Diagnosis of agricultural research and extension in Suriname

Johannes Roseboom, IDB Consultant

DRAFT – 10 May 2013

Contents

[Acronyms and abbreviations iii](#_Toc355291485)

[1. Introduction 1](#_Toc355291486)

[2. Key actors 1](#_Toc355291487)

[2.1 Agricultural Research Department, LVV 1](#_Toc355291488)

[2.2 Agricultural Department, LVV 7](#_Toc355291489)

[2.3 Livestock Department, LVV 12](#_Toc355291490)

[2.4 Fisheries Department, LVV 13](#_Toc355291491)

[2.5 Anne van Dijk Rice Research Center Nickerie 14](#_Toc355291492)

[2.6 Center for Agricultural Research Suriname (CELOS), ADEKUS 16](#_Toc355291493)

[2.7 Faculty of Technical Sciences, ADEKUS 19](#_Toc355291494)

[2.8 Summary 20](#_Toc355291495)

[3. LVV Policy Regarding Agricultural Research and Extension 23](#_Toc355291496)

[4. Benchmarking of Agricultural Yields 25](#_Toc355291497)

[5. SWOT Analysis of Agricultural Research and Extension 29](#_Toc355291498)

[6. Options for Reforming Agricultural Research and Extension 31](#_Toc355291499)

[References 33](#_Toc355291500)

[Annex 1: Organograms 35](#_Toc355291501)

[Annex 2: Survey Results ARD 38](#_Toc355291502)

[Annex 3: Overview ARD Research Activities 39](#_Toc355291503)

[Annex 4: Survey Results CELOS 41](#_Toc355291504)

# Acronyms and abbreviations

ADEKUS Anton de Kom University of Suriname

AES Agricultural Experiment Station

AHFS Agricultural Health and Food Safety

ARD Agricultural Research Department

ADRON Anton van Dijk Rice Research Center Nickerie (ADRON)

CELOS Center for Agricultural Research Suriname

FTS Faculty of Technical Sciences

GAP Good Agricultural Practice

HACCP Hazard Analysis and Critical Control Points

HRM Human Reosurces Management

IDB Inter-American Development Bank

IGSR Institute for Graduate Studies and Research

IPPC International Plant Protection Convention

LVV Ministry of Agriculture, Livestock and Fisheries

M&E Monitoring and Evaluation

NATIN Natuur-Technisch Instituut (Technical School for mid-level professionals)

SNRI Foundation National Rice Research Institute

SRD Suriname Dollar

SWOT Strengths, Weaknesses, Opportunities, Threats

# 1. Introduction

This diagnosis forms part of the preparation of an IDB policy-based loan to the Government of Suriname. The aim of this document is to form a solid stepping stone towards the development of an agricultural innovation strategy for the Ministry of Agriculture, Livestock and Fisheries (LVV) within the next few months.

# 2. Key actors

The key actors in the agricultural research and extension system of Suriname are:

1. Agricultural Research Department, LVV;
2. Agricultural Department, LVV;
3. Livestock Department, LVV;
4. Fisheries Department, LVV;
5. ‘Anne van Dijk’ Rice Research Organization (ADRON);
6. Center for Agricultural Research in Suriname (CELOS), ‘Anton de Kom’ University of Suriname; and
7. Faculty of Technical Sciences, ‘Anton de Kom’ University of Suriname.

## 2.1 Agricultural Research Department, LVV

The Agricultural Research Department (ARD) has a rich history as the successor of the Agricultural Experiment Station (AES), which was established in 1903. It became an independent department within the Ministry of Agriculture in 1919, but its name change to Agricultural Research Department (i.e., Onderdirectoraat Onderzoek) is of a more recent date (19??). The research by AES focused primarily on crop production[[1]](#footnote-1), although during some periods it also covered livestock production (mainly grassland research). At its peak (1977/78), AES employed 24 post-graduate researchers – 20 MSc and 4 PhD (Villanueva 1986). After that, there has been a steady decline in post-graduate research staff at AES/ARD. The number of postgraduates dropped to 7 (all MSc) in 1986 (Villanueva 1986) and in 2013 there is only 1 MSc left at ARD.

In 2012, ARD had a total staff of approximately 136, of which 36 in general support functions (secretariat, financial administration, HRM, library, archive, cleaners, drivers, gardeners, etc.), 54 in support of the four experimental gardens (Boma, La Poule, Dirkshoop and Tijgerkreek-West) , and 46 in specific thematic (research) divisions (Table 1).

The experimental gardens are currently undergoing a major overhaul and upgrade. In the new setup they will have the following functions: (i) provide facilities for the research divisions to conduct experiments; (ii) function as demonstration farms to show farmers state-of-the-art technologies; (iii) maintain certain plant collections (e.g., manja, cocos, citrus and tomato) that have been collected over the years; and (iv) run nurseries in order to provide farmers with good planting materials.

**Table 1: Personnel Agricultural Research Department, LVV (2012)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **General support functions** | **Experimental gardens** | **Research divisions** | | | | | | | | | | | | | **Total** |
| **Agro-hydrology & soil fertility** | **Entomo-logy** | **Mycology & Bacteriology** | **Nemato-logy** | **Carambola fruit fly** | **Flowers and ornamentals** | **Horti-culture** | **Fruit trees** | **Seed unit** | **Pesticides** | **Plant health and quality inspection** | **Residue lab** | **CODEX** |
| *Researchers* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PhD |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MSc |  |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 1 |
| BSc |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 15 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Technicians* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HBO+ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MBO | 2 | 4 | 3 | 1 | 1 | 1 | 1 |  | 1 | 1 | 1 | 1 | 7 |  |  | 24 |
| Other | 1 |  |  |  | 1 |  |  |  |  |  |  |  | 2 |  |  | 4 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Support staff* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HBO+ | 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MBO | 3 |  |  |  |  |  |  |  |  |  |  |  | 1 |  |  | 5 |
| Other | 26 | 49 |  |  | 1 |  |  | 2 |  | 1 | 1 |  | 1 |  | 1 | 4 |
|  |  |  |  |  |  |  |  |  |  |  |  |  | 2 |  |  | 83 |
| Total | 36 | 54 | 4 | 2 | 4 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 15 | 1 | 2 | 136 |

Note: Another five ARD staff members were reported to be on loan to SURZWAM.

The research staff at ARD is spread very thinly over a large number of specializations – there are some 13 divisions (see Annex 1 for organogram ARD), each with very limited critical mass. All divisions are made up of only one or two researchers, assisted with a few technicians and support staff (see Table 1).

ARD undertakes three types of research, namely:

1. *Statutory* research is research that LVV is required to conduct in order to execute control functions that have been delegated to LVV by law, such as control of plant health and food safety, control of pesticide import and use, and control of seed quality;
2. *Diagnostic and monitoring* research aims to provide individual farmers and agribusinesses with critical information regarding soil fertility, diseases and pests and/or monitoring the incidence of diseases and pests in order to alert government and farmers; and
3. *Innovation-oriented* research. This is research that aims to develop, screen, test and validate new knowledge and technology to be adopted by farmers.

Table 2 classifies the research orientation of each division. Together, the Plant Health and Quality Inspectorate and the Residue Laboratory form the Agricultural Health and Food Safety Unit (AHFSU). They conduct statutory research. Other divisions whose research is mainly in support of their legal control functions are the Seed Unit and the Pesticides Division. The Codex division is not doing any research as such, but in its orientation it is closest to statutory research and therefore classified as such.

A breakdown of the research capacity in terms of research staff with a BSc or higher shows that ARD dedicates only a very modest portion of its capacity (41%) to innovation-oriented research (Figure 1). Moreover, this innovation-oriented research focuses mainly on the testing and validation of imported technologies and not on the development of new technologies as such. The latter fact explains why, according to the survey results (see Annex 2), the ARD divisions hardly publish anything in peer-reviewed, scientific publications. Their outputs are more in the form of leaflets, posters and manuals promoting tested and validated technologies. Statutory and diagnostic research activities also rarely result in scientific publications.

Statutory research absorbs a large part (44%) of ARD’s research capacity. Moreover, this capacity is projected to expand further in order to effectively implement the various legal control functions of LVV. For example, the Plant Health and Quality Inspectorate will undergo a major expansion in the coming years (although mainly at the level of technicians and support staff). While this is definitely needed, innovation-oriented research seems to be relatively neglected.

Diagnostic and monitoring research absorbs about 15% of ARD’s research capacity. ARD no longer has a functioning soil laboratory and depends on the laboratory facilities of CELOS for soil analyses. Based on these analyses and other soil characteristics, ARD staff provides farmers with fertilizer recommendations. As far as we know, no commercial soil analyses are offered by fertilizer suppliers in Suriname.

**Table 2: Mandate and Research Orientation of the ARD Divisions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Research divisions** | **Research mandate** | **Research orientation** | | |
| **Statutory** | **Diagnostic and monitoring** | **Innovation** |
| Horticulture | To test new varieties and improve agronomic management practices in horticultural production |  |  | X |
| Fruit trees | To test new varieties and improve agronomic management practices in fruit production |  |  | X |
| Flowers and ornamentals | To test new varieties and improve agronomic management practices in flower and ornamental production |  |  | X |
| Soil and agro-hydrology | To conduct diagnostic research in order to advise farmers on fertilization, irrigation and drainage. |  | X | X |
| Entomology | To conduct diagnostic and monitoring research as well as research to test new management strategies for insect control in horticultural crops |  | X | X |
| Mycology and bacteriology | To conduct diagnostic and monitoring research as well as research to test improved and sustainable control strategies of phytopathogenic fungus and bacteria in economically important crops |  | X | X |
| Nematology | To conduct diagnostic and monitoring research as well as research to test improved and sustainable control strategies of plant-parasitic nematodesin economically important crops |  | X | X |
| Carambola fruit fly | To conduct diagnostic and monitoring research and research to test fruit fly control and monitoring methodologies |  | X | X |
| Plant health and quality inspectorate | To control the health and quality of (unprocessed) imported and exported crops | X |  |  |
| Residue laboratory | To control agricultural products for chemical residues | X |  |  |
| Seed unit | To develop standards for the seed industry and make sure that they are met and to control the quality of imported seeds | X |  |  |
| Pesticides | To control the import of pesticides and to ensure that pesticides brought into the country comply with national legislation; to promote the proper use and disposal of pesticides. | X |  |  |
| Codex | To make sure that agricultural production standards and practices comply with international (i.e., Codex Alimentarius) standards. | X |  |  |

**Figure 1: Breakdown of ARD research capacity by type of research**

*Budget*

No specific budget figures have been received for ARD. However, assuming that the recurrent budget for ARD is more-or-less proportional to the share of ARD staff in total LVV staff, table 3 provides an estimate of ARD’s recurrent budget. Salaries as a share of the recurrent budget increased from 64% in 2007 to a rather high 79% in 2011. It is projected to drop to 71% in 2013, which is an improvement (in part due to a hiring freeze of staff) but still rather high.

**Table 3: Estimate of ARD’s Recurrent and Development Budget**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** |
|  | *(million SRD)* | | | | | | |
| *LVV budget* |  |  |  |  |  |  |  |
| Personnel costs | 16.482 | 17.647 | 22.270 | 26.836 | 27.977 | 27.599 | 31.048 |
| Operational costs | 4.450 | 4.155 | 5.027 | 5.525 | 5.964 | 7.489 | 9.086 |
| Capital costs | 4.734 | 3.959 | 0.997 | 1.669 | 1.352 | 2.492 | 3.703 |
| Total recurrent expenditures/budget LVV | 25.666 | 25.761 | 28.294 | 34.030 | 35.293 | 37.580 | 43.837 |
|  |  |  |  |  |  |  |  |
| Development budget LVV (approved) | 41.700 | 33.300 | NA | 33.633 | 26.146 | 66.988 | 110.678 |
| Development budget LVV (realized) | 24.118 | 16.771 | 51.983 | 15.025 | 15.431 | 44.757\* |  |
| Percentage realized (%) | 57.8 | 50.4 | NA | 46.6 | 59.0 | 66.8\* |  |
|  |  |  |  |  |  |  |  |
| *ARD budget* |  |  |  |  |  |  |  |
| ARD share in recurrent expenditures/budget\*\* | 3.474 | 3.487 | 3.830 | 4.606 | 4.777 | 5.087 | 5.933 |
| ARD share in development budget |  |  |  |  |  |  | 20.179 |

Source: LVV (2011, 2012); \* Tentative; \*\*Approximate based on the share of ARD staff in total LVV staff in 2012.

Approved recurrent budget and actual recurrent expenditures usually differ only slightly. In the case of the development budget, however, the difference between budgeted and actual expenditures tends to be quite large -- realized expenditures has for the past six years fluctuated between 47-67% of the approved budget. This seems to be a widespread problem throughout the government – implementation of plans is slower than expected which is often due to a lack of implementation capacity. Moreover, the volume of development expenditures has been quite volatile over the past seven years. The peak in development expenditures in 2009 was due to an exceptional amount of development assistance being spent in that year. Dutch development assistance was cancelled in 2010, which explains the decline in LVV’s development budget in 2011 (although, surprisingly, not in actual expenditures). In more recent years, however, LVV’s development budget has recovered quite strongly to the point that one can wonder whether LVV has sufficient implementation capacity – the 2013 development budget is more than double the current budget.

Of the 2013 development budget of SRD 110.7 million, about SRD 63.5 million targets agricultural research and extension (Table 4). It indicates a relatively strong commitment of LVV to these activities. The largest part of that budget (SRD 34.9 million) goes to activities that have both a research and extension component such as the establishment of an aquaculture research and demonstration station by the Fisheries Department (SRD 15.5 million) and the small ruminant project of the Livestock Department (SRD 2.0 million). A rather unspecified amount of SRD 14.25 million is available for agricultural research, extension and development under the agricultural infrastructure and export promotion budget line.

**Table 4: The Agricultural Innovation Component in the 2013 Development Budget of LVV**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Total** |  | **ADRON** | **ARD** | **Extension** | **Mixed** | **Subtotal innovation** |
|  |  | *(million SRD)* | | | | | | |
| 100 | Alliance | 1.086 |  |  |  |  |  |  |
| 102 | Commewijne | 0.275 |  |  |  |  |  |  |
| 103 | National Parcs | 0.750 |  |  |  |  |  |  |
| 105 | ADRON | 3.479 |  | 3.479 |  |  |  | 3.479 |
| 106 | Land reclaim and development | 1.000 |  |  |  |  |  |  |
| 108 | Maintenance rural infrastructure | 15.000 |  |  |  |  |  |  |
| 118 | Gender | 0.070 |  |  |  |  |  |  |
| 119 | Institutional development | 15.632 |  |  | 15.429 | 0.203 |  | 15.632 |
| 120 | Water boards | 4.859 |  |  |  |  |  |  |
| 121 | Knowledge development and transfer | 1.000 |  |  |  | 1.000 |  | 1.000 |
| 122 | Promotion private sector development | 0.411 |  |  |  | 0.411 |  | 0.411 |
| 124 | Agricultural census | 0.300 |  |  |  |  |  |  |
| 126 | Livestock | 11.332 |  |  |  | 3.050 | 1.950 | 5.000 |
| 127 | Fisheries | 25.470 |  |  |  | 0.175 | 15.533 | 15.708 |
| 130 | Promotion agricultural sector development | 3.186 |  |  |  |  | 3.186 | 3.186 |
| 134 | Construction | 0.828 |  |  |  |  |  |  |
| 135 | Agricultural infrastructure and export promotion | 26.000 |  |  | 4.750 |  | 14.250 | 19.000 |
|  |  |  |  |  |  |  |  |  |
|  | Total | 110.678 |  | 3.479 | 20.179 | 4.839 | 34.919 | 63.416 |

Source: LVV (2012)

ARD receives its development budget through two budget lines, namely ‘institutional development’ and ‘agricultural infrastructure and export promotion’. Most of the ARD development budget for 2013 (SRD 20.2 million) goes to building up the agricultural health and food safety program (SRD 10.3 million), the establishment of the cluster lab (SRD 6 million), and the rehabilitation of the experimental gardens (SRD 3 million). There is hardly any investment in concrete research activities. The only exception is a budget line of SRD 0.4 million for research in floriculture.

Agricultural extension receives development budget support through various budget lines, most importantly SRD 3 million for the transformation of the State Farm into a livestock training and demonstration facility, SRD 1 million for the training of extension officers, SRD 0.4 million for an agri-business training program, and SRD 0.2 million for a Global GAP training program.

*Survey results*

The research divisions indicate that they are interacting in a fairly intensive manner with the extension service and that they are involved in: (i) the development of information brochures, posters and manuals; (ii) training events targeting extension officers and farmers; and (iii) providing analytical and other services to farmers in collaboration with the extension service. However, ARD staff also noted during discussions that the extension service often promotes technologies that are not validated by ARD.

According to the survey results (see Annex 2 for a summary), the research divisions of ARD regard the research infrastructure as fairly sufficient to insufficient. The soil fertility, the pesticides and the flower and ornamental divisions report lack of adequate research infrastructure as a critical bottleneck. For example, the soil fertility division does not have a functioning soil laboratory at the moment.

The research divisions are on average positive about their operating budgets which are considered to be fairly adequate to adequate. As one the respondents indicated, the most critical bottleneck is the lack of qualified personnel not operating budget.

Most research divisions have participated in international workshops, seminars or conferences over the past three years. The Fruit Fly Division is the most active as it participates in some international research projects (including membership of the Technical Panel on Fruit Flies of IPPC). Nevertheless, the research divisions are less positive about their access to international literature and sources of knowledge.

The overall picture that emerges from the surveys and the annual division reports (see Annex 3 for an overview of research activities) is of a department with a multitude of relatively isolated research activities, without much of an overall vision of what it wants to accomplish. For most of the activities there are no clearly documented objectives and targets. Without these no proper M&E is possible. This also explains why respondents were unable to provide adoption scores for many of the research activities. There is no culture within ARD to organize activities in projects, except when there is external funding involved (which currently is almost negligible). In order to make ARD more impact-oriented, it is recommended that ARD introduces a strict project culture for all *innovation-oriented* research activities – each with clear objectives and targets.[[2]](#footnote-2) This would switch the emphasis in reporting within ARD from annual division reports to annual (or, if deemed necessary, more frequently) progress reports of projects. Projects involving only one division are possible, but projects involving multiple divisions should be more the norm. Moreover, projects can also mobilize external partners (e.g., extension and other research organizations) when necessary.

Each innovation-oriented research project proposal should go through a formal approval process, which screens it for relevance, quality and cost-effectiveness. This can be done internally, but in many countries such approval of research projects is organized externally in the form of competitive research funding schemes. For the moment, we suggest LVV settles for an internal approval process with external input from farmers and other stakeholders and specialists. The research system is just too small to carry the fixed costs of a competitive agricultural research funding scheme.

## 2.2 Agricultural Department, LVV

The main responsibility for agricultural extension in Suriname lies with the Agricultural Department of LVV, but focuses only on crops. The responsibility for livestock extension is with the Livestock Department of LVV. In addition, ADRON has a dedicated technology transfer program in rice production, using mainly mass media instruments as it does not have extension field officers. CELOS and ADEKUS also claim to do some extension work, but they do not employ dedicated extension staff. There are also some NGOs active in agricultural extension. Most of them work in the interior areas. They often rely on LVV for technical backstopping. The Caribbean Institute, a local NGO, is active in the coastal zone promoting: (a) ‘plant clinics’, which is an idea backed internationally by CABI; and (b) organic vegetable production. IICA is another actor that supports technology transfer activities in the form of training events and the like.

The Agricultural Department of LVV is in charge of extension regarding crop production. It employs a cadre of 132 extension officers, of which the large majority (73) has aspirant status (Table 5). Except for a small team at headquarters and the extension officers for the interior, most of the extension officers are based in the different regions and resorts.

**Table 5: Distribution of the Extension Officers of the Agricultural Department**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Category** | **Agricultural department** | | | | | **Total** |
| **East** | **Middle** | **West** | **Interior** | **HQ** |
| Senior extension officer | 5 | 10 | - | 3 | 1 | 19 |
| Junior extension officer | 1 | 9 | 5 | 1 | 1 | 17 |
| Aspirant extension officer | 20 | 50 | 13 | 13 | - | 96 |
| Other | 8 | 9 | - | 1 | 2 | 20 |
| Total | 34 | 78 | 18 | 18 | 4 | 152 |

Geographically, LVV has three regional offices (east, middle, and west) in the coastal zone. Each of the regions comprises several resorts, also with their own offices. In total there are 13 resorts in the coastal zone – two in the eastern region, six in the middle region, and five in the western region. The regional offices are led by a regional coordinator, which oversees all activities of LVV in that region, including extension. The regional coordinators report directly to the director of the Agricultural Department. The livestock extension officers (some 15 in total, but not included here) are also attached to the resort offices and report to the regional coordinator for sick leave, etc., but with regard to their activities they report to the Livestock Department (see next section).

Agricultural extension and other agricultural services for the interior areas have for long been problematic. Under the previous government, the Ministry of Regional Development operated an Agricultural Division that targeted these areas specifically. When the current government took over in 2010, this division was closed down and the responsibility for agriculture in the interior areas reverted back to LVV. The presence of LVV in the interior areas is currently minimal – there are no regional offices or resort offices for the interior areas in operation. The current strategy of LVV is to reach farmers in these areas (most of them subsistence farmers) also through NGOs.

The role of the agricultural extension officers is broader than just extension. About 24% of their time is spent on non-extension activities such as data collection (8%), supervising infrastructural works (6%), monitoring of diseases and pest (5%), and performing control functions (5%). The remaining 76% of their time is spent on actual extension activities. A breakdown of this time into specific extension activities is provided in figure 2. Farm visits are by far the dominant mode of agricultural extension (75%), followed by training events (7%), demonstrations (4%) and presentations at agricultural fairs and exhibitions (3%). No time was reported for activities such as developing information brochures and posters (apparently those are all being developed by ARD), keeping information centers open, and the operation of a website. Also very little time is spent on radio and television (2%). The strategic question for LVV to consider is whether this balance in extension activities is appropriate. If not, what would be a more appropriate balance? In other words, what type of extension activities should be expanded in the coming years and what does that mean for the profile of the extension staff needed?

**Figure 2: Breakdown of extension activities**

Differentiating the extension staff data per staff category (senior, junior and aspirant), senior extension officers stand out as spending slightly more time (80%, against 75% on average) on actual extension activities (and less on data collection). They also spend less time on farm visits (67%, against 75% on average) and more on other extension activities such training and farm field schools.

Table 6 provides an overview of the technologies promoted by the Extension Service of the Agricultural Department over the past five years. Unfortunately, for most campaigns no information was provided about the number of farmers reached. It reflects the absence of a proper M&E system within the ministry.

**Table 6: Technologies Promoted by the Extension Service of the Agricultural Department (2008-2012)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Technology** | **Farm visits** | **Training** | **Demonstration** | **Information brochures** | **Learning by doing** |
| *Permanent campaigns* |  |  |  |  |  |
| Intelligent Solar Insect Killer | X |  | X |  | X |
| Production in Surisombra greenhouse | X |  | X | X |  |
| (Global) Good Agricultural Practices (GAP) | X | X | X |  |  |
| Crop protection techniques | X | X |  |  |  |
| Organic farming | X | X |  |  |  |
| Plant propagation techniques |  | X |  |  | X |
| Composting techniques |  | X | X |  | X |
|  |  |  |  |  |  |
| *One-off campaigns* |  |  |  |  |  |
| Production of cassava |  | X |  |  |  |
| Production of bitter gourd according to GAP rules |  | X |  |  |  |
| Hydroponic technology | X | X |  |  |  |
| Drip irrigation |  | X |  |  |  |
| Agro-business management (in collaboration with the Chamber of Commerce) |  | X |  |  |  |
| Chili pepper production (in collaboration with IICA) |  | X |  |  |  |
| Leaf spot diseases in bananas |  | X | X |  |  |

Source: Questionnaire response.

Tables 7 and 8 provide an overview of respectively the training events and the demonstration trials organized by the Extension Service over the past three years. For the training events often external expertise is mobilized from ARD, CELOS and ADEKUS or is implemented in collaboration with a third party such as IICA (Chili pepper production) or the Chamber of Commerce (agri-business management). Often also extension officers attend the various training events as trainee. Only for one of the demonstrations collaboration with ARD has been reported, which confirms the impression of limited collaboration between research and extension.

**Table 7: Training Events Organized by the Extension Service of the Agricultural Department (2010-2012)**

|  |  |  |
| --- | --- | --- |
| **Technology / topic** | **Place(s) and date(s)** | **Number of farmers that attended (absolute and as a % of the target group)** |
| Plant propagation techniques | Saramacca; Onverwacht / Lelydorp (November 2011) | 100 participants; 60 participants (50% of the target group) |
| Composting techniques | Saramacca; Palissadenweg/ Meursweg | 100 participants; 50 participants (30% of the target group) |
| Cassava production\* | C.T.Boma; Saramacca (November/December 2012) | 45 participants; 150 participants |
| Crop protection methods | C.T.Boma (December 2012) | 20 participants |
| Greenhouse production | Wanica A-Kwatta (2012) | 90 participants |
| Fertilization | Saramacca | 100 participants |
| Leaf spot disease in bananas | C.T.Boma (May 2011) | 30 participants |
| Chili pepper production (in collaboration with IICA) | 's Landsboerderij | 30 participants (100% of the target group) |
| GAP training | Para | 100 farmers (50% of the target group) |
| Agri-business management (in collaboration with the Chamber of Commerce)\*\* | Paramaribo (June 2012); Nickerie (June 2012); Saramacca (November 2012); Commewijne and Marowijne (January 2013) | ?? |

Source: Questionnaire response + LVV website. \* In 2013, another 400 (part-time) farmers are expected to attend cassava production training events in some 10 different locations. In December 2012 also some 50 extension officers have been trained in cassava production. \*\* In total 11 training events have been planned.

**Table 8: Demonstrations Organized by the Extension Service of the Agricultural Department (2010-2012)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Technology / topic** | **Duration of the demonstration trial** | **Number of locations** | **In collaboration with research (yes/no)** | **Number of farmers that visited the demonstration trials (absolute and as a % of the target group)** |
| Leaf spot disease bananas | 2 months | 2 (Wayambo & Uitkijk) | Yes | ?? (100%) |
| Composting |  | 5 | No | 50 (30%) |
| Greenhouse production | On going | 5 | No |  |
| Good Agricultural Practices |  | Country wide | No |  |
| Solar Insect Killers | On going | Country wide | No |  |

Source: Questionnaire response + LVV website.

A crucial problem of the Extension Service in the Agricultural Department is the low level of education of the majority of the extension officers. All aspirant and junior extension officers should be brought up to the level of NATIN (i.e., mid-level, vocational education which offers an agriculture specialization). Senior extension officers currently do have NATIN (at least that is what we have been told), but should perhaps move up to a higher level. For the coming years, a development budget line of SRD 1 million per annum has been allocated for this purpose.

Another problem is a relatively weak link between the technical expertise sitting in ARD at headquarters and the extension services in the field. While researchers indicated that they were involved in answering questions of extension officers (in particular in crop diseases), extension officers do not feel that they get a lot of support. At the same time, researchers complain that extension officers promote technologies that have not been validated by their department. A closer link between the two is definitely desirable. Also the link between CELOS and LVV’s extension service is weak.

Specific problems that require attention in LVV’s extension strategy is the fact that a large part of the farmers (and in particular in horticulture) are part-time farmers that farm in their spare time. They are difficult to reach during normal office hours. Another aspect that has not received much attention is that of the position of women in agriculture. The agricultural extension staff is predominantly male. How does that influence their effectiveness?

An important change in the agricultural extension strategy of LVV is the greater use of ‘demonstration’ as a technology transfer technique. All four experimental gardens of ARD, for example, will be rehabilitated and their demonstration function strengthened. Also some of the other locations of LVV, such as resort offices, have been assigned a demonstration role. For example, several of them have recently been equipped with greenhouses. LVV staff at those locations (including extension officers) are expected to demonstrate and promote horticultural production under greenhouse conditions.

*Budget*

No specific budget figures have been received for the extension activities of the Department of Agriculture. However, assuming that the recurrent budget for the extension activities of the Department of Agriculture is more-or-less proportional to the share of extension staff in total LVV staff, table 9 provides an estimate of the extension budget of the Department of Agriculture. In addition, for 2013, the items in the development budget that target crop extension specifically have been identified to amount to SRD 1.6 million -- of which SRD 1 million for the upgrading of the extension staff, SRD 0.411 for agribusiness management training for farmers (in collaboration with the Chamber of Commerce), and SRD 0.203 for GAP training and certification (see also Table 4). In addition, there is an unspecified SRD 3.2 million budget line for agricultural sector development promotion that has several extension components, including, for example, the promotion of greenhouse vegetable production and home garden production.

**Table 9: Estimate of the Recurrent and Development Budget for Agricultural Extension Activities by the Agricultural Department**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** |
|  | *(million SRD)* | | | | | | |
| Recurrent budget for extension by the  Agricultural Department \* | 3.474 | 3.487 | 3.830 | 4.606 | 4.777 | 5.087 | 5.933 |
| Development budget for extension by the  Agricultural Department |  |  |  |  |  |  | 1.614 |

Source: LVV (2011, 2012); \* Approximate based on share of crop extension staff in total LVV staff in 2012.

## 2.3 Livestock Department, LVV

The Livestock Department of LVV comprises three principal divisions, namely: (i) Livestock Development; (ii) Veterinary Services; and (iii) Slaughterhouses (see Annex 1 for organogram).

LVV’s livestock research and extension activities are implemented by the Livestock Development Division, which comprises a livestock research and extension unit. It consists of a small group of technical experts (some six in total, of which 2 MSc, 2 BSc and 2 HBO) based at headquarters, 15 extension officers spread over the different resorts and a few support staff (Table 10). The technical experts function as focal points or subject matter specialists that feed and backstop the livestock extension program. They cover the following categories of animals: (i) cattle; (ii) dairy; (iii) poultry; (iv) pigs; and (v) small ruminants. The research of these focal points (if any) is limited mainly to the testing of imported technologies for their suitability under Surinamese circumstances and the development of recommendations regarding best practices.

**Table 10: Staff at the Research and Extension Unit of the Livestock Development Division**

|  |  |
| --- | --- |
| **Positions** | **Staff** |
| Focal points/subject matter specialists | 6 |
| Senior extension officers | 10 |
| Junior extension officers | 5 |
| Other support staff | ?? |
| Total | ?? |

Training events organized by the Livestock Development Division in recent years are summarized in table 11.

**Table 11: Training Events Organized by the Livestock Development Division**

|  |  |
| --- | --- |
| **Date** | **Training event** |
| January 2013 | GAP training dairy farmers in Commewijne |
| January 2013 | Training in artificial insemination of pigs at 99 Quality Farms |
| November 2012 | Hands-on training of farmers and transporters in ‘pregnancy recognition’ |
| September 2012 | Training poultry production for starters |
| May/June 2012 | GAP training dairy farmers in Santo Boma |
| June 2012 | Hands-on training of farmers and transporters in ‘pregnancy recognition’ |
| May 2012 | Training small-scale poultry production |
| May 2012 | GAP training dairy farmers in Houttuin |
| March 2012 | Train-the-trainers course in artificial insemination of sheep (in collaboration with IICA) |

Source: Website LVV

The Veterinary Services Division of the Livestock Department has some laboratory facilities (currently under reconstruction) and analytical capacity in support of government control functions regarding animal health. In addition, the same capacity is also being used to provide animal health services to farmers. However, the Veterinary Services are not mandated to do innovation-oriented research -- i.e. research that would lead to better disease control methods or medicines.

*Budget*

No specific budget figures have been received for the research and extension activities of the Livestock Development Division of the Livestock Department. However, assuming that the recurrent budget for these activities is more-or-less proportional to the share of the research and extension staff of the Livestock Department in total LVV staff, table 12 provides an estimate of the recurrent budget of the Livestock Department for livestock research and extension. In addition, LVV’s development budget for 2013 that targets livestock research and extension activities yields some SRD 5 million, of which SRD 3 million for the rehabilitation and transformation of the old State Farm into a training and demonstration center for the livestock sector, SRD 1.95 million for the promotion of small ruminants (mainly to be invested in the rehabilitation of infrastructure), and SRD 0.05 million for training in GAP and HACCP.

**Table 12: Estimate of the recurrent and development budget dedicated to livestock research and extension**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** |
|  | *(million SRD)* | | | | | | |
| Recurrent budget for research and extension by the  Livestock Department \* | 0.571 | 0.573 | 0.630 | 0.758 | 0.786 | 0.837 | 0.976 |
| Development budget for research and extension by the  Livestock Department |  |  |  |  |  |  | 5.000 |

Source: LVV (2011, 2012); \* Approximate based on share of crop extension staff in total LVV staff in 2012.

## 2.4 Fisheries Department, LVV

At present, LVV’s Fisheries Department does not have any dedicated fisheries research or extension capacity as such. In the case of research it depends mostly on external local (ADEKUS) and foreign technical expertise that help with stock assessments, specific studies, etc. In the case of extension, there are only ad hoc projects such as an FAO project in Nickerie that promoted fish production in rice fields (2004-2006) and one-off training events.

In order to manage the sustainability of the Surinamese fisheries sector, there is a need to monitor fisheries stocks more precisely and timely in order to make sound policy decisions regarding fisheries licenses. The current data collection focuses on fish catch, but hardly on fish stocks and fish stock dynamics. The Fisheries White Paper (LVV 2011g) highlights the urgent need for capacity building in this area.

The Aquaculture White Paper (LVV 2011h) prioritizes the development of small- and medium-scale aquaculture production. As part of this objective, the Fisheries Department aims to establish an aquaculture research and training center. An FAO study is currently underway looking into the possibilities of small-scale aquaculture production in Suriname. Based on this study, the next steps regarding an aquaculture research and training center will be taken.

*Budget*

Table 13 summarizes the amount of recurrent and development budget dedicated to fisheries research and extension by LVV. There is currently no recurrent budget that targets these activities, although there is a substantial development budget to create an aquaculture research and training center (SRD 15.533 million) and a small amount for the preparation of a training school for fisheries addressing in particular data collection issues (SRD 0.175 million).

**Table 13: Estimate of the Recurrent and Development Budget Dedicated to Fisheries Research and Extension**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** |
|  | *(million SRD)* | | | | | | |
| Recurrent budget for research and extension by the  Fisheries Department | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Development budget for research and extension by the  Fisheries Department |  |  |  |  |  |  | 15.708 |

Source: LVV (2011, 2012);

## 2.5 Anne van Dijk Rice Research Center Nickerie (ADRON)

The ‘Anne van Dijk’ Rice Research Center Nickerie (ADRON), established in 1994, operates under the auspices of the Foundation National Rice Research Institute (SNRI). SNRI/ADRON continues the rice research activities (and in particular the rice breeding) that in earlier years had been undertaken by the Foundation for the Promotion of Mechanized Farming (SML) between 1949 and 1993 and Adaptive Rice Research by the Ministry of Agriculture between 1973 and 1984. ADRON, which inherited the old rice research facilities of the Ministry of Agriculture, received financial and technical assistance from the European Union (EU) during the first phase of its development (1996-2001). During that phase a complete new building and facilities were setup.

The SNRI Board is appointed by the Ministry of Agriculture and is composed of government representatives of the Ministry of Agriculture, the Ministry of Finance and the Ministry of Trade and Industry; a representative of the university; and representatives of rice producers and processors (but this latter group is very much in the minority).

The overall impression of ADRON is that it is a small entity, but fairly well managed. It has proper planning (i.e., research strategy, annual plans) and M&E procedures in place. Its annual report is professional and informative. In addition to its three research programs (rice breeding, crop management and post-harvest processing), ADRON is also active in seed multiplication and technology transfer. Facilities and staff capacity at ADRON are very limited. For example, ADRON does not have a soil laboratory. Also its post-harvest research program is constrained by lack of adequate equipment and facilities.

Table 14 summarizes the development of staff and budget over the past three years. In 2012, ADRON’s income consisted of seed sales (20%), an export levy (14%) and a subsidy by LVV (66%). The latter is paid out of LVV’s development budget. The export levy (which is a fee for the quality inspection of rice export) is collected by LVV through its Plant Health and Quality Inspectorate. Of this income, 90% is going to ADRON. There has been some discussion that this levy is unfair as it only taxes those who export. Moreover, it only is charged on the export of unprocessed paddy and not on processed (i.e., polished) rice. A shift in export from unprocessed to processed rice in recent years has had a negative impact on this income stream. It is important that the rice sector continues to co-finance ADRON as this strengthens the ownership by the rice sector. A new funding formula may be needed to secure and expand ADRON’s funding base. At the same time, a greater representation of the rice sector on the ADRON board is warranted.

**Table 14: Staff and Budget of ADRON**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2010 | 2011 | 2012 |
| Post-graduate | 2 | 2 | 1 |
| Undergraduate | 1 | 2 | 3 |
| Other | 58 | 57 | 58 |
| Total | 61 | 61 | 61 |
|  |  |  |  |
| Expenditures | SRD 2.6 million | SRD 2.8 million | SR 3.1 million |
| Of which salaries | 62% | 68% | 65% |
| Of which operating costs | 28% | 27% | 28% |
| Of which investments | 10% | 5% | 7% |

ADRON currently comprises the following five programs:

1. **Breeding program**. Over the past 15 years ADRON has made some 1600 crosses, of which 36 resulted in promising lines[[3]](#footnote-3). Currently there are three ADRON lines (ADRON-125, ADRON-128, and ADRON-130) that are the most popular. They have been released in respectively 2004 (ADRON-125) and 2010 (ADRON-128 and ADRON-130). ADRON lines cover about 90% of the total rice area sown. Yields of these ‘non-hybrid’ lines under ideal circumstances are around 8 ton per hectare, which is reasonable, but not exceptional according to international standards.[[4]](#footnote-4) Average yields in farmer fields currently fluctuate between 4-5 tons per hectare harvested, which is close to the world average (see chapter 4 for a more detailed discussion).
2. **Crop management research program.** This program comprises the following sub-themes: (i) Soil fertility; (ii) Integrated Pest Management; (iii) Red rice and other invasive species; (iv) Soil preparation; and (v) Water management.
3. **Post-harvest research program**. This program currently focuses on the following themes: (i) Improving drying methods to increase milling yields; and (ii) Rice bran stabilization.
4. **Communication program**. This program started in 2005 in order to improve the technology transfer aspect of ADRON. Activities undertaken by the program include: (i) The production of information brochures, posters and billboards on various topics of relevance to rice farmers; (ii) Production of a newsletter ‘Aleisi Tori’; (iii) The production of information spots on radio and television; (iv) The operation of a website (including a set of on-line information videos); (v) On-farm research trials; (vi) Farmer field schools; (vii) Open days; and (viii) Answering questions of farmers and the general public. However, ADRON does not employ dedicated extension officers who visit farmers on their farm in the way LVV does. The problem is that the link between ADRON and the LVV extension officers is weak.
5. **Seed production program**. ADRON has some six hectares in use for the production of foundation or elite seed. This seed should be perfectly clean. This seed (some 8 ton) is used to be multiplied in two harvests into seed that is sold to farmers. The first harvest is on some 55 ha and the second harvest on 1,500 ha. This should yield sufficient seed to plant some 30,000 ha. ADRON contracts out a large part of the seed multiplication as it does not have sufficient capacity to do it all in house. However, it does have the responsibility to regularly test the final quality of the seeds and make sure that farmers get good quality seed.

## 2.6 Center for Agricultural Research Suriname (CELOS), ADEKUS

CELOS, established in 1967, operates as a semi-autonomous entity (it has its own board) under the auspices of the Aton de Kom University of Suriname (ADEKUS). Its budget, however, is part of the overall budget of the University of Suriname. In its early years, CELOS received a lot of support from Wageningen Agricultural University in the Netherlands. In more recent years, however, this line of support has almost vanished (there is still some collaboration in forestry).

*Structure*

CELOS currently comprises three research clusters, namely:

1. *Agronomy & crop protection*;
2. *Forestry* (including community forestry, agro-forestry, and biodiversity); and
3. *Laboratory services*, including: (a) wood technology, (b) plant tissue culture, (c) chemical analysis (soil, water, etc.), (d) microbiology, and (e) GIS and remote sensing.

Older organograms and descriptions of CELOS refer to a far broader set of research activities, including livestock and fisheries research. For the moment these activities are inactive due to lack of staff and funding. The informal division of labor between ARD and CELOS is that ARD concentrates on agricultural production in the coastal zone and CELOS on agricultural production more land-inwards in the savannah zone and on forestry.

In recent years, cassava has been the primary focus of the Agronomy & Crop Protection Cluster of CELOS. This crop was prioritized by the Agricultural Sector Plan 2005-2010 (LVV 2004) as a crop with considerable potential both in primary production as well as in processing. CELOS was asked to take the lead on it. As a first step it established collaboration with EMBRAPA in Brazil on cassava technology and research. Cassava research activities at CELOS in recent years have included the establishment of a cassava variety collection, the development of agronomic production recommendations, in-vitro propagation of cassava, and the development of knowledge regarding cassava diseases and disease control methods. These activities are supporting the current expansion of cassava production (a recent training program in cassava production attracted 400 participants) and the establishment of a cassava processing plant in Para. In addition to this work on cassava, the Agronomy Division is managing various plant and seed collections, which it tries to keep accessible for farmers – i.e. making planting materials and seeds available to farmers. A new line of research by the Agronomy Division is the development of sustainable integrated agrosilvipastoral systems.[[5]](#footnote-5)

The Forestry Management Division of CELOS falls outside the focus of our current study, except for the agro-forestry sub-division. This sub-division conducts research on agricultural production methods by farmers in the interior areas. Some of this work is done jointly with the agronomy division.

Several divisions of CELOS (together with ISGR) have contributed in 2011 and 2012 to a Roadmap Study on Biofuels in Suriname commissioned by Staatsolie. The Agronomy Division has also conducted some sugarcane field experiments for Staatsolie. Staatsolie has plans to setup a bio-ethanol plant to be fed by sugarcane at Wageningen.

In addition to its headquarters and experimental fields near Paramaribo (Leysweg -20 ha), CELOS has experimental stations in the following five locations:

1. Phedra in Para (5 ha) is being used for crop research;
2. Tijgerkreek West in Saramacca (30 ha) is being used for crop research;
3. Mapane in Para (2173 ha) is being used for forestry research;
4. Kabo in Para (1150 ha) is being used for forestry research; and
5. The Central Suriname Nature Reserve functions as a location for biodiversity research.

In addition, CELOS has greenhouse facilities covering 366 m2. The laboratory facilities of CELOS (covering some 2000 m2) have a double purpose. In addition to providing analytical services, they are also used for the training of students.

*Staffing*

Staffing of CELOS is summarized in table 15. In total CELOS has 14 ‘researchers’, of which 7 hold an MSc and 7 a BSc. In comparison to ARD, CELOS has a research staff that is about similar in size, but significantly better qualified. In part this is due to the fact that CELOS can pay better salaries than LVV. Similar to ARD, CELOS has a rather high support-staff-per-researcher ratio (8 per researcher). CELOS aims to upgrade some of its researchers to PhD level, by stimulating their PhD research efforts. However, keeping them at CELOS after they have obtained their PhD seems to be problematic.

**Table 15: Breakdown of CELOS Staff by Division, Category and Education Level**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Agronomy & plant diseases** | **Forestry** | **Laboratory services** | **Subtotal** | **Administration** | **Support Divisions** | **Total** |
| *Researchers* |  |  |  |  |  |  |  |
| PhD |  |  |  |  |  |  |  |
| MSc | 2 | 2 | 3 | 7 |  |  | 7 |
| BSc | 2 | 2 | 2 | 6 |  | 1 | 7 |
|  |  |  |  |  |  |  |  |
| *Technicians* |  |  |  |  |  |  |  |
| HBO |  |  | 1 | 1 | 1 |  | 2 |
| MBO | 2 | 4 | 5 | 11 |  | 3 | 14 |
| Other |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| *Support staff* |  |  |  |  |  |  |  |
| HBO |  |  |  |  |  |  |  |
| MBO |  |  |  |  | 5 |  | 5 |
| Other | 8 | 8 | 13 | 29 | 4 | 60 | 93 |
|  |  |  |  |  |  |  |  |
| Total | 13 | 16 | 24 | 53 | 10 | 64 | 127 |

Source: Questionnaire.

*Budget*

The government contribution to CELOS comes from the Ministry of Education, but it is channeled through the budget of the University of Suriname. It covers the salaries and some of the operational costs, but hardly provides any funding for research costs (Table 16). This deficiency is compensated only very partially by own income and external funding. As a result, the research activities of CELOS are strongly influenced by the priorities of foreign donors.

**Table 16: Expenditures CELOS 2008-2012**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 2008 | 2009 | 2010 | 2011 | 2012\* |
| *University budget* |  |  |  |  |  |
| Salaries | 3.000 | 2.900 | 3.500 | 5.140 | 6.750 |
| Operational costs | 0.387 | 0.446 | 0.235 | 0.120 | 0.740 |
| Capital costs | 0.003 | 0.004 | 0.025 | 0.000 | 0.160 |
| Total | 3.390 | 3.350 | 3.760 | 5.260 | 7.650 |
|  |  |  |  |  |  |
| *Extra-comptable* |  |  |  |  |  |
| Salaries | 0.078 | 0.190 | 0.115 | 0.018 | 0.065 |
| Operational costs | 0.200 | 0.100 | 0.170 | 0.131 | 0.122 |
| Capital costs | 0.017 | 0.055 | 0.015 | 0.028 | 0.020 |
| Total | 0.295 | 0.345 | 0.300 | 0.176 | 0.207 |
|  |  |  |  |  |  |
| *Consolidated* |  |  |  |  |  |
| Salaries | 3.078 | 3.090 | 3.615 | 5.158 | 6.815 |
| Operational costs | 0.587 | 0.546 | 0.405 | 0.251 | 0.862 |
| Capital costs | 0.020 | 0.059 | 0.040 | 0.028 | 0.180 |
| Total | 3.685 | 3.695 | 4.060 | 5.436 | 7.857 |

Source: Questionnaire; \*Budget data.

Over the past five years, between 84 to 95% of the consolidated budget of CELOS was spent on salaries. Capital investment over these years has been minimal. This is also reflected in the survey results, which indicated that a large part of the laboratory equipment, agricultural machinery and transport vehicles is out date and depreciated and needs replacement. Like ARD, CELOS has known better times and has gone through several crises over the past decades. Mobilizing sufficient resources seems to be a major bottleneck.

*Survey results*

The respondents of the survey (heads of divisions at CELOS) classified the agricultural research facilities at CELOS as well as the operating budget for research as fairly sufficient to insufficient (see Annex 4 for a summary of the results). Being part of the university, non-research activities of CELOS staff includes teaching and supervising students. In addition, the Laboratory Cluster is doing some diagnostic work for third parties (farmers, etc.), while the Forestry Division is sometimes doing more development-oriented work such as helping local communities in the interior areas setting up new businesses.

Most divisions report international collaboration, in particular with EMBRAPA. Other agencies mentioned include: FAO, Procitropicos, Tropenbos, WWF, GEF, von Tunen Institute, and the University of Brasilia. Some attendance of international workshops and conferences is reported by the Agronomy and Forestry Clusters, but not by the Laboratory Cluster. Access to international literature is rated by the respondents as ‘fairly good’ on average, but with scores both lower and higher.

Only the Forestry Division reports some publications in peer-reviewed research publications. None of the other divisions do.

In addition to research reports, CELOS produces a variety of publications such as brochures and leaflets, posters, manuals, and articles in the popular press.

The respondents reported that the collaboration with agricultural extension at LVV is limited. In part this may be due to the rather y limited agricultural extension capacity in the interior areas.

## 2.7 Faculty of Technical Sciences, ADEKUS

The Faculty of Technical Sciences (FTS) comprises the following BSc programs: (i) Agricultural production; (ii) Mineral production; (iii) Electrical engineering; (iv) Infrastructure; (v) Environmental sciences; and (vi) Mechanical engineering. The Department of Agricultural Production, which has a faculty staff of about 14, offers the following BSc-level specializations: crops, livestock, forestry, fisheries, and agro-processing. The BSc program takes three years. The annual intake of new students by the Agricultural Production Department is currently about 20. Some research is undertaken by staff of the agricultural production department. Most of it is related to supervising student thesis work.

In addition to the BSc programs, the FTS also runs several MSc programs, including an international Master of Science Program on Sustainable Management of Natural Resources (SMNR). This Master Program was launched in 2009 in collaboration with the Flemish Universities of Belgium and is part of a larger Institutional University Cooperation program between ADEKUS and the Flemish Universities (which was launched in 2008 and is expected to run for 10 years). Part of the teaching in this program is done by Flemish and other foreign professors and the teaching is in English in order to attract students from within the Caribbean region and elsewhere. Total program staff is about 26 professors and lecturers –11 local and 16 foreign. All of them are part-time.

The aim of the SMNR program is to offer a research-oriented MSc degree covering topics such as land and water management, renewable energy, mineral resources, sustainable forestry, sustainable agriculture, biodiversity and natural products. Projected annual intake of new students is 15-30. No foreign students have been attracted yet. Because most students combine their study with work, there has been a considerable dropout of students (30%) and only one student of the first group graduated within three years (MSNR 2012 a & b).

Some of the MSc research done under this program is of relevance to agriculture. Recently completed MSc thesis included topics such as:

* Seabob shrimp trawling in Suriname: spatio-temporal fishery patterns in relation to population characteristic, Formulating advice for an ecosystem-based fisheries management.
* A measurement system for methane emission of flooded rice cultivation.
* Comparison of generated drainage networks of large river basins using different available topographic data sets.
* Developing a framework for the sustainable management of Suriname’s genetic resources (MSNR 2012b).

SMNR lecturers are also expected to conduct research. One of the local SMNR lecturers is working on a PhD dissertation: “Evaluation of agricultural practices by farmers in Suriname (district Commewijne) and the use of constructed wetlands for treatment of agricultural runoff.” In addition, SMNR lecturers are working on research projects such as “Evaluation of plant-derived substances for their potential efficacy against angiogenesis”, “Research about the movement of the salinity in the Nickerie river” and “Future change of the climate in Suriname as derived from the PRECIS regional climate modeling system” (MSNR 2012b).

While there is some concrete evidence of research output (in particular by the SMNR program), it is very difficult to get even an approximate figure for staff time and expenditures dedicated by FTS to agricultural research.

## 2.8 Summary

Figure 3 provides an overview of the different public entities that are involved in agricultural research and extension in Suriname. The aquaculture research and training center does not exist yet, but budget for its establishment has been approved.

The differentiation of research into statutory, diagnostic & monitoring, and innovation-oriented research is important because they target quite distinctive policy-objectives. Despite the fact that they use the same laboratory equipment and scientific staff, these activities differ intrinsically from each other. Statutory and diagnostic research can be classified as routine activities. Their performance is best monitored on the basis of the number of controls executed and samples analyzed. Innovation-oriented research, however, is not a routine activity. Every innovation intervention is unique. Therefore, innovation-oriented research organizations around the world tend to work on the basis of research projects, which bring people and resources together for a defined period of time to address a specific challenge or opportunity. The emphasis in such organizations is on managing a portfolio of agricultural research projects which changes through time. Given the relative dominance of statutory and diagnostic research in ARD, the practice within ARD to work on the basis of projects is very much underdeveloped or nonexistent. For example, all the reporting within ARD is done by division, not by project. It is only when external resources are involved that there is some notion of a project.

To strengthen ARD’s innovation orientation it is important to introduce an organization and management system that is based on projects. However, this does not apply to the statutory (and diagnostic) research activities. They are probably better off to be organized along functional lines as they are at present.

In order to strengthen the linkage between agricultural research and extension, a merger has been suggested between ARD and the extension service of the Agricultural Department. In our opinion, such a merger only makes sense for the innovation and diagnostic research parts of ARD. It is better to keep statutory research out of such a merger, as it is an intrinsically different activity. Borderline cases are ARD’s pesticides division and the seed unit as they have links with extension. Figure 2 can also help to contemplate the strengths and weaknesses of other possible mergers, such as: (i) merging all crops, livestock and fisheries research and extension at LVV in a single entity; or (ii) merging ARD and CELOS.

**Figure 3: Overview agricultural research and extension in Suriname**

*ADRON*

*CELOS, ADEKUS*

Fisheries Inspection Institute

*Fisheries Department*

Veterinary Services

Livestock development division

*Livestock Department*

*Innovation-oriented research*

*Agricultural Research Department*

Extension service

Agricultural Production Department

Sustainable Management of Natural Resouces MSc Program

Agronomy

Forestry

*Agricultural Department*

Crop protection

Laboratory services

Plant Health and Quality Insp.

Residue Laboratory

Pesticides Division

Seed Unit

Codex Division

Horticulture

Fruit

Flowers & ornamentals

*Diagnostic & monitoring*

*Statutory research*

*Extension*

*Faculty of Technical Sciences, ADEKUS*

*Aquaculture research and training center*

Communication program

Rice breeding

Crop management

Post-harvest

Soil & Agrohydrology

Entomology

Nematology

Fruit Fly

Table 17 summarizes the total public agricultural research and extension budget for 2013. Considering only the recurrent budget, the bulk of the research and extension investment is going into crops. Relative to their contribution to AgGDP (respectively 20% and 24%), livestock and fisheries research and extension receive relatively little attention. This also still holds after taking out the substantial AHFS component that is included in ARD.

**Table 17: 2013 Budget for Agricultural Research and Extension in Suriname**

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

The 2013 development budget for agricultural research and extension is exceptionally large. However, most of this investment is going into the rehabilitation of old infrastructure and establishment of some new infrastructure. Only minor items are going into actual research and extension activities. LVV has to be careful not to end up with a lot of new or rehabilitated infrastructure, but with very few (qualified) staff and operating budget to implement activities.

Table 18 provides an estimate of the intensity ratios for agricultural research and extension in Suriname, which are calculated as all public agricultural research and extension expenditures as a percentage of AgGDP.

The estimated agricultural research intensity ratio yields 1.1% of AgGDP for 2011. This agricultural research intensity ratio is substantially above the average for middle-income countries (0.6% -- Beintema et al 2012) and within the range of 1-1.5% recommended by the GCARD Road Map (GFAR 2011). This relatively high score of Suriname is typical for a small country. Roseboom, Cremers and Lauckner (2001), 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). The problem with small countries is that they lack economies of scale. To maintain the same level of services as large countries, they have to invest relatively more. In that light, we recommend for Suriname an agricultural research investment level of 1.5-2.0% of AgGDP. This is still substantially lower than what rich countries invest – about 3% of AgGDP on average (Beintema et al 2012).

**Table 18: Calculation of the Public Agricultural Research and Extension Intensity Ratios, 2011**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Research expenditures** | **Extension expenditures** | **Notes** |
|  | *(million SRD)* | |  |
| ARD, LVV | 4.777 |  | Estimated current budget expenditures. ARD has a substantial AHFS component, which in many other countries is reported separately from research. |
| Agricultural Department, LVV |  | 4.777 |  |
| Livestock Department, LVV | 0.196 | 0.589 |  |
| ADRON | 2.660 | 0.140 | We have assumed that ADRON spends 5% of its budget on extension activities. |
| CELOS | 5.436 |  | Includes forestry research, but AgGDP also includes forestry production. |
| ADEKUS | NA |  | Mainly supervising BSc and MSc theses |
| Total | 13.069 | 5.506 |  |
| AgGDP | 1221 | 1221 | Central Bank statistic |
| Intensity ratio | 1.07% | 0.45% | These intensity ratios would be considerably higher if we would factor in LVV’s development budget. Most of that, however, is going into infrastructure and into establishing AHFS – these are one time investments that distort the overall picture. |

In the case of public agricultural extension there is considerable less international quantitative data and analysis available that would allow 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. In relative terms the investment in agricultural extension in Suriname is considerably weaker than in agricultural research.

# 3. LVV Policy Regarding Agricultural Research and Extension

The Agricultural Sector Plan 2005-2010 (LVV 2004) argued that there is substantial fragmentation and duplication in agricultural research in Suriname, which are 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 to give agricultural research a financial impulse and improve collaboration and coordination between the different research actors. In order to achieve the latter, the Plan proposed the establishment of a National Agricultural Research Council. This Council was established in 2008, but met only twice in 2008/2009 and has been dormant since then. Regarding agricultural extension, the Plan indentified 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 2010-2015 (LVV 2010) and in a series of white papers (some eight in total) published in 2011 (LVV 2011 a-h), which provide more specific detail that is summarized in table 19. Except for a white paper on agricultural health and food safety, all other white papers are commodity specific (rice, bananas, horticulture, horticulture agribusiness, livestock, fisheries, and aquaculture). Hence policy statements regarding agricultural research and extension are quite scattered. All commodity white papers (except bananas) stress the need for better extension and research, but they do not go in much detail how this should look like. No new Agricultural Sector Plan (the latest one ended in 2010) has been produced.

**Table 19: Summary of Agricultural Research and Extension Plans LVV**

|  |  |
| --- | --- |
| **White paper** | **Research and extension recommendations / plans** |
| Rice | # Intensification of rice research, extension and training. Continuation of ADRON’s rice breeding, agronomic and post-harvest research. The latter has to explore possibilities of post-harvest ‘value addition’ such as a better use of waste products. Collaboration with Guyana to be continued.  Rice extension is the responsibility of LVV (ADRON’s role is that of knowledge center, backstopping LVV extension officers). The recommendations/ plans regarding rice extension are the same as those for the whole agricultural extension service. A major upgrade of LVV’s agricultural extension staff is needed.  # Extension methods have to be more participatory, but farmers paying for extension services is not contemplated for the moment.  # Capacity building is needed throughout the whole rice value chain at all levels – from farmer organizations to input suppliers. |
| Banana | None |
| Horticulture | To improve R&D and extension in support of the horticulture value chains, the white paper proposes the following action program: (i) Strengthening and professionalization of research staff; (ii) Upgrading of laboratory facilities regarding seeds and plant protection; (iii) Promotion of improved technologies (e.g. green houses); (iv) Upgrading of researchers, extension officers and technical support staff regarding international standards and norms in horticulture; (v) Stimulating product innovations through public-private partnerships; (vi) Capacity building in more efficient production systems and quality management (GAP, GMP and GHP); (vii) Quality improvement of traditional Surinamese agri-food products; (viii) Quality improvement of seeds and planting materials; and (ix) Preparing the certification of planting materials. |
| Livestock | Development/extension priorities: (i) Promotion of the use of improved grassland; (ii) Upgrading and expansion of the veterinary services; (iii) Introduction of GAP practices and certification among livestock farmers (and in particular dairy farmers); (iv) Adoption of better animal breeding practices; (v) Expansion of the number of milk collection points; (vi) Transformation of the State Farm into a livestock training and demonstration facility; (vii) Feasibility study large-scale, export-oriented livestock production; (viii) Feasibility study livestock production in disbanded mining areas; and (ix) Stimulation of local animal feed production. (Because the Livestock Department only has very limited research capacity of its own, many of the studies will have to be outsourced.) |
| Fisheries | # Better research and data collection is needed in order to facilitate the implementation of government fisheries policies such as the Fisheries Management Plan in order to secure the long-term sustainability of the fisheries sector. At the same time, all actors within the sector have to be made aware of this government policy and agree with the policy (or at least act according to the rules).  # Market research should help to stimulate the development of the fisheries sector.  # The establishment of an aquaculture research and training centre is being proposed in order to stimulate small- and medium-scale aquaculture production. It will test and adapt imported aquaculture technology to local circumstances, demonstrate aquaculture techniques, provide information and advice, and function as a hatchery for specific species.  # Aquaculture research topics that will be outsourced include: (i) Reduction of the feed costs in aquaculture through local sourcing of feed stuff; (ii) A survey regarding the pollution of rivers in Suriname, the impact of such pollution on fisheries/aquaculture, and how to reduce the pollution; |
| Agricultural Health and Food Safety | The AHFS action plan comprises the following components: (i) Institutional strengthening (investments in buildings and laboratory equipment); (ii) Capacity strengthening (hiring and training of staff; HACCP and GAP certification; and animal and plant disease survey and monitoring system); (iii) Raising public awareness (including workers in agriculture and fisheries) regarding AHFS risks and how to avoid them; and (iv) Communication plan. A total budget of SRD 28 million is needed for this plan. |

The development budgets for 2011-2013 provide more concrete insight into LVV’s agenda regarding agricultural research and extension.

One major initiative is to rehabilitate a great deal of the old infrastructure of LVV and turn it into demonstration and training units or information centers, namely:

* The four experimental gardens operating under ARD will be rehabilitated and their demonstration aspect strengthened. In addition, they are responsible for maintaining plant and fruit tree collections, operate as nurseries and provide ARD researchers with experimental fields;
* The old agricultural research building will be rehabilitated and transformed into an agricultural information center;
* The old State Farm is being transformed into a livestock training and demonstration facility, which will be run as state-owned foundation; and
* The Fisheries Department is planning to set up a research and demonstration unit for small-scale aquaculture production.

Another initiative is to reorganize agricultural extension and upgrade the knowledge and skills of the extension officers.

Specific agricultural innovation topics that are receiving development budget support include:

* Agricultural Health and Food Safety – major investments in infrastructure and capacity building;
* Cluster laboratory – this is linked to AHFS but can also be used by the other research divisions;
* ADRON – regular subsidy;
* Promotion of greenhouse production – demonstration greenhouses set up in various locations, extension officers and other LVV staff (to be) trained in greenhouse production;
* Promotion of home garden production by making good quality planting material available;
* Horticulture value chain development (for export) – concentration on a selected number of crops;
* Promotion of small-scale, home garden fruit production by providing good quality planting material and production information;
* Promotion of Good Agricultural Practices (GAP) practices and certification;
* Training of extension officers and farmers in agribusiness management skills;
* Promotion of small ruminant production; and
* Promotion of small-scale aquaculture production.

# 4. Benchmarking of Agricultural Yields

Benchmarking the agricultural yields of Suriname against international averages is rather tricky as production statistics for Suriname are rather incomplete or distorted. For example, FAO still reports that Suriname produces sugarcane, while it stopped doing so long ago. One of the complications is that Suriname produces a very wide variety of crops, but most of them in very small amounts. There are only three crops that cover nation-wide more than a 1000 ha, namely: rice (54,500 ha), bananas (2,400 ha), and oranges (1,420 ha).Total acreage under vegetables is less than 1,000 ha and most vegetables covered only between 25 to 100ha each in 2009 (LVV 2010a).

*Rice yield*

Figure 4 provides a long-term picture of the average rice yield in Suriname in comparison with some benchmarks. What stands out is that Suriname has lost its very significant yield advantage over time and has started to lack behind. This is best illustrated at the hand of Guyana, which produces rice under very similar circumstances. Throughout the 1960s, 1970s, 1980s and early 1990s, rice yields in Suriname (very much) exceeded those of Guyana, but since the mid-1990s rice yields in Guyana have exceeded those of Suriname in most years. This comparison is based on FAO data, which many (including ADRON) believe underestimate the actual rice production in Suriname (farmers and processors underreport in order to avoid taxation) and hence yields.

**Figure 4: Rice production per hectare harvested (kg/ha)**

Source: FAOSTAT

ADRON reports average yields by farmers that are 15-22% higher than those reported by FAO and 10-20% higher than the official statistics by LVV (Table 20). While such upward correction may paint the current rice yields in Suriname somewhat more positively, the point remains that Suriname has lost a lot of its yield advantage over time. At the same time, some caution is warranted regarding rice yield data. There are substantial yield differences between rain-fed and irrigated rice production systems, as well as between rice production systems that harvest once or twice (or sometimes even more) a year. In the latter instance, yield per harvest may be lower because of a shorter growing season but annual yield per hectare may be higher. For example, average rice yields under irrigation in Brazil are in the order of 7-8 ton/ha, but with only one harvest per year (irrigated rice is concentrated in the South of Brazil). In contrast, Suriname produces with two harvests 8-10 ton/ha per year. In the end of the day, however, what matters is the cost price of rice. Without detailed cost data, it is difficult to judge their relative efficiency.

The development of hybrid rice varieties, which started in China in the 1980s, has now also reached Brazil and will most likely boost rice yields in Brazil quite significantly in the coming years. There is some mention of developing hybrid rice seed by ADRON’s plant breeding program, but it is unclear how close this work is to an actual release of hybrid rice varieties.

**Table 20: Comparison of Rice Yield Data**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1985** | **1995** | **2000** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** |
| *FAO* |  |  |  |  |  |  |  |  |  |
| Area (ha) | 74,890 | 60,000 | 41,995 | 45,563 | 44,232 | 42,087 | 43,654 | 54,492 | 53,553 |
| Production (MT) | 299,185 | 242,000 | 163,655 | 163,955 | 182,659 | 179,012 | 182,877 | 229,370 | 226,686 |
| Yield (kg/ha) | 3,995 | 4,033 | 3,897 | 3,598 | 4,130 | 4,253 | 4,189 | 4,209 | 4,233 |
| *White Paper* |  |  |  |  |  |  |  |  |  |
| Area (ha) | 74,900 | 61,400 | 42,000 | 47,200 | 44,200 | 40,300 | 43,700 | 54,500 | 54,800 |
| Production (MT) | 325,900 | 216,000 | 164,000 | 185,300 | 182,700 | 188,600 | 182,900 | 229,400 | 228,500 |
| Yield (kg/ha) | 4,351 | 3,518 | 3,905 | 3,926 | 4,133 | 4,680 | 4,185 | 4,209 | 4,170 |
| *ADRON* |  |  |  |  |  |  |  |  |  |
| Area (ha) |  |  |  | 44,500 | 44,000 | 41,100 | 43,300 | 53,500 | 51,475 |
| Production (MT) |  |  |  | 195,200 | 206,400 | 213,400 | 212,400 | 259,100 | 253,800 |
| Yield (kg/ha) |  |  |  | 4,387 | 4,691 | 5,192 | 4,905 | 4,843 | 4,931 |

Sources: FAOSTAT, LVV (2011d), ADRON (2011)

*Bananas*

After the take-off of the banana industry in the 1960s, banana yields in Suriname have fluctuated for a long period between 20 and 30 tons per hectare, but they started to falter in the 1990s. At the same time, Central American competitors continued to raise their yields to the upper 30 tons per hectare. SBBS collapsed in 2002, but was brought back into operation with a lot of EU assistance. Since then, banana yields have improved remarkably and yields are now in the 40-50 ton per hectare range (Figure 5). This is pretty good compared to yields in the rest of the world. However, it is all based on imported technology.

**Figure 5: Banana production per hectare planted (kg/ha)**

Source: FAOSTAT

*Oranges*

Orange production in Suriname has fluctuated around 1200-1400 ha over the past decade. Average yields per hectare are showing some increase, but are only about half the South American average and also substantially lower than the world average (Figure 6). There is a considerable yield gap that could be closed, but which will require a far more professional way of production at a larger scale. Only the yield averages reported for Central America and the Caribbean are more-or-less in the same range as the one for Suriname.

**Figure 6: Orange production per hectare (kg/ha)**

Source: FAOSTAT

*Milk*

Dairy farming in Suriname is rather underdeveloped. There are only some ten farmers in Suriname that have herds of 50 dairy cows or more. The large majority of dairy farmers have only 3-4 cows. Most dairy farmers milk by hand, only the larger farms have been mechanized. The major bottleneck is the poor feeding of dairy cattle (they are often just grazing along the road or the poor quality of the grassland), resulting in very low average yields (6-8 liters per day – Poerschke 2010). Under ideal circumstances good cows can give 50-60 liters per day. Milk prices are kept artificially high (in 2011 it was raised to SRD 2.50 /liter – which is far above the world market price) in order to support the large group of small, inefficient dairy farmers. This price support policy is probably supporting in particular the larger, more efficient farmers.

Table 21 shows the development of the volume of milk delivered to the Melkcentrale (the only buyer of fresh milk in the country) and the development of the milk price paid to farmers over the past decade. An unknown amount of fresh milk finds its way directly to the consumer or is being processed on-farm.

**Table 21: Milk Delivery to the Melkcentrale**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** |
| Milk delivery to the Melkcentrale (‘000 liters) | 1,449 | 2,107 | 2,898 | 3,644 | 4,401 | 5,684 | 5,847 | 6,055 | 5,120 | 4,935 |
| Milk price paid by the Melkcentrale | 0.60 | 0.92 | 1.30 | 1.61 | 1.60 | 1.60 | 1.77 | 1.90 | 1.90 | 1.90 |

Source: LVV (2010a)

*Vegetables*

Vegetables in Suriname are grown in relatively small volumes (i.e., less than 100ha each). Only okra covered more than 100 ha in 2009 (namely 117 ha). Overall, vegetable yields per ha in Suriname are higher than the Caribbean average, but lower than the South American and world averages. However, in the case of chili peppers and okra the reported yields for Suriname stand out as pretty good internationally.

**Table 22: Yields per Hectare for Some Key Vegetables (2009)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Suriname | Caribbean | South America | Central America | World |
|  | *(ton per hectare)* | | | | |
| Tomatoes | 16.4 | 13.0 | 50.0 | 28.3 | 34.0 |
| Cabbage | 17.3 | 18.8 | 25.7 | 16.0 | 28.4 |
| Cucumber | 20.6 | 10.4 | 15.6 | 30.0 | 30.7 |
| Chili peppers | 19.8 | 7.0 | 15.0 | 14.0 | 15.4 |
| Pumpkin | 16.8 | 6.4 | 17.6 | 17.9 | 12.7 |
| Okra | 14.6 | 8.6 | 5.1 | 7.8 | 6.7 |

Source: LVV (2010a) for Suriname and FAOSTAT for the different regions.

With the exception of rice, Suriname does not have breeding programs for any of the crops grown in the country. The volumes grown are far too small for breeding activities to pay off. This means that Suriname can only improve the *biological* potential of crops by importing improved varieties from elsewhere. However, actual yields in farmer fields are usually very much lower (50% or more is not exceptional) than the maximum biological yield under ideal production circumstances. This suggests that there is ample opportunity to increase yields by adopting better agronomic practices. One such opportunity is the production of vegetables in greenhouses, which can raise actual yields per hectare quite significantly (but also production costs). Moreover, they make vegetable production less dependent on climatic seasons and hence may help to dampen supply and price volatility.

# 5. SWOT Analysis of Agricultural Research and Extension

SWOT analyses of agricultural research and extension in Suriname are presented in tables 23 and 24. An overarching issue is the weak coordination and collaboration between research (ARD, but also ADRON, CELOS and ADEKUS), extension and market development. Moreover, LVV lacks dedicated specialists regarding market development.

**Table 23: SWOT Analysis Agricultural Research**

|  |  |
| --- | --- |
| Strengths  # Rich history of agricultural research  # Rice breeding program | Weaknesses  # Two parallel structures, but both have been in decline for a long time  # Large parts of the research infrastructure of ARD and CELOS run down and out of date  # Lack of funding for operational research costs at CELOS and ADEKUS  # Weak coordination and collaboration  # No culture at LVV to formulate research activities in the form of research projects and programs 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 too low – hardly any MSc’s left at ARD  # Weak research-extension linkages |
| Opportunities  # Present government committed to 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 | Threats  # 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 development of agriculture |

**Table 24: SWOT Analysis Agricultural Extension LVV**

|  |  |
| --- | --- |
| Strengths  # 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 | Weaknesses  # 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%<) |
| Opportunities  # 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 (?) | Threats  # 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 |

# 6. Options for Reforming Agricultural Research and Extension

Key insights derived from the diagnosis are:

1. Despite its enormous agricultural production potential, Suriname runs a deficit on its agricultural & food trade balance. Production costs are relatively high (in particular labor costs), while production efficiency is relatively weak (i.e., yields tend to be lower than the world average).
2. The research and extension capacity of Suriname is rather fragmented and there is a lack of coordination and collaboration between the different actors. There are various options of how to resolve this problem ranging from intensified coordination and collaboration to consolidation of (some of the) research and extension capacity into a single organization.
3. There is very little capacity within LVV to deal with market and value chain development issues. Such capacity is essential in order to accelerate the development of the agricultural sector and turn Suriname into an agricultural exporter.
4. With perhaps the exception of ADRON, most actors lack clear targets and M&E of results. A far stronger orientation on results is needed, which could be facilitated by organizing all innovation-oriented activities in the form of projects. Projects also allow mobilizing different organizations around a common goal.
5. Over the years, the educational profile of research and extension staff has eroded significantly. In the case of research, also the absolute number of staff in research positions has declined. This requires very serious attention.
6. Significant investments in agricultural research and extension infrastructure are underway, which should boost research and extension activities. However, this requires the mobilization of additional human resources and operating budgets and a strategy what to do and how.
7. Agricultural research in Suriname will have to limit itself mainly to screening and validation of imported technologies. The volume of production of most agricultural commodities is too small to do much more. Only in a few selected cases, some adaptive research is economically feasible.

The guiding principles agreed upon earlier for an agricultural innovation strategy are:

1. Adopt an innovation approach which integrates research, extension and market development.
2. Focus on results and clear measurable targets.
3. Adopt a demand-driven approach.
4. Minimize duplication.
5. Treat farmers and fishermen as partners and entrepreneurs and not as passive recipients of government advice.
6. Stimulate the learning capacity of farmers and fishermen.
7. Keep a focus on accessing international knowledge and technologies, by enhancing linkages with international research and extension organizations.
8. Try to be a dynamic, learning organization and experiment with different approaches.

The governmen can consider the following reform options:

**Option 1**. Leave the agricultural research and extension structure as it is. As a result, many of the problems noted above will continue, which negatively affects the overall efficiency and effectiveness of the agricultural innovation system;

**Option 2**. Adopt an agricultural innovation system perspective, which aims at: (a) closer linkages between research, extension and market development; (b) a stronger orientation towards results; and (c) switching emphasis from what you are doing (i.e., research, extension and market development) to what you want to achieve (i.e., innovation and development). The establishment of an Agricultural Innovation Council should mark this change in focus, improve the overall coordination and collaboration within the system, and provide guidance in the form of a system-wide agricultural innovation agenda. The introduction of agricultural innovation projects should substantially strengthen the orientation towards results and promote more cross-institutional collaboration between different actors. Moreover, LVV should try to steer the agricultural research capacity of CELOS and ADEKUS more strongly towards national agricultural research priorities by providing operational funding for research activities that target LVV priorities. Closer collaboration beween different actors within the system may in the medium-to-long run open the way for organizational mergers (for example between research and extension within LVV). The upgrading and expansion of the agricultureal research and extension infrastructure at LVV that is underway needs to be complemented with an upgrade and expension of staff in selected areas and adequate operational funds. These interventions should result into better coordination and collaboration between the different actors within the agricultural innovation system and make the system more result-oriented. This approach requires a serious commitment from the different actors to collaborate more intensively and overcome organizational and administrative dividing lines.

**Option 3.** Merge ARD and CELOS and transform it in an autonomous agricultural research institute. This idea was proposed by a consultant in 2003 (Everaarts 2003), but was not adopted at that time despite some positive feedback. The advantage of this merger is a consolidation of research capacity and an elimination of overlap and duplication. At the same time, however, such a merger will be difficult to pull off because of the involvement of different ministries and it will most likely create a greater distance between research and extension.

# References

Beintema, N., G-J. Stads, K. Fuglie and P. Heisey. 2012. *ASTI* [*Global Assessment*](http://www.asti.cgiar.org/pdf/ASTI_global_assessment.pdf) *of Agricultural R&D Spending: Developing Countries Accelerate Investment*. Washington, DC: IFPRI.

Everaarts, A.P. 2003. *Een Inventarisatie van het Landbouwkundig Onderzoek in Suriname*. Lelystad: Praktijkonderzoek Plant en Omgeving.

GFAR. 2011. *The* [*GCARD Roadmap*](http://www.fao.org/docs/eims/upload/294891/GCARD%20Road%20Map.pdf)*:* Transforming Agricultural Research for Development Systems for Global Impact. Rome: GFAR Secretariat, FAO.

Hosein, A. 2009. *Report Plant Breeding and Related Biotechnology Capacity: Suriname*. Port of Spain: Global Partnership Initiative for Plant Breeding Capacity Building (GIPB).e

Milton, P. 2009. *Country Report on the State of Plant Genetic Resources for Food and Agriculture: Suriname*. Paramaribo: FAO.

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

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2009. *Ministerie van Landbouw, Veeteelt en Visserij: Jaarverslag 2008*. Paramaribo: LVV.

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2010a. *5 jarenverslag 2005-2010 Ministerie van Landbouw, Veeteelt en Visserij*. Paramaribo: LVV.

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

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2011a. *Beleidswitboek Agrarische Gezondheid en Voedselveiligheid*. Paramaribo: LVV.

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2011 b. *Beleidswitboek Bananensector*. Paramaribo: LVV.

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2011c. *Beleidswitboek Agribusiness*. Paramaribo: LVV.

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2011d. *Beleidswitboek Rijst*. Paramaribo: LVV.

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2011e. *Beleidswitboek Tuinbouw*. Paramaribo: LVV.

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2011f. *Beleidswitboek Veeteelt*. Paramaribo: LVV.

Ministerie van Landbouw, Veeteelt en Visserij (LVV). 2011g. *Beleidswitboek Subsector Visserij – Deel 1*. Paramaribo: LVV.

Ministerie *van* Landbouw, Veeteelt en Visserij (LVV). 2011h. *Beleidswitboek Visserij – Subsector Aquaculture, Deel 2*. Paramaribo: LVV.

MSNR. January 2012. *Report of the Master of Science Programme in Sustainable Management of Natural Resources – 2009-2011*. Paramaribo: MSc in MSNR Office, ADEKUS.

MSNR. October 2012. *Annual Report Master of Science Programme in Sustainable Management of Natural Resources – 2011-2012*. Paramaribo: MSc in MSNR Office, ADEKUS.

Poerschke, I.J. 2005. *Organization and Management Aspects of Rice Industry in Suriname*. Paper prepared as part of Project 9ACP RPR 006: Support ot the Competitiveness of the Rice Sector in the Caribbean.

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: International Service for National Agricultural Research.

Roseboom, J. 2012. *Modernization of Public Agricultural Services Program: A Policy Analysis*. Washington, DC: Inter-American Development Bank.

SNRI/ADRON. 2010. *Jaarverslag 2009*. Nickerie: SNRI.

SNRI/ADRON. 2011. *Jaarverslag 2010*. Nickerie: SNRI.

Villanueva, G. 1986. *Agricultural Research in Suriname*. Paramaribo: IICA and LVV.

# Annex 1: Organograms

# Annex 2: Survey Results ARD



Note: The following divisions did not complete (this part of) the questionnaire: horticulture, fruit trees, plant health and quality inspectorate, residue lab, and CODEX.

# Annex 3: Overview ARD Research Activities

|  |  |  |  |
| --- | --- | --- | --- |
| **Research theme/ project / activities** | **Research division(s)** | **Results** | **Adoption rate** |
| **Cashew** research in collaboration with EMBRAPA (2006-present): visit by EMBRAPA experts (2006); training of staff in cashew production in Brazil (2007); and the setup of cashew field trials by Brazilian experts (2010) | Agro-hydrology and soil fertility | No results yet that can be transferred to farmers | 0 |
| **Composting** training (2006-2009): training of extension officers and farmers in traditional composting. | Agro-hydrology and soil fertility | ?? number trained | ?? |
| **Composting** research (2010): research trial ‘The effect of compost on the soil fertility of sandy soils’ | Agro-hydrology and soil fertility | No results yet, research has to be continued | 0 |
| **Composting** research (2011): the use of different soil types mixed with compost for cultivation of **chinese cabbage** types in pots. | Agro-hydrology and soil fertility | No results yet, research has to be continued | 0 |
| **Composting** research (2013): testing of Bocashi composting together with the preparation and use of organic liquid fertilizers | Agro-hydrology and soil fertility | No results yet, research is ongoing | 0 |
| **Global GAP** training (2012): training of extension officers and farmers in Santo in soil and fertilizers | Agro-hydrology and soil fertility | ?? number trained | ?? |
| **Global GAP** training(2012): On-farm demonstration trials how to grow **eggplant, bittergourd** and **okra** for export in line with GLOBAL GAP requirements. | Agro-hydrology and soil fertility; entomology; |  |  |
| **Coconut Palm** research (2011): inventory of existing literature and inventory of coconut palm growers. | Agro-hydrology and soil fertility | None | 0 |
| **IPM** research (2007-2012): testing of pesticides in order to control the **tomato** fruitborer | Entomology | A 50% drop in the incidence of fruitborer | 7 |
| **IPM** research (2009-2010): experiments in controlling curling disease in **hot pepper** | Entomology | No severe outbreak reported in the last three years | 3 |
| **IPM** research (2012): experiments in the control of stinkbug in **bittergourd** | Entomology | Research not completed yet | 2 |
| **Pesticides** labeling (2007): development of new legislation | Pesticides | New legislation adopted | 7 |
| Recycling of **pesticides** bottles (ongoing): Setting up of a recycling system for pesticide bottles | Pesticides | Eight collection points setup | 3 |
| Regulation of **pesticides** sales (ongoing): Preparation of new legislation | Pesticides | None yet | 0 |
| Training of extension workers, other governments employees and farmers in the proper use and handling of **pesticides** (ongoing) | Pesticides | Three training events in 2010, three in 2011 and 10 in 2012 | ?? |
| **Flower** research (????): Screening of **Curcuma Alismatifolia** varieties for export | Flowers and ornamental plants | Three of the six varieties were identified as most suitable for export | 0 |
| **Fruit fly** research (1986-present): Inventory of fruits in Suriname and their infestation by fruit flies | Fruit fly | Documented in annual reports and some specific publications. | 2 |
| **Fruit fly** research in collaboration with IAEA (2008-2013): Comparison of Carambola fruit fly with other Bactrocera’s | Fruit fly | No results reported yet | 0 |
| **Fruit fly** research (2010-2011): Lure/trap test | Fruit fly | Best trap identified, but is not available commercially. Final on-farm testing still pending. | 0 |
| **Fruit fly** research (2011-2012): Test of GF-120 to control fruit flies in **carambola** orchard | Fruit fly | Some impact found, but pesticide used was old. No definitive conclusion. | 0 |
| **Fruit fly** research (2012-2013): Test of solar insect killer for fruit fly control in **carambola** orchard | Fruit fly | Conclusion: not suitable. Report sent to extension service. | NA |
| **Fruit fly** research (2010-2013): Fruit fly trapping | Fruit fly | Reporting in annual reports. Some farmers requested traps. | 3 |
| **Fruit fly** research (2010-2013): Fruit fly rearing for parasitoid rearing | Fruit fly | Rearing of Carambola fruit fly to establish colony so that an egg-parasitoid can be introduced and reared. If effective, will be introduced in field. Colony is now ok, working on paperwork to get parasitoid introduced from Hawaii. | 0 |
| **Fruit fly** research (2011): Evaluation trapping systems for fruit flies in several Caribbean Islands | Fruit fly | See annual reports |  |
| Member of theTechnical Panel on **Fruit Flies** (TPFF) of the International Plant Protection Convention (IPPC)(2008-present): Contributions to the development of the ISPM 26 (Establishment of Pest Free Areas for Fruit Flies), ISPM 30 (Establishment of Areas of Low Pest Prevalence of Fruit Flies) and ISPM 35 (Systems Approach for Pest Risk Management of Fruit Flies). | Fruit fly | Participation in TPFF gives Suriname direct access to the latest developments in this area. | NA |
| **Seed quality** research (ongoing): (i) description valuable export crops; (ii) conduct germination tests for those crops; (iii) determination of 100 seed weight; (iv) survey under farmers how they produce their seed; and (v) literature study | Seed unit | Expected result: Collected knowledge should help farmers to source/produce better quality seed . | 0 |
| **Global GAP** information/training (2013) | Seed unit | Expected result: Farmers know how to document the origin of the seed that they have used | 0 |
| Establishment and maintenance of collections of fruit species (**citrus, passion fruit, mango**) at the experimental stations Dirkshoop and La Poule (ongoing) | Fruit crops |  |  |
| Improvement of **citrus** planting material at the experiments stations Dirkshoop and La Poule | Fruit crops |  |  |
| Demonstration trials of pruning **citrus** and **passion fruit** trees at the experiment stations Dirkshoop and La Poule | Fruit crops |  |  |
| Research of **mango** varieties suitable for export | Fruit crops |  | ?? |
| Survey fruit crops in Coronie (2012) | Fruit crops |  | 0 |
| Literature study dwarf **pomme de cythere** (2012) | Fruit crops | Resulted in a leaflet “ The cultivation of dwarf pomme cythere” | ?? |
| Testing of three different planting methods for **pomme de cythere** (2012) | Fruit crops | Resulted in a research report | ?? |
|  |  |  |  |

Note: This list is incomplete as not all research division did provide information.

# Annex 4: Survey Results CELOS



1. Crops that have been under investigation by AES/ARD in the past include: bananas, cacao, citrus, coconut, coffee, cotton, groundnuts (and other legumes), maize, oil palm, rice, rubber, spices, sorghum, sugarcane, tuber crops, and various fruits and vegetables (Villanueva 1986). [↑](#footnote-ref-1)
2. A project approach is less relevant for statutory and diagnostic research. Their activities are more routinely. [↑](#footnote-ref-2)
3. Because Suriname does not have a Plant Breeder’s Rights legislation in place, successful lines cannot be registered as varieties. However, some ADRON lines have been registered as varieties in France. [↑](#footnote-ref-3)
4. The absolute maximum for the "perfect" hybrid rice variety is believed to be 20 tons per hectare. [↑](#footnote-ref-4)
5. In the past CELOS has also conducted research on soybean, maize-soybean rotation and cashew. Apparently that work has stopped as it is not reported by the questionnaire. [↑](#footnote-ref-5)