, and how to reduce the pollution.

3. ***Training of fishermen and other actors in the fisheries value chain*** has been prioritized in order to improve the hygiene, good practices and sustainability aspects of fisheries and aquaculture production. Moreover, a better awareness and understanding of the various government regulations regarding fisheries and aquaculture production should raise their effectiveness.
4. ***Product innovation*** is needed in order to increase the value addition by the fisheries processing industry. This task will be primarily a responsibility of the processing industry itself, but the Fisheries Sub-Directorate is willing to consider financial support for product innovation initiatives by the industry.

Where possible, the Fisheries Sub-Directorate will seek collaboration with staff and students of the BSc Program on Aquaculture and the MSc Program on Sustainable Management of Natural Resources of the University of Suriname (ADEKUS).

4.2.4 Renewal of innovation priorities

The innovation priorities identified in this strategy are not set in stone, but should be updated regularly. This will be done by organizing this strategy in the form of a portfolio of innovation projects that will change through time. Every year a part of the budget will fall free because projects come to an end, which opens up opportunities for new projects. LVV will be responsible to formulate, in close collaboration with the private sector, the overall innovation priorities (e.g., in the form of updated white papers or innovation foresight studies). Agricultural innovation projects will have to target such priorities. As of 2016, the selection of new agricultural innovation projects will be made more competitive and independent by introducing an external review mechanism of innovation project proposals.

4.3 Creating the right conditions for effective innovation service delivery

Lack of sufficient and effective innovation has undermined the competitiveness of the agricultural sector in Suriname. As a result, the deficit on the agriculture and food trade balance has increased over time. It is only through raising the competitiveness of the agricultural sector that this development can be stopped and reversed. A substantial expansion and quality impulse of the agricultural innovation system is needed. A major overhaul and upgrade of the agricultural

innovation system is needed in terms of human resources, infrastructure, and organization management in order to boost and accelerate innovation in the agricultural sector.

Given the scarcity in qualified staff and infrastructure within the agricultural innovation system, this strategy proposes to develop system-wide plans for both aspects in order to minimize duplication and maximize efficient use of these two important inputs. These plans will also have to reflect the innovation challenges and priorities as formulated in section 4.2.

4.3.1 Human resources: upgrading and expansion of staff

Agricultural research capacity at both ARSD and CELOS has eroded dramatically since the late 1970s. A substantial increase in the number of researchers at ARSD and CELOS that focus on innovation-oriented agricultural research is needed as well as an upgrade in their educational profile. There are also important bottlenecks at the technical support staff level.

A long-standing problem with agricultural extension at LVV is that a large part of the staff does not have the right educational qualifications for the job. In particular the large group of aspirant extension officers that has entered the Extension Service with no more than primary school plus a few years of vocational education constitutes a major challenge. They have to be trained internally in order to bring them up to an adequate level of agricultural knowledge and extension skills. For many years, however, this aspect has been neglected. A training program is currently underway to bring this group up to an acceptable level. At the same time, LVV will have to stop recruiting extension officers at aspirant level.

The reorganization plan for the Extension Service (see below) should provide an overview of the type of staff needed for the renewed Extension Service – most likely this will result in higher ‘minimum’ educational requirements for extension officer positions as well as a greater differentiation in the capabilities of extension staff, such as subject matter specialists and specialists in modern media.

The low educational level of farmers is another major bottleneck in the agricultural innovation system. The absence of adequate vocational education in agriculture in the country has been noted for many years. Together with the Ministry of Education, LVV is exploring the possibilities of establishing one or more agricultural schools.

A human resources development plan will be developed covering all government actors in the agricultural innovation system, taking into account priority areas for innovation as identified by the white papers and other policy documents. Once the plan has been approved by NAIB and LVV, it should form the basis for budget negotiations with the government and other potential donors. The AIB will be in charge of monitoring the implementation of the plan.

4.3.2 Infrastructure: rehabilitation and expansion

LVV has already committed itself to substantial investments in the rehabilitation of existing agricultural innovation infrastructure as well as in new infrastructure, including:

- The rebuilding and refurnishing of the joint laboratory facilities that burnt down in 2010;
- The rehabilitation of the four experimental gardens operating under ARSD. The demonstration role of these gardens will be strengthened. In addition, they will also house plant and fruit tree collections that have been built up over the years, operate as nurseries and provide ARSD researchers with experimental fields;

- The rehabilitation and transformation of the old State Farm into a livestock training and demonstration facility;
- The establishment of a new aquaculture research and training unit for small-scale aquaculture production; and
- A cluster laboratory for agronomy and crop protection.

Hence the agricultural innovation infrastructure investment plan will be largely a compilation of existing plans, but it should also identify and prioritize agricultural innovation infrastructure needs of the other innovation actors (ADRON, CELOS, and FTW-ADEKUS) that have not been addressed yet. Coordination between these infrastructure investments is much needed in order to minimize duplication and maximize efficient use.

An *infrastructure development plan* will be developed covering all government actors in the agricultural innovation system, taking into account the priority areas for innovation as identified by the white papers and other policy documents. Once the plan has been approved by NAIB and LVV, it should form the basis for budget negotiations with the government and other potential donors. The AIB will be in charge of monitoring the implementation of the plan.

4.3.3 Organization and management

Agricultural Innovation Board

LVV strongly believes that better coordination between the key actors within the agricultural innovation system is needed -- i.e., between the different agricultural research entities, between research and extension, and between government and the private sector. This strategy proposes a renewed attempt of introducing a coordinating mechanism, this time in the form of a National Agricultural Innovation Board (NAIB). This Board, appointed by LVV and reporting to LVV, will: (i) assume overall coordination within the national agricultural innovation system; (ii) promote collaboration between the different actors; and (iii) provide a platform for all stakeholders to meet and discuss new and ongoing innovation initiatives and exchange information. The NAIB will also be made responsible for: (a) providing policy advice to the government on agricultural innovation issues; (b) monitoring and evaluating the implementation of the agricultural innovation strategy; and (c) initiating the renewal of the national agricultural innovation strategy in due time.

The NAIB will comprise three sub-committees (crops, livestock and fisheries). Each sub-committee will comprise an uneven number of members representing the public and the private sector. The latter category should not only cover farmers' organizations or farmer's representatives, but also the processing industry, traders / input suppliers, etc. During the first term of the NAIB the chairperson of each sub-committee will be a representative from LVV. In the terms hereafter the chairperson will be elected. The chairpersons of the sub-committees will receive technical assistance and policy instructions through LVV.

The chairpersons of the three sub-committees together will form the central committee of the NAIB. The principal responsibilities of the central committee will be: (i) to coordinate policy advice on cross-sectoral innovation issues; (ii) monitor the implementation of the agricultural innovation strategy; and (iii) initiate the renewal of the agricultural innovation strategy. In as far innovation policy advice

is sub-sector specific, such advice can be delivered directly to the respective sub-directorates of LVV without any intervention by the central committee.

Innovation topics that cut across multiple sub-sectors (e.g., agri-business development, good agricultural practices) will be discussed in each sub-sector separately. Only when a joint policy recommendation is required (e.g., because there is a request from LVV for such a recommendation), the executive committee will have to coordinate and synthesize these discussions. In some instances, joint meetings between sub-sectors may be required to discuss issues where innovation mandates between sub-sectors overlap – e.g., the production of animal feed or integrated production systems.

A project is a set of time-bound activities that are planned and budgeted in order to achieve a predetermined goal (i.e., a product, service or result).

Project mode of operation

In order to make agricultural innovation more results-oriented and to facilitate a more intensive collaboration between research and extension, the innovation-oriented research and extension branches of LVV will adopt a project mode of operation. This requires quite a substantial overhaul of organizational and administrative procedures. The project mode of operation should also open up the opportunity to contract in contributions by third parties (other national and international research organizations, consultants, NGOs, etc.).

In order to orientate LVV's innovation activities more strongly on results, a project mode of operation will be (re-)introduced. The agricultural innovation strategy will be implemented as a portfolio of agricultural innovation projects. By definition, agricultural innovation projects will integrate research and extension activities and hence enforce collaboration between research and extension. Moreover, collaboration between LVV and third will be enforced by setting a certain minimum target for such joint projects.

The portfolio of agricultural innovation projects will gradually evolve through time – when projects are completed, budget and capacity falls free for new projects. The recommended duration of agricultural innovation projects is between 2-4 years.

The adoption of a project mode of operation will require the necessary administrative reconfiguration. Hence, a project operations manual will have to be developed that describes in detail the processes, systems and standards that will be used by LVV throughout the life cycle of an agricultural innovation project.

Key elements that will have to be covered by the project operations manual include:

1. *A standard outline for innovation project proposals* in order to make sure that all relevant information is recorded, including a problem analysis, a literature review, a description of the proposed project activities, their expected outputs, outcomes, and ultimate objectives (i.e., the project logframe), logframe indicators, a timeframe, and a budget.
2. *The selection process of agricultural innovation projects.* During the transition period of transforming ongoing innovation activities into agricultural innovation projects, the

management teams of the three sub-directorates (crops¹³, livestock and fisheries) will be responsible for selecting and approving the agricultural innovation projects. As of 2016, however, the selection of innovation projects will be organized more competitively and transparently by introducing a selection process that involves external reviewers¹⁴, which is managed by the sub-directorates. Moreover, at this time a staged selection process will be introduced whereby a pre-selection of project ideas (2 pages maximum) is made by each sub-directorate before full project proposals are being requested. This pre-selection should keep project development and selection costs at bay and make sure that project proposals are in line with the overall innovation priorities of LVV.

Each project proposal will be reviewed by two external reviewers, who should score them on three basic criteria: (i) Have beneficiaries been consulted; (ii) Can it be done (i.e., is the design of the project sound enough that it has a reasonable chance of being implemented successfully); and (iii) Is it relevant (i.e., are the expected economic benefits generated by the project sufficient enough to pay for the costs). If a proposal does not pass one or more of the three basic criteria, it should be rejected or sent back for revision. Subsequently, the proposals that pass the minimum criteria should be ranked by the external reviewers. At this stage other selection criteria could be brought into the scoring process that may result in bonus points such as collaboration with third parties, mobilization of third party funding or a specific focus on disadvantaged groups.

Based on this technical ranking by external reviewers, LVV management will make its budget allocation decisions whereby a trade-off may occur between budget availability (there may not be enough budget to fund all approved projects) and a certain balance in the agricultural innovation portfolio reflecting the overall innovation strategy.

3. *The implementation process of the agricultural innovation projects.* A specific innovation project portfolio management unit (IPPMU) will be established by LVV in order to facilitate the implementation of the “portfolio of agricultural innovation projects”, handling tasks such as the project selection process, project budgeting and administration, and M&E. Project managers and project staff will have to be instructed about their responsibilities during project implementation. The project manager will have specific reporting responsibilities regarding the resources allocated to the project, which can be monetary (i.e., the purchase of project-specific inputs) as well as non-monetary (e.g., staff time), the project activities implemented, and the results that have been obtained through the project. The latter requires that project proposals have formulated relevant and realistic progress indicators and that, at the start of the project, baseline data have been collected against which progress can be measured. Starting in 2015, the innovation project portfolio management unit (IPPMU) will be responsible for producing a consolidated M&E report for the whole portfolio of agricultural innovation projects every six months and highlight those projects that require management attention as they are not developing as planned.

In the medium-to-long run, the other actors in the agricultural innovation system may want to adopt the same project format as LVV. This would make it possible to create a centralized agricultural

¹³ In the case of crops it will be a joint decision of the management teams of the Agricultural Sub-Directorate and the Agricultural Research Sub-Directorate.

¹⁴ These external reviewers should be impartial as much as possible. This may be difficult in Suriname as the pool of experts to rely upon is rather small. Foreign reviewers should be mobilized when impartiality is a serious issue.

innovation project database. In the selection/development of the electronic project information system this aspect should be taken into account.

Possible merger of innovation-oriented research and extension

Closer collaboration between research and extension in agricultural innovation projects may provide the basis for a complete integration of the two activities in a single division or sub-directorate within LVV in the medium-to-long run. In this scenario, statutory research (in particular the AHFS unit) should continue separately.

Responsiveness to beneficiary needs

Innovation is a joint effort between government (providing research and extension) and the private sector (putting new knowledge and technology into use). Close collaboration between the two is essential in order to be successful. This strategy aims to enhance the responsiveness of government actors to beneficiaries through more and better consultation at the level of the Agricultural Innovation Board as well as at the level of individual innovation projects. In the latter instance, this means that innovation project proposals will have to indicate: (a) how beneficiaries have been consulted during the project preparation phase (if there has been no consultation, the proposal should be rejected); and (b) how they will be involved during the implementation phase.

Reorganization Extension Service

A reorganization of the Extension Service of the Agricultural Sub-Directorate of LVV has been long overdue. With the coming on board of: (i) more complicated and differentiated extension messages (i.e., integrated pest management, agri-business management, etc.); (ii) alternative extension methods (i.e., mass media, farmer field schools, etc.); and (iii) various new knowledge, demonstration and training centers, the portfolio of activities of the Extension Service is changing. This all has implications in terms of staffing and infrastructural needs.

4.3.4 Interaction with other partners within the system (ADRON, CELOS, FTW-ADEKUS)

Although a separate institute, ADRON is rather closely tied to LVV through budget and a strong representation of LVV on the Board of ADRON. ADRON's funding is in part based on a levy collected by LVV for the quality control on paddy export. It is LVV's intention to continue this funding instrument and explore opportunities to broaden and stabilize its funding base. By sitting on the Board of ADRON, LVV has a fairly strong influence over ADRON's strategy. More effort will be put into improving the link between rice research and agricultural extension. At the moment this link is very weak.

CELOS and FTW-ADEKUS are funded by the Ministry of Education. [The CELOS foundation board includes a representative of LVV](#). The Agricultural Innovation Board should provide a platform for LVV, CELOS, FTW-ADEKUS and other actors to coordinate their activities and cement collaboration.

Given the shortage of operational funding for research activities at CELOS and FTW-ADEKUS, LVV will initiate a funding modality that will provide operational funding for selected research activities of

national priority by these agencies. In this way CELOS and FTW-ADEKUS will be encouraged to contribute more strongly to the national agricultural innovation agenda.

4.3.5 Linkages with sources of knowledge and technology outside Suriname

As a small country, Suriname is highly dependent on the import of agricultural knowledge and technology. It is therefore important that Suriname maintains international contacts with national, regional and international agricultural research agencies and networks. Strategic guidelines on this topic will be developed, which identify for each sub-sector and commodity group: (a) the most relevant international contacts and sources of information; and (b) what is needed to maintain and intensify these contacts – this could be attending international meetings, participation in joint projects, explorative missions, membership fees in order to have access to regional research networks and international databases, maintaining bilateral contacts (e.g., with EMBRAPA), etc.. Some budget needs to be set aside for these activities. Moreover, agricultural innovation project proposals will have to be screened on whether: (a) a good analysis has been made of the international sources of knowledge and information; and (b) international collaboration has been secured. The latter is not a binding requirement, but should give projects some extra bonus points when compared with alternatives. Project budgets will be allowed to include costs related to such international collaboration.

4.4 Logical framework for the policy reforms in the agricultural innovation system

Table 5: Logical framework table

		Verifiable indicators / Means of verification	Critical assumptions
Goal	1. Agricultural growth accelerated 2. Rural poverty reduced 3. Agriculture & food trade balance improved	1. Agricultural growth rate above 4% per annum / AgGDP statistics 2. Rural poverty reduced by 20% / Poverty statistics 3. Deficit on the agricultural & food trade balance reduced by 25% between 2013 and 2018 / Trade statistics	
Outcomes	1. Performance of the agricultural innovation system substantially improved 2. Agricultural innovation uptake improved 3. Increased yields	1. At least 80% of the LVV-funded innovation projects have been completed on time / NAIB M&E Reports 2. At least 50% of the LVV-funded innovation projects can demonstrate that by the end of the project they have reached their innovation targets or more / Ex post evaluation reports of innovation projects. 3a. Rice yields have improved with 2% per year / Rice production statistics 3b. Carcass weight of cattle and pigs improved by 5% per annum / Slaughterhouse statistics	# Uptake of agricultural innovations sufficient enough to off-set higher wages due to the boom in the mining sector.
Outputs	1. Coordination and collaboration between the actors in the agricultural innovation system substantially improved. 2. Improved orientation of agricultural innovation activities on concrete, measurable results. 3. Improved performance of the Extension Service. 4. Educational qualifications and on-the-jobs skills of agricultural research and extension staff improved and key bottlenecks in staffing resolved. 5. Agricultural research and extension infrastructure rehabilitated and expanded. 6. Acquisition of foreign knowledge and technology improved.	1a. NAIB's subcommittees and central committee are holding regular meetings (at least four times a year) / Minutes of the meetings. 1b. The implementation of the agricultural innovation strategy is properly monitored and evaluated / NAIB M&E reports 1c. From budget year 2017 onwards, at least 30% of LVV-led innovation projects have an external (local or international) partner / LVV budget request for 2017 2a. By budget year 2017, all LVV-funded innovation activities are formulated in the form of innovation projects with clear targets and budgets / LVV budget proposal 2b. Independent, external evaluation of innovation projects has helped to improve the relevance and quality of the innovation projects / Documentation of project selection process. 2c. Performance of agricultural innovation projects properly monitored and evaluated / LVV M&E reports 3. The use of more collective extension methods (i.e., training,	# 'Enabling' innovation factors, such as macro-economic stability, rural infrastructure, credit, export facilities, and regulatory frameworks, are conducive to the uptake of innovations by farmers

		<p>demonstration plots, modern media, innovation platforms, etc.) rather than individual farm visits increased from 25% at present to 50% by 2018 / Survey</p> <p>4a. At least a 25% increase of mid-level and higher research and extension staff by 2018 / Staffing data</p> <p>4b. At least 50% of the research and extension staff received some form of on-the-job training between 2013-2018 / Training records</p> <p>5. Implementation of the Infrastructure Plan on schedule / NAIB M&E reports</p> <p>6. By 2018, at least 10% of the innovation projects have a foreign partner.</p>	
Activities	<p>1a. Establishment of the NAIB: by-laws developed and approved, chairpersons and members appointed by the Minister of LVV.</p> <p>1b. NAIB subcommittees and central committee regularly meet.</p> <p>1c. NAIB produces an annual M&E report, which monitors the implementation of the agricultural innovation strategy, and discusses the findings and recommendations of the report with all stakeholder</p> <p>1d. NAIB initiates the renewal of the Agricultural Innovation Strategy (2018)</p> <p>2a. Appointment of a taskforce to introduce a project approach</p> <p>2b. The development of a project operations manual</p> <p>2b. Training of staff in project proposal writing and project management</p> <p>2c. Establishment of an innovation project portfolio management unit at LVV, handling tasks such as the project selection process, project budgeting and administration, and M&E.</p> <p>2d. Transformation of LVV's innovation activities into projects: 25% by budget year 2015; 75% by budget year 2016; and 100% by budget year 2017</p> <p>2e. Introduction of external reviewers as part of the project selection procedure by 2016, affecting the 2017 budget allocation.</p> <p>2f. Production of a semi-annual, consolidated progress report of all LVV-funded agricultural innovation projects (starting mid-2015)</p> <p>3a. Appointment of a taskforce to organize the reorganization</p>		<p># Sufficient budget and staff to implement the reform plan</p> <p># All public and private actors within the agricultural innovation system will actively contribute to and participate in the implementation of the agricultural innovation strategy</p> <p># Sufficient budget can be secured to fund the HR and Infrastructure Plans</p>

	<p>of the extension service and recruitment of advisers or consultants (2013).</p> <p>3b. Development of a reorganization plan for the agricultural extension service completed by the third quarter of 2014</p> <p>3c. Implementation of the reorganization plan (2014- 2016)</p> <p>4a. Appointment of a taskforce to develop a Human Resources Management (HRM) Plan for the national agricultural innovation system (late 2013)</p> <p>4b. Development of the HRM Plan completed by mid-2014</p> <p>4c. Implementation of the HRM Plan (2014-2018)</p> <p>5a. Appointment of a taskforce to develop an Infrastructure Plan for the national agricultural innovation system (late 2013)</p> <p>5b. Development of the Infrastructure Plan completed by mid-2014.</p> <p>5c. Implementation of the Infrastructure Plan (2014-2018)</p> <p>6a. Appointment of a taskforce to develop strategic guidelines for international linkages in support of agricultural innovation</p> <p>6b. Development of the strategic guidelines completed by mid-2014.</p> <p>6c. Implementation of the international linkages strategy (2014-2018)</p>		
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5. Action Plan

Table 6: Action plan table

Intervention	Activities	Time period	Resources	Responsible unit
1. Establishment of an Agricultural Innovation Board	1a. Establishment of the NAIB: by-laws developed and approved, chairpersons and members appointed by the Minister of LVV.	Completed by the end of 2013	Staff time	LVV Directorate
	1b. NAIB subcommittees and central committee regularly meet (at least four times a year, but more often if needed).	Annually, from 2014 onwards	Staff time + budget remuneration members	LVV Directorate and Sub-Directorates
	1c. NAIB produces an annual M&E report, which monitors the implementation of the agricultural innovation strategy, and discusses the findings and recommendations of the report with all stakeholder	Annually, first report to be produced by 3rd quarter of 2015	Staff time + consultant(s)	NAIB central committee
	1d. NAIB organizes every two years an innovation conference for each sub-sector	2015	Staff time + consultant(s) + event costs	
	1e. NAIB initiates the renewal of the Agricultural Innovation Strategy (2018)	2018	Staff time + consultant(s)	NAIB central committee
2. Introduction of a project mode of operation	2a. Appointment of a taskforce to introduce a project mode of operation	September 2013	Staff time	LVV Directorate
	2b. The development of an operations manual for a project management system	October-December 2013	Staff time + consultant(s)	LVV Directorate
	2c. Training of LVV staff in project proposal development and writing and in project management.	January-March 2014	Staff time + trainers	LVV Directorate
	2d. Establishment of an innovation project portfolio management unit at LVV, handling tasks such as the project selection process, project budgeting and administration, and M&E.	From 2014 onwards	Establishment costs + yearly operational costs	LVV Directorate
	2e. Transformation of LVV's innovation activities into projects: 25% by budget year 2015; 75% by budget year 2016; and 100% by budget year 2017.	2014-2017. First batch of innovation project proposals needs to be ready by April 2014 in order to be integrated into the 2015 budget request which is submitted in May 2014.	Staff time + development budget to absorb non-recurrent innovation costs (e.g., contracting external partners).	LVV Directorate + Sub-directorates
	2f. Introduction of external reviewers as part of the	Annually, starting in 2016.	Staff time + budget to	LVV Directorate + Sub-

Intervention	Activities	Time period	Resources	Responsible unit
	project selection procedure by 2016, affecting the 2017 budget allocation.		compensate the external reviewers	directorates
	2g. Production of a half-yearly, consolidated progress report of all LVV-funded agricultural innovation projects	Annually, starting mid-2015	Staff time (costs covered by the innovation project portfolio management unit – see above)	Innovation Project Portfolio Management Unit
3. Reorganization Extension Service	3a. Appointment of a taskforce to organize the reorganization of the extension service and recruitment of advisers or consultants	ASAP	Staff time	LVV Directorate + Sub-directorate Agriculture
	3b. Development of a reorganization plan for the agricultural extension service.	January-June 2014	Staff time + consultant(s)	LVV Directorate + Sub-directorate Agriculture
	3c. Implementation of the reorganization plan	2014-2015	Staff time + reorganization costs	LVV Directorate + Sub-directorate Agriculture
4. National HRM Plan	4a. Appointment of a taskforce to develop a National Human Resource Plan for the national agricultural innovation system	Before the end of 2013	Staff time	LVV Directorate
	4b. Development of a National Human Resource Plan for the agricultural innovation system	January-June 2014	Staff time + consultant(s)	LVV Directorate
	4c. Implementation of the HRM Plan	2014-2018	Staff time + budget for training + budget for additional staff	LVV Directorate
5. National Infrastructure Plan	5a. Appointment of a taskforce to develop an Infrastructure Plan for the national agricultural innovation system	Before the end of 2013	Staff time	LVV Directorate
	5b. Development of a national Infrastructure Plan	January-June 2014	Staff time + consultant(s)	LVV Directorate
	5c. Implementation of the Infrastructure Plan	2014-2018	Staff time + investment costs	LVV Directorate
6. International linkages strategy	6a. Appointment of a taskforce to develop strategic guidelines on international linkages in support of agricultural innovation	Before the end of 2013	Staff time	LVV Directorate
	6b. Development of strategic guidelines on international linkages	January-June 2014	Staff time + consultant(s)	LVV Directorate
	6c. Implementation of the international linkages strategy	2014-2018	Staff time + budget	LVV Directorate

Table 7: Action plan time table

Activities completed by	Year																							
	2013		2014				2015				2016				2017				2018					
	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
Agricultural innovation strategy approved		X1																						
Establishment of an National Agricultural Innovation Board (NAIB)																								
NAIB established, by-laws developed and approved, and the chairpersons and members of the sub-committees appointed by the Minister of LVV			X1																					
Each sub-committee has met at least four times a year and has produced summary reports of the discussions and recommendations			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
The central committee of the Board has produced an M&E report on the implementation of the agricultural innovation strategy and submitted it to LVV and all NAIB members.									X3				X				X				X			
The central committee of the Board has initiated the renewal of the agricultural innovation strategy																			X					
Introduction of a project mode of operation																								
A taskforce to introduce a project mode of operation appointed		X																						
A project operations manual has been developed and approved			X																					
Staff trained in writing project proposals and in project management			X	X2																				
Project Portfolio Management Unit established				X2																				
At least 7% of LVV’s recurrent budget for 2015 is invested in agricultural innovation projects. At least 10% of these innovation projects are joint projects with external partners.				X2																				
At least 20% of LVV’s recurrent budget for 2016 is invested in agricultural innovation projects. At least 20% of these innovation projects are joint projects with external partners, of which at least one with a foreign partner.								X3																
As of the 2017 budget, all innovation activities of LVV are formulated as innovation projects. At least 30% of these projects are joint projects with external partners, of which at least two with a foreign partner.												X				X				X				
As of the 2017 budget, external reviewers are participating in the selection of innovation project proposals.												X				X				X				
Innovation projects submit half yearly progress reports to the Project Portfolio Management Unit, which analyses the results and submits a synthesis report (including alerts and recommendations) to LVV and NAIB.									X3		X		X		X		X		X		X			
Reorganization of agricultural extension																								
Taskforce to organize the reorganization of the Extension Service appointed and consultants/advisors identified		X																						
Reorganization plan for the agricultural Extension Service completed and approved			X	X2																				

Implementation of the reorganization plan (to be monitored by the Agriculture Sub-directorate).					X	X	X	X3	X	X	X	X	X	X										
Human resources																								
Taskforce established to develop a national human resources plan for the key government actors in the agricultural innovation system		X																						
National human resources plan submitted and approved			X	X2																				
Implementation of the National Human Resource Plan (to be monitored by NAIB)					X	X	X	X	X3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Infrastructure																								
Taskforce established to develop a national infrastructure plan for the agricultural innovation system		X																						
National Infrastructure Plan developed and approved			X	X2																				
Implementation of the National Infrastructure Plan (to be monitored by NAIB)					X	X	X	X	X3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Strengthening of international linkages																								
Taskforce established to develop strategic guidelines on international linkages in support of agricultural innovation		X																						
Strategic guidelines have been developed and approved			X	X2																				
Implementation of the strategy (to be monitored by NAIB)					X	X	X	X	X3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Note: The numbered targets (1, 2, and 3) are linked to the release conditions for the tranches of the Policy-Based Loan.